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Motivation and physical activity in individuals with severe mental illness

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Summary

There is increasing evidence for physical activity having a positive impact on physical and mental health, as well as on illness symptoms in individuals with severe mental illness (SMI). However, individuals with SMI experience several barriers related to physical activity that makes it difficult for them to take advantage of the benefits associated with physical activity. One barrier consistently reported to impede physical activity is related to motivational issues. Targeting motivation has therefore been highlighted as a key in order to facilitate increased physical activity engagement. Thus, the main aim of the current thesis was to increase the knowledge about motivation for physical activity among individuals with SMI.

The thesis: The study has three parts: In the first part, two systematic reviews provide an overview of the existing research on motivation for physical activity of individuals with SMI (Paper I and II). In the second part, two cross-sectional studies addressed current limitations in the literature. This was done by purposeful choice of samples, employing a theoretical framework, examining inter- and intra-individual factors influencing motivation, and including objective assessment of physical activity (Paper III and IV). The third part examined the feasibility of increasing physical activity level among inpatients with SMI through implementing a short educational intervention among mental health staff (Paper V).

Part 1: The two systematic reviews showed that there is increasing interest for examining motivation for physical activity in individuals with SMI, but the current body of research is still relatively small. Results from the cross-sectional studies (k = 19) indicated that there was a positive association between theory-based motivational constructs and physical activity. However, results from intervention studies (k = 10) were equivocal with respect to change in motivational constructs and only in one trial was the main aim enhancing motivation for physical activity. Intervention studies yielded therefore little direction on how to enhance motivation for physical activity in persons with SMI. Consequently, there is a great need for

well-designed, longitudinal studies focusing mainly on motivation for physical activity and particularly on how to enhance motivation for physical activity in this population.

Part 2: The two cross-sectional studies were grounded on Self-Determination Theory (SDT) and recruited participants with SMI from a municipality (n = 106) and a public health network promoting physical activity (n = 88). The latter sample implied that participants had a positive preference for physical activity while participants in the former sample was intended to reflect a generalizable sample as to physical activity preferences. Results showed that need support and need satisfaction were positively associated with autonomous motivation. Physical activity was positively associated with the more autonomous forms of motivation and perceived competence while it was unrelated or negatively associated with the more controlled forms of motivation and amotivation. Together, this provide support for using SDT as a theoretical framework to understand physical activity behaviour in individuals with SMI. Findings also suggest that integrated regulation is positively associated with physical activity even when controlling for clinical variables and that it is not only the amount of physical activity that is important for health related quality of life, it is also the experience during physical activity. Finally, the municipality sample displayed low physical activity engagement, especially activity with moderate or vigorous intensity, but over 90% wanted to be more physically active. The majority of network participants were physically active on a regular basis.

Part 3: The 7-hour educational intervention regarding *"how to enhance physical activity motivation among inpatients with SMI"* was implemented as part of the professional development plan for the staff at three psychiatric wards. The results suggests that the intervention was insufficient in order to produce meaningful change in physical activity pattern among inpatients. Likewise, there seemed to be no change in motivation and self-efficacy for promoting physical activity among the staff. Lastly, across 14 weeks of direct

observation of physical activity about 70% of patients were doing less than one 10-min bout of physical activity per day and increased physical activity were associated with clear skies rather than rainy weather and week days rather than weekend days. Together the results suggests that more comprehensive and possibly multi-level interventions are needed to reduce the alarmingly high proportion of inpatients being inactive each day.

Conclusion: Altogether, this thesis shows that on a cross-sectional level there is a positive association between physical activity and several theory-based motivational constructs. This finding is similar to what is found in the general population. Results also indicate that individuals with SMI both have interest in physical activity and motivation for physical activity. However, the challenges related to increasing physical activity and the low physical activity level displayed by individuals with SMI suggest that they may need additional support to translate their interest and motivation into action. This entails that mental health staff are encouraged to enhance motivation in individuals with SMI in a structured, theory-based, and thorough manner.

Sammendrag

Det finnes nå økende belegg for at fysisk aktivitet har en positiv innvirkning på fysisk og mental helse, samt ulike sykdomssymptomer hos personer med alvorlige psykiske lidelser (APL). Personer med APL opplever mange barrierer knyttet til fysisk aktivitet, dette gjør det vanskelig for dem å dra nytte av fysisk aktivitet. Utfordringer med motivasjon er en barriere som ofte går igjen. Det å jobbe med motivasjon har derfor blitt løftet frem som avgjørende for å kunne fremme fysisk blant personer med APL. Hovedmålet med denne avhandlinger er derfor å bidra til økt kunnskap om motivasjon for fysisk aktivitet blant personer med APL.

Avhandlingen: Denne studien har tre deler: I den første delen gir to systematiske oversiktsartikler et sammendrag av eksisterende forskning på motivasjon for fysisk aktivitet hos personer med APL (Artikkel I og II). I del 2 bidrar to tverrsnittsundersøkelser til å adressere mangler i forskningslitteraturen. Dette blir gjort ved strategisk rekruttering av deltagere, basere studiene på et teoretisk rammeverk, undersøke inter- og intraindividuelle faktorer som kan påvirke motivasjon og inkludere et objektivt mål på fysisk aktivitet (Artikkel III og IV). Den tredje delen prøver ut muligheten for å øke aktivitetsnivået til inneliggende pasienter med APL ved å implementere et kort undervisningsopplegg om motivasjonsarbeid blant ansatte ved et psykiatrisk sykehus (Artikkel V)

Del 1: De to systematiske oversiktsartiklene viser at det er økende interesse for å undersøke motivasjon for fysisk aktivitet blant personer med APL, men at det foreliggende kunnskapsgrunnlaget er relativ lite. Resultater fra tverrsnittsundersøkelser (k = 19) indikerer at det er en positiv sammenheng mellom teoribaserte motivasjonsbegrep og fysisk aktivitet. Resultater fra intervensjonsstudier (k = 10) var tvetydige i forhold til endring av motivasjon og i kun en studie var hovedformålet å påvirke motivasjon for fysisk aktivitet. Studiene bidrar dermed med lite kunnskap om hvordan en kan påvirke motivasjon for fysisk aktivitet hos personer med APL. Det er derfor et stort behov for robuste, longitudinelle studier som i

hovedsak fokuserer på motivasjon for fysisk aktivitet og da særlig på hvordan en kan påvirke motivasjon for fysisk aktivitet.

Del 2: De to tverrsnittsundersøkelsene var basert på Selvbestemmelsesteori (SDT) og rekrutterte deltagere med APL fra en bestemt kommune (n = 106) og fra et offentlig organisert nettverk som fremmer fysisk aktivitet (n = 88). Den første gruppen var ment å reflektere et representativt utvalg personer med APL med tanke på deres forhold til fysisk aktivitet mens i den andre gruppen ble det antatt at deltagerne hadde et positivt forhold til fysisk aktivitet. Resultatene viser at behovsstøtte og behovstilfredsstillelse var positivt relatert til autonom motivasjon. Fysisk aktivitet var positivt relatert til mer autonome former for motivasjon og oppfattet kompetanse mens det var negativt eller urelatert til mer kontrollerte former for motivasjon og amotivasjon. Dette gir støtte for å bruke SDT som teoretisk rammeverk for å forstå fysisk aktivitetsatferd blant personer med APL. Resultater viste også at integrert regulering var assosiert med fysisk aktivitet selv når en kontrollerer for kliniske variabler og at det ikke bare er mengden fysisk aktivitet, men også innholdet, som er viktig i forhold til deltagernes helserelaterte livskvalitet. Deltagere rekruttert fra kommunen var i liten grad fysisk aktive, dette gjaldt særlig aktivitet med moderat eller høy intensitet, men over 90% ønsket å bli mer aktive. Majoriteten av deltagerne fra nettverket oppga å være i regelmessig fysisk aktivitet.

Del 3: En 7-timers undervisningsintervensjon som omhandlet "*hvordan fremme motivasjon for fysisk aktivitet blant inneliggende pasienter med APL*" ble implementert som en del av fagutviklingsplanen for ansatte på tre psykiatriske avdelinger. Resultatene indikerer at en slik intervensjon ikke er tilstrekkelig for å påvirke verken fysisk aktivitetsmønstret til pasientene eller motivasjon og mestringstroen til ansatte i forhold til å fremme fysisk aktivitet. Avslutningsvis viste 14 uker med direkte observasjon av fysisk aktiv at omlag 70% av pasientene gjennomførte mindre enn en 10 minutter sammenhengende aktivitet hver dag og at

økt fysisk aktivitet var assosiert med godt vær i motsetning til dårlig vær og hverdager i motsetning til helgedager. Tilsammen foreslår resultatene at det trengs mer omfattende intervensjoner for å redusere den høye andelen av inaktive inneliggende pasienter med APL.

Konklusjon: Tilsammen viser denne avhandlingen at det er en positiv sammenheng mellom fysisk aktivitet og teoribaserte motivasjonskonsepter. Dette er tilsvarende til hva som har blitt funnet i den generelle befolkningen. Resultatene indikerer også at personer med APL har både interesse for fysisk aktivitet og motivasjon for fysisk aktivitet. På den andre siden viser det lave aktivitetsnivået og utfordringene knyttet til å øke aktivitetsnivået blant personer med APL at de kan trenge ekstra støtte for å omgjøre interesse og motivasjon til handling. Ansatte i psykisk helsevern blir derfor oppfordret til å jobbe med motivasjon for fysisk aktivitet på en strukturert, teoribasert og grundig måte.

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I started at the Norwegian School of Sport Sciences (NSSS) in 2004 with a plan of taking one year of sport science. However, I was never "able" to quit and 12 years later I completed my doctoral thesis. So first I would like express my gratitude to NSSS and the Department of Coaching and Psychology for taking such good care of me when I was both a student and doctoral candidate.

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Mamma og Pappa, my sisters and I grew up in a safe and caring home and I think all three of us are endlessly grateful for growing up with you as parents. Marianne and Kristine, I value your support as my sister and for being such great aunts (and for organising a lot of "joint" presents). To all my grandparents: I have always been proud of you and I can only hope my children will have the same relationship with their grandparents. To my family-in-law, Bente and Erik, I am happy to be part of your family and next year I will be back and competing for another "Idrettsmerke". Last, but not least, to my three girls: Kristin, you made this journey so much easier and I love you. Sara and Nora, you put things in the right perspective and are the most important parts of my life.

Anders Farholm, Oslo, 1th December, 2016

List of papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals:

I. Farholm, A., & Sørensen, M. (2016a). Motivation for physical activity and exercise in severe mental illness: A systematic review of intervention studies. *International Journal of Mental Health Nursing, 25,* 194-205. DOI: 10.1111/inm.12214

II. Farholm, A., & Sørensen, M. (2016b). Motivation for physical activity and exercise in severe mental illness: A systematic review of cross-sectional studies. *International Journal of Mental Health Nursing, 25,* 116-126. DOI: 10.1111/inm.12217

III. Farholm, A., Sørensen, M., Halvari, H., & Hynnekleiv, T. Physical activity, motivation, apathy, and functioning in inhabitants with mental illness from a rural municipality: A cross-sectional study (in review)

IV. Farholm, A., Sørensen, M., & Halvari, H. (2016). Motivational factors associated with physical activity and quality of life in people with severe mental illness. *Scandinavian Journal of Caring Sciences*, DOI: 10.1111/scs.12413

V. Farholm, A., & Sørensen, M. Increasing physical activity in patients at a psychiatric hospital through implementing a short educational intervention among staff: A feasibility study (manuscript in preparation)

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INTRODUCTION

Mental illness has profound consequences on both a societal and personal level and it is estimated to affect approximately 27% of the adult EU population within any given 12-month period (Wittchen & Jacobi, 2005). Globally, it is estimated that in 2010 mental illness had a cost of US$ 2.5 trillion and this is expected to increase to US$ 6.0 trillion in 2030 (Bloom et al., 2011). On the individual level it can cause significant disturbance in cognition, emotional regulation, and behaviour and it is associated with major distress or disability in occupational, social ,or other personally important activities (American Psychiatric Association, 2013).

Furthermore, it is well established that individuals with severe mental illness (SMI), such as schizophrenia, bipolar disorder, and major depression, have increased prevalence of physical health illnesses. This comorbidity includes amongst other things elevated rates of metabolic syndrome, cardiovascular disorders, Type-2 diabetes, hypertension, respiratory disorders, hyperlipidaemia, and obesity (Allison et al., 2009; De Hert et al., 2011; Leucht, Burkard, Henderson, Maj, & Sartorius, 2007; Vancampfort et al., 2013d; 2014a; 2016a). Next, there is extensive evidence for individuals with SMI having an excess mortality rate compared with the general population, resulting in in approximately 20 and 15 years shorter life expectancy for men and women, respectively (Harris & Barraclough, 1998; Nordentoft et al., 2013; Wahlbeck, Westman, Nordentoft, Gissler, & Laursen, 2011). Individuals with schizophrenia and bipolar disorder seem particularly subject to increased mortality (Laursen, Munk-Olsen, Nordentoft, & Mortensen, 2007). Alarmingly, there are studies indicating that this mortality gap has increased over time (Laursen & Nordentoft, 2011; Lawrence, Kisely, & Pais, 2010; Saha, Chant, & McGrath, 2007). Altogether, this makes mental illness the fifth leading global cause of disability-adjusted life years and the leading cause of years lived with disability, accounting for respectively 7.4% and 22.9% of the total burden (Whiteford et al., 2013).

Although suicide can explain part of the reduced life expectancy, the main contributor is physical illness, in particular cardiovascular disorders (Crump, Sundquist, Winkleby, & Sundquist, 2013; Crump, Winkleby, Sundquist, & Sundquist, 2013; Laursen et al., 2013; Nordentoft, Mortensen, & Pedersen, 2011). Several factors in a complex interplay contribute to the poor physical health in people with SMI. First, individuals with SMI display disproportionally high rates of unhealthy behaviour (i.e., smoking, drug abuse, poor diet, and sedentary life styles), which are well known to negatively affect physical health (Bobes, Arango, Garcia-Garcia, & Rejas, 2010; Davidson et al., 2001; McCreadie, 2002, 2003; Osborn, Nazareth, & King, 2007; Scott & Happell, 2011). Secondly, cardiometabolic side effects of antipsychotic medication (De Hert, Detraux, van Winkel, Yu, & Correll, 2012), genetic disposition (Andreassen et al., 2013; Hansen et al., 2011; Ryan, Collins, & Thakore, 2003), and health care disparities (De Hert et al., 2009; Lawrence & Kisely, 2010) add further burden to the physical health problems experienced by people with SMI.

Physical activity as a means to improve physical health has long been widely acknowledged (Haskell et al., 2007; Warburton, Nicol, & Bredin, 2006). The potential of physical activity was highlighted in a recent meta-analysis, which showed that physical activity was broadly as effective as pharmacological interventions in preventing mortality caused by cardiovascular diseases (Naci & Ioannidis, 2013). However, the effect of physical activity is not confined to physical health only. In the general population there is an abundance of evidence for physical activity having a positive impact on psychological well-being, mental health, and quality of life (Berger & Tobar, 2007; Biddle, Fox, & Boutcher, 2000; Biddle & Mutrie, 2008; Bize, Johnson, & Plotnikoff, 2007; Landers & Arent, 2007).

More recently, the benefit of physical activity for managing symptoms and improving various mental health outcomes have been demonstrated among individuals with SMI (e.g., Rosenbaum, Tiedemann, Sherrington, Curtis, & Ward, 2014). Accordingly, there are strong

arguments for employing physical activity as an adjunct part in treatment of individuals with SMI. Unfortunately, physical activity is underutilised as a treatment strategy (Sylvia et al., 2013) and research consistently shows that individuals with SMI engage in little physical activity and less than the general population (Janney et al., 2014; Jerome et al., 2009; Stubbs et al., 2016a). Over the last decade research has identified several barriers and facilitators that can influence physical activity engagement in individuals with SMI (e.g., Firth et al., 2016a)—among them is motivation, or lack thereof (Fraser, Chapman, Brown, Whiteford, & Burton, 2015). Indeed, motivation has been highlighted as one of the most important research topics within the field of physical activity and SMI (Vancampfort et al., 2016e, 2016f). Moreover, there have been several calls for developing novel approaches to facilitate physical activity motivation, understand the influence of intrinsic and extrinsic motivation, and better understand how to encourage individuals with SMI to begin and continue with physical activity (Bonsaksen, 2011; Gorczynski & Faulkner, 2010; Kane, Lee, Sereika, & Brar, 2012), The work constituting the present thesis was carried out to improve our knowledge about motivation for physical activity among individuals with SMI.

Structure of the thesis

The next part of the introduction will outline issues related to defining SMI. This will be followed by an overview of the knowledge base as to physical activity level and preferences, as well as barriers and facilitators influencing physical activity in individuals with SMI. Then a review on the benefits of physical activity for this population will be presented. These two aspects are included in the thesis because they serve as important justifications for targeting motivation for physical activity among people with SMI. The last part of the introduction will outline previous research on motivation for physical activity in persons with SMI and present the tenets and empirical underpinnings of Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000a), which serves as the theoretical framework of the thesis. The

introduction will be concluded with the purpose of the thesis and the research questions that guided the study. The methods chapter will start by presenting the overall research design of the thesis before detailing the purpose, study design, and procedures, as well as the measurements applied and data analyses performed in each individual paper. The main results of each paper are presented in the result chapter and the reader is referred to the attached papers for more details. In the discussion chapter, each research question will be discussed separately before a more general discussion is provided. The thesis' methodological limitations, clinical implications, and suggestions for future research will also be discussed. I will conclude with a short concluding paragraph summarising the main findings of the thesis.

Defining severe mental illness

A mental disorder can broadly be described as a syndrome characterized by "clinically significant disturbance in an individual's cognition, emotion regulation, or behaviour that reflects a dysfunction in the psychological, biological, or developmental process underlying mental functioning. Mental disorders are usually associated with significant distress or disability in social, occupational, or other important activities." (American Psychiatric Association, 2013, p. 20). However, there seems to be no agreement at an international level on a definition of SMI (Lora, Bezzi, & Erlicher, 2007; Slade, Powell, & Strathdee, 1997). The various definitions proposed appear to be either hyper or hypo inclusive. This is highlighted by Schinnar, Rothbard, Kanter and Jung (1990) who applied 17 different definitions of SMI on a sample of 222 adult inpatients. Depending on the definition selected, between 4% and 88% of the inpatients qualified for SMI.

As a general rule, the criteria for defining SMI are based on diagnosis, disability, and service utilisation (Slade et al., 1997). When diagnosis is used as a criterion, psychotic disorders like schizophrenia and bipolar disorders and some non-psychotic disorders like major depression and panic disorders are typically included (National Advisory Mental Health

Council, 1993). However, diagnosis alone is inadequate for describing SMI because severity of symptoms and levels of disability are highly variable within each diagnostic category (Lora et al., 2007). For instance, general psychopathology has been found to be a better predictor for cognitive and executive functioning than diagnosis (Stordal et al., 2005). The third criterion, service utilisation, can be operationalized as duration of treatment or more precisely as number of admissions or outpatient contacts within a given time period (Lora et al., 2007; Ruggeri, Leese, Thornicroft, Bisoffi, & Tansella, 2000). The value of the two latter criteria and not restricting SMI to particular diagnostic groups is underscored in an epidemiological study examining prevalence of SMI in London and Verona (Ruggeri et al., 2000). According to their specific operationalization of SMI, one third of individuals with a functional psychosis were categorised with SMI and about 40% of those classified with SMI were affected by a non-psychotic disorder.

With respect to this thesis, no formal definition of SMI is applied nor is it restricted to examining motivation for physical activity in one particular diagnostic group. Rather, an effort was made to include diverse samples of patients who were suffering from SMI. The reason for this approach was a desire to increase the external validity through including participants who mental health care practitioners encounter in their clinical everyday practice.

The physical activity pattern in people with severe mental illness

Physical activity is a modifiable behaviour that has the potential to improve mental and physical health. Thus, it is important to have knowledge on the physical activity level, preferences, barriers, and facilitators related to physical activity in people with SMI.

Physical activity level of people with severe mental illness

Initial evidence on physical activity level in this population was often surveyed in epidemiological studies examining risk factors for cardiovascular disorders (Brown, Birtwistle, & Roe, 1999; Davidson et al., 2001; Elmslie, Mann, Silverstone, Williams, &

Romans, 2001; Kilbourne et al., 2007; McCreadie, 2003; Roick et al., 2007). In general, it was found that individuals with SMI tended to engage in less physical activity than the general population, a larger proportion was completely inactive, and when individuals with SMI were physically active it typically involved low intensity activities, such as walking.

Succeeding studies examining cardiovascular risk factors were surveys that had their main focus on physical activity level and variables associated with physical activity (e.g. Carpiniello, Primavera, Pilu, Vaccargiu, & Pinna, 2013; Faulkner, Cohn, & Remington, 2006; Nyboe & Lund, 2013; Ussher, Stanbury, Cheeseman, & Faulkner, 2007). While these studies yielded more detailed information on the physical activity pattern of the participants, the findings are largely in line with the above described results. In brief, individuals with SMI engaged in less physical activity than control persons, 20-25% achieved 30 minutes of physical activity on most days, 32% were inactive, 7% had a physical activity level described as moderate to high, 75% and 40% reported no vigorous or moderate activity, and low intensity activities was preferred. In contrast to this, two surveys found that 39-49% of the participants achieved the national physical activity recommendation (Daumit et al., 2005; McLeod, Jaques, & Deane, 2009). These numbers equalled those in a matched reference group and national norm data.

All of the studies discussed in the two preceding paragraphs used self-report measurements of physical activity, which is prone to both systematic and random errors and in most cases inferior to objective measurements of physical activity (Vanhees et al., 2005). It has become more common to apply objective measurements, like accelerometers, when assessing physical activity. However, using accelerometer precludes obtaining information on the qualitative aspects of the activity (e.g. what type). Use of subjective and objective measures can augment each other and it is therefore recommended to use multiple measures when assessing physical activity in persons with SMI (Lindamer et al., 2008).

In a study using accelerometer to measure physical activity in individuals with SMI 55 of 66 participants provided valid physical activity data by complying to wear the device for at least 10 hours/day on at least four days (Jerome et al., 2009). Compliers and non-compliers did not differ with respect to gender, age, race, BMI, diagnosis, or psychiatric symptoms. On average, participants engaged in 120 min/week of moderate or vigorous activity. However, when counting only moderate or vigorous activity that occurred in ≥10 min bouts the average fell to 25 min/week. Depending on which of the two procedures used, 35% and 4% of the sample accumulated 150 min/week of moderate or vigorous activity. In a similar study including individuals in need of outpatient care due to depression and/or anxiety disorders (77% had concurrent disorders), 165 of 308 participants were classified as accelerometer compliers (Helgadottir, Forsell, & Ekblom, 2015). Results showed that participants spent the majority of recorded time being sedentary (546 min/day), some of the time doing low intensity physical activity (260 min/day), and little of their time doing moderate or vigorous physical activity (42 min/day). Nearly 20% did ≥30 min of moderate or vigorous activity in ≥10 min bouts on seven days a week while 34% did it on five days a week. The largest study investigating physical activity level in bipolar disorder using accelerometer involved 60 participants (Janney et al., 2014). On average participants wore the accelerometer for 17 h/day. Approximately 13.5 h/day (78% of monitoring time) was classified as sedentary time while light physical activity accounted for 21% (215 min/day). The remaining time, 14 min/day, was spent doing moderate or vigorous physical activity. None of the participants achieved the nationally recommended 150 min/day of moderate or vigorous activity.

The increasing interest in examining physical activity behaviour has resulted in meta-analyses trying to establish evidence across individual studies. Burton and colleagues (2013) conducted a meta-analysis including studies of participants having a depressive disorder and measuring physical activity with an accelerometer. A case-control analysis with data from

nine studies and 453 individuals yielded a large effect size in favour of healthy controls being more physically active than their respective counterparts with depressive disorder. One recent review concluded that a sedentary lifestyle is common among individuals with bipolar disorder (Melo, Daher Ede, Albuquerque, & de Bruin, 2016) while another estimate sedentary time to constitute over 10 hours/day (Vancampfort et al., 2016c). The latter meta-analysis further showed that individuals with bipolar disorder engaged in 125 min/day of light physical activity, 95 min/day of moderate physical activity, and 23 min/day of vigorous physical activity. Noticeably, these results are based on 3-5 studies and 149-195 participants. Finally, results from a meta-analysis showed that individuals with schizophrenia engaged in 1 min/day of vigorous physical activity, 16 min/day of moderate physical activity, and 89 min/day of light physical activity (Stubbs et al., 2016a). These results reflect the findings of over 20 studies involving over 2500 participants. In line with previous research, it was demonstrated that people with schizophrenia engaged in significantly less moderate and vigorous physical activity than healthy controls.

To summarise, over the last 15 years there has been a proliferation in studies examining physical activity behaviour in people with SMI. The methodology for assessing physical activity has improved and more recent studies often use objective measurements. In general, independent of measurement method and diagnoses, there is consistent evidence for people with SMI engaging in little physical activity and less than the general population. This is especially salient for moderate and vigorous activity.

Barriers and facilitators for physical activity

With the recognised benefits of physical activity and the established low levels of physical activity in the population with SMI a vital first step towards development and implementation of effective treatment is to understand the barriers and facilitators of physical activity participation. For instance, a better understanding of physical activity barriers and facilitators

experienced by individuals with SMI could help reduce a drop-out rate of 20-30% reported in exercise trials (Firth, Cotter, Elliott, French, & Yung, 2015; Stubbs et al., 2016b).

A recent systematic review found that the large majority of persons with SMI (80-90%) embraced improving physical and mental health as important motives for being physically active. Moreover, enjoyment of being physically active and social aspects like meeting other people were important for about 50% and 30%, respectively, while weight-loss and appearance was important for about 70-80% of the participants (Firth et al., 2016a). The somewhat low response to social interaction stands in contrast to a review of qualitative research in which social interaction or "being part of something" is one of the major findings (Mason & Holt, 2012). Similarly, social support has been identified as a factor that enables physical activity participation. This support can come from mental health practitioners (Carpiniello et al., 2013; Fraser et al., 2015; Hodgson, McCulloch, & Fox, 2011; Ussher et al., 2007) or from friends, family, and other with similar challenges (Aschbrenner et al., 2013; Johnstone, Nicol, Donaghy, & Lawrie, 2009; Soundy et al., 2014a). An organisational structure that includes exercise along with well-organised exercise sessions with qualified leaders has also been stressed as a facilitating factor (Hodgson et al., 2011; Leutwyler, Hubbard, Jeste, & Vinogradov, 2013; Stubbs et al., 2016b; Vancampfort et al., 2016g).

Regarding preferences related to physical activity, several studies suggest that walking is the most popular form activity, advice or assistance in becoming more active is highly welcome, activities that can be performed at home or without going to a facility are preferable, and about half prefer individual activities while the other half favour group activities (Carpiniello et al., 2013; Fraser et al., 2015; Ussher et al., 2007).

Major barriers for physical activity consistently reported in the literature are mental illness symptoms, side effects of medication, and physical health comorbidities (Carpiniello et al., 2013; Johnstone et al., 2009; Soundy et al., 2014a; Vancampfort et al., 2012a; 2013a;

Verhaeghe, De Maeseneer, Maes, Van Heeringen, & Annemans, 2013b). Other barriers are financial issues (Kilbourne et al., 2007; Verhaeghe, De Maeseneer, Maes, Van Heeringen, & Annemans, 2011), transportation problems (Beebe et al., 2011), limited experience or lack of confidence of how to be physically active (Johnstone et al., 2009; Rastad, Martin, & Asenlof, 2014), fatigue or feeling tired (Fraser et al., 2015; Klingaman, Viverito, Medoff, Hoffmann, & Goldberg, 2014), stigma or discrimination (McDevitt, Snyder, Miller, & Wilbur, 2006; Verhaeghe et al., 2011) and lack of support or negative staff attitudes (Firth et al., 2016a; Roberts & Bailey, 2011). Finally, one major barrier consistently reported by individuals with SMI and very often highlighted as *the* most important obstacle by health care practitioners is related to motivation, or lack thereof (Fraser et al., 2015; Happell, Platania-Phung, & Scott, 2013; Rastad et al., 2014; Soundy, Stubbs, Probst, Hemmings, & Vancampfort, 2014b).

The importance of motivation within the physical activity domain in persons with SMI has been highlighted several times (e.g., Bonsaksen, 2011; Gorczynski & Faulkner, 2010). Specifically, Beebe (2008, p. 29) states that "after medical clearance for exercise is obtained, clinicians should first focus on motivation". Liu and Spaulding (2010, p. 239) elaborate on this statement by saying "motivational factors are important considerations for recruitment and participation in health-focused interventions ... recruitment and intervention strategies should directly target motivational factors to increase engagement and participation in health interventions". Prior to outlining research regarding motivation for physical activity in people with SMI the focus will be on the potential benefits of physical activity for this population.

The value of physical activity in people with severe mental illness

For a long time the potential effect of physical activity on mental and physical health among individuals with SMI was relatively unexplored (Fogarty & Happel, 2005). However, from the late 1990s there has been an increasing interest for using exercise and physical activity adjunct treatment for people with SMI (Callaghan, 2004). Most studies examining the effect

of physical activity within the mental health domain have focused on depression and depressive symptoms in clinical and non-clinical samples, respectively (Barbour, Edenfield, & Blumenthal, 2007) and to some extent anxiety, although the majority of evidence regarding anxiety derive from non-clinical samples (Wipfli, Rethorst, & Landers, 2008). The following three sub-chapters will summarise the evidence base concerning benefits of physical activity for individuals with depression, schizophrenia, and bipolar disorder. For additional information on exact values of effect sizes with confidence interval, number of studies and participants, and heterogeneity see Appendix A.

The effect of physical activity or exercise on depression

After 2008 at least eight meta-analyses including only randomised controlled trials (RCT) have examined the effect of exercise on the management of depression. Three of them are Cochrane Reviews (Cooney et al., 2013; Mead et al., 2008; Rimer et al., 2012), and the latest compared exercise with no treatment or control in 1356 participants spread across 35 RCTs. This comparison yielded a moderate clinical effect of exercise on depression at the end of treatment. However, when including only the six trials (n = 464) with the most robust methodology, the effect was small and not significant. For the eight trials (n = 377) with long-term follow-up data it was a small effect in favour of exercise. Exercise was also compared with psychological therapy in seven trials (n = 189) and pharmacological treatment in four trials (n = 300) and no significant difference in neither of the two comparisons was found.

The findings from five other meta-analyses are largely in line with the results in the latest Cochrane review. They all found exercise to be beneficial in comparison to a control condition, with effect sizes in the range -0.40 to -0.98 (Josefsson, Lindwall, & Archer, 2014; Krogh, Nordentoft, Sterne, & Lawlor, 2011; Kvam, Kleppe, Nordhus, & Hovland, 2016; Rethorst, Wipfli, & Landers, 2009; Schuch et al., 2016a). Furthermore, three of the reviews found support for trials with low methodological quality to overestimate the effect of exercise

(Josefsson et al., 2014; Krogh et al., 2011; Schuch et al., 2016a) while one found the opposite (Rethorst et al., 2009). Noticeably, the most recent review found rigorous trials to yield a large effect in favour of exercise while the oldest found a non-significant small effect in favour of exercise. Two reviews examined the long-term effect of exercise and they found a small, non-significant effect and no effect (Krogh et al., 2011; Kvam et al., 2016). One review found no statistical difference when comparing exercise to psychological or pharmacological treatment (Kvam et al., 2016) and two found an increased effect of exercise when it was compared to placebo or no treatment (Josefsson et al., 2014; Kvam et al., 2016). Finally, two reviews found a larger effect of exercise among individuals with clinical depression compared to individuals with depressive symptoms only (Rethorst et al., 2009; Schuch et al., 2016a).

The efficacy of exercise in relieving depression is further supported by a recent meta-analysis examining the control group response in exercise RCTs (Stubbs et al., 2016c). The results showed that for exercise to demonstrate effectiveness it has to overcome a powerful control group response (large effect size). Sensitivity analyses yielded even larger control group responses in high quality studies and in studies only including participants with major depression. In addition to the antidepressant effect of exercise, one recent meta-analysis found exercise to have a positive impact on health related quality of life (Schuch et al., 2016b).

To summarise, findings from several meta-analyses indicate that exercise is an effective intervention for depression when compared to various types of control conditions, particularly when compared to no treatment, and it is as effective as pharmacological and psychological treatment. Thus, exercise can be a viable alternative for individuals not responding to a given treatment or for those who do not receive or want traditional treatment. Factors that could be a reason to concern is the often reported high heterogeneity between studies, low sample size, and low methodological quality in individual studies. However, more recent trials typically have better quality than earlier trials (Schuch et al., 2016a).

Benefits of physical activity for people with schizophrenia

The effects of exercise on schizophrenia were initially mainly examined in light of managing side-effects of antipsychotic treatment—physiological outcomes such as weight and metabolic syndrome were targeted while ignoring psychological and neurobiological changes (Malchow et al., 2013)

Arguably, the first systematic review devoted entirely to examining the overall therapeutic effect of physical activity among individuals with schizophrenia was published in 1999 by Faulkner and Biddle. This review included 12 studies with various designs (e.g., case studies, ethnography, and experimental time-series). The first (and only) Cochrane review on exercise therapy for schizophrenia was published in 2010 (Gorczynski & Faulkner). It included three RCTs (n = 86). The conclusion in the Cochrane review echoes the findings in the systematic review described above: "regular exercise programmes are possible in this population, and they can have healthful effects on both the physical and the mental health and well-being of individuals with schizophrenia. Larger randomised studies are required before any definitive conclusions can be drawn" (Gorczynski & Faulkner, 2010, p. 2).

After 2010, a wealth of studies was published regarding benefits of physical activity among individuals with schizophrenia. Two recent systematic reviews have examined the effect of exercise on a range of outcomes (Dauwan, Begemann, Heringa, & Sommer, 2016; Firth et al., 2015). Firth et al. (2015) included 17 trials (n = 659) with various designs. For clinical symptoms, eight RCTs were eligible and results showed no significant difference between exercise and control condition for change in total symptom score. However, in four of these trials exercise was used as a control condition for yoga and consisted mainly of low-intensity activities, such as walking, stretching, and postures. Therefore, sensitivity analyses including only trials with more comprehensive exercise was performed. These analyses yielded a moderate effect in favour of exercise on both positive and negative symptoms.

Functioning and quality of life were assessed in seven trials and yielded inconsistent results, with exercise typically having a positive, but not always significant impact.

The review conducted by Dauwan et al. (2016) had somewhat broader inclusion criteria than that of Firth et al. (2015) and its final sample comprised of 29 trials with 1109 participants. The results showed that exercise compared to control had a moderate effect on negative symptoms and a small effect on positive symptoms. Moreover, it had a moderate-to-large effect on depression, a small effect on global functioning, and a moderate effect on quality of life. Finally, there were no differences between exercise and control condition on change in any of the cognitive outcomes (Dauwan et al., 2016). The latter finding stands in contrast to a meta-analysis including 10 controlled trials where exercise had a small, but significant, effect on global cognition. In a sensitivity analysis including only RCTs the effect was somewhat larger (Firth et al., 2016b).

To summarise, the evidence base regarding the benefits of exercise for individuals with schizophrenia has increased largely over the last decade, but is still immature compared with depression. Irrespective of that, the current evidence indicates that exercise can safely be recommended as a robust add-on treatment with small-to-moderate positive effects on positive and negative symptoms, quality of life, global functioning, physical fitness, and cognition. Especially the positive effects on negative and cognitive symptoms are important because antipsychotic medicine typically has little effect on those symptoms (Erhart, Marder, & Carpenter, 2006; Goldberg et al., 2007). However, some caution regarding the results should be mentioned. There is a high degree of heterogeneity in several of the analyses reported. Furthermore, pooling of data from studies with different design (i.e., non-controlled, non-randomised, and randomised trials), not considering the methodological quality, and often low sample size attenuate the ability to draw firm conclusion regarding the effectiveness of exercise on mental health outcomes in this population.

Benefits of physical activity for individuals with bipolar affective disorder

The available evidence for the benefits of physical activity on bipolar disorder is scant (Malchow et al., 2013). Thus, when physical activity is recommended for people with bipolar disorder it is not based on empirical evidence, but on extrapolation from evidence regarding unipolar depression, theory, and clinical expertise (Thomson et al., 2015).

The first systematic review focusing only on bipolar disorder and physical activity was published as late as in 2009 (Wright, Everson-Hock, & Taylor). The review included six studies. Four examined the acute effects of physical activity and two examined the effect of chronic physical activity. It was concluded that more research is required, but the existing evidence suggests that physical activity may be a feasible intervention and it could play a role in promoting mental health. A more recent systematic review that included 31 studies with various design (e.g., qualitative, cross-sectional, intervention) concludes: "exercise was associated with improved health measures including depressive symptoms, functioning and quality of life. Evidence was insufficient to establish a cause-effect relationship between mood and physical exercise" (Melo et al., 2016, p. 32). In this review three studies are described as intervention studies, one of them examined acute exercise while the two other included five and ten participants.

In the absence of trials examining the effect of physical activity on clinical symptoms of depression and mania in bipolar disorder, one can look at qualitative studies on the topic. In a study using a semi-structured approach 25 participants were interviewed on their experiences with exercise and their illness (Wright, Armstrong, Taylor, & Dean, 2012). One theme emerging was the "double-edged sword" theory. For some, exercise brought structure and support while for other is was of little help. Moreover, exercise could be beneficial in mood regulation and directing excess energy, but it could also be detrimental in exacerbating manic symptoms and spiral manic and hypomanic symptoms. This is coherent with another

qualitative study including 32 well-functioning individuals with bipolar disorder (Suto, Murray, Hale, Amari, & Michalak, 2010). In this study exercise and rest was identified as one of the most helpful factors in managing the illness. Regarding type of exercise, it is suggested that finding the right type is an individual matter (Suto et al., 2010). However, many also describe that exercise with an inherent rhythm, like swimming or walking, may provide a calming effect due to the cadenced nature of these activities (Wright et al., 2012).

To summarise, there is considerably less research on the benefits of physical activity in bipolar disorder compared with in depression or schizophrenia. Regardless, the existing evidence shows some promise for the use of exercise for alleviating comorbid illness as well as regulating mood. With respect to the latter, it is of high importance to further examine the role of exercise within the manic or hypomanic state, as there are indications that exercise may exacerbating symptoms.

Motivation for physical activity in people with severe mental illness

Motivational deficits are a central feature of SMI due to its core role in negative and depressive symptoms (American Psychiatric Association, 2013). Thus, it is no wonder why motivation or "problems with motivation" is a recurring theme in studies on physical activity among individuals with SMI. In this body of literature, motivational issues emerge in different contexts and with different shapes. For instance, motivation is reported as reason for attrition, as inclusion criterion, used to improve adherence, mentioned anecdotally or devoted entire papers to in order to explain how it was influenced, used to predict physical activity behaviour, treated in light of a theoretical framework, or as atheoretical motives with different strengths. The next paragraphs will outline how motivational issues are implemented and treated in trials and cross-sectional studies and findings from central studies will be discussed.

Regarding trials, several describe using motivational techniques as part of their interventions (e.g., Abdel-Baki, Brazzini-Poisson, Marois, Letendre, & Karelis, 2013;

Maggouritsa et al., 2014; Tetlie, Eik-Nes, Palmstierna, Callaghan, & Nottestad, 2008; Trivedi et al., 2011; Warren et al., 2011). The motivational techniques used varied a great deal, from implementing motivational interviewing to unstructured motivational prompts, goal-setting, contingency management, and instructing staff to give personal acknowledgement to increase self-efficacy. Common for the studies was how they only briefly described the techniques used, often just mentioning using them to increase adherence, and not evaluating whether the motivational techniques affected any outcomes. A more structured approach for using motivational techniques in an intervention is to apply a theoretical framework. Significantly fewer trials have done this (e.g., Daumit et al., 2013; Green et al., 2015; McKibbin et al., 2006; Usher, Park, Foster, & Buettner, 2013; Verhaeghe et al., 2013a). Other trials have assessed motivational constructs, but not described any strategies on how to influence them or analysed motivation in relation to other variables (e.g., Goldberg et al., 2013; McDevitt, Wilbur, Kogan, & Briller, 2005; Singh, Clements, & Fiatarone, 1997; Van Citters et al., 2010). Common for these trials was how they were only *informed* by theory, meaning that even though a theoretical framework or construct was included there was no or limited/partial application of the framework in study's components and measures (Painter, Borba, Hynes, Mays, & Glanz, 2008). Consequently, these studies yield little clarification on the role of motivation for managing to be physically active or information on how to influence motivation for physical activity among people with SMI.

To gain insight into the role of motivation trials must either *apply* or *test* theory. To *apply* theory implies specifying a theoretical framework and using at least one of the theoretical constructs in the study. To *test* theory one must use a theoretical framework, apply or measure more than half of the theoretical constructs, and explicitly test theoretical tenets (Painter et al., 2008). Physical activity trials that applied motivational theory have yielded mixed results with respect to change in motivational constructs (self-efficacy and outcome

expectations) and main outcomes (depression and weight loss). However, they both showed an increase in the secondary outcomes physical activity behaviour and 6-minute walk test (Chalder et al., 2012a; 2012b; Daumit et al., 2011).

To the best of my knowledge, there are currently only three trials and two longitudinal observational studies that examine physical activity among individuals with SMI and test motivational theory (Arbour-Nicitopoulos, Duncan, Remington, Cairney, & Faulkner, 2014; Beebe et al., 2010; 2011; Gohner, Dietsche, & Fuchs, 2015; Kramer, Helmes, Seelig, Fuchs, & Bengel, 2014; Sailer et al., 2015). The observational studies were both based on the Health Action Process Approach (HAPA; Schwarzer, 2011). In general, the associations between the HAPA constructs were largely in line with the theoretical expectations (Arbour-Nicitopoulos et al., 2014; Kramer et al., 2014). Additionally, Kramer et al. (2014) showed that outpatients with a depressive disorder scored significantly lower on most of the HAPA constructs when compared with a non-depressed control group. Even high-intenders in the clinical group had problems executing their physical activity intentions into action. This problem is often labelled "the intention-behaviour gap" (Sniehotta, Scholz, & Schwarzer, 2005).

One technique based on cognitive behavioural therapy that was specifically designed to overcome this problem is the Mental Contrasting and Implementation (MCII) approach (Oettingen & Gollwitzer, 2010). A recent pilot RCT tested whether this technique could increase attendance in an exercise program among inpatient and outpatients with schizophrenia in three open, non-acute wards (Sailer et al., 2015). In wards where autonomy and self-supply was encouraged, the MCII condition increased exercise attendance and persistence relative to the control condition. This effect did not appear in a ward with a highly structured environment, possibly due to a ceiling effect. The two other RCTs also yielded mixed results. Beebe et al (2010; 2011) included 97 outpatients with schizophrenia. The motivational intervention was based on Social Cognitive Theory (SCT; Bandura, 1997) and

consisted of four weekly 1-hour group sessions. Results from the trial were equivocal with respect to change in motivational constructs and there was only a trend towards the intervention group being more physically active than the control group after the motivational intervention. The trial conducted by Göhner et al (2015) was based on the Motivation Volition Process Model (MoVo; Fuchs, Goehner, & Seelig, 2011) and involved inpatients at a psychosomatic rehabilitation hospital (n = 112; mainly affective disorders). The motivational intervention consisted of five components: Two 60 min group meetings at the second and third week of the 3-week hospital stay, one one-on-one 10 min interview between group meetings, 10 min of telephone coaching six weeks after discharge, and self-monitoring in the six weeks after discharge. As in the previous trial, results were equivocal. The intervention group experienced an increase in motivational constructs after the intervention, but the intervention effect (group x time) was not significant. Despite this, for physical activity there was a significant intervention effect in favour of the intervention group. The increased physical activity level was also maintained over time. Given the limited evidence available from intervention studies on the role of motivation in the physical activity context, I will now take a glance at cross-sectional studies.

In one the largest cross-sectional studies using motivational theory Leas and McCabe (2007) tested the utility of the Protection Motivation Theory (Rogers, 1983). The study involved 153 participants with schizophrenia and major depression and a control group of 147 individuals with no history of SMI. In comparison to the control group, participants with SMI reported significantly lower physical activity level and unfavourable levels of self-efficacy, intention, and barriers for physical activity. There were no significant differences between the two groups of disorders in any of the variables. In a hierarchical multiple regression self-efficacy, barriers, and intention explained 25% of the variance in physical activity behaviour. Next, a study based on The Transtheoretical Model (TTM; Prochaska & Velicer, 1997)

showed that 27% of the variance in physical activity could be explained by self-efficacy, decisional balance, and cognitive and behavioural processes of change (Bezyak, Berven, & Chan, 2011). TTM is further supported by later stages of change being associated with increased physical activity (Archie et al., 2007; Lindamer et al., 2008) and stages being associated with TTM constructs (Bassilios, Judd, Pattison, Nicholas, & Moeller-Saxone, 2015; Gorczynski, Faulkner, Greening, & Cohn, 2010). The results described above indicate that self-efficacy plays a pivotal role in physical activity behaviour. One interesting finding regarding self-efficacy is the relationship between exercise self-efficacy and general self-efficacy. Two studies assessing both constructs found that exercise self-efficacy was significantly associated with fitness or stages of change while general self-efficacy was not (Bassilios et al., 2015; Jerome et al., 2012). These results suggest that general self-efficacy does not constrain exercise self-efficacy. This is important as it is hypothesized that individuals with SMI have decreased general self-efficacy (Bassilios, 2005).

One final, although important, clarification is that even if motivation is highlighted as a major barrier for starting or maintaining physical activity, this does not equate to a lack of interest in physical activity. This is reflected in a recent study (n = 102) where 'lack of motivation' was the most cited barrier (73.5%) for participating in an exercise program designed to improve mood in persons with depression. However, 68% also indicated that they were willing to participate, while 34% and 4% answered 'maybe' and 'no', respectively (Busch et al., 2016). The interest in physical activity is further supported by exercise being ranked as the third most desirable intervention in a report by the Schizophrenia Commission (2012) and 30-50% of individuals with SMI having a strong desire to exercise more regularly (Carpiniello et al., 2013; Ussher et al., 2007). The low proportion (10%) of individuals with SMI being in the TTM pre-contemplation stage also indicate that few have no interest in increasing their physical activity level (Archie et al., 2007).

The apparent gap between interest in physical activity and actual uptake is an important issue to address. Facilitating motivation for physical activity can be one factor that could contribute to bridge this gap. Indeed, identifying the most effective motivational strategies for ensuring adoption and maintenance of physical activity has recently been highlighted as one of the most important research questions regarding physical activity and SMI (Vancampfort et al., 2016e, 2016f). Cross-sectional studies have identified various motivational constructs (e.g., self-efficacy) that are associated with physical activity and able to explain a significant amount of variance physical activity. However, the few trials trying to influence some of the same constructs show that this can be a challenging task. This uncertainty in how to best influence motivation has resulted in calls for doing theory based research on the role of motivation in treatment outcomes in general and for physical activity in particular (Medalia & Brekke, 2010; Vancampfort & Stubbs, 2016). One prominent theory of motivation that can be used as a theoretical framework is SDT (Deci & Ryan, 2000; Ryan & Deci, 2000a). SDT has been successfully applied in various health contexts (Ng et al., 2012) and have gained recent attention as a framework for understanding motivation in people with SMI (Gard, Fisher, Garrett, Genevsky, & Vinogradov, 2009; Saperstein, Fiszdon, & Bell, 2011; Vancampfort, Stubbs, Venigalla, & Probst, 2015c). The next section is devoted to explaining the central tenets of SDT and reviewing relevant research applying SDT.

Self-Determination Theory

SDT is an empirically based macrotheory concerned with human motivation, development, and wellness. One basic assumption in SDT is that all individuals have a natural, innate tendency towards growth, seeking optimal challenges, and integrating new experiences into a coherent self. However, SDT also acknowledges that this process cannot be taken for granted as there are social-contextual factors that can either support or hinder this tendency (Ryan & Deci, 2002). Within SDT, the factors facilitating or thwarting this natural tendency towards

healthy development are organized around the concept of basic psychological needs. The theory posits three such basic needs, namely the need for autonomy, competence, and relatedness, and describe them as "innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being" (Deci & Ryan, 2000, p. 229). The need for *autonomy* refers to a feeling of choice and volition, and concurrence with one's own actions (deCharms, 1968). In SDT, autonomy is considered different from independence (e.g., Deci & Ryan, 2008b). Indeed, a patient can be autonomously dependent on his/her therapist if reflectively choosing to rely on the therapist for guidance or advice, or even follow treatment requests *if* they are congruently endorsed (Ryan & Lynch, 1989). The need for *competence* concerns having the opportunity to express and exercise one's capacities as well as a feeling of being effective in ongoing interaction with the environment (White, 1959). Competence is therefore not an acquired skill, it is more a sense of confidence and effectance in action (Ryan & Deci, 2002). The need for *relatedness* refers to a sense of connection and reciprocal feeling of care with other individuals and groups (Baumeister & Leary, 1995). When the needs are satisfied, people will experience increased well-being and demonstrate more integrated and volitional forms of motivation. Whereas if the social context leads to thwarting of the needs, ill-being and more controlled forms of motivation is expected (Deci & Ryan, 2000).

The second core aspect in SDT is the distinguishing between qualitatively different forms of motivation, rather than focusing on the quantity or amount of motivation (Ryan & Deci, 2000a). The most basic distinction is between *intrinsic* and *extrinsic* motivation. Specifically, intrinsic motivation is doing an activity because it is inherently interesting and enjoyable, while extrinsic motivation is referring to do something because of a separable consequence, like obtaining a reward or avoiding a negative outcome (Ryan & Deci, 2000b). Not all activities are inherently interesting and when people engage in such activities, they can do it for a number of reasons. SDT acknowledges this through assuming that extrinsic

motivation can have different forms depending on how well it is internalised and integrated by the person. In this context internalisation means how people, in relation to the social environment, take in and accept norms and values that regulate their behaviour. Through internalisation and integration, behaviour that was previously executed because of external prompts or cues becomes increasingly self-regulated. In other words, internalisation represent the process in which externally regulated motives for uninteresting, but maybe important, tasks becomes increasingly self-determined. Hence, SDT has proposed four different extrinsic motivational regulations lying along a self-determination continuum.

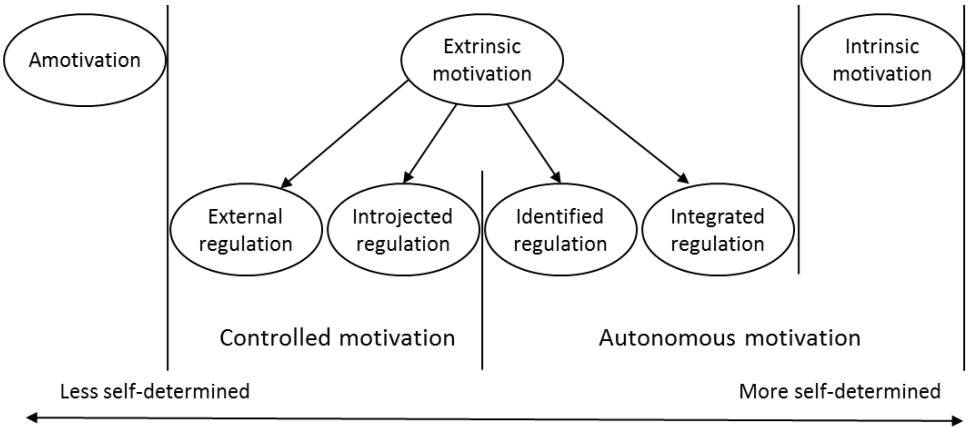

Figure 1. The SDT motivation continuum (adapted from Deci & Ryan, 2008a, p. 17)

External regulation is the least self-determined form of extrinsic motivation—it is the classic instance of being motivated to obtain rewards or avoid punishment. *Introjected* regulation is extrinsic motivation that has only been partially internalised, it is within the person but not as an integrated part of the self. Behaviour based on introjected regulation are performed to avoid shame and guilt or to attain enhancement in worth or self-esteem. *Identified* regulation is viewed as quite self-determined and involves consciously accepting the behaviour or behavioural goal as important to one's self. The most self-determined form of extrinsic motivation is *integrated* regulation, which is when people integrate identifications to be in coherence with personally endorsed values, goals, and needs. Integrated regulation

shares many qualities with intrinsic motivation as behaviour is performed volitionally and in accordance with one's own values. Nonetheless, it is still considered extrinsic because it is conducted to attain a separable outcome (although it is personally valued and well-integrated) rather than the behaviour being inherently interesting and enjoying (Ryan & Deci, 2002).

As SDT evolved there has been a shift in focus from intrinsic versus extrinsic motivation to autonomous versus controlled motivation (Deci & Ryan, 2008b). *Autonomous* motivation comprises identified regulation, integrated regulation, and intrinsic motivation and is characterised by people self-endorsing their actions and experiencing volition. Conversely, *controlled* motivation encompass introjected regulation and external regulation and is characterised by behaviour being governed by either external or internal pressures, such as coercion, seduction, guilt, or shame (Deci & Ryan, 2008a). In contrast to both autonomous and controlled motivation stands *amotivation*. SDT describe amotivation as a lack of motivation to act or not having any intentions for performing an activity. Amotivation can stem from a person finding the activity or outcome unimportant, a lack of competence in achieving a valued outcome, or not perceiving any contingency between a behaviour and a desired outcome (Ryan & Deci, 2000b).

Importantly, the SDT motivation continuum (depicted in Figure 1) is *not* suggested to be a developmental continuum, even though internalisation is viewed as developmentally important (Ryan & Deci, 2000b). This means that one does not have to progress through each stage of internalisation in order to integrate a new behavioural regulation. Indeed, a person can adopt a new behavioural regulation at any point of the continuum based on prior experience and situational factors, as well as progress upwards and downwards with different leaps (Ryan, 1995). For instance, an inactive person can join the gym because of external pressure, but then experience the activities as inherently satisfying and so continue at the gym for intrinsic reasons.

The process of internalisation is considered a natural process, however, it is also assumed that there are certain requirements for this process to function effectively. In SDT, the three basic needs provide the psychological nutrients for this internalisation process and they have to be satisfied within the social environment where the internalisation takes place. As such, satisfaction of basic psychological needs is seen as the mechanism that mediates the relationship between the social environment and individual motivational regulation (Deci & Ryan, 2000). In extension of this, basic psychological needs provide a useful means to understand how various social cues and prompts and interpersonal relationships can affect motivation and well-being. A significant amount of research has been devoted to examining how the social-contextual environment, often through important others like a manager or physician, facilitates the internalisation process through supporting the three basic psychological needs. The most widely used term to describe such a supportive environment in previous research was autonomy support, even though this concept included support for all three basic needs (Williams, Grow, Freedman, Ryan, & Deci, 1996). More recently it has become more common to describe this concept with the term *need supportive*, which is the term used in this thesis (Teixeira, Carraca, Markland, Silva, & Ryan, 2012).

In SDT, an environment supporting the need for autonomy is characterised by encouraging personal initiation, offering opportunities for relevant choices, providing sound rationales for suggestions and advice, responsiveness to a person's thoughts, questions, and initiatives, and consideration of persons' perspective. Supporting the need for competence can be done through informational feedback, providing optimally challenging tasks, assist in realistic goal-setting, and help to develop coping strategies for overcoming barriers. The need for relatedness is supported with a warm, welcoming and emphatic atmosphere, unconditional regard, and acknowledging persons' feelings and views (Deci & Ryan, 2008b; Fortier et al., 2007a; Haase, Taylor, Fox, Thorp, & Lewis, 2010; Teixeira et al., 2012).

In addition to the key concepts of need support, need satisfaction, and motivation, research using SDThas shown perceptions of competence to be important for health behaviour change (Williams, 2002). In SDT, perceived competence means that "people perceive themselves to be competent when they feel able to control important outcomes" (Williams, McGregor, Zeldman, Freedman, & Deci, 2004, p. 58). In that way, perceived competence is similar to self-efficacy as it relates to peoples' capability to act and perform well (Bandura, 1997; Williams et al., 2006). Indeed, some have argued that there is considerably overlap between these constructs (Fortier et al., 2007a).

In line with the organismic-dialectical view postulated in SDT, individual differences are recognised when explaining human motivation and functioning. Accordingly, a person's motivation in a particular situation is a function of both inner resources and influence of the social environment. These inner resources are assumed to develop over time as a function of prior interaction with social contexts, and are viewed as relatively stable motivational orientations. These causality orientations represent a tendency to experience the social context in different ways and to behave accordingly (Ryan & Deci, 2002). SDT identifies three such orientations, namely autonomy orientation, controlled orientation, and impersonal orientation. *Autonomy* orientation involves regulating behaviour on the basis of self-endorsed values and interests. *Controlled* orientation entails orienting towards directives and controls concerning on how one should behave. Finally, *impersonal* orientation relates to amotivation and not behaving intentionally (Deci & Ryan, 2000). The other individual difference that influences motivation and functioning in SDT is related to personal aspiration and life goals. Broadly these goals and aspirations fall into two categories labelled intrinsic and extrinsic goals or aspirations. Specifically, intrinsic goals and aspirations such as personal growth and affiliation, tend to enhance need satisfaction and thus well-being and autonomous motivation, whereas extrinsic, such as fame and wealth, do not (Deci & Ryan, 2008a).

Research on Self-Determination Theory

There is extensive evidence across several domains for the predictive ability of key SDT concepts and internal coherence between the concepts (Ng et al., 2012). These associations and consequences have been examined as part of a larger SDT process model (see Figure 2) or as isolated parts of the model (e.g., relations between autonomous motivation and physical activity behaviour). There is some variation in how the SDT process model is presented and used, depending on the outcomes examined, concepts included, and research aims in the specific study (e.g., Fortier, Duda, Guerin, & Teixeira, 2012; Ng et al., 2012; Williams, 2002). However, the model depicted in Figure 2 encapsulates the central associations proposed by SDT and the process model as a whole. For this thesis, the most relevant SDT research derives from the physical activity context. Thus, research from this domain will serve as examples to support the central SDT tenets described earlier and presented in Figure 2.

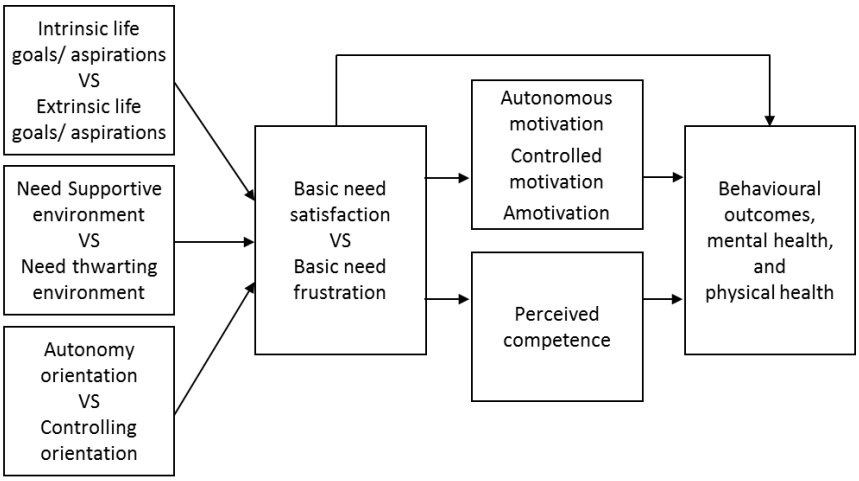

Figure 2. The SDT process model

There is a growing interest for applying SDT within the physical activity context and a systematic review included 66 experimental, cross-sectional, and prospective studies (Teixeira et al., 2012). Although the majority of the included studies were cross-sectional, several prospective and experimental studies have been conducted over the last decade.

A RCT situated in the Canadian primary care system (n = 120 inactive persons) tested the efficacy of a 3-month need supportive counselling intervention on influencing autonomous motivation and perceived competence, and ultimately physical activity (Fortier, Sweet, O'Sullivan, & Williams, 2007b). The results showed that the intervention group, compared to the control group, experienced a higher degree of need support and self-reported more physical activity at week 13. Moreover, autonomous motivation and perceived competence at Week 6 predicted physical activity at week 13. However, even though the intervention was successful in affecting need support, need support did *not* predict autonomous motivation at Week 6. Another RCT involving 239 overweight or obese women tested the efficacy of a 1-year weight management intervention based on SDT (Silva et al., 2010a; Silva et al., 2010b). Results from the trial showed that at 12 months the intervention group had lost significantly more weight and had higher physical activity level when compared to the control group. They also exhibited significantly greater autonomous motivation and perceived their health care providers as more need supportive. Furthermore, a SDT process model including need support, need satisfaction, motivational regulations, and physical activity was tested and the associations were in line with theoretical expectations. Noticeably, it was just intrinsic motivation that predicted physical activity and this applied for moderate to vigorous activity, but not for lifestyle activity. Finally, exercise autonomous motivation predicted weight loss three years after programme initiation (Silva et al., 2011).

Within an exercise context, Edmunds, Ntoumanis, and Duda (2006, 2007, 2008) conducted a series of studies with various design (cross-sectional, prospective, and experimental) in which they examined the applicability of SDT. In general, they found positive associations between need support, need satisfaction, more autonomous forms of motivation, various measures of exercise behaviour, and indices of well-being. However, they also found no difference in perceived need support, need satisfaction (except for relatedness),

and autonomous motivation among participants that adhered more or less to an "exercise on prescription" scheme (Edmunds et al., 2007). Likewise, they did not find any differences in change in any of the motivational regulations between participants in a need supportive exercise class and a standard exercise class, although adherence in the former class was better (Edmunds et al., 2008). A similar finding is reported in an exploratory cluster RCT involving 347 participants from an exercise referral scheme (Duda et al., 2014). In this study both conditions (need supportive versus standard treatment) were equally effective in affecting change in the SDT concepts and indices of physical and mental health, and physical activity behaviour did differ between the study conditions. For both conditions as a whole, the results supported the central SDT tenets. However, results also showed that it might require a more rigorous and comprehensive SDT intervention if it shall show effect over and above a control condition that is already quite need supportive. A recent study conducted in a vocational rehabilitation setting further supports the SDT process model (Farholm, Halvari, Niemiec, Williams, & Deci, 2016). The rehabilitation lasted 4-6 weeks, physical activity was the main component, and the treatment philosophy was closely linked to SDT. Results showed that need support assessed at end of rehabilitation was associated with change in need satisfaction during rehabilitation, which was associated with change in perceived competence and autonomous motivation six weeks after rehabilitation completion. Perceived competence was associated with increased physical activity and autonomous motivation was associated with increased well-being.

Furthermore, several cross-sectional and longitudinal studies have examined the proposed relationship between SDT concepts and between SDT concepts and outcomes related to physical activity or indices of well-being, ill-being, and healthy functioning. For instance, studies have found evidence for positive relationships between need support and need satisfaction (Adie, Duda, & Ntoumanis, 2008; Puente & Anshel, 2010), need support

and autonomous motivation (Puente & Anshel, 2010; Wilson, Rodgers, & Fraser, 2002; Wilson, Rodgers, Blanchard, & Gessell, 2003), need satisfaction and various indices of well-being or healthy functioning (Adie et al., 2008; Wilson, Longley, Muon, Rodgers, & Murray, 2006; Wilson, Mack, Blanchard, & Gray, 2009), autonomous motivation and increased physical activity participation (Gillison, Standage, & Skevington, 2006; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997; Wilson et al., 2003), autonomous motivation and different indices of well-being and healthy functioning (Gillison et al., 2006; Thogersen-Ntoumani & Ntoumanis, 2006; Wilson & Rodgers, 2002), and controlled motivation and indices of ill-being (Frederick & Ryan, 1993; Thogersen-Ntoumani & Ntoumanis, 2006).

Altogether, this summary supports using SDT as a theoretical framework to improve our understanding of the relation between motivation and physical activity and how various characteristics in the environment can affect motivation. However, none of the studies included participants with SMI and only a few included participants from a clinical setting (typically related to obesity). The next section will focus on research applying SDT when examining physical activity among individuals with SMI.

Self-Determination Theory within the severe mental illness domain

The first study to examine SDT concepts among individuals with SMI in a physical activity context was conducted in 2006 (Sørensen). Using a cross-sectional design (n = 106) it was found that intrinsic motivation was positively associated with both self-reported physical activity level and a decrease in psychiatric symptoms during activity. External regulation was negatively related to physical activity level and exercise self-schema (i.e., viewing themselves as a physically active person), while identified and intrinsic motivation was positively related to holding an exercise self-schema.

More recently, Vancampfort and colleagues have published a series of cross-sectional articles based a large multi-centre study measuring motivational regulations, self-reported

physical activity, and stages of change in 296 participants with SMI. Associations between physical activity and the different motivational regulations were in accordance with the theoretical expectations made by SDT (Vancampfort et al., 2015c). Moreover, no significant differences in motivational regulations were found according to treatment setting (inpatient VS outpatient), gender, educational level, and with one exception, diagnosis (schizophrenia [*n* = 129] VS major depression [*n* = 96] VS bipolar disorder [*n* = 69]). The exception was that individuals with schizophrenia reported less introjected regulation than individuals with either of the affective disorders did. Several other articles are published using sub-samples of the same participants. Among individuals with schizophrenia (Vancampfort et al., 2013c) and affective disorders (Vancampfort et al., 2015b) there were positive associations between physical activity and autonomous motivation and negative associations between controlled forms of motivation/amotivation and physical activity. Furthermore, participants with schizophrenia (Vancampfort et al., 2014c), affective disorders (Vancampfort et al., 2016d), and first-episode psychosis (Vancampfort et al., 2016b) exhibited more autonomous motivation and less controlled motivation/amotivation in the latter stages of change while an obverse pattern was visible in the former stages. Additionally, among participants with affective disorders, autonomous motivation was positively related to positive affect and negatively related to negative affect. The opposite pattern was observed for amotivation and external regulation, while introjected regulation was only positively associated with negative affect (Vancampfort et al., 2015b).

In a study independent from the multi-centre articles, Vancampfort et al. (2015a) investigated the relationship between motivational regulation and schizophrenia symptoms (*n* = 55). Results showed that with the exception of autonomous motivation being negatively related to negative symptoms, none of the motivational regulation was significantly associated with any of the negative, positive, depressive, excitatory, or cognitive symptoms of

schizophrenia. Finally, a pilot study examining the feasibility of pedometer use reported on extrinsic and intrinsic physical activity motives among 12 individuals with schizophrenia (Kane et al., 2012). The primary motives for being physically active were for fitness and appearance while social motives was the least important reason. Associations between motives and number of steps were not analysed.

To the best of my knowledge, these are the only studies assessing SDT concepts related to physical activity in participants with SMI. However, one of the largest RCT examining the effectiveness of physical activity on depression was based on SDT (Chalder et al., 2012a) and one paper was devoted to thoroughly accounting for the implementation of SDT in the trial (Haase et al., 2010). Unfortunately, none of the key SDT concepts were assessed and it is thus difficult to evaluate how effective the intervention was in affecting them or how it may have influenced the outcomes. The same evaluation problem is also apparent in a cluster preference RCT concerning health promotion for people with mental illness that based its intervention on SDT and SCT (Verhaeghe et al., 2013a).

The purpose of the thesis

Motivation for physical activity has been highlighted as a major research and clinical issue within the field of physical activity and severe mental illness (Beebe, 2008; Beebe et al., 2010; Vancampfort et al., 2013c; 2016e, 2016f), and the overall aim of the current thesis is to contribute to this line of research. This will be done by using a three-stepped approach that includes providing an overview of the existing research, examining motivation for physical activity in two strategically chosen samples, and testing the feasibility of increasing physical activity engagement in inpatients through implementing a short theory-based motivational intervention among staff at a psychiatric hospital. The thesis is grounded in Self-Determination Theory (Deci & Ryan, 2000; Ryan & Deci, 2000a). Self-Determination Theory is increasingly applied in the SMI domain for investigating the role of motivation in treatment

outcomes in general (Gard et al., 2009; Saperstein et al., 2011) and for physical activity in particular (Sørensen, 2006; Vancampfort et al., 2013c). Based on the overall aim of the thesis the following research questions were formulated:

Research questions

1. What is the current status of the body of quantitative research regarding motivation for physical activity among individuals with SMI? (Paper I-II)
2. How does variation in motivational regulations and perceived competence relate to physical activity in individuals with SMI? (Paper III-IV)
3. What is the association between motivational variables, clinical variables, health related quality of life, and physical activity in individuals with SMI? (Paper III-IV)
4. What is the physical activity level among individuals with SMI who were strategically recruited from three different settings: I) Individuals from a municipality recruited to a study with another focus than physical activity. II) Individuals recruited from a setting implying that they held a positive view on physical activity and had recent experience with physical activity. III) Inpatients at a rural psychiatric hospital with easily accessible opportunities to be physically active. (Paper III-V)
5. Is it feasible to increase physical activity level among inpatients with SMI through implementing a short educational intervention among mental health staff? (Paper V)

METHOD

Overall research design of the thesis

This thesis can broadly be divided into three main parts. In the first part, two systematic reviews summarise the evidence base regarding motivation for physical activity among people with SMI derived from cross-sectional studies and intervention studies. In the second part, two cross-sectional studies address current limitations in the literature. This was performed by purposeful choice of samples, having a theoretical approach, examining socio-contextual as well as intra-individual variables influencing motivation, and including objective measurement of physical activity. The third part address the repeated calls for novel approaches to increase physical activity level in individuals with SMI. Based on Parts 1 and 2 and grounded in SDT and TTM, a brief educational intervention concerning strategies for enhancing motivation and physical activity among inpatients with SMI was developed. This intervention was then implemented as part of the professional development plan for staff working at three inpatient wards in one psychiatric hospital.

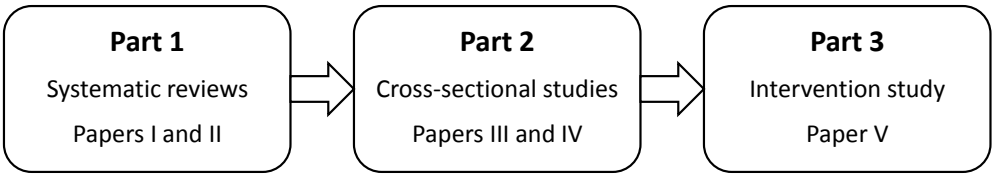

Figure 3. The overall research design of the thesis

Purpose, study design, procedures, and participants

Paper I and II

At the commencement of this thesis there existed no systematic review concerning motivation for physical activity in individuals with SMI. Hence, the purpose of Papers I and II was to summarise the evidence base regarding this topic derived from intervention studies (Paper I) and cross-sectional studies (Paper II). Accordingly, two systematic reviews were conducted.

The following electronic databases were searched from their inception to February 2015: Web of Science, PubMed, PsycINFO, CINAHL, SportDiscus, Embase, and MedLine. The search phrase applied in all databases was ("physical activity" OR "exercise" OR "motor activity") AND ("mental illness" OR "mental disorder" OR "schizo*" OR "psychoses OR "psychosis" OR "bipolar disorder" OR "major depressive disorder" OR "major depression"). Search words related to motivation were *not* included in the search phrase because initial searches revealed this to exclude studies that were anecdotally referring to application of motivational techniques. Search words could appear in the title, abstract, or keywords. Additional search limitations were that studies was published English and that only persons over the age of 18 were included.

Neither of the systematic reviews focused on a particular diagnosis, but one of the inclusion criteria was that participants had to be described with either a generic term like SMI, psychoses, or a diagnosis like schizophrenia, bipolar disorder, or major depression. Other inclusion criteria were: 1) published in peer-reviewed journals (Papers I & II). 2) Quantitative design including an intervention (Paper I) or cross-sectional design (Papers II). 3) The intervention involved either doing physical activity / exercise or education on physical activity / exercise (Paper I). 4) Reporting empirical data on motivational constructs related to physical activity (Papers I & II) or intervention based on a theoretical framework / using motivational techniques as part of the intervention (Paper I).

For both papers, two independent assessors evaluated the relevance of the articles and discrepancies were solved by discussion. In short, the assessment procedure entailed a stepwise exclusion of papers based on the relevance of the title, abstract, and methods/results sections. Studies complying with the inclusion criteria were read in full and data was extracted with a predesigned template adapted to the design of the study. All physical activity intervention studies were read in full to detect potential anecdotal references to motivational

techniques or theoretical frameworks. For additional details regarding assessment procedure, extraction of data, exact reasons for exclusion, and quality assessment see method section in Papers I and II and flowcharts.

Paper III

The main purpose was to examine associations between physical activity and motivation for physical activity, sociodemographic, and clinical variables in individuals with SMI in a municipality sample recruited to a study with another focus than physical activity.

Paper III was part of a larger cross-sectional study examining the experience of the health care services of patients with SMI living in a rural Norwegian municipality. In this study, SMI was operationalized as being frequently in need of mental health services, independent of diagnosis (i.e., at least two hospital stays every year during the last three years). Participants could also be included if they fulfilled one of the two following conditions; not being able to maintain independent basic living conditions due to psychiatric disorders, or being followed up by local psychiatric services with a need of yearly hospitalization, but no admissions due to the patient's refusal or clinical expectations of little or no treatment effect.

A comprehensive identification and recruitment process was implemented. This included examining lists of individuals utilising mental health service in the municipality and searching for eligible participants in relevant mental hospital and outpatient clinics. This resulted in the identification of 208 eligible participants. It was not possible to establish contact with 26 of these and 15 others had moved to another municipality. Of the remaining 167 eligible participants, 61 declined for various reasons. Typical reasons were "lack of energy", "health problem", "no interest in the study", and often "no reason at all". Some initially agreed to participate, but failed to turn up at the scheduled time. Importantly, because the main objective in the overarching study was to examine the health care experiences of the

participants it is likely that participants did not accept or decline taking part in the study based on their physical activity preferences. In total, 106 participants (male = 41 and female 65, mean age = 45.7 years, SD = 11.9) were interviewed in the study.

Two trained mental health nurses conducted the interviews between May 2013 and April 2015. To ensure inter-rater reliability both mental health nurses conducted pilot interviews, which afterwards were presented, rated, and discussed with the principal investigator (T.H.). Although no formal reliability analysis was carried out, the pilot interviews were considered satisfactory as all crucial items were rated identical or near identical, both between the mental health nurses and between the mental health nurses and the principal investigator. The interviews lasted approximately two hours and were carried out at a place convenient for the participant, often in their own residence. If participants fatigued during the interview, the interview was split up in two parts. After completion of the interview, participants were debriefed. If requested by the participant or if the interviewer considered it appropriate, participants were followed-up by qualified health-care personnel.

Paper IV

The purpose of paper IV was to examine associations between variables assumed to precede motivation (need support and need satisfaction) and motivation for physical activity, as well as the associations between motivation, physical activity, and health related quality of life among individuals with SMI who had recent experience with physical activity.

To ensure that participants for this cross-sectional study had recent experiences of being physically active, they were recruited through a public health network that promoted physical activity for individuals with SMI. The network is a collaboration between a regional psychiatric hospital, ten associated municipalities, and one regional psychiatric centre. The network is coordinated through the psychiatric hospital and each municipality has one contact person. The network is open for all individuals with SMI, independent of diagnose, and

organises weekly exercise sessions at local gyms and monthly seasonal activities, such as skiing in the winter or hiking in the autumn. All activities arranged by the network follow a policy of not distinguishing between participants and companions.

Over a 6-month period (October 2013 – March 2014) individuals affiliated with the network and participating in activities were invited to take part in the study. A total of 88 individuals participated in the study (female = 62 and male = 26; 17 = ≤ 35 years old, 29 = 36 to 50 years old, and 42 = ≥ 51 years old). Half of the participants (n = 44) were recruited at a monthly event (overnight mountain trip in the autumn), which was open for all affiliated municipalities. The remaining participants were recruited at exercise sessions in four of the municipalities. At both types of recruitment locations the study was introduced by health care personnel affiliated with the network. At the monthly event and in one of the municipality exercise sessions one of the researchers was also present. The policy of not distinguishing between participant and companion, combined with activities being offered both separately and jointly by the municipalities and the hospital, makes it difficult to estimate the number of individuals that regularly take part in the network. Due to this, the exact response rate is impossible to calculate. However, based on attendance the response rate was estimated to be about $^{2}/_{3}$ at the monthly event and $^{3}/_{4}$ at local exercise sessions.

Paper V

The purpose Paper V was examine the feasibility of increasing physical activity level among inpatients with SMI through implementing a short educational intervention among mental health staff.

This feasibility study used an uncontrolled pre-post design where the educational intervention was conducted at staff level while the main outcome—physical activity—was at patient level. The intervention was conducted at two closed wards and one open ward located at the same psychiatric hospital. The first closed ward had 11 beds and patients were mainly

hospitalised due to psychotic disorders. The second closed ward was a subacute ward with nine beds where patients were mainly hospitalised due to affective disorders. The last ward had eight beds and it was an open, early intervention ward for young individuals with psychotic disorders. Across the three wards there were 70 full time positions occupied by 97 employees. Of those 97 employees, 70 had a full time equivalent of 75% or more.

The intervention was an educational intervention on "how to enhance physical activity motivation among patients with SMI", which was organised into two 3-hour sessions with two weeks between them and a 1-hour booster session 12 weeks later. The intervention content was based on SDT and TTM. The motivational strategies were organised according to the different stages proposed by TTM and sessions were organised to facilitate interaction between staff and the presenter and in between the staff. The SDT contribution in the intervention was three folded. First, strategies for supporting the three needs and thus facilitating autonomous motivation were explicitly described under the action and maintenance stage. Secondly, in the three preceding stages motivational strategies were presented from a SDT perspective, but without explicitly mentioning how the motivational strategy would contribute to enhancing autonomous motivation. Finally, efforts were made to present the intervention content in a need supportive way (see Paper V for more details).

Physical activity engagement among inpatients was assessed by direct observation at three time points; pre-intervention (T1), post-intervention (T2), and 16 week follow-up (T3). Patients were admitted and discharged both within and between each physical activity assessment. This precluded examining intra-individual change in physical activity level between the time-points. On staff level, motivation and self-efficacy for promoting physical activity in patients were assessed at T1 and T2. The total number of beds for the three wards was 28, but the mean number of patients involved in the physical activity assessment at T1, T2, and the T3 were 24.4, 22.0, and 23.9, respectively. Patients being granted leave,

admission and discharge of patients not necessarily occurring on the same day, and one ward not registering physical activity the last two weeks at T2 caused this difference. Attendance at the first, second, and third (booster-session) intervention sessions were 45, 42, and 41, respectively. In total, 47 of the staff responded to the questionnaire at either T1 (n = 37), T2 (n = 23) or both (n = 13). One of the wards did not distribute the questionnaire at T2 to the staff due to a misunderstanding. The majority of the participants were female (n =34) and approximately half were 50 years or older (n = 23) or between 31 – 49 years old (n = 21).

Measurements

In addition to the scales described below the following variables were assessed. Paper III: Age, gender, relationship status, the municipality one were raised in, number of hospitalisations, age at first contact with mental health service, and body mass index. Paper IV: Age groups, gender, living arrangement, self-reported diagnosis and comorbid diagnosis according to ICD-10 diagnostic groups. Paper V: Age group, gender, occupation, percentage of full-time equivalent. The reader is referred to the attached papers for information on example items and the internal consistency (α) of each scale.

Physical activity

In this thesis, physical activity behaviour was assessed in a variety of ways, including self-report, objective measurement, and direct observation.

Self-reported physical activity behaviour

The short-form of the International Physical Activity Questionnaire (IPAQ) was used in Paper III and in the data collection for Paper IV. IPAQ assesses the total amount of physical activity performed in at least 10 minute bouts for three different intensities—vigorous, moderate, and walking. Moreover, participants were stratified into groups of low, moderate, and high physical activity level by following an algorithm developed specifically for IPAQ (IPAQ, 2005). In paper III we added a fourth group (no physical activity) encompassing those who

reported zero minutes of physical activity. The IPAQ short-form has been shown to possess acceptable reliability and validity in both the general population (Craig et al., 2003) and among individuals with schizophrenia (Faulkner et al., 2006). In Paper III, the questionnaire was interview administered and the recall period was the last seven days. In paper IV, the recall period was 'a typical week from the last month'. Noticeably, results regarding IPAQ are *not* presented in paper IV, but these are presented in a later paper.

In paper IV physical activity was assessed with a version of the stages of physical activity change (Wester, Wahlgren, Wedman, & Ommundsen, 2008). This is a one-item questionnaire with five possible responses to the stem "are you engaged in regular physical activity according to the definition above?" In this paper, regular physical activity was defined as "activities that make you breathe harder than normal, last at least 30 minutes, and are conducted on most days of the week". Similar questionnaires have successfully been used in individuals with SMI (Archie et al., 2007; Vancampfort et al., 2015c) and Bassilios et al. (2015) found an almost perfect correlation ($r = 0.95$, $p < 0.001$) between self-rated exercise stage and "actual" exercise stage determined by an exercise behaviour interview.

Objective and direct measurements of physical activity behaviour

In Paper III physical activity was objectively measured by an accelerometer-equipped wristwatch (Polar Active, Polar Electro Oy, Kempele, Finland). A written detailed description on how to adjust the settings of the activity monitor was developed and the two interviewers were trained accordingly. To reassure participants on what the activity monitor measured and *not* measured (e.g., location) they were given a thorough verbal and written explanation on the characteristics of the monitor. Participants who accepted to wear the Polar Active monitor wore it in the week after the interview. The activity monitor measured activity in five intensity zones: very easy (e.g. watching TV), easy (e.g. slow walking), moderate (e.g. gymnastics), vigorous (e.g. dancing), and vigorous+ (e.g. fast running). Only the three latter

intensities are considered to be physical activity (Polar Electro Inc.). Polar Active technology has been validated by measuring energy expenditure using indirect calorimetry (Brugniaux et al., 2010). Daily wear time was calculated as the sum of all five intensity zones. To be included for analysis participants had to have >600 minutes of wear time on at least four days.

In Paper V, physical activity was assessed by direct observation from the staff at the three wards. Physical activity was defined according to Caspersen, Powell, and Christenson (1985, p. 126) as "any bodily movement produced by skeletal muscles that results in energy expenditure". Staff were instructed to note all physical activity lasting more than 10 min on a predesigned form placed in the staff room. The physical activity registration came in addition to regular work assignments, because of this a simple form was developed to make the registrations as easy as possible. The form included one column for specifying the type of activity and one column for each day of the week. If a patient went swimming, this was noted in the type of activity column and the duration of the activity was noted under the correct weekday. The direct observations were performed over periods of five and four weeks in an effort to account for external events that could influence the activity at the ward. Additionally, the exercise therapist arranging twice-weekly ballgame sessions open for all patients and staff at the hospital took attendance at each session during the physical activity assessment periods.

Motivational regulations

Motivational regulations were measured in Paper III–V using three different scales. In Paper III items related to physical activity were added to the protocol after it was finalised, and even before adding physical activity related items participants had a significant study burden. Hence, it was imperative to keep physical activity related items to a minimum. When deciding on a scale measuring motivational regulations the only previous study assessing this within the SMI domain had used single items for each regulation (Sørensen, 2006). It was decided to use a modified 15-item version of the Treatment Self-Regulation Questionnaire (TSRQ:

Levesque et al., 2007). The 15 items were chosen based on factor loadings obtained from a Norwegian study where the majority of the participants had light to moderate mental disorders and/or musculoskeletal disorders (Farholm et al., 2016). The scale measured integrated, identified, introjected, external, and amotivated regulation and items were answered on a 7-point Likert-scale ranging from 1 (*not true at all*) to 7 (*very true*).

Due to using an abridged version of TSRQ the psychometric properties are reviewed more thoroughly than for the other scales used in this thesis. As predicted by SDT (Deci & Ryan, 2000) the five motivational regulations displayed a simplex pattern of associations where adjacent subscales were more closely related than non-adjacent. However, the internal consistency were well below what is typically regarded as acceptable in introjected regulation and amotivation (Kline, 1999). In an exploratory factor analysis (EFA) using maximum likelihood with varimax rotation the problems related to introjected and amotivation items were further confirmed. These items cross loaded or displayed low loadings (<.30) on the four emerging factors. It was decided to remove all items related to introjected regulation and amotivation. A new EFA yielded a three-factor solution where all items loaded on the expected factor and 74% of the variance were explained.

In Paper IV motivational regulations were assessed with the Behavioural Regulation Exercise Questionnaire version 2 (BREQ-2; Markland & Tobin, 2004). The factorial structure in BREQ-2 has been validated in individuals with both schizophrenia and affective disorders (Vancampfort et al., 2013c; 2015b). The same studies also showed acceptable internal consistency for all subscales (all $\alpha > .73$). BREQ-2 includes 19 items and the following subscales: Intrinsic motivation, identified regulation, introjected regulation, external regulation, and amotivation. Participants responded to a 5-point Likert-scale ranging from 0 (*not true at all*) to 4 (*very true*). Aligned with SDT and past research (Deci & Ryan, 2008a; Standage, Sebire, & Loney, 2008) we averaged the intrinsic motivation and identified

regulation subscales to form a score for autonomous motivation, whereas a controlled motivation score was created by averaging the subscales of introjected and external regulations. The term "exercise" was replaced with "physical activity" in all items.

In Paper V, staffs motivational regulations to promote physical activity were measured with the Multidimensional Work Motivation Scale (MWMS). MWMS is validated in Norwegian and measures the same regulations as BREQ-2 (Gagne et al., 2015). In the current study we did not include the three items assessing external regulations based on material reasons (e.g., risk losing job if I don't put enough effort in it). They were deemed improper because participants' work assignments were not directly related to promoting physical activity and they would neither be rewarded nor sanctioned for their efforts (or lack of) in promoting physical activity. Participants responded to the 16 items on a 7-point Likert scale ranging from "*not at all*" through "*moderate*" to "*completely*".

Need support and need satisfaction

Need support and need satisfaction was measured in Paper IV. The short form Health-Care Climate Questionnaire (HCCQ: Williams, Freedman, & Deci, 1998) includes 6 items concerning participants' perceived support for health behaviour from a significant other. The HCCQ has previously shown good reliability ($\alpha > .91$) within the physical activity domain (Edmunds et al., 2007; Saebu, Sørensen, & Halvari, 2013). Participants were asked to indicate the person (or persons) who was the most important for them with respect to their physical activity and to think of this person when answering the items. Responses were given on 7-point Likert-scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Need satisfaction during physical activity was assessed with The Basic Psychological Needs in Exercise Scale (BPNES: Vlachopoulos & Michailidou, 2006). The BPNES measures satisfaction of the three psychological needs in an exercise context. The questionnaire was adapted by replacing the term “exercise” with “physical activity” because

this term better reflects the activities organised by the network. The 12 items were responded to on a 7-point Likert-scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous research with the Norwegian version of the BPNES have shown good internal reliability in each of the needs separately (all $\alpha > .78$) and with all three needs collapsed (all $\alpha > .88$) (Saebu et al., 2013; Solberg, Hopkins, Ommundsen, & Halvari, 2012). An EFA yielded a single factor (maximum likelihood with varimax rotation; factor loadings from .71 to .90, and 67% explained variance). It was decided to collapse the three needs into 'total need satisfaction'. Several studies testing the SDT process model have used total need satisfaction when testing the model (e.g., Halvari et al., 2016; Standage, Duda, & Ntoumanis, 2005).

Perceived competence and self-efficacy

Perceived competence for being in regular physical activity was assessed by the Perceived Competence Scale (PCS; Williams et al., 1998). The scale contains four items and responses are made on a 7-point Likert scale ranging from 1 (*not true*) to 7 (*very true*). Previous research from Norway (Halvari et al., 2016) using the PCS adapted to a physical activity setting has shown that the scale possesses good internal consistency ($\alpha > .92$).

Staff self-efficacy for promoting physical activity among inpatients was measured with four items developed specifically for Paper V. This is in line with Bandura (2006) arguing for the importance of developing self-efficacy measurements designed specifically for a given behaviour and population. The four items were answered on a horizontal 100 mm visual analogue scale anchored with "absolutely unsure" and "absolutely sure".

Clinical variables and health related quality of life

The Health of the Nation Outcome Scale (HoNOS) was specifically developed to measure health and social functioning for people with SMI (Wing et al., 1998). The scale consists of 12 clinician rated items covering four domains: 1) behaviour (e.g., self-injury and problem drinking), 2) function / impairment (e.g., cognitive problems and physical illness), 3)

symptoms (e.g., problems with depressed mood or delusions), and 4) social functioning (e.g., problems with relationships or activities of daily living). Each item is scored from 0 (no problem) to 4 (severe/very severe), yielding a total score ranging 0 to 48. A systematic review of HoNOS validation studies concluded that it had good validity, and adequate test-retest reliability and inter-rater reliability (Pirkis et al., 2005). Scoring yields individual item scores, subscale score, and a total score. In addition, Lelliott (1999) proposed a procedure to stratify individuals into groups of severity based on their HoNOS scores. Parabiaghi, Kortrijk, and Mulder (2014) later refined the procedure to contain four groups: 'very severe' (more than one item's score >2), 'moderately severe' (one item's score >2), 'clinical' (at least one item's score of 2), and subclinical (score <2 on all items). HoNOS was applied in Paper III.

Apathy was assessed based on Marin's (1990, p. 22) conceptualisation of apathy as "diminished motivation not attributable to diminished level of consciousness, cognitive impairment, or emotional distress". In paper III, this conception of apathy was measured with the 12-item abridged version of the Apathy Evaluation Scale (AES; Faerden et al., 2008). Participants responded on a 4-point Likert scale ranging from 1 (*not at all*) to 4 (*very much*). The short form AES has a scale range of 12 – 48 and it has been suggested that a score of 27 can be used as a cut-off value indicating clinical apathy (Faerden et al., 2009).

Health related quality of life was assessed with the Medical Outcomes Study Short Form Version 2 (SF-12; Ware, Kosinski, & Keller, 1996). SF-12 is widely used within the health research domain and has been validated for use in nine countries, including Norway (Gandek et al., 1998), and among individuals with SMI (Salyers, Bosworth, Swanson, Lamb-Pagone, & Osher, 2000). Scoring was conducted according to established guidelines and yields a mental- and a physical component score of health related quality of life (Ware, Kosinski, Turner-Bowker, & Gandek, 2002). Scores are norm-based with a mean of 50 ± 10. Higher scores indicate better health functioning. The SF-12 version 2 was used in paper IV.

Weather and temperature

Data on the weather and temperature was obtained every morning before 09.00 from the weather forecast on the official webpage of the Norwegian Meteorological Institute (www.yr.no). Weather data was collected between 09.00 and 21.00 and based on the weather symbols in the hour-to-hour weather forecast. The weather symbols were given ascending numbers starting from 1 (heavy rain and thunder) to 16 (clear sky). These numbers were then averaged over the 13-hour time period to give an indication of the typical weather on that day (see Appendix 1 in Paper V for overview and description of each weather symbol). A similar procedure was used to calculate the average temperature in °C.

Data analysis

Paper I and II

In both Papers I and II it was considered inappropriate to apply meta-analytic statistics because of heterogeneity in how motivation was treated in the included papers. Consequently, a narrative approach was used for presenting the results while frequency data were presented regarding characteristics of participants and study details.

Paper III-V

Data analyses conducted in Paper III-V were conducted in SPSS version 21-24 (IBM Corp., Armonk, New York, USA) and structural equation model (SEM) testing in paper IV was performed with M*plus* version 7.31 (Muthén & Muthén, Los Angeles, California, USA).

Initially all data were screened for typing error, missing values, and normality. Missing values were treated with different procedures in each paper. In Paper III mean insertion was applied if respondents had completed 67% of the items in the scales related to apathy, motivational regulations, and perceived competence. An advantage of inserting mean values is that a participant's score remains unchanged, but such practice can decrease the variance in the data (Tabachnick & Fidell, 2007). In Paper IV missing data during SEM

analyses was treated with full information maximum likelihood procedure. Full information maximum likelihood is one of the preferred methods for handling missing data in SEM (Enders & Bandalos, 2001; Olinsky, Chen, & Harlow, 2003). In Paper V an expectation maximum algorithm was performed to obtain a complete data set.

Normality distribution of data was tested with the Kolmogorov-Smirnov test, checking skewness and kurtosis, and visually inspecting Q-Q plots and data distribution in histograms. In Paper III two clearly non-normal patterns were revealed. There was an accumulation of participants reporting zero or towards zero minutes of activity (this was least pronounced for activity with low intensity / walking). For the motivational scales there was a trend towards treating questions in a dichotomous way (responding at either end of the scale). In the clinical variables the non-normal distribution were less obvious. In Paper IV all variables, except amotivation and physical activity level, were normally distributed. Hence, in SEM analyses the MLR estimator was chosen because it is robust to non-normal data (Muthén & Muthén, 1998-2011). In Paper V skewness and kurtosis were within the range of what is suggested to be to acceptable (Hair, Anderson, Tatham, & Black, 1995; Kline, 2011). However, the Kolmogorov-Smirnov test and visual inspection of data distribution indicated some deviation from a normality distribution of data. Due to this and the small sample size, all statistical tests were performed using both parametric and non-parametric procedures. Only parametric results are reported as both types of tests yielded similar results.

Across Paper III-V differences between two or more groups were examined using Kruskal-Wallis test, one-way analysis of variance, Mann-Whitney *U*-test, independent *t*-test, paired samples *t*-test, or chi-square test, as appropriate. When relevant, *post hoc* analyses with Bonferroni corrections were applied. Bivariate associations were examined with Pearson's *r* or Spearman's *rho* depending on whether data had normal distribution or not. In Paper III all variables associated with physical activity level with a significance of $p < 0.10$ in the

univariate comparisons were included as independent variables in logistic regression analyses. Furthermore, a potential moderating effect of accepting to wear the accelerometer on the association between self-reported physical activity and clinical variables was tested following the procedure of Cohen, Cohen, West, and Aiken (2003). The fit of the SEM model to the data (Paper IV) was evaluated using the Standardized Root Mean Square Residual (SRMR) coupled with the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA). For CFI values of over .90 represent an acceptable fit, whereas values close to (or above) .95 indicate excellent fit. Values close to or lower than .08 and .06 indicate well-specified models for the SRMR and RMSEA, respectively (Hu & Bentler, 1999). To permit an acceptable participant-to-estimated parameter ratio a path analysis rather than a full latent variable analysis was conducted. Potential indirect relationships were tested using a bias-corrected bootstrapping (10 000) procedure in M*plus*. For more details on data analyses in Paper III-V see the attached papers at the back of the thesis.

Ethical approval

No ethical approval was needed for Papers I and II as they did not include human participants. Paper III was approved by the Regional Committee for Medical and Health Research Ethics (No. 2013/154). The Norwegian Social Science Data Services approved Paper IV (No. 35087) and Paper V (No. 44045). All participants gave written informed consent and no incentive was provided for participation in the studies. Approval letters are attached in Appendix C, D and E.

SUMMARY OF RESULTS

Paper I

Primary aim: To summarize findings from all intervention studies on physical activity or exercise for individuals with SMI that include either empirical data on motivational constructs or apply motivational techniques / theories in their intervention.

The search procedure resulted in 7695 potentially eligible articles, and 79 articles (reporting results from 67 unique trials) of those met all inclusion criteria. The included articles could be divided in two main groups: 1) intervention studies reporting empirical data on motivational constructs (n = 15), and 2) studies not measuring motivational constructs but that incorporate motivational theory or motivational techniques in their intervention (n = 64).

In the first group, two articles were excluded due to low study quality. The remaining 13 reported data from 10 unique interventions. Only one of these had as main objective to enhance motivation for physical activity. Results from this RCT were equivocal with respect to change in motivational variables as well as change in physical activity behaviour. In the remaining nine interventions, motivation was a secondary outcome, with physical activity behaviour and/or mental and physical health being primary outcomes. Furthermore, eight of them did not analyse motivation in relation to physical activity and the ninth found no such association. With respect to change in motivational variables, results were mixed.

In the second group, 44 interventions (reported in 51 articles) described using motivational technique or incorporated a motivational aspect in their intervention. A broad spectre of techniques was used, ranging from unstructured motivational prompts to a well-described motivational interviewing process. The most common techniques used were motivational counselling and goal setting, applied in 15 and 22 interventions, respectively. Finally, 11 interventions described in 13 articles reported to base their intervention on motivational theory. In general, these studies concluded that their interventions were both

feasible and produced health behaviour change. However, they did not examine if their intervention was successful in affecting any of the motivational constructs related to the chosen theoretical framework. Altogether, the included studies yielded little knowledge and direction on how to enhance motivation for physical activity in persons with SMI.

Paper II

Primary aim: To summarize the evidence base from cross-sectional studies on motivation for physical activity among people with SMI.

The literature search yielded 7695 unique articles. Of those, 21 articles (describing 19 unique samples) met all inclusion criteria. The 19 samples included 1704 individuals (890 male and 810 female). The response rate was about 90%, but could be lower if there were individuals declining participation in the nine studies not reporting their response rate.

The majority of studies included were more or less guided by theory. However, many did not examine if there was a relationship between motivational constructs and physical activity, although, some of them did test if there were differences in level of motivation on a selection of variables (e.g., gender or patient status). Thirteen of the articles analysed motivational constructs in relation to physical activity or physical fitness. Across these studies, increased scores on motivational constructs, such as autonomous motivation, self-efficacy, and greater readiness for physical activity, were associated with increased physical activity. Moreover, three studies supported the applicability of the TTM, one study found that variables from the Protection Motivation Theory could predict 25% of the variance in physical activity, and there was preliminary support for the reliability and validity of HAPA.

Across the included studies gender, age, BMI, medication, and diagnosis seemed to be largely unrelated to motivational constructs. The only exceptions were men displaying higher self-efficacy in two studies, and older age being positively related to externally regulated motivation in one study. Furthermore, in the three studies including a comparison group, the

SMI group scored lower on motivational constructs compared with the healthy control group. There was also a trend towards inpatients exhibiting a more favourable motivational profile than outpatients. Lastly, in two studies negative symptoms were negatively related to autonomous motivation and later stages of change, respectively. Noticeably, because few of the associations reported in the review were examined in more than two individual studies, results must be interpreted with some caution.

Paper III

Primary aim: To examine associations between physical activity and motivation for physical activity, sociodemographic, and clinical variables in individuals with SMI in a municipality sample recruited to a study with another focus than physical activity.

According to IPAQ nearly $^{2}/_{3}$ of the participants reported that they did not do any 10-minute bouts of moderate or vigorous physical activity during last week. Furthermore, the majority of participants were categorised into 'no activity' (21%) or 'low activity' (43%) groups. Only 12% and 13% were categorised in the 'moderate active' and 'high active' groups, respectively. Fifty-six participants wore the accelerometer enough to calculate a meaningful score of physical activity. Approximately half of these were physically active for more than 30 minutes per day, but less than 30% did on average more than 10 minutes of moderate or vigorous physical activity each day. Of all participants, 90% stated that they would like to increase their physical activity level.

Participants who wore the accelerometer self-reported more physical activity than those who did not, but there were no differences in sociodemographic, motivational, or clinical characteristics. However, the two groups had clearly different patterns of associations. The associations between study variables were stronger for participants with objective data on physical activity in comparison to those without. Especially the associations between self-reported physical activity and clinical variables (i.e., apathy and health and social functioning)

were different between the two groups. Further analyses showed that there was a moderating effect of accepting to wear the accelerometer on the association between self-reported physical activity and clinical variables. In the group who accepted to wear the accelerometer, participants with more favourable scores on clinical variables self-reported more physical activity than those with less favourable scores. In contrast, there was no association between clinical variables and physical activity among participants *not* wearing the accelerometer.

Univariate analyses comparing motivational, clinical, and sociodemographic variables across self-reported physical activity level showed that individuals with higher physical activity level reported significantly higher scores of integrated regulation and perceived competence. With respect to objectively measured physical activity, individuals being physically active for more than 30 min/day reported significantly higher scores of integrated and identified regulation, and perceived competence compared with those being physically active less than 30 min. Likewise, they also reported significantly lower scores of apathy and were assessed to have better health and social functioning.

A multinomial logistic regression model showed that increased level of integrated regulation and perceived competence were significantly associated with increased physical activity level, even when controlling for the other variables. The odds ratios were larger when predicting 'moderate/high physical activity' level compared to 'low physical activity' level. A binary logistic regression model showed that increased level of integrated regulation again was significantly associated with increased objective physical activity. In this analysis, unlike in the multinomial model, lower scores in health and social functioning was significantly associated with increased level of physical activity.

Paper IV

Primary aim: To examine associations between variables assumed to precede motivation (need support and need satisfaction) and motivation for physical activity, as well as the

associations between motivation, physical activity, and health related quality of life among individuals with SMI that had recent experience with physical activity.

Participants were generally physically active, with 59% indicating being physically active for 30 minutes on most days of the week for more than six month and 17% for less than six months. The remaining participants either considered starting with regular physical activity (5%) or had a plan of doing so (19%).

Preliminary analyses showed that individuals living alone reported higher scores of controlled motivation, and that the youngest age group reported significantly lower need satisfaction and mental health related quality of life compared to the middle and oldest age group, respectively. Furthermore, according to the norm-based standards of SF-12 participants scored significantly lower than the general population in both mental and physical health related quality of life.

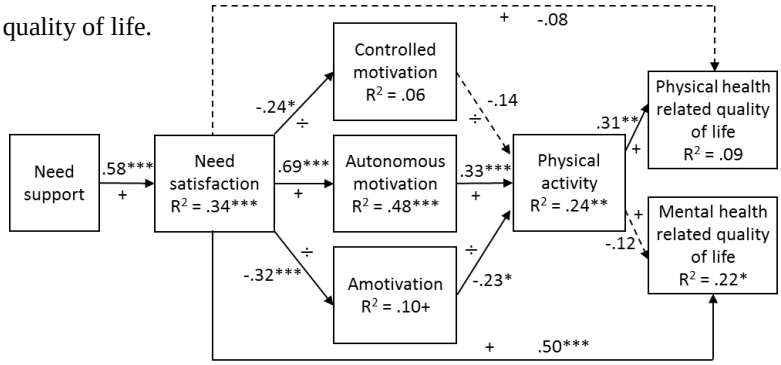

Figure 4. The SDT process model tested in paper IV. Dashed lines represent hypothesized paths that were not significant. $+p < 0.1$, $*p < 0.05$,$**p < 0.01$, $***p < 0.001$

The associations between study variables were examined according to the SDT process model and were broadly in line with theoretical expectations. The path model yielded a good fit of the model to the data [χ^2 (16) = 19.30, $p = .25$; $\chi^2/df = 1.21$; SRMR = .058; RMSEA [90% CI] = .048 [.000, .115]; CFI = .975]. The standardized parameter estimates are shown in Figure 4. The model included 15 indirect relationships. Eight of these were significant (e.g., need support having an indirect relationship with autonomous motivation through need satisfaction).

Paper V

Primary aim: To examine the feasibility of increasing physical activity level among inpatients with SMI through implementing a short educational intervention among mental health staff.

Approximately the same percentage of patients (~30%) were physically active in at least one 10-minute bout during the day at each time point, but active patients at T1 engaged in significantly longer activity bouts than patients at T2. Consequently, patients at T1 were observed to engage in significantly more physical activity than patients at T2. Furthermore, there were no significant differences in amount of time walking, but for patients at T2 and T3 walking constituted a significantly greater share of their overall physical activity time than it did for patients at T1. This tendency of patients at T1 to engage in more minutes and more varied physical activity than patients from T2 and T3 is supported by the total number of patients attending the twice-weekly ballgame sessions organised outside the wards. During T1, 16 patients (comprising at least five different patients) were present across 10 ballgame sessions while only one patient attended once during both T2 and T3. Across the three time points, increased physical activity was associated with week days rather than weekend days and with clear skies rather than rainy weather.

Staff were clearly more motivated to promote physical activity among patients for autonomous reasons rather than controlled reasons and their self-efficacy towards promoting physical activity was relatively high. There was no significant change from T1 to T2 in neither the motivational regulations nor self-efficacy. This applied for both comparing the 13 participants responding at both time points and when comparing two independent groups using participants responding at T2 (n=23) and the T1 responses to the remaining participants (n=24). This last approach implied only using the T2 scores of participants answering at both time points.

DISCUSSION

This chapter will start by discussing the five research questions separately before a more general discussion is provided. In discussing the research questions, each of them is introduced by an overview of relevant results and they are ended with a brief summary. The last part of the discussion chapter is devoted to methodological limitations, clinical implications, and suggestions for future research. The thesis will end with a short concluding paragraph summarising the main findings.

Research question 1

What is the current status of the body of quantitative research regarding motivation for physical activity among individuals with SMI? (Paper I-II)

Summary of results:

- Many physical activity interventions incorporate motivational strategies. However, few do it with a theory-based and structured approach and only one trial was aimed at enhancing motivation for physical activity.
- Results in studies examining change in motivational constructs were equivocal and intervention studies yielded little direction on how to enhance motivation for physical activity in persons with SMI.
- The majority of cross-sectional studies were more or less guided by theory and higher scores of autonomous motivation, self-efficacy, and readiness for physical activity were consistently associated with increased physical activity engagement.

At the commencement of this thesis there existed no systematic review concerning motivation for physical activity among individuals with SMI. Establishing an overview of the existing body of research on this topic was therefore a natural starting point in the response to the calls for research addressing how to help individuals with SMI begin and continue with physical activity (e.g., Bonsaksen, 2011; Gorczynski & Faulkner, 2010).

The results from Paper I revealed that incorporating motivational strategies in physical activity intervention was relatively common, in fact, 79 of the 218 identified articles describing a physical activity intervention included various aspects related to motivation for physical activity. However, in the majority of these trials the motivational strategies used

were only briefly described, often just anecdotally. The "motivational approach" differed greatly between the studies, from reward systems based on tokens or lunch vouchers (Maggouritsa et al., 2014; Warren et al., 2011) to a well-described program including elements of SMART goal-setting, increasing exercise self-efficacy, motivational balance, stages of change, planning exercise, and overcoming relapse and setbacks (Strom et al., 2013). Common for all these trials was that they did not evaluate the effect of the motivational strategies employed. Moreover, the greater share of these trials were atheoretical. This is unfortunate because within the public health and health promotion context there is increasing evidence for theory-based trials being more effective than atheoretical trials (Glanz & Bishop, 2010). This latter issue was partly addressed in 11 of the trials identified in Paper I. These trials were theory based (typically SCT, SDT, and/or TTM), but they did not assess motivation (e.g., Daumit et al., 2013; Green et al., 2015; Usher et al., 2013). Hence, they yielded little knowledge on the role of motivation in physical activity adoption and maintenance or how to best influence physical activity motivation in individuals with SMI.

In Paper I only one trial was identified that aimed at enhancing physical activity motivation (Beebe et al., 2010; 2011) and only nine other trials assessed motivational constructs (as a secondary or tertiary outcome). The trial conducted by Beebe et al. yielded equivocal results with respect to change in motivational constructs and there was only a trend towards the intervention group being more physically active than the control group. One reason that may explain the absence of effect on motivation was the *lack* of physical activity during the intervention. This is important as first-person mastery experience is regarded as the most influential source affecting self-efficacy (Bandura, 1997). Furthermore, with the limited effect of the motivational intervention it would be rather surprising to see differences between the two groups in the subsequent walking program. Neither of the articles reported on the association between physical activity engagement and motivation (Beebe et al., 2010; 2011).

This is unfortunate because variation in motivation could potentially have explained variation in physical activity, independent of the intervention being successful or not. This limitation is shared by all, except one (Daumit et al., 2011) of the trials assessing motivation for physical activity. Indeed, there is a dearth of studies examining the association between motivation and physical activity from a longitudinal perspective.

In contrast to intervention studies, the majority of the cross-sectional studies identified in Paper II were based on theory. Several of them (13 of 21) examined the association between physical activity and motivation. In general, these studies demonstrated a positive relationship between increased physical activity engagement and higher scores on autonomous motivation, self-efficacy, and readiness for physical activity. Moreover, the applicability of TTM for explaining physical activity behaviour among individuals with SMI was supported in three studies (Bassilios et al., 2015; Bezyak et al., 2011; Gorczynski et al., 2010) while the utility of Protection Motivation Theory was supported in one study (Leas & McCabe, 2007). One interesting, although preliminary was how motivational constructs were largely unrelated to gender, age, BMI, medication, and diagnosis. This is in line with a large multi-centre study that was published after the writing of Paper II and that broadly found no association between motivational regulations and diagnosis (i.e., bipolar disorder, major depression, and schizophrenia), gender, BMI, education, and age (Vancampfort et al., 2015c).

In both cross-sectional and intervention studies there was great variability in how motivation was implemented. Self-efficacy can be used as an example: It has been applied as an atheoretical construct (e.g., confidence), as a motivational technique (e.g., increasing exercise self-efficacy), as a theory based construct measured in interventions with or without a theoretical framework (e.g., with or without a strategy of affecting exercise self-efficacy), and not measured in intervention studies based on theory (e.g., with a strategy of affecting exercise self-efficacy).

After the publication of Papers I and II, several studies concerning motivation for physical activity in individuals with SMI were published, including three longitudinal theory-based studies (two intervention- and one observational study) focusing mainly on motivation for physical activity (Gohner et al., 2015; Kramer et al., 2014; Sailer et al., 2015). Results from these three studies are broadly in line with the findings from Paper I and II (see pages 18-19 for description of studies and their results).

To summarise, the body of research examining motivation for physical activity among individuals with SMI is still relatively small and there is a paucity of well-designed studies focusing mainly on motivation for physical activity and particularly on how to enhance motivation for physical activity. The existing research base contains several limitations that future studies should address. First, a substantial proportion of the studies either has an atheoretical approach or does not analyse motivation in relation to other study variables (e.g., physical activity). Second, although there seems to be a positive relationship between physical activity and autonomous motivation, self-efficacy, and readiness for physical activity (at least on a cross-sectional level) few studies examine how to influence these constructs. Third, the heterogeneity in how motivation is implemented and treated across individual studies makes it inappropriate to compile results in quantitative way and impedes the opportunity to draw firm conclusions. In addition, most studies use convenience samples and such samples may hold more positive attitudes towards physical activity than individuals with SMI in general. Finally, studies often measure physical activity solely by self-report and there is a lack of well-validated instruments for assessing motivation for physical activity in persons with SMI.

Research question 2

How does variation in motivational regulations and perceived competence relate to physical activity in individuals with SMI? (Paper III-IV)

Summary of results:

- Higher scores of autonomous motivation, integrated regulation, and perceived competence were all positively associated with increased physical activity engagement. The magnitude of the associations were modest-to-strong and strong.
- Results indicate that controlled motivation only plays a minor role in why individuals with SMI are physically active.
- High levels of identified regulated motivation across physical activity level suggest that individuals with SMI *are* motivated for physical activity, but that motivation based on being aware of and value the health benefits of physical activity may not be of sufficient quality for transferring intentions into action.

There is little research on the association between the various motivational regulations proposed by SDT and physical activity in individuals with SMI. Only one study was published ahead of the present thesis (Sørensen, 2006), while more recently three cross-sectional studies deriving from a large multi-centre study have added to this knowledge (Vancampfort et al., 2013c; 2015b; 2015c). These studies measured and operationalized motivation in different ways (e.g., one item versus several items for each regulation and collapsing intrinsic and identified regulation versus analysing them separately). Irrespective of that, their results were largely in line with the theoretical expectations (Deci & Ryan, 2000) and results found in other clinical groups as well as in the general population (e.g., Farholm et al., 2016; Halvari et al., 2016; Teixeira et al., 2012). However, identified regulation was associated with physical activity in Vancampfort et al. (2015c) while it was not in Sørensen (2006) and neither of the studies assessed integrated regulation. Thus, results from Paper III and IV can extend the present knowledge on the role of motivational regulations in relation to physical activity.

In Paper III, the participants reported low levels of externally regulated motivation (potentially so low that it could be a floor effect) and external regulation was unrelated to

physical activity, independent of how physical activity was measured or operationalized. Likewise, controlled motivation was unrelated to physical activity engagement in paper IV and even though the level of controlled motivation was somewhat higher (in relation to the scale range) than for external regulation in paper III, it was still relatively low. This difference may have been the result of collapsing introjected and external regulation into the overarching concept of controlled motivation. Amotivation specifically directed towards physical activity was only examined in Paper IV. The results showed that participants scored very low on amotivation, which is not surprising as participants were voluntarily taking part in physical activities that were organised by a public health network. Moreover, there was a moderate negative association between physical activity engagement and amotivation.

The results regarding the more self-determined sorts of motivation are more intriguing. Participants in Paper III reported high levels of identified regulation irrespective of their self-reported physical activity level. This may explain why the association between self-reported physical activity and identified regulation was not significant. However, identified regulation was significantly associated with objective physical activity operationalized into a categorical measure (high versus low with a cut-off point of 30 min/day) while it was not when it was used as a continuous measure (min/day). The association between integrated regulation and physical activity (both objective and self-report) was more pronounced with more physically active participants reporting higher scores of integrated regulation. However, depending on how physical activity was operationalized one of the relationships was clearly deviant from the others, although all were significant. The association between integrated regulation and objective, continuous physical activity was of moderate magnitude ($r = 0.37$) while the three other relationships were stronger ($r = 0.53 – 0.55$). The importance of integrated regulation was highlighted in the logistic regression analyses as it was positively associated with increased physical activity even when controlling for other clinical and motivational

variables. Integrated regulation has rarely been measured in research due to the difficulty of empirically distinguishing it from identified regulation and intrinsic motivation (Teixeira et al., 2012). However, Sørensen (2006) found that holding an exercise self-schema (Kendzierski & Morganstein, 2009 [i.e., having an identity as a physically active person]) was associated with increased physical activity level. It could be argued that an exercise self-schema has some conceptual overlap with integrated regulation (i.e., reasons for physical activity behaviour have been assimilated into being in coherence with the self). In Paper IV it was a positive association between autonomous motivation and physical activity engagement and the magnitude was moderate to strong. This result is in line with previous cross-sectional research within the SMI context (Vancampfort et al., 2013c; 2015b; 2015c).

The finding of high levels of identified regulated motivation across physical activity level in paper III is particularly interesting as it challenges the widespread notion of "individuals with SMI lacking motivation for physical activity" (Fraser et al., 2015; Happell et al., 2013; Soundy et al., 2014b). This notion is further challenged by over 90% of the participants in Paper III reporting that they would like to increase their physical activity level. Likewise, several studies show that only a minority of individuals with SMI have no interest or intention for starting with physical activity (Archie et al., 2007; Bezyak et al., 2011; Gorczynski et al., 2010). Thus, one could argue that individuals with SMI have both interest and motivation for physical activity. However, motivation based on being aware of and value the benefits of physical activity (i.e., identified regulation) may not be of sufficient quality for overcoming an intention-behaviour gap (Kramer et al., 2014; Sniehotta et al., 2005). This line of argument is supported by research that shows individuals with SMI to a high degree acknowledge the mental and physical health benefits of physical activity (e.g., Firth et al., 2016a; Fraser et al., 2015) while at the same time there is considerable evidence for low physical activity uptake (Burton et al., 2013; Stubbs et al., 2016a).

Another aspect that can make it difficult for individuals with SMI to translate intentions into action is low perceptions of self-efficacy or competence for being physically active (Johnstone et al., 2009; Kramer et al., 2014; Rastad et al., 2014). In Paper III the results showed that the participants in general reported high levels of perceived competence and that increased perceptions of competence had a strong positive association with physical activity behaviour. However, when controlling for clinical and motivational variables in the logistic regression analyses, perceived competence was associated with higher levels of self-reported, but not objective, physical activity. This may be explained by participants *with* and *without* objective measurement of physical activity displaying different patterns of associations. It could be that among participants *with* objective measurement of physical activity health and social functioning was more important than perceptions of competence while the opposite was the case for those *without* objective measurement of physical activity. Moreover, low active participants reported relatively high scores of perceived competence and low scores of integrated regulation while high active participants reported high scores of perceived competence and relatively high scores of integrated regulation. This may explain why the effect above only emerged for perceived competence and not integrated regulation. The relatively high level of perceived competence among low active participants is a peculiar finding. This may stem from these participants being unable to accurately assess their competence for physical activity due to insufficient experience.

Although no previous studies have examined the relationship between physical activity and perceived competence from a SDT perspective, several studies have used the related concept of self-efficacy. Indeed, two studies present similar results as discussed in the previous paragraph. They found positive bivariate associations between self-efficacy and physical activity (Bezyak et al., 2011) and exercise stages of change (Bassilios et al., 2015). However, self-efficacy did not make a unique and significant contribution in the presence of

other TTM constructs when performing linear regression analyses with physical activity / exercise stages of change as dependent variable.

To summarise, the findings from Paper III-IV show that amotivation and external or controlled motivation are negatively and unrelated to physical activity, respectively. Findings also showed that participants scored relatively low on these motivational regulations. Together, this indicates that controlled motivation only plays a minor role in why individuals with SMI are physically active. Next, in paper IV participants displayed relatively high scores of autonomous motivation and autonomous motivation was positively associated with physical activity engagement. Examining identified and integrated regulation as separate regulations instead of collapsing them revealed two interesting findings. First, integrated regulation had a strong positive relationship with physical activity while identified regulation had a moderate, positive *non*-significant relationship. Second, participants reported relatively high or high scores of identified regulation across physical activity level while less and more active participants reported low and high scores of integrated regulation, respectively. This, combined with 90% of participants stating that they would like to increase their physical activity level, suggests that individuals with SMI, indeed, have motivation for and interest in physical activity. Finally, participants reported high levels of perceived competence and perceived competence had a strong, positive association with physical activity.

Research question 3

What is the association between motivational variables, clinical variables, health related quality of life, and physical activity? (Paper III-IV)

Summary of results:

- Integrated regulated motivation and perceived competence are positively associated with self-reported physical activity even when controlling for apathy and health and social functioning.
- The applicability for using SDT to explain physical activity behaviour among individuals with SMI was supported by demonstrating the important role of need support and need satisfaction for enhancing autonomous motivation and thus also increased physical activity engagement.
- Being rated to have better or worse health and social functioning and reporting more or less apathy did not influence whether participants were interested in physical activity (i.e., accepting to wear the accelerometer and self-reporting higher physical activity level). However, among those with more interest in physical activity, better health and social functioning and less apathy were associated with increased physical activity engagement.
- Physical health related quality of life is positively associated with physical activity engagement whereas mental health related quality of life is positively associated with need satisfaction during physical activity. Together this indicates that both the amount of physical activity and the experience during physical activity are important for health related quality of life.

Several studies demonstrate that higher levels of more autonomous forms of motivation and self-efficacy or competence are positively associated with increased physical activity in individuals with SMI (Arbour-Nicitopoulos et al., 2014; Bezyak et al., 2011; Kramer et al., 2014; Sørensen, 2006; Vancampfort et al., 2015c). However, the relationship between physical activity and motivation or competence is influenced by several external factors. Thus, it is unfortunate that few, or no, studies have taken into account the potential influence of clinical variables on this relationship or examined factors that are proposed to positively influence autonomous motivation (i.e., need support and need satisfaction).

Acknowledging clinical variables when examining motivation for physical activity is important as there are studies suggesting that poorer functional outcome and increased levels of negative symptoms are associated with decreased physical activity level and functional

exercise capacity, and lower scores of autonomous motivation (Vancampfort et al., 2012a; 2012b; 2015a). In Paper III, general level of apathy and the severity of illness (assessed by their health and social functioning) served as clinical indicators. To illustrate the clinical status of the participants approximately half rated themselves as apathetic while in nearly $^{3}/_{4}$ persons the illness severity was rated to be either "very severe" or "moderately severe".

In the univariate analyses health and social functioning and apathy were both unrelated to self-reported physical activity. Contrary to this, in the sub-sample accepting to wear the accelerometer higher levels of objective physical activity was associated with less apathy and better health and social functioning. The latter result is what one would expect based on previous research (Vancampfort et al., 2012a; 2012b; 2015a). These opposing results may stem from the design in Paper III, resulting in recruitment of two sub-populations, one with 'more interest' and one with 'less interest' for physical activity (determined by accepting or declining to wear the accelerometer). This method of differentiating is based on assuming that participants with more interest in physical activity would be inclined to take on the extra "work load" of wearing the accelerometer for a week. This is strengthened by results showing that participants who wore the accelerometer self-reported higher levels of physical activity and displayed a tendency towards reporting increased scores on integrated regulation. Moreover, in the group wearing the accelerometer, clinical variables were related to physical activity and integrated regulation. This was not the case for those who declined wearing the accelerometer. Indeed, a moderating effect of willingness to wear the accelerometer was found in the relationship between physical activity and clinical variables. This interplay between interest in physical activity, clinical variables, and physical activity needs be further elucidated in future studies, preferably longitudinal, before drawing any firm conclusions.

The multivariate analyses conducted in Paper III were performed in order to examine the relative importance of motivational and clinical variables for physical activity level. In the

multinomial regression analysis with self-reported physical activity as dependent variable, higher scores of integrated regulation and perceived competence were associated with higher odds ratios for being more active. The lack of contribution from apathy, health and social functioning, and identified regulation is, as expected, based on their non-significant results in the univariate analyses. The logistic regression analysis with objective physical activity level as dependent variable revealed what may be the most important finding in Paper III. Higher scores on integrated regulation was still associated with increased physical activity level, even in the presence of clinical variables that were associated with objective physical activity. This analysis also revealed that health and social functioning was a significant predictor of physical activity, while perceived competence and apathy were not. Altogether, the multivariate analyses indicate that physical activity specific motivation, in particular integrated regulation, is associated with physical activity even when controlling for clinical variables.

The important role of autonomous motivation in fostering physical activity is well-established in the general population (Teixeira et al., 2012) and there is emerging evidence for this relationship among individuals with SMI as well (e.g., Sørensen, 2006; Vancampfort et al., 2015c). Thus, to enable clinicians to create an environment that promotes autonomous motivation for physical activity it is imperative to develop an understanding of factors that can enhance or impede this process. In Paper IV, need support was a strong predictor and explained a significant amount of variance in need satisfaction ($R^2 = 0.34$). Then, need satisfaction positively predicted autonomous motivation and negatively predicted controlled motivation and amotivation. However, it was only in autonomous motivation that need satisfaction could explain a significant amount of variance ($R^2 = 0.48$). The finding of need satisfaction being a stronger predictor for autonomous motivation than for controlled motivation and amotivation could be explained by assessing need satisfaction rather than need thwarting. The latter is expected to lead to more harmful consequences (e.g., controlled

motivation) than low degrees of need satisfaction (Bartholomew, Ntoumanis, Ryan, Bosch, & Thogersen-Ntoumani, 2011). Next, the three types of motivation explained 24% of the variance in physical activity, but only autonomous motivation and amotivation made unique and significant contributions. Lastly, mediation analyses revealed that need support had a positive indirect effect on autonomous motivation and physical activity, and negative indirect effects on controlled motivation and amotivation. Altogether, these findings are in line with previous research within the health behaviour context in general and physical activity context in particular (Ng et al., 2012; Teixeira et al., 2012).

The findings in paper IV lend support to the importance of creating a need supportive environment in order to facilitate autonomous motivation and physical activity. Even though these results are preliminary and should be replicated in prospective, experimental studies, they are valuable because they support extrapolating knowledge on how to create a need supportive environment from the general population into a SMI context. However, future studies could extend these findings by refining and adjusting need supportive strategies to optimally suit individuals with SMI. These accommodations could benefit from taking into consideration special characteristics of individuals with SMI, such as illness symptoms or being hospitalised at closed psychiatric wards.

Based on previous research examining the relationship between need satisfaction / physical activity and quality of life / well-being (Adie et al., 2008; Breitborde, Kleinlein, & Srihari, 2012; Dauwan et al., 2016; Farholm et al., 2016; Rosenbaum et al., 2014) it was hypothesised that both physical activity and need satisfaction would be associated with mental and physical health related quality of life. However, results revealed that only need satisfaction during physical activity was associated with mental health related quality of life whereas only physical activity was associated with physical health related quality of life. Together, these results show that it is not only the amount of physical activity, it is also the

content (i.e., being experienced as need satisfying), that is important for health related quality of life. This is in line with a study among young adults with disability where need satisfaction during physical activity was related to mental but not physical health related quality of life (Sæbu, 2011). Furthermore, the importance of the content or the characteristics of physical activity is highlighted in a meta-analyses examining the relation between exercise and affective responses (Ekkekakis, Parfitt, & Petruzzello, 2011). Results showed that there was a relation between exercise intensity and the affective responses (i.e., intensity above lactate threshold leading to reduced pleasure) and that self-selected, rather than imposed, intensity level appeared to foster greater tolerance for increased intensity. Overall, these findings suggest that the ways in which mental health staff organise physical activity and how they relate to individuals during physical activity can influence the individual's autonomous motivation, physical activity level, and mental health related quality of life.

To summarise, the results support the utility of SDT to understand physical activity behaviour in individuals with SMI. Findings showed that autonomous forms of motivation were associated with increased physical activity while more controlled forms of motivation were not. Additionally, increased perceptions of need support was associated with higher levels of need satisfaction which again was associated with enhanced autonomous motivation and decreased controlled motivation and amotivation. Moreover, integrated regulation and perceived competence were associated with self-reported physical activity level even when controlling for clinical variables. Results also showed that both the amount of physical activity and how it was experienced were important for health related quality of life. Finally, having better or worse functioning and more or less apathy did not influence whether participants were interested in physical activity (i.e., accepting to wear the accelerometer), but among those with more interest in physical activity, better health and social functioning and less apathy were associated with increased physical activity engagement.

Research question 4

What is the physical activity level among individuals SMI strategically recruited from three different settings? (Paper III-V)

Summary of results:

- Individuals with SMI that were recruited to partake in a study with another focus than physical activity displayed low levels of physical activity, especially physical activity with moderate or vigorous intensity.
- In three psychiatric wards (two closed and one open) staff observed about 70% of the patients to be physically inactive each day over three assessment periods of respectively five, five, and four weeks.
- About $^{3}/_{4}$ of individuals with SMI taking part in activities organised by a public health network promoting physical activity self-reported to be physically active for 30 minutes per day on most days of the week.

It is well-established that individuals with SMI engage in little physical activity with moderate or vigorous intensity and that they are less physically active than the general population (e.g., Stubbs et al., 2016a; Vancampfort et al., 2016c). However, very few studies have examined physical activity solely among inpatients and there are large discrepancies in the proportion adhering to physical activity recommendations. Additionally, few have followed the recommendation of Lindamer et al. (2008) of using both objective and self-report measurements. Indeed, there is still a need for examining physical activity level among individuals with SMI.

Although direct comparisons are difficult due to different assessments techniques, results suggest that participants in Papers III and V displayed quite different levels of physical activity engagement than participants in Paper IV. One interesting aspect of considering physical activity engagement across the three papers is related to how participants were recruited. First, the results in Paper III are likely to be less biased by participants' preferences for physical activity because they were recruited to a study with another focus than physical activity. The representativeness of the group (with respect to physical activity) is strengthened by chart review indicating that over half of all individuals with SMI living in this municipality

were recruited to the study. Furthermore, this municipality is within the catchment area of both the hospital where the feasibility study was conducted and it is one of the municipalities taking part in the public health network described in Paper IV. Thus, the physical activity engagement displayed by participants in Paper III can be used as a reference when interpreting the physical activity engagement reported in Papers IV and V. With this as background, the high levels of physical activity reported by individuals in Paper IV (over ¾ state being physically active for 30 minutes on most days of the week) is especially promising. This suggest that physical activity promotion programs attuned to the terms and needs of individuals with SMI have potential for increasing physical activity level in this population. In order to succeed, such programs can benefit from providing an environment that emphasises social support and interaction (Fraser et al., 2015; Mason & Holt, 2012), offering well-organised exercise sessions guided by competent personnel (Hodgson et al., 2011; Vancampfort et al., 2016g), and creating an environment that facilitates autonomous motivation and self-efficacy (Bezyak et al., 2011; Vancampfort et al., 2015c). Likewise, these programs should also help participants overcome known barriers for being physically active, such as transportation problems, financial costs, social stigma, and lack of or bad experiences with physical activity (Beebe et al., 2011; Happell, Scott, Platania-Phung, & Nankivell, 2012; Kilbourne et al., 2007; Rastad et al., 2014).

In Paper III about $^{2}/_{3}$ of the participants self-reported no moderate or vigorous intensity physical activity and over $^{1}/_{5}$ reported not doing any physical activity (including walking). Similarly, around 70% of all the inpatients in Paper V were sedentary each day and among those being active, walking constituted for between $^{1}/_{3}$ and $^{2}/_{3}$ of total time spent on physical activity. The high proportion of participants being inactive is problematic as sedentary behaviour is associated with adverse health outcomes and increased mortality, independent of time spent on physical activity (Chau et al., 2013; Proper, Singh, van

Mechelen, & Chinapaw, 2011; Wilmot et al., 2012). The importance of also paying attention to sedentary behaviour during treatment is underscored in a recent meta-analysis (Martin et al., 2015). Their results demonstrate that interventions primarily focusing on physical activity had little effect on sedentary time, whereas those more holistically oriented towards changing physical activity, sedentary behaviour, and diet were more successful in reducing sedentary time. Thus, researchers and clinicians should target *both* increasing physical activity engagement (particularly moderate and vigorous intensity activity) and reducing sedentary time when developing interventions or working clinically with individuals having SMI.

To summarise, although there is now a considerable volume of studies examining physical activity level in individuals with SMI the results presented in the current thesis make an important contribution to this knowledge base. First, in Paper III both objective and subjective assessment of physical activity was employed and this was conducted in a sample larger than the 35 and 16 participants in the two previous studies, using both measurement methods (Faulkner et al., 2006; Lindamer et al., 2008). Results from both measurement methods showed that the physical activity level among participants in Paper III were low and that the majority of time spent on physical activity was within the low intensity / walking range. Next, the direct observation of physical activity among inpatients in Paper V is among the first studies to examine physical activity pattern in only hospitalised individuals with SMI and probably the first to have to have done so over as many as 14 weeks. Results in Paper V revealed that an alarming high proportion of hospitalised patients are sedentary each day, even in a hospital with readily accessible opportunities to be physically active. Finally, the results from Paper IV were rather encouraging as they indicated that the majority of participants recruited from the public health network stated that they were doing at least 30 minutes of physical activity on most days of the week.

Research question 5

Is it feasible to increase physical activity level among inpatients with SMI through implementing a short educational intervention among mental health staff? (Paper V)

Summary of results:

- The results suggests that offering staff at psychiatric wards a 7-hour educational intervention on "how to enhance physical activity motivation among patients with SMI" is not sufficient in order to produce a meaningful change in physical activity pattern among patients.
- Approximately the same percentage of patients (~30%) was physically active in at least one 10-minute bout during the day at T1, T2, and T3. However, active patients at T1 engaged in significantly longer activity bouts than patients at T2 and were thus observed to engage in significantly more physical activity than patients at T2 did.
- The intervention yielded no significant change in staff motivation or staff self-efficacy for promoting physical activity among their patients.

Several calls have been made for studies to address how to best foster physical activity in individuals with SMI (Bonsaksen, 2011; Gorczynski & Faulkner, 2010). In extension of this, a large proportion of nurses working in mental health care would like additional training related to physical activity promotion (Happell et al., 2013). Targeting motivation has also been highlighted as a key in order to facilitate increased physical activity engagement (Beebe, 2008; Goldberg et al., 2013; Liu & Spaulding, 2010). We developed a 7-hour educational program with the topic *"how to enhance physical activity motivation among patients with SMI"*. Then, we examined if it was feasible to increase physical activity level among inpatients with SMI by implementing the program as part of the professional development plan at three psychiatric wards.

There can be several reasons for the limited success of this feasibility study. First, the proportion of staff taking part in the educational intervention was about 60%. This participation rate was a compromise between wards sending as many staff as possible to the interventions sessions without affecting patient care. Although it can be challenging to reach all, or nearly all, of staff at psychiatric wards due to shift work, many not holding full time

positions, and employment of on-call staff, a higher participation rate would obviously have increased the chance of effectiveness. Another debilitating factor is the fact that physical activity promotion was not a part of the job description for participating staff. In a demanding everyday situation physical activity is likely to be a low priority compared to tasks that are part of the job description. Indeed, staff anecdotally reported time-constraints, shortage of staff, fluctuation in illness symptoms among other patients, and external events like reorganisation of the hospital to undermine the opportunities to facilitate physical activity. This is consonant with qualitative findings on the views held by mental health nurses on physical activity (Happell et al., 2012). They also describe the high demands of everyday practice, unpredictable occurrences and crises, and shortage of staff as common circumstances that prevent them from motivating and promoting physical activity in a structured and considerate way.

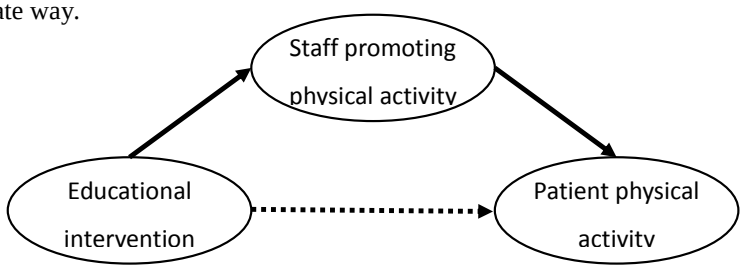

Figure 5. A conceptual mediation model. Bold lines indicate how the intervention was planned to work while the dotted line indicate that the intervention did not directly target patients.

Moreover, it is possible that the design of the educational program was sub-optimal. The main emphasis in the program was on motivational strategies that staff could employ on an individual basis, maybe it would have been beneficiary to include how the ward as a unity could work systematically with facilitating physical activity. Next, it is possible that to increase the confidence and ability for facilitating physical activity among staff with the least competence and experience (with physical activity) a more comprehensive intervention would be required. Finally, the study could be described as depending solely on a mediation effect as the intervention was at the staff level while the outcome was at the patient level could and the

intervention did not directly target patients (see Figure 5). One major pitfall using this design is the uncertainty of how well (or if) the intervention content is conveyed to the patients.

Besides examining the feasibility of increasing physical activity among inpatients through offering staff a short educational intervention, the study makes an important contribution in describing the physical activity pattern of hospitalised individuals with SMI. The extensive physical activity registration over 14 weeks revealed several interesting patterns. Primarily, it is striking that approximately 70% of the patients were doing less than one 10-minute bout of activity each day on all three time-points. This illustrates that there is certainly room for improvement when it comes to promote physical activity among inpatients at psychiatric wards. Next, patients engaged in significantly less physical activity on weekends compared to weekdays. This is the opposite pattern of what that is found among overweight and obese individuals without SMI (Young, Jerome, Chen, Laferriere, & Vollmer, 2009). A potential explanation for this can be that the staff per patient ratio is lower on the weekend, which may reduce staff opportunities to engage patient in physical activity outside the ward. However, this cannot explain why patients are less physically active on Fridays compared with the other weekdays (Mon-Thu). One speculative explanation for this could be related to administrative tasks and journal recordings that accumulated during the week and those may have been performed on Friday. Another external factor influencing both the number of patients being active each day and for how long they were active was the weather, with clear skies, rather than rainy weather, predicting increased physical activity.

To summarise, the results from the feasibility study indicate that conducting a short educational intervention among staff working at psychiatric wards was not sufficient in order to increase physical activity level among inpatients with SMI. This suggest that more comprehensive and possibly multi-level interventions are needed to reduce the alarmingly high proportion of inpatients being inactive each day.

General discussion

The main aim of the present thesis was to contribute to the relatively scant knowledge base regarding motivation for physical activity in individuals with SMI. This was accomplished by conducting two systematic reviews including intervention studies and cross-sectional studies, respectively. Next, we strategically recruited two different samples of participants with SMI in order to examine associations between motivational variables grounded in SDT, physical activity behaviour, clinical variables, and health related quality of life. These two samples intended to reflect a representative sample with respect to physical activity preferences and a sample that most likely held a positive view on physical activity and had recent experience with physical activity. The last contribution of the thesis was to examine the feasibility of increasing physical activity in inpatients through conducting a short, theory-based, educational intervention among staff at three psychiatric wards.

There is an increasing interest for examining motivation for physical activity in individuals with SMI. Cross-sectional studies (Paper II-IV) indicate that there is a positive association between physical activity and several theory-based motivational concepts. Findings based on SDT were largely in concert with theoretical expectations, suggesting that SDT could be a suitable framework for further investigation of motivation for physical activity in individuals with SMI. In extension of this, one important finding was that physical activity specific motivation (i.e., integrated regulation) was associated with physical activity level—even when controlling for clinical variables. This finding is partially supported by task-specific intrinsic motivation not being contingent on a general state of motivation among individuals with schizophrenia (Choi, Choi, Felice Reddy, & Fiszdon, 2014). However, intervention studies (Papers I and V) show that facilitating physical activity and motivation for physical activity in populations with SMI are demanding tasks. Indeed, few longitudinal studies manage to enhance motivation for physical activity. The challenge of enhancing

motivation in individuals with SMI is apparent in other contexts as well. Recently, a cluster RCT examined the effect on treatment engagement and treatment motivation by comparing treatment as usual with treatment as usual and clinician provided motivational feedback based on SDT (Jochems, van der Feltz-Cornelis, van Dam, Duivenvoorden, & Mulder, 2015). The trial found neither effect on treatment engagement nor on treatment motivation and suggests that more elaborate and comprehensive interventions are needed for individuals with SMI

Together these findings suggest that the motivational process among individuals with SMI is relatively similar to what is found in the general population, but that it requires structured, thorough, and theory-based work to enhance motivation in persons with SMI. Hence, there is great need for developing improved programs or interventions that can effectively enhance motivation and ultimately physical activity. Lastly, results from the present study confirmed that individuals with SMI, both hospitalised and community dwelling, engaged in little physical activity, especially activity with moderate or vigour intensity. However, results also revealed that individuals with SMI *can* be regularly physically active if the activity offered is adapted to their needs and challenges.

Motivation is obviously not the only determinant for physical activity. This is reflected in the number of barriers and facilitators described on pages 8-10 and how positive change in physical activity after motivational interventions seems not necessarily to depend on positive change in motivational variables (Gohner et al., 2015). Thus, addressing motivation should be just one of many strategies applied to achieve the target of increasing physical activity engagement. If physical activity programs do not account for common barriers experienced by persons with SMI, they are probably less likely to yield positive results. In short, it will not help to be autonomously motivated for taking part in physical activity if it is too expensive, you are not able to get there, feeling stigmatised when attending, or if the activity is not compatible with your ability, physical health, or fitness. Moreover, there are structural,

environmental, and organisational factors that also influence physical activity engagement in individuals with SMI. For instance, variation in the built environment (i.e., the totality of places built or designed, including buildings, grounds around buildings, layout of communities, transportation infrastructure, parks, and trails) is associated with both sedentary time and physical activity (Vancampfort et al., 2013b; 2014b). Furthermore, qualified instructors providing well-organised physical activity and an organisational structure emphasising physical activity are other factors that can facilitate increased physical activity (Hodgson et al., 2011; Leutwyler et al., 2013; Stubbs et al., 2016b; Vancampfort et al., 2016g). The finding in Paper V of weather and weekday influencing physical activity engagement among inpatients is thus aligned with several other external factors that can affect physical activity in this population. Finally, experience shows that it takes a very long time to implement new knowledge into clinical psychiatry (Munk-Jorgensen et al., 2015). A significant amount of the evidence demonstrating the benefits of physical activity for individuals with SMI is recent. Hence, to pave the way for integrating physical activity into being an adjunct part of treatment, resources should be devoted to inform stakeholders, policy makers, managers, education providers, and of course clinicians of the unexploited potential of physical activity

Methodological considerations

The results in Papers I–V need to be considered in the context of their limitations. The methodological limitation in Papers I–II are discussed in the next paragraph while limitations in Papers III–V will be discussed under the headings design, measurement, and analysis.

In the two systematic review papers (I-II) the included studies displayed great diversity with respect to design, procedures, main objective, types of measurement, and how motivation was treated. Due to this heterogeneity results were presented with use of a qualitative approach rather than a meta-analytic. Using this method allows for potential bias

regarding interpretation of individual study results and synthesising multiple study outcomes. The use of a pre-designed template for data extraction can partially compensate for this potential bias. Next, the quality of eligible studies measuring motivational constructs in Paper I was assessed, which resulted in the exclusion of two studies. However, it is important to note that this quality assessment pertained to the methodological quality of the study and not how well motivation was implemented or treated in the study. Thus, it was possible to obtain scores indicating good methodological quality but still treat motivation for physical activity in an improvident way. In Paper II, the majority of the included studies used convenience samples and only 10 of 19 studies reported the number of individuals who declined to participate. Hence, there may be a selection bias towards participants holding more positive physical activity attitudes.

Design

"To be motivated means *to be moved* to do something" (Ryan & Deci, 2000b, p. 54). In line with this, and extensive experimental research based on motivational theory, the results in Papers III-IV suggest that motivation precedes physical activity (Deci & Ryan, 2000; Ng et al., 2012; Ryan & Deci, 2000a; Teixeira et al., 2012). However, the cross-sectional design means that one cannot draw any causal conclusions regarding the associations between the variables. Indeed, it may be that the results actually reflect how participants' experiences of physical activity influenced their motivation. The design in Paper V contained several limitations. Perhaps the most important was that the design precluded examining intra-individual change in physical activity among patients in relation to the education intervention. Other limitations were the lack of information regarding the patients being hospitalised, not controlling for external occurrences at the wards, and not being able to assess intervention fidelity (i.e., whether staff employed the motivational strategies in their clinical practice). The main reason for designing a feasibility study with these inherent limitations was to be able to

carry it out within the financial and time restrictions of the doctoral work. One aspect about the design that could be changed was the timing of physical activity assessment. Even though the T2 physical activity assessment started directly after the booster-session it was 12 weeks between the main intervention part and the booster session. Hence, it is possible that there was a short-term effect of the intervention, but that this effect faded between the second intervention session and the booster session and that a one-hour session was not enough to rekindle it. However, even if one had established such a short-term effect, the cost-benefit of implementing the program would be open for discussion bearing in mind that the total time spent by all staff taking part in the intervention equates to nearly seven weeks of full time work for one person.

Measurement

The majority of instruments applied across Paper III-V are based on self-report, except clinician rated health and social functioning, and physical activity assessed by direct observation and accelerometer. Self-report questionnaires, especially used in cross-sectional design, inadvertently inflate common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). However, in many cases self-report is the preferred option, often the only option, and sometimes the best option. For instance, self-reports are needed to assess participants' need satisfaction and motivational regulations. Moreover, it is argued from a theoretical viewpoint that perceptions of need support is a more important determinant of need satisfaction and motivation than an objective assessment of need support (Ntoumanis, 2005). Recent research has also shown that clinicians show poor to moderate capability of estimating SMI patients' perceived self-determined motivation for treatment engagement (Jochems et al., 2016). Thus, all motivational variables were assessed by self-report.

Unfortunately, some of the scales used in Paper III displayed poor psychometric properties. In general, participants tended to treat the scales in a dichotomous way, resulting

in an aggregation of responses in either end of the scales. Introjected regulation and amotivation displayed low internal consistency and they were removed from further analyses. The measurement problems with assessing motivational regulations in Paper III could be related to TSRQ (Levesque et al., 2007) not being sensitive towards participants with little experience with physical activity and in extension it might not have captured the relevant reasons for the different motivational regulations. In contrast, BREQ-2 (Markland & Tobin, 2004) yielded acceptable psychometric properties in Paper IV. This is in line with previous research examining the factorial validity of BREQ-2 in individuals with SMI (Vancampfort et al., 2013c; 2015b). Finally, one problem with examining the SDT-model is the many concepts involved (see Figure 2, page 27). This can lead to lengthy questionnaires (especially if one is also interested in examining other variables), which again can influence the response quality and willingness to complete the questionnaire (Galesic & Bosnjak, 2009).

In contrast to the motivational variables, it is viable to assess physical activity behaviour by both self-report and objective measurements. However, to accurately assess physical activity is difficult because it is a multidimensional and complex behaviour (Lamonte & Ainsworth, 2001). Regardless, objective assessments are typically preferred over self-report as they are associated with less bias (Hills, Mokhtar, & Byrne, 2014). In brief, self-reported physical activity is prone to both systematic and random errors (Vanhees et al., 2005) and there is a tendency in self-report measurements to overestimate physical activity (Sallis & Saelens, 2000). Factors that may undermine the reliability and validity of self-report questionnaires are recall bias, social desirability, and the definition or interpretation of physical activity (Baranowski, 1988; Sallis & Saelens, 2000). Although accelerometers are viewed as superior over self-report, they have limitations as well. For instance, accelerometers are less sensitive with regards to certain types of activities, such as cycling or resistance training (Hills et al., 2014). Furthermore, there is the possibility of participants being reactive

and changing their habitual physical activity pattern based on the awareness of being monitored (Dencker & Andersen, 2011).

Lastly, there were several limitations related to the direct observation of physical activity in Paper V. The prolonged assessment of physical activity had disadvantages. First, an unexpected aspect was that staff several times during the intervention emphasised that observing and registering patient physical activity at baseline increased their awareness regarding patient physical activity level and encouraged them to promote physical activity among patients. This unintended effect may have inflated the baseline measurement of physical activity. Next, it was important to assess physical activity over a prolonged period in an effort to account for unexpected events at the ward and illness variability in the patients. However, it was necessary to find a balance between a long enough assessment period to obtain a trustworthy picture of the physical activity pattern and a short enough period for not tiring the staff leading them to inaccurately assessing physical activity. Thirdly, the naturalistic approach of the study led to patients being continuously admitted and discharged throughout the study period and also during physical activity assessment. Consequently, we could only examine inter-individual change in patients' pre- and post-intervention. Such an approach runs the danger of comparing "apples with oranges". This comparison problem was highlighted by staff discussing that patients being admitted at different times varied greatly in their motivation, preferences, and engagement towards physical activity. Finally, the validity and reliability of the physical activity observation was not assessed. Thus, patient physical activity level could be underestimated or overestimated if staff missed, did not notice, or registered it wrong.

Analysis

The statistical procedures conducted in Paper III-V were appropriate for examining the relevant hypotheses. Notwithstanding, there are always advantages and disadvantages with

choices related to treatment of data and statistical procedures. For instance, the results in Paper III regarding the association between physical activity and integrated and identified regulation indicate that these associations were influenced by how physical activity was measured (i.e., objective versus self-report) and operationalized (i.e., continuous versus categorical). Moreover, in Paper IV we used composite scores for autonomous and controlled motivation rather than separate motivational regulations. Recently, it has been advocated that to fully exploit the multidimensional conceptualisation of motivation proposed by SDT each motivational regulation should be analysed on its own instead of collapsing them into higher order constructs or relative autonomy indexes (Chemolli & Gagne, 2014). This issue is emphasised in Paper III where identified and integrated regulation clearly related to physical activity in different manners. This information would have been lost by collapsing the two regulations. However, it was still decided to use autonomous and controlled motivation in favour of the different regulation for statistical and conceptual reasons. In SEM there are limitations in how many variables it is possible to include in relation to the sample size (Kline, 2011). Hence, as the aim was to test the whole model and not just the relations between motivational regulations and physical activity it was chosen to use autonomous and controlled motivation. Likewise, we used total need satisfaction instead of each individual need.

Implications for practise

The implications of the findings in the present thesis are relevant for mental health staff working both directly with physical activity and those with more general clinical practice.

First, results in this thesis demonstrate that individuals with SMI in general engage in little physical activity, but that the large majority are interested in increasing their physical activity level. Moreover, even individuals engaging in little or no physical activity show relatively high levels of identified regulated motivation for physical activity (i.e., being aware

of and valuing the benefits of physical activity). Together, this suggest that the low physical activity engagement may be a result of difficulties related to transferring intention and motivation into action more than "a lack of motivation". Mental health care staff could help individuals with SMI overcome the gap between intention/motivation and behaviour. Results from Papers II-IV demonstrate that facilitating autonomous motivation and perceived competence can contribute to bridging this gap. According to SDT, the interaction between practitioner and patient as well as the environment comprising the physical activity are important for enhancing autonomous motivation and competence. Thus, mental health care staff are encouraged to work systematically with creating an environment that supports satisfaction of the three psychological needs.

Supporting the need for autonomy can be done through involving patients in decision-making and solution finding processes, providing sound rationales for decisions, advice or suggestions made by practitioners, and offering choice. These choices should be relevant to the patients and they should perceive themselves as competent to make them. Furthermore, encouraging personal initiation, being responsive to a patient's thoughts, questions, and initiatives, and taking the patient's perspective in consideration are other strategies for supporting the need for autonomy.

Probably the most important strategy for supporting the need for competence and increasing perceptions of competence or self-efficacy is to facilitate mastery experiences of physical activity by providing optimally challenging tasks. Other strategies are to assist in realistic goal-setting, help develop coping strategies for overcoming barriers, and give informational feedback. The latter point is especially salient in activities that inherently provide little feedback on progression or improvement.

The need for relatedness can be supported by creating a warm, welcoming, and emphatic atmosphere, acknowledging the other person’s feelings and views, emphasise

unconditional regard, and by organising physical activity so that patients can develop and strengthen attachment with others (Deci & Ryan, 2008b; Fortier et al., 2007a; Haase et al., 2010; Ryan, Lynch, Vansteenkiste, & Deci, 2011; Teixeira et al., 2012). Finally, although enhancing motivation is part of the equation, it is one of many factors one should target when facilitating physical activity. For instance, research indicate that it is beneficiary to incorporate physical activity as part of the organisational structure and that it is favourable to have qualified personnel offering well-organised and adapted physical activity (Hodgson et al., 2011; Leutwyler et al., 2013; Stubbs et al., 2016b; Vancampfort et al., 2016g).

Future research

With accumulating evidence demonstrating the benefits of physical activity for individuals with SMI it is imperative for future research to continue to develop knowledge on factors that promote or impede physical activity engagement in this population. Obviously, motivation is one such factor. Research on this topic is currently in its infancy, leaving open several lines of enquiry that future research can pursue.

First, even though cross-sectional studies have demonstrated positive associations between several motivational constructs (e.g., autonomous motivation and self-efficacy) and physical activity, few longitudinal studies have managed to enhance motivation for physical activity. Hence, future studies should emphasise developing and examining strategies that can facilitate motivation for physical activity. Next, the potential interrelationship between context specific motivation (i.e., physical activity), general functioning or illness symptoms, and physical activity is broadly an unexplored area. A better understanding of these relationships and how they might influence each other would be valuable when designing physical activity interventions or treatment programs. Thirdly, with the results from Paper IV in mind, future studies should carefully consider the content of the physical activity intervention, also beyond physical aspects such as frequency, intensity, and duration, as this

may have an impact on not merely motivational outcomes but also mental health outcomes. In extension of this, studies should be designed in order to examine both efficacy (the beneficial effect during optimal conditions) and effectiveness (the beneficial effect during more real world settings) of the intervention. Lastly, one major issue is to develop interventions that foster long-term maintenance of physical activity engagement. Arguably, one essential component in such interventions should be enhancing autonomous motivation and perceived competence for being physically active.

There are several lines of inquiries open for research using SDT as a framework for examining motivation for physical activity among individuals with SMI. First, and in line with the above suggestion, there is a need for the development of need supportive strategies in order to effectively facilitate need satisfaction and promote autonomous motivation. Next, the role of each individual psychological need in relation to need support, motivational regulations, and mental health is uncharted waters. Likewise, it is possible that knowledge on need thwarting and need frustration in relation to physical activity could bring forth valuable input towards understanding why individuals with SMI engage little in physical activity. Finally, there is a need for further examining the relationship between physical activity and the more self-determined types of motivation.

Conclusion

The findings of the present thesis show that there is increasing interest in motivation for physical activity among individuals with severe mental illness. However, the current body of research is still relatively small and there is a paucity of well-designed studies focusing mainly on motivation for physical activity and in particular longitudinal studies investigating how to enhance motivation. Results showed that study participants in general engaged in little physical activity, especially activity with moderate and vigorous intensity. Nevertheless, results also showed that the majority of individuals taking part in a public health network

promoting physical activity for people with severe mental illness were physically active on a regular basis. Furthermore, the results challenges the notion that "individuals with severe mental illness are lacking motivation for physical activity". The large majority of participants wanted to increase their physical activity level and across physical activity level participants displayed high levels of motivation reflecting that they value the benefits of physical activity (i.e., identified regulation). The thesis also provide support for Self-Determination Theory (Deci & Ryan, 2000; Ryan & Deci, 2000a) as a means to understand physical activity behaviour in individuals with severe mental illness. In brief, the results showed that need support and need satisfaction were positively associated with autonomous motivation. Then, physical activity was positively associated with the more autonomous forms of motivation and perceived competence while it was unrelated or negatively associated with the more controlled forms of motivation. These findings are similar to what is found in the general population (Teixeira et al., 2012). Additionally, findings also suggest that integrated regulation is associated with physical activity, even when controlling for the clinical variables apathy and health and social functioning, and that both physical activity engagement and how physical activity is experienced are important for health related quality of life. Finally, the feasibility study indicated that conducting a short educational intervention for staff working at psychiatric wards is not sufficient in order to increase physical activity level among inpatients with severe mental illness. This finding suggests that more comprehensive and possibly multi-level interventions are needed to reduce the alarming high proportion of inpatients with SMI who are inactive.

REFERENCES

Abdel-Baki, A., Brazzini-Poisson, V., Marois, F., Letendre, E., & Karelis, A. D. (2013). Effects of aerobic interval training on metabolic complications and cardiorespiratory fitness in young adults with psychotic disorders: A pilot study. *Schizophrenia Research, 149*, 112-115.

Adie, J. W., Duda, J. L., & Ntoumanis, N. (2008). Autonomy support, basic need satisfaction and the optimal functioning of adult male and female sport participants: A test of basic needs theory. *Motivation and Emotion, 32*, 189-199.

Allison, D. B., Newcomer, J. W., Dunn, A. L., Blumenthal, J. A., Fabricatore, A. N., Daumit, G. L., ... Alpert, J. E. (2009). Obesity among those with mental disorders: A National Institute of Mental Health meeting report. *American Journal of Preventive Medicine, 36*, 341-350.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th. ed.). Arlington, VA: American Psychiatric Association.

Andreassen, O. A., Djurovic, S., Thompson, W. K., Schork, A. J., Kendler, K. S., O'Donovan, M. C., ... Dale, A. M. (2013). Improved detection of common variants associated with schizophrenia by leveraging pleiotropy with cardiovascular-disease risk factors. *American Journal of Human Genetics, 92*, 197-209.

Arbour-Nicitopoulos, K. P., Duncan, M., Remington, G., Cairney, J., & Faulkner, G. E. (2014). Development and reliability testing of a health action process approach inventory for physical activity participation among individuals with schizophrenia. *Frontiers in Psychiatry, 5*, 68: http://dx.doi.org/10.3389/fpsyt.2014.00068.

Archie, S. M., Goldberg, J. O., Akhtar-Danesh, N., Landeen, J., McColl, L., & McNiven, J. (2007). Psychotic disorders, eating habits, and physical activity: Who is ready for lifestyle changes? *Psychiatric Services, 58*, 233-239.

Aschbrenner, K., Carpenter-Song, E., Mueser, K., Kinney, A., Pratt, S., & Bartels, S. (2013). A qualitative study of social facilitators and barriers to health behavior change among persons with serious mental illness. *Community Mental Health Journal, 49*, 207-212.

Bandura, A. (1997). *Self-Efficacy: The exercise of control*. New York: Freeman.

Bandura, A. (2006). Guide for constructing self-efficacy scales. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307-337). Greenwich, CT: Information Age Pubishing.

Baranowski, T. (1988). Validity and reliability of self report measures of physical activity: An information processing perspective. *Research Quarterly for Exercise and Sport, 59*, 314-327.

Barbour, K. A., Edenfield, T. M., & Blumenthal, J. A. (2007). Exercise as a treatment for depression and other psychiatric disorders: A review. *Journal of Cardiopulmonary Rehabilitation and Prevention, 27*, 359-367.

Bartholomew, K. J., Ntoumanis, N., Ryan, R. M., Bosch, J. A., & Thogersen-Ntoumani, C. (2011). Self-determination theory and diminished functioning: The role of interpersonal control and psychological need thwarting. *Personality & Social Psychology Bulletin, 37*, 1459-1473.

Bassilios, B. (2005). *Physical exercise activity in individuals with schizophrenia.* (Doctoral thesis), The University of Melbourne, Melbourne. http://hdl.handle.net/11343/36791

Bassilios, B., Judd, F., Pattison, P., Nicholas, A., & Moeller-Saxone, K. (2015). Predictors of exercise in individuals with schizophrenia: A test of the transtheoretical model of behavior change. *Clinical Schizophrenia and Related Psychoses, 8*, 173-182A.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*, 497-529.

Beebe, L. H. (2008). Obesity in schizophrenia: Screening, monitoring, and health promotion. *Perspectives in Psychiatric Care, 44*, 25-31.

Beebe, L. H., Smith, K., Burk, R., Dessieux, O., Velligan, D., Tavakoli, A., & Tennison, C. (2010). Effect of a motivational group intervention upon exercise self efficacy and outcome expectations for exercise in Schizophrenia Spectrum Disorders (SSDs). *Journal of the American Psychiatric Nurses Association, 16*, 105-113.

Beebe, L. H., Smith, K., Burk, R., McIntyre, K., Dessieux, O., Tavakoli, A., ... Velligan, D. (2011). Effect of a motivational intervention on exercise behavior in persons with schizophrenia spectrum disorders. *Community Mental Health Journal, 47*, 628-636.

Berger, B. G., & Tobar, D. (2007). Physical activity and quality of life. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of sport psychology* (3rd ed. ed., pp. 598-620). Hoboken, NJ: Wiley.

Bezyak, J. L., Berven, N. L., & Chan, F. (2011). Stages of change and physical activity among individuals with severe mental illness. *Rehabilitation Psychology, 56*, 182-190.

Biddle, S. J. H., Fox, K. R., & Boutcher, S. H. (2000). *Physical Activity and Psychological Well-Being*. London: Routledge.

Biddle, S. J. H., & Mutrie, N. (2008). *Psychology of physical activity: Determinants, well-being, and interventions* (2nd ed.). London: Routledge.

Bize, R., Johnson, J. A., & Plotnikoff, R. C. (2007). Physical activity level and health-related quality of life in the general adult population: A systematic review. *Preventive Medicine, 45*, 401-415.

Bloom, D. E., Cafiero, E. T., Jané-Llopis, E., Abrahams-Gessel, S., Bloom, L. R., Fathimam, S., ... Weinstein, C. (2011). *The global economic burden of non-communicable diseases*. Geneva: World Economic Forum

Bobes, J., Arango, C., Garcia-Garcia, M., & Rejas, J. (2010). Healthy lifestyle habits and 10-year cardiovascular risk in schizophrenia spectrum disorders: An analysis of the impact of smoking tobacco in the CLAMORS schizophrenia cohort. *Schizophrenia Research, 119*, 101-109.

Bonsaksen, T. (2011). Participation in physical activity among inpatients with severe mental illness: A pilot study. *International Journal of Therapy and Rehabilitation, 18*, 91-99.

Breitborde, N. J. K., Kleinlein, P., & Srihari, V. H. (2012). Self-determination and first-episode psychosis: Associations with symptomatology, social and vocational functioning, and quality of life. *Schizophrenia Research, 137*, 132-136.

Brown, S., Birtwistle, J., & Roe, L. (1999). The unhealthy lifestyle of people with schizophrenia. *Psychological Medicine, 29*, 697-701.

Brugniaux, J. V., Niva, A., Pulkkinen, I., Laukkanen, R. M., Richalet, J. P., & Pichon, A. P. (2010). Polar Activity Watch 200: A new device to accurately assess energy expenditure. *British Journal of Sports Medicine, 44*, 245-249.

Burton, C., McKinstry, B., Szentagotai Tatar, A., Serrano-Blanco, A., Pagliari, C., & Wolters, M. (2013). Activity monitoring in patients with depression: A systematic review. *Journal of Affective Disorders, 145*, 21-28.

Busch, A. M., Ciccolo, J. T., Puspitasari, A. J., Nosrat, S., Whitworth, J. W., & Stults-Kolehmainen, M. (2016). Preferences for exercise as a treatment for depression. *Mental Health and Physical Activity, 10*, 68-72.

Callaghan, P. (2004). Exercise: A neglected intervention in mental health care? *Journal of Psychiatric and Mental Health Nursing, 11*, 476-483.

Carpiniello, B., Primavera, D., Pilu, A., Vaccargiu, N., & Pinna, F. (2013). Physical activity and mental disorders: a case-control study on attitudes, preferences and perceived barriers in Italy. *Journal of Mental Health, 22*, 492-500.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports, 100*, 126-131.

Chalder, M., Wiles, N. J., Campbell, J., Hollinghurst, S. P., Haase, A. M., Taylor, A. H., ... Lewis, G. (2012a). Facilitated physical activity as a treatment for depressed adults: Randomised controlled trial. *BMJ, 344*, e2758.

Chalder, M., Wiles, N. J., Campbell, J., Hollinghurst, S. P., Searle, A., Haase, A. M., ... Lewis, G. (2012b). A pragmatic randomised controlled trial to evaluate the cost-effectiveness of a physical activity intervention as a treatment for depression: The treating depression with physical activity (TREAD) trial. *Health Technology Assessment, 16*, 10: DOI: https://dx.doi.org/10.3310/hta16100

Chau, J. Y., Grunseit, A. C., Chey, T., Stamatakis, E., Brown, W. J., Matthews, C. E., ... van der Ploeg, H. P. (2013). Daily sitting time and all-cause mortality: a meta-analysis. *Plos One, 8*, e80000 http://journals.plos.org/plosone/article?id=80010.81371/journal.pone.0080000.

Chemolli, E., & Gagne, M. (2014). Evidence against the continuum structure underlying motivation measures derived from self-determination theory. *Psychological Assessment, 26*, 575-585.

Choi, J., Choi, K. H., Felice Reddy, L., & Fiszdon, J. M. (2014). Measuring motivation in schizophrenia: Is a general state of motivation necessary for task-specific motivation? *Schizophrenia Research, 153*, 209-213.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (Third ed.). New York: Routledge.

Cooney, G. M., Dwan, K., Greig, C. A., Lawlor, D. A., Rimer, J., Waugh, F. R., ... Mead, G. E. (2013). Exercise for depression. *Cochrane Database of Systematic Reviews, 9*, CD004366.

Craig, C. L., Marshall, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., ... Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise, 35*, 1381-1395.

Crump, C., Sundquist, K., Winkleby, M. A., & Sundquist, J. (2013). Comorbidities and mortality in bipolar disorder. A Swedish national cohort study. *Jama Psychiatry, 70*, 931-939.

Crump, C., Winkleby, M. A., Sundquist, K., & Sundquist, J. (2013). Comorbidities and mortality in persons with Schizophrenia: A Swedish national cohort study. *American Journal of Psychiatry, 170*, 324-333.

Daumit, G. L., Goldberg, R. W., Anthony, C., Dickerson, F., Brown, C. H., Kreyenbuhl, J., ... Dixon, L. B. (2005). Physical activity patterns in adults with severe mental illness. *Journal of Nervous and Mental Disease, 193*, 641-646.

Daumit, G. L., Dalcin, A. T., Jerome, G. J., Young, D. R., Charleston, J., Crum, R. M., ... Appel, L. J. (2011). A behavioral weight-loss intervention for persons with serious mental illness in psychiatric rehabilitation centers. *International Journal of Obesity, 35*, 1114-1123.

Daumit, G. L., Dickerson, F. B., Wang, N. Y., Dalcin, A., Jerome, G. J., Anderson, C. A., ... Appel, L. J. (2013). A behavioral weight-loss intervention in persons with Serious mental illness. *New England Journal of Medicine, 368*, 1594-1602.

Dauwan, M., Begemann, M. J., Heringa, S. M., & Sommer, I. E. (2016). Exercise improves clinical symptoms, quality of life, global functioning, and depression in schizophrenia: A systematic review and meta-analysis. *Schizophrenia Bulletin, 42*, 588-599.

Davidson, S., Judd, F., Jolley, D., Hocking, B., Thompson, S., & Hyland, B. (2001). Cardiovascular risk factors for people with mental illness. *The Australian and New Zealans Journal of Psychiatry, 35*, 196-202.

De Hert, M., Dekker, J. M., Wood, D., Kahl, K. G., Holt, R. I., & Moller, H. J. (2009). Cardiovascular disease and diabetes in people with severe mental illness position statement from the European Psychiatric Association (EPA), supported by the European Association for the Study of Diabetes (EASD) and the European Society of Cardiology (ESC). *European Psychiatry, 24*, 412-424.

De Hert, M., Correll, C. U., Bobes, J., Cetkovich-Bakmas, M., Cohen, D., Asai, I., ... Leucht, S. (2011). Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. *World Psychiatry, 10*, 52-77.

De Hert, M., Detraux, J., van Winkel, R., Yu, W., & Correll, C. U. (2012). Metabolic and cardiovascular adverse effects associated with antipsychotic drugs. *Nature Reviews Endocrinology, 8*, 114-126.

deCharms, R. (1968). *Personal causation: The internal affective determinants of behavior*. New York: Academic Press.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227-268.

Deci, E. L., & Ryan, R. M. (2008a). Facilitating optimal motivation and psychological well-being across life's domain. *Canadian Psychology, 49*, 14-23.

Deci, E. L., & Ryan, R. M. (2008b). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology, 49*, 182-185.

Dencker, M., & Andersen, L. B. (2011). Accelerometer-measured daily physical activity related to aerobic fitness in children and adolescents. *Journal of Sports Sciences, 29*, 887-895.

Duda, J. L., Williams, G. C., Ntoumanis, N., Daley, A., Eves, F. F., Mutrie, N., ... Jolly, K. (2014). Effects of a standard provision versus an autonomy supportive exercise referral programme on physical activity, quality of life and well-being indicators: A cluster randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity, 11*, 10: https://ijbnpa.biomedcentral.com/articles/10.1186/1479-5868-1111-1110.

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2006). A test of self-determination theory in the exercise domain. *Journal of Applied Social Psychology, 36*, 2240-2265.

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2007). Adherence and well-being in overweight and obese patients referred to an exercise on prescription scheme: A self-determination theory perspective. *Psychology of Sport and Exercise, 8*, 722-740.

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2008). Testing a self-determination theory-based teaching style intervention in the exercise domain. *European Journal of Social Psychology, 38*, 375-388.

Ekkekakis, P., Parfitt, G., & Petruzzello, S. J. (2011). The pleasure and displeasure people feel when they exercise at different intensities: decennial update and progress towards a tripartite rationale for exercise intensity prescription. *Sports Medicine, 41*, 641-671.

Elmslie, J. L., Mann, J. I., Silverstone, J. T., Williams, S. M., & Romans, S. E. (2001). Determinants of overweight and obesity in patients with bipolar disorder. *Journal of Clinical Psychiatry, 62*, 486-491.

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling, 8*, 430-457.

Erhart, S. M., Marder, S. R., & Carpenter, W. T. (2006). Treatment of schizophrenia negative symptoms: Future prospects. *Schizophrenia Bulletin, 32*, 234-237.

Faerden, A., Nesvag, R., Barrett, E. A., Agartz, I., Finset, A., Friis, S., ... Melle, I. (2008). Assessing apathy: The use of the Apathy Evaluation Scale in first episode psychosis. *European Psychiatry, 23*, 33-39.

Faerden, A., Friis, S., Agartz, I., Barrett, E. A., Nesvag, R., Finset, A., & Melle, I. (2009). Apathy and functioning in first-episode psychosis. *Psychiatric Services, 60*, 1495-1503.

Farholm, A., Halvari, H., Niemiec, C. P., Williams, G. C., & Deci, E. L. (2016). Changes in return to work among patients in vocational rehabilitation: A self-determinatoin theory perspective. *Disability and Rehabilitation*, http://dx.doi.org/10.1080/09638288.09632016.01215559.

Faulkner, G., & Biddle, S. (1999). Exercise as an adjunct treatment for schizophrenia: A review of the literature. *Journal of Mental Health, 8*, 441-457.

Faulkner, G., Cohn, T., & Remington, G. (2006). Validation of a physical activity assessment tool for individuals with schizophrenia. *Schizophrenia Research, 82*, 225-231.

Firth, J., Cotter, J., Elliott, R., French, P., & Yung, A. R. (2015). A systematic review and meta-analysis of exercise interventions in schizophrenia patients. *Psychological Medicine, 45*, 1343-1361.

Firth, J., Rosenbaum, S., Stubbs, B., Gorczynski, P., Yung, A. R., & Vancampfort, D. (2016a). Motivating factors and barriers towards exercise in severe mental illness: A systematic review and meta-analysis. *Psychological Medicine, 46*, 2869-2881.

Firth, J., Stubbs, B., Rosenbaum, S., Vancampfort, D., Malchow, B., Schuch, F., ... Yung, A. R. (2016b). Aerobic exercise improves cognitive functioning in people with schizophrenia: A systematic review and meta-analysis. *Schizophrenia Bulletin*, doi: 10.1093/schbul/sbw115

Fogarty, M., & Happel, B. (2005). Exploring the benefits of an exercise program for people with schizophrenia: A qualitative study. *Issues in Mental Health Nursing, 26*, 341-351.

Fortier, M. S., Hogg, W., O'Sullivan, T. L., Blanchard, C., Reid, R. D., Sigal, R. J., ... Beaulac, J. (2007a). The physical activity counselling (PAC) randomized controlled trial: Rationale, methods, and interventions. *Applied Physiology, Nutrition, and Metabolism, 32*, 1170-1185.

Fortier, M. S., Sweet, S. N., O'Sullivan, T. L., & Williams, G. C. (2007b). A self-determination process model of physical activity adoption in the context of a randomized controlled trial. *Psychology of Sport and Exercise, 8*, 741-757.

Fortier, M. S., Duda, J. L., Guerin, E., & Teixeira, P. J. (2012). Promoting physical activity: development and testing of self-determination theory-based interventions. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 20: doi: 10.1186/1479-5868-9-20

Fraser, S. J., Chapman, J. J., Brown, W. J., Whiteford, H. A., & Burton, N. W. (2015). Physical activity attitudes and preferences among inpatient adults with mental illness. *International Journal of Mental Health Nursing, 24*, 413-420.

Frederick, C. M., & Ryan, R. M. (1993). Differences in motivation for sport and exercise and their relations with participation and mental health. *Journal of Sport Behavior, 16*, 124-146.

Fuchs, R., Goehner, W., & Seelig, H. (2011). Long-term effects of a psychological group intervention on physical exercise and health: The MoVo concept. *Journal of Physical Activity and Health, 8*, 794-803.

Gagne, M., Forest, J., Vansteenkiste, M., Crevier-Braud, L., van den Broeck, A., Aspeli, A. K., ... Westbye, C. (2015). The Multidimensional Work Motivation Scale: Validation evidence in seven languages and nine countries. *European Journal of Work and Organizational Psychology, 24*, 178-196.

Galesic, M., & Bosnjak, M. (2009). Effects of questionnaire length on participation and indicators of response quality in a web survey. *Public Opinion Quarterly, 73*, 349-360.

Gandek, B., Ware, J. E., Aaronson, N. K., Apolone, G., Bjorner, J. B., Brazier, J. E., ... Sullivan, M. (1998). Cross-validation of item selection and scoring for the SF-12 Health Survey in nine countries: Results from the IQOLA Project. International Quality of Life Assessment. *Journal of Clinical Epidemiology, 51*, 1171-1178.

Gard, D. E., Fisher, M., Garrett, C., Genevsky, A., & Vinogradov, S. (2009). Motivation and its relationship to neurocognition, social cognition, and functional outcome in schizophrenia. *Schizophrenia Research, 115*, 74-81.

Gillison, F. B., Standage, M., & Skevington, S. M. (2006). Relationships among adolescents' weight perceptions, exercise goals, exercise motivation, quality of life and leisure-time exercise behaviour: A self-determination theory approach. *Health Education Research, 21*, 836-847.

Glanz, K., & Bishop, D. B. (2010). The role of behavioral science theory in development and implementation of public health interventions. *Annual Review of Public Health, 31*, 399-418.

Gohner, W., Dietsche, C., & Fuchs, R. (2015). Increasing physical activity in patients with mental illness: A randomized controlled trial. *Patient Educ Couns, 98*, 1385-1392.

Goldberg, R. W., Reeves, G., Tapscott, S., Medoff, D., Dickerson, F., Goldberg, A. P., ... Dixon, L. B. (2013). "MOVE!" Outcomes of a weight loss program modified for veterans with serious mental illness. *Psychiatric Services, 64*, 737-744.

Goldberg, T. E., Goldman, R. S., Burdick, K. E., Malhotra, A. K., Lencz, T., Patel, R. C., ... Robinson, D. G. (2007). Cognitive improvement after treatment with second-generation antipsychotic medications in first-episode schizophrenia: Is it a practice effect? *Archives of General Psychiatry, 64*, 1115-1122.

Gorczynski, P., & Faulkner, G. (2010). Exercise therapy for schizophrenia. *Cochrane Database of Systematic Reviews*.

Gorczynski, P., Faulkner, G., Greening, S., & Cohn, T. (2010). Exploring the construct validity of the transtheoretical model to structure physical activity interventions for individuals with serious mental illness. *Psychiatric Rehabilitation Journal, 34*, 61-64.

Green, C. A., Yarborough, B. J. H., Leo, M. C., Yarborough, M. T., Stumbo, S. P., Janoff, S. L., ... Stevens, V. J. (2015). The STRIDE weight loss and lifestyle intervention for individuals taking antipsychotic medications: A randomized trial. *American Journal of Psychiatry, 172*, 71-81.

Haase, A. M., Taylor, A. H., Fox, K. R., Thorp, H., & Lewis, G. (2010). Rationale and development of the physical activity counselling intervention for a pragmatic TRial of Exercise and Depression in the UK (TREAD-UK). *Mental Health and Physical Activity, 3*, 85-91.

Hair, J. E., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data analysis with readings*. Englewood Cliffs, New Jersey: Prentice-Hall.

Halvari, H., Healy, J., Olafsen, A. H., Byrkjeland, R., Deci, E. L., & Williams, G. C. (2016). Physical activity and motivational predictors of change in health behavior and health among DM2 and CAD patients. *Scandinavian Journal of Medicine & Sience in Sports*, doi: 10.1111/sms

Hansen, T., Ingason, A., Djurovic, S., Melle, I., Fenger, M., Gustafsson, O., ... Werge, T. (2011). At-risk variant in TCF7L2 for type II diabetes increases risk of schizophrenia. *Biological Psychiatry, 70*, 59-63.

Happell, B., Scott, D., Platania-Phung, C., & Nankivell, J. (2012). Nurses' views on physical activity for people with serious mental illness. *Mental Health and Physical Activity, 5*, 4-12.

Happell, B., Platania-Phung, C., & Scott, D. (2013). Survey of Australian mental health nurses on physical activity promotion. *International Journal of Mental Health Promotion, 15*, 148-161.

Harris, E. C., & Barraclough, B. (1998). Excess mortality of mental disorder. *British Journal of Psychiatry, 173*, 11-53.

Haskell, W. L., Lee, I. M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., ... Bauman, A. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Medicine and Science in Sports and Exercise, 39*, 1423-1434.

Helgadottir, B., Forsell, Y., & Ekblom, O. (2015). Physical activity patterns of people affected by depressive and anxiety disorders as measured by accelerometers: a cross-sectional study. *Plos One, 10*, e0115894. doi: 10.1371/journal.pone.0115894

Hills, A. P., Mokhtar, N., & Byrne, N. M. (2014). Assessment of physical activity and energy expenditure: an overview of objective measures. *Frontiers in Nutrition, 1*, 5: doi: 10.3389/fnut.2014.00005

Hodgson, M. H., McCulloch, H. P., & Fox, K. R. (2011). The experiences of people with severe and enduring mental illness engaged in a physical activity programme integrated into the mental health service. *Mental Health and Physical Activity, 4*, 23-29.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55.

IPAQ. (2005). Guidelines for data processing and analysis of the international physical activity questionnaire (IPAQ) - Short and long forms. *www.ipaq.ki.se*.

Janney, C. A., Fagiolini, A., Swartz, H. A., Jakicic, J. M., Holleman, R. G., & Richardson, C. R. (2014). Are adults with bipolar disorder active? Objectively measured physical activity and sedentary behavior using accelerometry. *Journal of Affective Disorders, 152-154*, 498-504.

Jerome, G. J., Young, D. R., Dalcin, A., Charleston, J., Anthony, C., Hayes, J., & Daumit, G. L. (2009). Physical activity levels of persons with mental illness attending psychiatric rehabilitation programs. *Schizophrenia Research, 108*, 252-257.

Jerome, G. J., Dalcin, A. T., Young, D. R., Stewart, K. J., Crum, R. M., Latkin, C., ... Daumit, G. L. (2012). Rationale, design and baseline data for the Activating Consumers to Exercise through Peer Support (ACE trial): A randomized controlled trial to increase fitness among adults with mental illness. *Mental Health and Physical Activity*, 166-174.

Jochems, E. C., van der Feltz-Cornelis, C. M., van Dam, A., Duivenvoorden, H. J., & Mulder, C. L. (2015). The effects of motivation feedback in patients with severe mental illness: A cluster randomized controlled trial. *Neuropsychiatric Disease and Treatment, 11*, 3049-3064.

Jochems, E. C., van Dam, A., Duivenvoorden, H. J., Scheffer, S. C., van der Feltz-Cornelis, C. M., & Mulder, N. L. (2016). Different perspectives of clinicians and patients with severe mental illness on motivation for treatment. *Clinical Psychology and Psychotherapy, 23*, 438-451.

Johnstone, R., Nicol, K., Donaghy, M., & Lawrie, S. (2009). Barriers to uptake of physical activity in community-based patients with schizophrenia. *Journal of Mental Health, 18*, 523-532.

Josefsson, T., Lindwall, M., & Archer, T. (2014). Physical exercise intervention in depressive disorders: Meta-analysis and systematic review. *Scandinavian Journal of Medicine & Sience in Sports, 24*, 259-272.

Kane, I., Lee, H., Sereika, S., & Brar, J. (2012). Feasibility of pedometers for adults with schizophrenia: Pilot study. *Journal of Psychiatric and Mental Health Nursing, 19*, 8-14.

Kendzierski, D., & Morganstein, M. S. (2009). Test, revision, and cross-validation of the Physical Activity Self-Definition Model. *Journal of Sport & Exercise Psychology, 31*, 484-504.

Kilbourne, A. M., Rofey, D. L., McCarthy, J. F., Post, E. P., Welsh, D., & Blow, F. C. (2007). Nutrition and exercise behavior among patients with bipolar disorder. *Bipolar Disorders, 9*, 443-452.

Kline, P. (1999). *The handbook of psychological testing* (2nd ed. ed.). London: Routledge.

Kline, R. B. (2011). *Principles and practices of structural equation modeling* (2nd ed.). New York: The Guilford Press.

Klingaman, E. A., Viverito, K. M., Medoff, D. R., Hoffmann, R. M., & Goldberg, R. W. (2014). Strategies, barriers, and motivation for weight loss among veterans living with schizophrenia. *Psychiatric Rehabilitation Journal, 37*, 270-276.

Kramer, L. V., Helmes, A. W., Seelig, H., Fuchs, R., & Bengel, J. (2014). Correlates of reduced exercise behaviour in depression: The role of motivational and volitional deficits. *Psychology & Health, 29*, 1206-1225.

Krogh, J., Nordentoft, M., Sterne, J. A., & Lawlor, D. A. (2011). The effect of exercise in clinically depressed adults: Systematic review and meta-analysis of randomized controlled trials. *Journal of Clinical Psychiatry, 72*, 529-538.

Kvam, S., Kleppe, C. L., Nordhus, I. H., & Hovland, A. (2016). Exercise as a treatment for depression: A meta-analysis. *Journal of Affective Disorders, 202*, 67-86.

Lamonte, M. J., & Ainsworth, B. E. (2001). Quantifying energy expenditure and physical activity in the context of dose response. *Medicine and Science in Sports and Exercise, 33*, S370-S378

Landers, D. M., & Arent, S. M. (2007). Physical activity and mental health. In G. Tenebaum & R. C. Eklund (Eds.), *Handbook of Sport Psychology* (pp. 469-491). Hoboken,NJ: John Wiley & Sons, INC..

Laursen, T. M., Munk-Olsen, T., Nordentoft, M., & Mortensen, P. B. (2007). Increased mortality among patients admitted with major psychiatric disorders: A register-based study comparing mortality in unipolar depressive disorder, bipolar affective disorder, schizoaffective disorder, and schizophrenia. *Journal of Clinical Psychiatry, 68*, 899-907.

Laursen, T. M., & Nordentoft, M. (2011). Heart disease treatment and mortality in schizophrenia and bipolar disorder - Changes in the Danish population between 1994 and 2006. *Journal of Psychiatric Research, 45*, 29-35.

Laursen, T. M., Wahlbeck, K., Hallgren, J., Westman, J., Osby, U., Alinaghizadeh, H., ... Nordentoft, M. (2013). Life expectancy and death by diseases of the circulatory system in patients with bipolar disorder or schizophrenia in the Nordic Countries. *Plos One, 8*, e67133 doi: 10.1371/journal.pone.0067133

Lawrence, D., & Kisely, S. (2010). Inequalities in healthcare provision for people with severe mental illness. *Journal of Psychopharmacology, 24*, 61-68.

Lawrence, D., Kisely, S., & Pais, J. (2010). The epidemiology of excess mortality in people with mental illness. *Canadian Journal of Psychiatry, 55*, 752-760.

Leas, L., & McCabe, M. (2007). Health behaviors among individuals with schizophrenia and depression. *Journal of Health Psychology, 12*, 563-579.

Lelliott, P. (1999). Defenition of severe mental illness. In P. Charlwood, Mason,A., Goldacre,M., Cleary,R., Wilkinson,E. (Ed.), *Health outcome indicators: severe mental illness.* (pp. 87-93). Oxford: National Centre for Health Outcomes Development.

Leucht, S., Burkard, T., Henderson, J., Maj, M., & Sartorius, N. (2007). Physical illness and schizophrenia: A review of the literature. *Acta Psychiatrica Scandinavica, 116*, 317-333.

Leutwyler, H., Hubbard, E. M., Jeste, D. V., & Vinogradov, S. (2013). "We're not just sitting on the periphery": A staff perspective of physical activity in older adults with schizophrenia. *The Gerontologist, 53*, 474-483.

Levesque, C. S., Williams, G. C., Elliot, D., Pickering, M. A., Bodenhamer, B., & Finley, P. J. (2007). Validating the theoretical structure of the Treatment Self-Regulation Questionnaire (TSRQ) across three different health behaviors. *Health Education Research, 22*, 691-702.

Lindamer, L. A., McKibbin, C., Nonnan, G. J., Jordan, L., Harrison, K., Abeyesinhe, S., & Patrick, K. (2008). Assessment of physical activity in middle-aged and older adults with schizophrenia. *Schizophrenia Research, 104*, 294-301.

Liu, N. H., & Spaulding, W. D. (2010). Pilot study of a health-focused day program on improving health behaviors, clinical functioning, and perceived wellness in individuals with severe mental illness. *Psychological Services, 7*, 233-241.

Lora, A., Bezzi, R., & Erlicher, A. (2007). Estimating the prevalence of severe mental illness in mental health services in Lombardy (Italy). *Community Mental Health Journal, 43*, 341-357.

Maggouritsa, G., Kokaridas, D., Theodorakis, I., Patsiaouras, A., Mouzas, O., Dimitrakopoulos, S., & Diggelidis, N. (2014). The effect of a physical activity programme on improving mood profile of patients with schizophrenia. *International Journal of Sport and Exercise Psychology, 12*, 273-284.

Malchow, B., Reich-Erkelenz, D., Oertel-Knochel, V., Keller, K., Hasan, A., Schmitt, A., ... Falkai, P. (2013). The effects of physical exercise in schizophrenia and affective disorders. *European Archives of Psychiatry and Clinical Neuroscience, 263*, 451-467.

Marin, R. S. (1990). Differential diagnosis and classification of apathy. *American Journal of Psychiatry, 147*, 22-30.

Markland, D., & Tobin, V. (2004). A modification to the behavioural regulation in exercise questionnaire to include an assessment of amotivation. *Journal of Sport & Exercise Psychology, 26*, 191-196.

Martin, A., Fitzsimons, C., Jepson, R., Saunders, D. H., van der Ploeg, H. P., Teixeira, P. J., ... Mutrie, N. (2015). Interventions with potential to reduce sedentary time in adults: Systematic review and meta-analysis. *British Journal of Sports Medicine, 49*, 1056-1063.

Mason, O. J., & Holt, R. (2012). Mental health and physical activity interventions: A review of the qualitative literature. *Journal of Mental Health, 21*, 274-284.

McCreadie, R. G. (2002). Use of drugs, alcohol and tobacco by people with schizophrenia: Case-control study. *British Journal of Psychiatry, 181*, 321-325.

McCreadie, R. G. (2003). Diet, smoking and cardiovascular risk in people with schizophrenia: Desprictive study. *British Journal of Psychiatry, 183*, 534-539.

McDevitt, J., Wilbur, J., Kogan, J., & Briller, J. (2005). A walking program for outpatients in psychiatric rehabilitation: Pilot study. *Biological Research for Nursing, 7*, 87-97.

McDevitt, J., Snyder, M., Miller, A., & Wilbur, J. (2006). Perceptions of barriers and benefits to physical activity among outpatients in psychiatric rehabilitation. *Journal of Nursing Scholarship, 38*, 50-55.

McKibbin, C. L., Patterson, T. L., Norman, G., Patrick, K., Jin, H., Roesch, S., ... Jeste, D. V. (2006). A lifestyle intervention for older schizophrenia patients with diabetes mellitus: A randomized controlled trial. *Schizophrenia Research, 86*, 36-44.

McLeod, H. J., Jaques, S., & Deane, F. P. (2009). Base rates of physical activity in Australians with schizophrenia. *Psychiatric Rehabilitation Journal, 32*, 269-275.

Mead, G. E., Morley, W., Campbell, P., Greig, C. A., McMurdo, M., & Lawlor, D. A. (2008). Exercise for depression. *Cochrane Database of Systematic Reviews*, CD004366.

Medalia, A., & Brekke, J. (2010). In search of a theoretical structure for understanding motivation in schizophrenia. *Schizophrenia Bulletin, 36*, 912-918.

Melo, M. C., Daher Ede, F., Albuquerque, S. G., & de Bruin, V. M. (2016). Exercise in bipolar patients: A systematic review. *Journal of Affective Disorders, 198*, 32-38.

Munk-Jorgensen, P., Blanner, K. C., Uwawke, R., Larsen, J. I., Okkels, N., Christiansen, B., & Hjorth, P. (2015). The gap between available knowledge and its use in clinical psychiatry. *Acta Psychiatrica Scandinavica, 132*, 441-450.

Muthén, L. K., & Muthén, B. O. (1998-2011). *Mplus user's guide* (Sixth Edition ed.). Los Angeles, CA: Mutnén & Muthén.

Naci, H., & Ioannidis, J. P. (2013). Comparative effectiveness of exercise and drug interventions on mortality outcomes: metaepidemiological study. *BMJ, 347*, f5577.

National Advisory Mental Health Council. (1993). Health care reform for Americans with severe mental illnesses: Report of the National Advisory Mental Health Council. *American Journal of Psychiatry, 150*, 1447-1465.

Ng, J. Y. Y., Ntoumanis, N., Thogersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-determination theory applied to health contexts: A meta-analysis. *Perspectives on Psychological Science, 7*, 325-340.

Nordentoft, M., Mortensen, P. B., & Pedersen, C. B. (2011). Absolute risk of suicide after first hospital contact in mental disorder. *Archives of General Psychiatry, 68*, 1058-1064.

Nordentoft, M., Wahlbeck, K., Hallgren, J., Westman, J., Osby, U., Alinaghizadeh, H., ... Laursen, T. M. (2013). Excess mortality, causes of death and life expectancy in 270,770 patients with recent onset of mental disorders in Denmark, Finland and Sweden. *Plos One, 8*, e55176 doi: 10.1371/journal.pone.0055176

Ntoumanis, N. (2005). A prospective study of participation in optional school physical education using a self-determination theory framework. *Journal of Educational Psychology, 97*, 444-453.

Nyboe, L., & Lund, H. (2013). Low levels of physical activity in patients with severe mental illness. *Nordic Journal of Psychiatry, 67*, 43-46.

Oettingen, G., & Gollwitzer, P. M. (2010). Strategies of setting and implementing goals: Mental contrasting and implemenation intentions. In J. E. Maddux & J. P. Tangney (Eds.), *Social psychological foundations of clinical psychology* (pp. 114-135). New York, NY: Guilford.

Olinsky, A., Chen, S., & Harlow, L. (2003). The comparative efficacy of imputation methods for missing data in structural equation modeling. *European Journal of Operational Research, 151*, 53-79.

Osborn, D. P., Nazareth, I., & King, M. B. (2007). Physical activity, dietary habits and coronary heart disease risk factor knowledge amongst people with severe mental illness: A cross sectional comparative study in primary care. *Social Psychiatry and Psychiatric Epidemiology, 42*, 787-793.

Painter, J. E., Borba, C. P. C., Hynes, M., Mays, D., & Glanz, K. (2008). The use of theory in health behavior research from 2000 to 2005: A systematic review. *Annals of Behavioral Medicine, 35*, 358-362.

Parabiaghi, A., Kortrijk, H. E., & Mulder, C. L. (2014). Defining multiple criteria for meaningful outcome in routine outcome measurement using the Health of the Nation Outcome Scales. *Social Psychiatry and Psychiatric Epidemiology, 49*, 291-305.

Pirkis, J. E., Burgess, P. M., Kirk, P. K., Dodson, S., Coombs, T. J., & Williamson, M. K. (2005). A review of the psychometric properties of the Health of the Nation Outcome Scales (HoNOS) family of measures. *Health and Quality of Life Outcomes, 3*, 76.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*, 879-903.

Polar Electro Inc. Polar Active user manual. http://support.polar.com/e_manuals/Active/Polar_Active_user_manual_English/Polar_Active_user_manual_English/Polar%20_Active_user_manual_EN.pdf

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*, 38-48.

Proper, K. I., Singh, A. S., van Mechelen, W., & Chinapaw, M. J. (2011). Sedentary behaviors and health outcomes among adults: a systematic review of prospective studies. *American Journal of Preventive Medicine, 40*, 174-182.

Puente, R., & Anshel, M. H. (2010). Exercisers' perceptions of their fitness instructor's interacting style, perceived competence, and autonomy as a function of self-determined regulation to exercise, enjoyment, affect, and exercise frequency. *Scandinavian Journal of Psychology, 51*, 38-45.

Rastad, C., Martin, C., & Asenlof, P. (2014). Barriers, benefits, and strategies for physical activity in patients with schizophrenia. *Physical Therapy, 94*, 1467-1479.

Rethorst, C. D., Wipfli, B. M., & Landers, D. M. (2009). The antidepressive effects of exercise: A meta-analysis of randomized trials. *Sports Medicine, 39*, 491-511.

Rimer, J., Dwan, K., Lawlor, D. A., Greig, C. A., McMurdo, M., Morley, W., & Mead, G. E. (2012). Exercise for depression. *Cochrane Database of Systematic Reviews*, CD004366.

Roberts, S. H., & Bailey, J. E. (2011). Incentives and barriers to lifestyle interventions for people with severe mental illness: A narrative synthesis of quantitative, qualitative and mixed methods studies. *Journal of Advanced Nursing, 67*, 690-708.

Rogers, R. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In B. L. Cacioppo & L. L. Petty (Eds.), *Social psychophysiology: A sourcebook* (pp. 153-176). London: Guilford. (Reprinted from: Not in File).

Roick, C., Fritz-Wieacker, A., Matschinger, H., Heider, D., Schindler, J., Riedel-Heller, S., & Angermeyer, M. C. (2007). Health habits of patients with schizophrenia. *Social Psychiatry and Psychiatric Epidemiology, 42*, 268-276.

Rosenbaum, S., Tiedemann, A., Sherrington, C., Curtis, J., & Ward, P. B. (2014). Physical activity interventions for people with mental illness: A systematic review and meta-analysis. *Journal of Clinical Psychiatry, 75*, 964-974.

Ruggeri, M., Leese, M., Thornicroft, G., Bisoffi, G., & Tansella, M. (2000). Definition and prevalence of severe and persistent mental illness. *British Journal of Psychiatry, 177*, 149-155.

Ryan, M. C., Collins, P., & Thakore, J. H. (2003). Impaired fasting glucose tolerance in first-episode, drug-naive patients with schizophrenia. *American Journal of Psychiatry, 160*, 284-289.

Ryan, R. M., & Lynch, J. H. (1989). Emotional autonomy versus detachment - Revisiting the vicissitudes of adolescence and young adulthood. *Child Development, 60*, 340-356.

Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of Personality, 63*, 397-427.

Ryan, R. M., Frederick, C. M., Lepes, D., Rubio, N., & Sheldon, K. M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sport Psychology, 28*, 335-354.

Ryan, R. M., & Deci, E. L. (2000a). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68-78.

Ryan, R. M., & Deci, E. L. (2000b). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54-67.

Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination: An organismic dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3-33). Rochester, NY: University of Rochester Press.

Ryan, R. M., Lynch, M. F., Vansteenkiste, M., & Deci, E. L. (2011). Motivation and autonomy in counseling, psychotherapy, and behavior change: A look at theory and practice. *The Counseling Psychologist, 39*, 193-260.

Saebu, M., Sørensen, M., & Halvari, H. (2013). Motivation for physical activity in young adults with physical disabilities during a rehabilitation stay: A longitudinal test of self-determination theory. *Journal of Applied Social Psychology, 43*, 612-625.

Saha, S., Chant, D., & McGrath, J. (2007). A systematic review of mortality in schizophrenia: Is the differential mortality gap worsening over time? *Archives of General Psychiatry, 64*, 1123-1131.

Sailer, P., Wieber, F., Propster, K., Stoewer, S., Nischk, D., Volk, F., & Odenwald, M. (2015). A brief intervention to improve exercising in patients with schizophrenia: A controlled pilot study with mental contrasting and implementation intentions (MCII). *BMC Psychiatry, 15*, 211. DOI: 10.1186/s12888-015-0513-y

Sallis, J. F., & Saelens, B. E. (2000). Assessment of physical activity by self-report: Status, limitations, and future directions. *Research Quarterly for Exercise and Sport, 71*, S1-S14.

Salyers, M. P., Bosworth, H. B., Swanson, J. W., Lamb-Pagone, J., & Osher, F. C. (2000). Reliability and validity of the SF-12 health survey among people with severe mental illness. *Medical Care, 38*, 1141-1150.

Saperstein, A. M., Fiszdon, J. M., & Bell, M. D. (2011). Intrinsic motivation as a predictor of work outcome after vocational rehabilitation in schizophrenia. *The Journal of Nervous and Mental Disease, 199*, 672-677.

Schinnar, A. P., Rothbard, A. B., Kanter, R., & Jung, Y. S. (1990). An empirical literature review of definitions of severe and persistent mental illness. *American Journal of Psychiatry, 147*, 1602-1608.

Schizophrenia Commission. (2012) The abandoned Iilness: A report from the Schizophrenia Commission. London: Rethink Mental Illness.

Schuch, F. B., Vancampfort, D., Richards, J., Rosenbaum, S., Ward, P. B., & Stubbs, B. (2016a). Exercise as a treatment for depression: A meta-analysis adjusting for publication bias. *Journal of Psychiatric Research, 77*, 42-51.

Schuch, F. B., Vancampfort, D., Rosenbaum, S., Richards, J., Ward, P. B., & Stubbs, B. (2016b). Exercise improves physical and psychological quality of life in people with depression: A meta-analysis including the evaluation of control group response. *Psychiatry Research, 241*, 47-54.

Schwarzer, R. (2011). Health behavior change. In H. S. Friedman (Ed.), *Oxford handbook of health psychology* (pp. 591-611). New York, NY: Oxford University Press.

Scott, D., & Happell, B. (2011). The high prevalence of poor physical health and unhealthy lifestyle behaviours in individuals with severe mental illness. *Issues in Mental Health Nursing, 32*, 589-597.

Silva, M. N., Markland, D., Vieira, P. N., Coutinho, S. R., Carraca, E. V., Palmeira, A. L., ... Teixeira, P. J. (2010a). Helping overweight women become more active: Need support and motivational regulations for different forms of physical activity. *Psychology of Sport and Exercise, 11*, 591-601.

Silva, M. N., Vieira, P. N., Coutinho, S. R., Minderico, C. S., Matos, M. G., Sardinha, L. B., & Teixeira, P. J. (2010b). Using self-determination theory to promote physical activity and weight control: A randomized controlled trial in women. *Journal of Behavioral Medicine, 33*, 110-122.

Silva, M. N., Markland, D., Carraca, E. V., Vieira, P. N., Coutinho, S. R., Minderico, C. S., ... Teixeira, P. J. (2011). Exercise autonomous motivation predicts 3-yr weight loss in women. *Medicine and Science in Sports and Exercise, 43*, 728-737.

Singh, N. A., Clements, K. M., & Fiatarone, M. A. (1997). A randomized controlled trial of progressive resistance training in depressed elders. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences, 52*, M27-35.

Slade, M., Powell, R., & Strathdee, G. (1997). Current approaches to identifying the severely mentally ill. *Social Psychiatry and Psychiatric Epidemiology, 32*, 177-184.

Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2005). Bridging the intention-behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology & Health, 20*, 143-160.

Solberg, P. A., Hopkins, W. G., Ommundsen, Y., & Halvari, H. (2012). Effects of three training types on vitality among older adults: A self-determination theory perspective. *Psychology of Sport and Exercise, 13*, 407-417.

Soundy, A., Freeman, P., Stubbs, B., Probst, M., Coffee, P., & Vancampfort, D. (2014a). The transcending benefits of physical activity for individuals with schizophrenia: A systematic review and meta-ethnography. *Psychiatry Research, 220*, 11-19.

Soundy, A., Stubbs, B., Probst, M., Hemmings, L., & Vancampfort, D. (2014b). Barriers to and facilitators of physical activity among persons with schizophrenia: A survey of physical therapists. *Psychiatric Services, 65*, 693-696.

Standage, M., Duda, J. L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *British Journal of Educational Psychology, 75*, 411-433.

Standage, M., Sebire, S. J., & Loney, T. (2008). Does exercise motivation predict engagement in objectively assessed bouts of moderate-intensity exercise? A self-determination theory perspective. *Journal of Sport & Exercise Psychology, 30*, 337-352.

Stordal, K. I., Mykletun, A., Asbjornsen, A., Egeland, J., Landro, N. I., Roness, A., ... Lund, A. (2005). General psychopathology is more important for executive functioning than diagnosis. *Acta Psychiatrica Scandinavica, 111*, 22-28.

Strom, M., Uckelstam, C.-J., Andersson, G., Hassmen, P., Umefjord, G., & Carlbring, P. (2013). Internet-delivered therapist-guided physical activity for mild to moderate depression: A randomized controlled trial. *PeerJ, 2013*, e178 http://dx.doi.org/110.7717/peerj.7178.

Stubbs, B., Firth, J., Berry, A., Schuch, F. B., Rosenbaum, S., Gaughran, F., ... Vancampfort, D. (2016a). How much physical activity do people with schizophrenia engage in? A systematic review, comparative meta-analysis and meta-regression. *Schizophrenia Research, 176*, 431-440.

Stubbs, B., Vancampfort, D., Rosenbaum, S., Ward, P. B., Richards, J., Soundy, A., ... Schuch, F. B. (2016b). Dropout from exercise randomized controlled trials among people with depression: A meta-analysis and meta regression. *Journal of Affective Disorders, 190*, 457-466.

Stubbs, B., Vancampfort, D., Rosenbaum, S., Ward, P. B., Richards, J., Ussher, M., & Schuch, F. B. (2016c). Challenges establishing the efficacy of exercise as an antidepressant treatment: A

systematic review and meta-analysis of control group responses in exercise randomised controlled trials. *Sports Medicine, 46*, 699-713.

Suto, M., Murray, G., Hale, S., Amari, E., & Michalak, E. E. (2010). What works for people with bipolar disorder? Tips from the experts. *Journal of Affective Disorders, 124*, 76-84.

Sylvia, L. G., Kopeski, L., Brown, C., Bolton, P., Laudate, C., DiGangi, G., ... Neuhaus, E. C. (2013). An adjunct exercise program for serious mental illness: Who chooses to participate and is it feasible? *Community Mental Health Journal, 49*, 213-219.

Sæbu, M. (2011). *Physical activity and motivation in young adults with a physical disability.* (Doctoral thesis), Norwegian School of Sport Sciences,Oslo, Norway. http://brage.bibsys.no/xmlui/bitstream/handle/11250/171307/saebu_dravh_nih2011.pdf?sequence=2&isAllowed=y

Sørensen, M. (2006). Motivation for physical activity of psychiatric patients when physical activity was offered as part of treatment. *Scandinavian Journal of Medicine & Sience in Sports, 16*, 391-398.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics* (Fifth Edition ed.). Boston, MA: Pearson Education.

Teixeira, P. J., Carraca, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 78: DOI: 10.1186/1479-5868-9-78

Tetlie, T., Eik-Nes, N., Palmstierna, T., Callaghan, P., & Nottestad, J. A. (2008). The effect of exercise on psychological & physical health outcomes: preliminary results from a Norwegian forensic hospital. *Journal of Psychosocical Nursing and Mental Health Services, 46*, 38-43.

Thogersen-Ntoumani, C., & Ntoumanis, N. (2006). The role of self-determined motivation in the understanding of exercise-related behaviours, cognitions and physical self-evaluations. *Journal of Sports Sciences, 24*, 393-404.

Thomson, D., Turner, A., Lauder, S., Gigler, M. E., Berk, L., Singh, A. B., ... Sylvia, L. (2015). A brief review of exercise, bipolar disorder, and mechanistic pathways. *Frontiers in Psychology, 6*, 147: doi: 10.3389/fpsyg.2015.00147

Trivedi, M. H., Greer, T. L., Church, T. S., Carmody, T. J., Grannemann, B. D., Galper, D. I., ... Blair, S. N. (2011). Exercise as an augmentation treatment for nonremitted major depressive disorder: A randomized, parallel dose comparison. *Journal of Clinical Psychiatry, 72*, 677-684.

Usher, K., Park, T., Foster, K., & Buettner, P. (2013). A randomized controlled trial undertaken to test a nurse-led weight management and exercise intervention designed for people with serious mental illness who take second generation antipsychotics. *Journal of Advanced Nursing, 69*, 1539-1548.

Ussher, M., Stanbury, L., Cheeseman, V., & Faulkner, G. (2007). Physical activity preferences and perceived barriers to activity among persons with severe mental illness in the United Kingdom. *Psychiatric Services, 58*, 405-408.

Van Citters, A. D., Pratt, S. I., Jue, K., Williams, G., Miller, P. T., Xie, H., & Bartels, S. J. (2010). A pilot evaluation of the In SHAPE individualized health promotion intervention for adults with mental illness. *Community Mental Health Journal, 46*, 540-552.

Vancampfort, D., Knapen, J., Probst, M., Scheewe, T., Remans, S., & De Hert, M. (2012a). A systematic review of correlates of physical activity in patients with schizophrenia. *Acta Psychiatrica Scandinavica, 125*, 352-362.

Vancampfort, D., Probst, M., Scheewe, T., Knapen, J., De Herdt, A., & De Hert, M. (2012b). The functional exercise capacity is correlated with global functioning in patients with schizophrenia. *Acta Psychiatrica Scandinavica, 125*, 382-387.

Vancampfort, D., Correll, C. U., Probst, M., Sienaert, P., Wyckaert, S., De Herdt, A., ... De Hert, M. (2013a). A review of physical activity correlates in patients with bipolar disorder. *Journal of Affective Disorders, 145*, 285-291.

Vancampfort, D., De Hert, M., De Herdt, A., Vanden Bosch, K., Soundy, A., Bernard, P. P., ... Probst, M. (2013b). Associations between physical activity and the built environment in patients with schizophrenia: A multi-centre study. *General Hospital Psychiatry, 35*, 653-658.

Vancampfort, D., De Hert, M., Vansteenkiste, M., De Herdt, A., Scheewe, T. W., Soundy, A., ... Probst, M. (2013c). The importance of self-determined motivation towards physical activity in patients with schizophrenia. *Psychiatry Research, 210*, 812-818.

Vancampfort, D., Vansteelandt, K., Correll, C. U., Mitchell, A. J., De Herdt, A., Sienaert, P., ... De Hert, M. (2013d). Metabolic syndrome and metabolic abnormalities in bipolar disorder: A meta-analysis of prevalence rates and moderators. *American Journal of Psychiatry, 170*, 265-274.

Vancampfort, D., Correll, C. U., Wampers, M., Sienaert, P., Mitchell, A. J., De Herdt, A., . . . De Hert, M. (2014a). Metabolic syndrome and metabolic abnormalities in patients with major depressive disorder: A meta-analysis of prevalences and moderating variables. *Psychological Medicine, 44*, 2017-2028.

Vancampfort, D., De Hert, M., De Herdt, A., Soundy, A., Stubbs, B., Bernard, P., & Probst, M. (2014b). Associations between perceived neighbourhood environmental attributes and self-reported sitting time in patients with schizophrenia: A pilot study. *Psychiatry Research, 215*, 33-38.

Vancampfort, D., Vansteenkiste, M., De Hert, M., De Herdt, A., Soundy, A., Stubbs, B., ... Probst, M. (2014c). Self-determination and stage of readiness to change physical activity behaviour in schizophrenia. *Mental Health and Physical Activity, 7*, 09-176.

Vancampfort, D., De Hert, M., Stubbs, B., Ward, P. B., Rosenbaum, S., Soundy, A., & Probst, M. (2015a). Negative symptoms are associated with lower autonomous motivation towards physical activity in people with schizophrenia. *Comprehensive Psychiatry, 56*, 128-132.

Vancampfort, D., Madou, T., Moens, H., De Backer, T., Vanhalst, P., Helon, C., ... Probst, M. (2015b). Could autonomous motivation hold the key to successfully implementing lifestyle changes in affective disorders? A multicentre cross sectional study. *Psychiatry Research.*

Vancampfort, D., Stubbs, B., Venigalla, S. K., & Probst, M. (2015c). Adopting and maintaining physical activity behaviours in people with severe mental illness: The importance of autonomous motivation. *Preventive Medicine, 81*, 216-220.

Vancampfort, D., Correll, C. U., Galling, B., Probst, M., De Hert, M., Ward, P. B., ... Stubbs, B. (2016a). Diabetes mellitus in people with schizophrenia, bipolar disorder and major depressive disorder: A systematic review and large scale meta-analysis. *World Psychiatry, 15*, 166-174.

Vancampfort, D., De Hert, M., Broderick, J., Lederman, O., Firth, J., Rosenbaum, S., & Probst, M. (2016b). Is autonomous motivation the key to maintaining an active lifestyle in first-episode psychosis? *Early Intervention in Psychiatry*, doi: 10.1111/eip.12373

Vancampfort, D., Firth, J., Schuch, F., Rosenbaum, S., De Hert, M., Mugisha, J., ... Stubbs, B. (2016c). Physical activity and sedentary behavior in people with bipolar disorder: A systematic review and meta-analysis. *Journal of Affective Disorders, 201*, 145-152.

Vancampfort, D., Moens, H., Madou, T., De Backer, T., Vallons, V., Bruyninx, P., ... Probst, M. (2016d). Autonomous motivation is associated with the maintenance stage of behaviour change in people with affective disorders. *Psychiatry Research, 240*, 267-271.

Vancampfort, D., Rosenbaum, S., Probst, M., Connaughton, J., du Plessis, C., Yamamoto, T., & Stubbs, B. (2016e). Top 10 research questions to promote physical activity in bipolar disorders: A consensus statement from the International Organization of Physical Therapists in Mental Health. *Journal of Affective Disorders, 195*, 82-87.

Vancampfort, D., Rosenbaum, S., Probst, M., Connaughton, J., du Plessis, C., Yamamoto, T., & Stubbs, B. (2016f). What are the top 10 physical activity research questions in schizophrenia? *Disability and Rehabilitation, 38*, 2235-2243.

Vancampfort, D., Rosenbaum, S., Schuch, F. B., Ward, P. B., Probst, M., & Stubbs, B. (2016g). Prevalence and predictors of treatment dropout from physical activity interventions in schizophrenia: a meta-analysis. *General Hospital Psychiatry, 39*, 15-23.

Vancampfort, D., & Stubbs, B. (2016). Physical activity and metabolic disease among people with affective disorders: Prevention, management and implementation. *Journal of Affective Disorders*, doi: 10.1016/j.jad.2016.07.042

Vanhees, L., Lefevre, J., Philippaerts, R., Martens, M., Huygens, W., Troosters, T., & Beunen, G. (2005). How to assess physical activity? How to assess physical fitness? *European Journal of Cardiovascular Prevention and Rehabilitation, 12*, 102-114.

Verhaeghe, N., De Maeseneer, J., Maes, L., Van Heeringen, C., & Annemans, L. (2011). Perceptions of mental health nurses and patients about health promotion in mental health care: A literature review. *Journal of Psychiatric and Mental Health Nursing, 18*, 487-492.

Verhaeghe, N., Clays, E., Vereecken, C., De Maeseneer, J., Maes, L., Van Heeringen, C., ... Annemans, L. (2013a). Health promotion in individuals with mental disorders: A cluster preference randomized controlled trial. *BMC Public Health, 13*, 657.

Verhaeghe, N., De Maeseneer, J., Maes, L., Van Heeringen, C., & Annemans, L. (2013b). Health promotion in mental health care: Perceptions from patients and mental health nurses. *Journal of Clinical Nursing, 22*, 1569-1578.

Vlachopoulos, S. P., & Michailidou, S. (2006). Development and initial validation of a measure of autonomy, competence, and relatedness in exercise: The basic psychological needs in exercise scale. *Measurement in Physical Education and Exercise Science, 103*, 179-201.

Wahlbeck, K., Westman, J., Nordentoft, M., Gissler, M., & Laursen, T. M. (2011). Outcomes of Nordic mental health systems: Life expectancy of patients with mental disorders. *British Journal of Psychiatry, 199*, 453-458.

Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal, 174*, 801-809.

Ware, J., Kosinski, M., & Keller, S. D. (1996). A 12-item Short-Form Health Survey: Construction of scales and preliminary tests of reliability and validity. *Medical Care, 34*, 220-233.

Ware, J. E., Kosinski, M., Turner-Bowker, D. M., & Gandek, B. (2002). *User's manual for the SF-12v2® health survey with supplement documenting SF-12® health survey*. Lincoln, RI: QualityMetric Incorporated.

Warren, K. R., Ball, M. P., Feldman, S., Liu, F., McMahon, R. P., & Kelly, D. L. (2011). Exercise program adherence using a 5-kilometer (5K) event as an achievable goal in people with schizophrenia. *Biological Research for Nursing, 13*, 383-390.

Wester, A., Wahlgren, L., Wedman, I., & Ommundsen, Y. (2008). Å bli fysisk aktiv [To become physically active]. In R. Bahr (Ed.), *Aktivitetshåndboken: Fysisk aktivitet i forebygging og behandling [Handbook of activity: Physical activity in prevention and treatment]* (pp. 84-102). Oslo: Helsedirektoratet.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66*, 297-333.

Whiteford, H. A., Degenhardt, L., Rehm, J., Baxter, A. J., Ferrari, A. J., Erskine, H. E., ... Vos, T. (2013). Global burden of disease attributable to mental and substance use disorders: Findings from the Global Burden of Disease Study 2010. *Lancet, 382*, 1575-1586.

Williams, G. C., Grow, V. M., Freedman, Z. R., Ryan, R. M., & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintenance. *Journal of Personality and Social Psychology, 70*, 115-126.

Williams, G.C, Freedman, Z., & Deci, E. (1998). Supporting autonomy to motivate patients with diabetes for glucose control. *Diabetes Care, 21*, 1644-1651.

Williams, G. C. (2002). Improving patients' health through supporting the autonomy of patients and providers. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 233-254). Rochester: Rochester University Press.

Williams, G. C., McGregor, H. A., Zeldman, A., Freedman, Z. R., & Deci, E. L. (2004). Testing a self-determination theory process model for promoting glycemic control through diabetes self-management. *Health Psychology, 23*, 58-66.

Williams, G. C., McGregor, H. A., Sharp, D., Levesque, C., Kouides, R. W., Ryan, R. M., & Deci, E. L. (2006). Testing a self-determination theory intervention for motivating tobacco cessation: Supporting autonomy and competence in a clinical trial. *Health Psychology, 25*, 91-101.

Wilmot, E. G., Edwardson, C. L., Achana, F. A., Davies, M. J., Gorely, T., Gray, L. J., ... Biddle, S. J. (2012). Sedentary time in adults and the association with diabetes, cardiovascular disease and death: Systematic review and meta-analysis. *Diabetologia, 55*, 2895-2905.

Wilson, P. M., & Rodgers, W. M. (2002). The relationship between exercise motives and physical self-esteem in female exercise participants: An application of self-determination theory. *Journal of Applied Biobehavioral Research, 7*, 30-42

Wilson, P. M., Rodgers, W. M., & Fraser, S. N. (2002). Examining the psychometric properties of the behavioral regulation in exercise questionnaire. *Measurement in Physical Education and Exercise Science, 6*, 1-21.

Wilson, P. M., Rodgers, W. M., Blanchard, C. M., & Gessell, J. (2003). The relationship between psychological needs, self-determined motivation, exercise attitudes, and physical fitness. *Journal of Applied Social Psychology, 33*, 2373-2392.

Wilson, P. M., Longley, K., Muon, S., Rodgers, W. M., & Murray, T. C. (2006). Examining the contributions of perceived psychological need satisfaction to well-being in exercise. *Journal of Applied Biobehavioral Research, 11*, 243-264.

Wilson, P. M., Mack, D. E., Blanchard, C. M., & Gray, C. E. (2009). The role of perceived psychological need satisfaction in exercise-related affect. *Hellenic Journal of Psychology, 6*, 183-206.

Wing, J., Beevor, A., Curtis, R., Park, S., Hadden, S., & Burns, A. (1998). Health of the Nation Outcome Scales (HoNOS). Research and development. *British Journal of Psychiatry, 172*, 11-18.

Wipfli, B. M., Rethorst, C. D., & Landers, D. M. (2008). The anxiolytic effects of exercise: A meta-analysis of randomized trials and dose-response analysis. *Journal of Sport & Exercise Psychology, 30*, 392-410.

Wittchen, H. U., & Jacobi, F. (2005). Size and burden of mental disorders in Europe - a critical review and appraisal of 27 studies. *European Neuropsychopharmacology, 15*, 357-376.

Wright, K., Everson-Hock, E. S., & Taylor, A. H. (2009). The effect of physical activity on physical and mental health among individuals with bipolar disorder. *Mental Health and Physical Activity, 2*, 86-94.

Wright, K., Armstrong, T., Taylor, A., & Dean, S. (2012). 'It's a double edged sword': A qualitative analysis of the experiences of exercise amongst people with bipolar disorder. *Journal of Affective Disorders, 136*, 634-642.

Young, D. R., Jerome, G. J., Chen, C., Laferriere, D., & Vollmer, W. M. (2009). Patterns of physical activity among overweight and obese adults. *Preventing Chronic Disease, 6*, A90. https://www.cdc.gov/pcd/issues/2009/Jul/08_0186.htm

Paper I

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REVIEW

Motivation for physical activity and exercise in severe mental illness: A systematic review of intervention studies

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ABSTRACT: *There has been increasing interest for research on motivation for physical activity (PA) and exercise among individuals with severe mental illness (SMI). The aim of this systematic review is to summarize findings from all intervention studies on PA or exercise that either include empirical data on motivational constructs or apply motivational techniques/theories in their intervention. Systematic searches of seven databases were conducted from database inception to February 2015. Studies were eligible if they: (i) included participants with SMI, (ii) had PA as part of the intervention, and (iii) reported empirical data on motivational constructs related to PA or incorporated motivational techniques/theory in their intervention. Of the 79 studies that met the inclusion criteria only one had motivation for PA as its main outcome. Nine additional interventions reported empirical data on motivational constructs. Altogether these studies yielded mixed results with respect to change in motivational constructs. Only one of those examined the association between motivation and PA, but found none. Sixty-four studies reported using motivational techniques/theory in their intervention. Motivational interviewing and goal-setting were the most popular techniques. Due to the exploratory nature of most of these studies, findings from intervention studies do not so far give very clear directions for motivational work with the patients. There is an urgent need for a more systematic theory based approach when developing strategies that target to increase engagement in PA among people with SMI.*

KEY WORDS: *behaviour change, exercise, intervention, motivation, mental disorder.*

INTRODUCTION

People with severe mental illness (SMI), such as schizophrenia, bipolar disorder, and major depression, have increased rates of comorbid physical illnesses (De Hert *et al.* 2011; Leucht *et al.* 2007). These illnesses contribute strongly to an excess mortality rate in people with SMI that translates into a reduced life expectancy of around 15–20 years compared to the general population (Nordentoft *et al.* 2013; Roshanaei-Moghaddam & Katon 2009; Vreeland 2007). In the general population, individuals who demonstrate a combination of smoking, poor diet, excessive drinking, and physical inactivity have a fourfold total risk of mortality (Khaw *et al.* 2008). People with SMI have disproportionately high prevalence of these health behaviours (Scott & Happell 2011). In addition, other factors like adverse effects of antipsychotic medication and inequality of health care provision add further burden to the physical health of people with SMI (Robson & Gray 2007). Physical activity (PA) has become an established strategy to manage physical illnesses and motivation for PA and exercise should therefore be a high priority topic in relation to this population.

Mental health nurses constitutes an important professional group with respect to increasing PA engagement among people with SMI (Happell *et al.* 2011). They have first-hand knowledge on patients' barriers and facilitators for participating in PA, progress of mental illness management, and prospects of support from significant others

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(Hardy & Gray 2010). This valuable knowledge can be used to adapt PA to the needs of each individual patient. As a consequence, nurses have been involved in interventions aiming at increasing physical activity among individuals with SMI (e.g. Ohlsen *et al.* 2004; Verhaeghe *et al.* 2013a).

With the growing evidence of poor physical health and the modifiable nature of health behaviours it is not surprising that there has been an increasing interest in research on healthy living and weight control in this population. This is demonstrated by a number of recent reviews (Bonfioli *et al.* 2012; Happell *et al.* 2012). Conclusions from these reviews indicate promising results with regard to weight-management and improvement of various physical health parameters.

The interest for utilizing PA in this population is not limited to weight control in lifestyle studies. From the late 1990s there has been an increasing interest in using exercise as a therapeutic add-on treatment (Callaghan 2004). In this line of enquiry outcomes are not restricted to physical health, but also mental health and quality of life. This has resulted in several reviews with different approaches regarding outcomes of physical activity interventions (Gorczynski & Faulkner 2010; Holley *et al.* 2011; Rosenbaum *et al.* 2014). Conclusions from these reviews are quite similar in that PA and exercise can have beneficial effects on both illness symptoms and quality of life. However, it is underscored that more rigorous studies are required before any definitive conclusions are drawn.

To be physically active can be challenging for individuals with SMI (Carpiniello *et al.* 2013; Ussher *et al.* 2007). These difficulties are apparent in lower levels of PA (Scott & Happell 2011) and decreased physical fitness compared with the general population (Scheewe *et al.* 2012). One possible explanation for this is related to the illness per se and side-effects of medicines (Glover *et al.* 2013; Hodgson *et al.* 2011). Lack of motivation could be another explanation. Health care staff have repeatedly reported motivation to be a major barrier when introducing exercise in the treatment of SMI (Harding 2013; Robson *et al.* 2013). From a lay perspective, motivation is often viewed as a desirable, stable entity that you have more or less of. That does not capture the complexity of motivation (Roberts 2001). There are at least 32 theories of motivation, each with its own definition (Ford 1992). Despite this diversity, there seems to be a consensus that motivation is a process rather than an entity (Roberts 2001). This has two important consequences. First, a dynamic process opens opportunities for change. In that regard, nurses are well positioned to practise influence on patients' motivation and behaviour due to their capacity to establish a therapeutic relationship with patients and meeting patients on a regular basis, often daily for inpatients (Bradshaw & Pedley 2012; Happell *et al.* 2012; Stanton & Happell 2014). Secondly, it becomes necessary to understand the process (Roberts *et al.* 2007). Thus, if we want to understand motivation for PA in SMI it is not enough to apply atheoretical descriptions of barriers and motives for being physically active; we need to pay attention to the constructs driving the motivational process (Biddle & Nigg 2000).

Furthermore, lack of motivation has anecdotally been given as a reason for participants with SMI dropping out of exercise interventions (Abdel-Baki *et al.* 2013; Archie *et al.* 2003; Oertel-Knöchel *et al.* 2014). It is also argued that lack of motivation could partly explain the problems of recruiting and retaining participants in such interventions (Beebe *et al.* 2010; Liu & Spaulding 2010). However, this association has not been sufficiently documented and needs further examination (Beebe *et al.* 2010; Scheewe *et al.* 2012). Further, the field of SMI and PA is increasingly moving beyond efficacy studies (the beneficial treatment effect during optimal conditions) to effectiveness studies (the beneficial treatment effect during more real world settings). In that regard, the importance of behaviour change processes has recently been highlighted (Taylor & Faulkner 2014). Hence, the focus on effectiveness studies may be the background for recent demands for novel approaches to increase PA motivation (Bonsaksen 2011), attempts to understand the influence of intrinsic and extrinsic motivation (Kane *et al.* 2012), and calls for new ways to best engage individuals with SMI to begin and continue with exercise or a healthy lifestyle (Goldberg *et al.* 2013; Gorczynski & Faulkner 2010).

Recently, there has been an emerging interest for examining the role of motivation within a physical activity context among persons with SMI (e.g. Beebe *et al.* 2010; Vancampfort *et al.* 2013, 2015). However, so far there is no systematic review on the topic. Hence, the primary aim of this review is to summarize findings from all intervention studies on PA or exercise that include either empirical data on motivational constructs or apply motivational techniques/theories in their intervention. The reason for only including intervention studies and not observational studies is based on this design being stronger with respect examining the effectiveness of motivational strategies.

MATERIALS AND METHODS

Eligibility criteria

Inclusion criteria were: (i) publications in peer-reviewed journals; (ii) quantitative study design including an

intervention; (iii) conducting PA/exercise or some sort of education on PA/exercise in the intervention; (iv) studies including participants described with either a generic term like psychosis and SMI, or a diagnose of schizophrenia, bipolar disorder, or major depressive disorder; (v) studies reporting empirical data on motivational constructs related to PA/exercise, or incorporating motivational theory or motivational techniques in their intervention. Studies included in this paper did not have to describe its population according to standardized criteria (e.g. DSM or ICD). However, studies were excluded if they only contained participants with a general diagnosis of depression without specifying major depressive disorder.

We did not distinguish between articles using PA and exercise even though PA is an overarching term and exercise is a subset of PA. PA is usually defined as "*any bodily movement produced by skeletal muscles that results in energy expenditure*" and exercise is typically defined as "*physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness*" (Caspersen *et al.* 1985 p. 126).

Information sources and search strategy

A systematic search strategy was conducted, and the following electronic databases were searched from its inception to February 2015: ISI Web of Science, PsycINFO, PubMed, CINAHL, SportDiscus, Embase, and MedLine. Search words used were "physical activity" OR "exercise" OR "motor activity" AND "mental illness" OR "mental disorder" OR "schizo*" OR "psychoses OR "psychosis" OR "bipolar disorder" OR "major depressive disorder" OR "major depression". Search words could be in title, abstract, or key-words. Following the electronic search, manual searches were also conducted by searching the reference lists of included studies. The search was limited to articles in English and with human subjects above 18 years old.

Data extraction

Two independent assessors assessed the relevance of the articles and discrepancy was solved by discussion. The following procedure was used: Initially all duplicates were deleted before irrelevant studies were identified by a four-stepped approach. First, all titles were read and obvious irrelevant studies were excluded. Secondly all abstract were read and irrelevant articles were excluded, and thirdly the method and result section of the remaining articles were read and articles not fulfilling inclusion criteria i–iv excluded. The remaining articles were organized into two groups: (i) Studies only using PA in their intervention; and (ii) studies with multimodal interventions including PA. Finally, all of these articles were read in full. For articles complying with the fifth inclusion criterion, data were extracted using a predesigned template, which included the following headings: Study reference information, design, participants, intervention, outcome measurements (relevant measurements of motivational constructs and if available PA measurements), and findings (relevant findings according to the aim of the review). A shortened template with only study reference information, design, and motivational technique/theory used was applied for studies not reporting empirical data on motivational constructs.

Study quality assessment

Overall study quality was assessed for studies reporting empirical data on motivational constructs related to PA. A previously developed evaluation form that calculates the quality as a percentage between 0 and 100 was used (Bradshaw *et al.* 2005). In line with previous use of the evaluation form, studies were classified as having good (75% or higher), fair (50–74.9%), or poor quality (less than 50%) (Happell *et al.* 2012). Only studies classified with good and fair quality were included in the review.

RESULTS

Study selection

The electronic database search resulted in 13 522 hits. Among those, 5861 were duplicates within one or more of the seven databases searched, and they were excluded. Through an additional hand search of reference lists, 34 potentially eligible articles were identified. This resulted in 7695 potentially eligible articles, of those 7477 were excluded during the three first steps of the screening procedure (see Fig. 1). The remaining 218 articles all dealt with SMI and PA, either alone or as part of a multimodal intervention. There were two noteworthy trends in this sample. First, the number of published articles has steeply increased through the last decade, and secondly, rigorous methodology was more frequently used in the more recent articles (see Supplementary material, Table S1). In total, 79 articles describing 67 unique populations reported varying degree of information related to motivational constructs. Two of these articles were excluded due to poor study quality.

The included articles can be divided in two main groups: (i) Intervention studies reporting empirical data on motivational constructs related to PA, and (ii) intervention studies that incorporate motivational theory or motivational techniques in their intervention but do not report empirical data on motivational constructs.

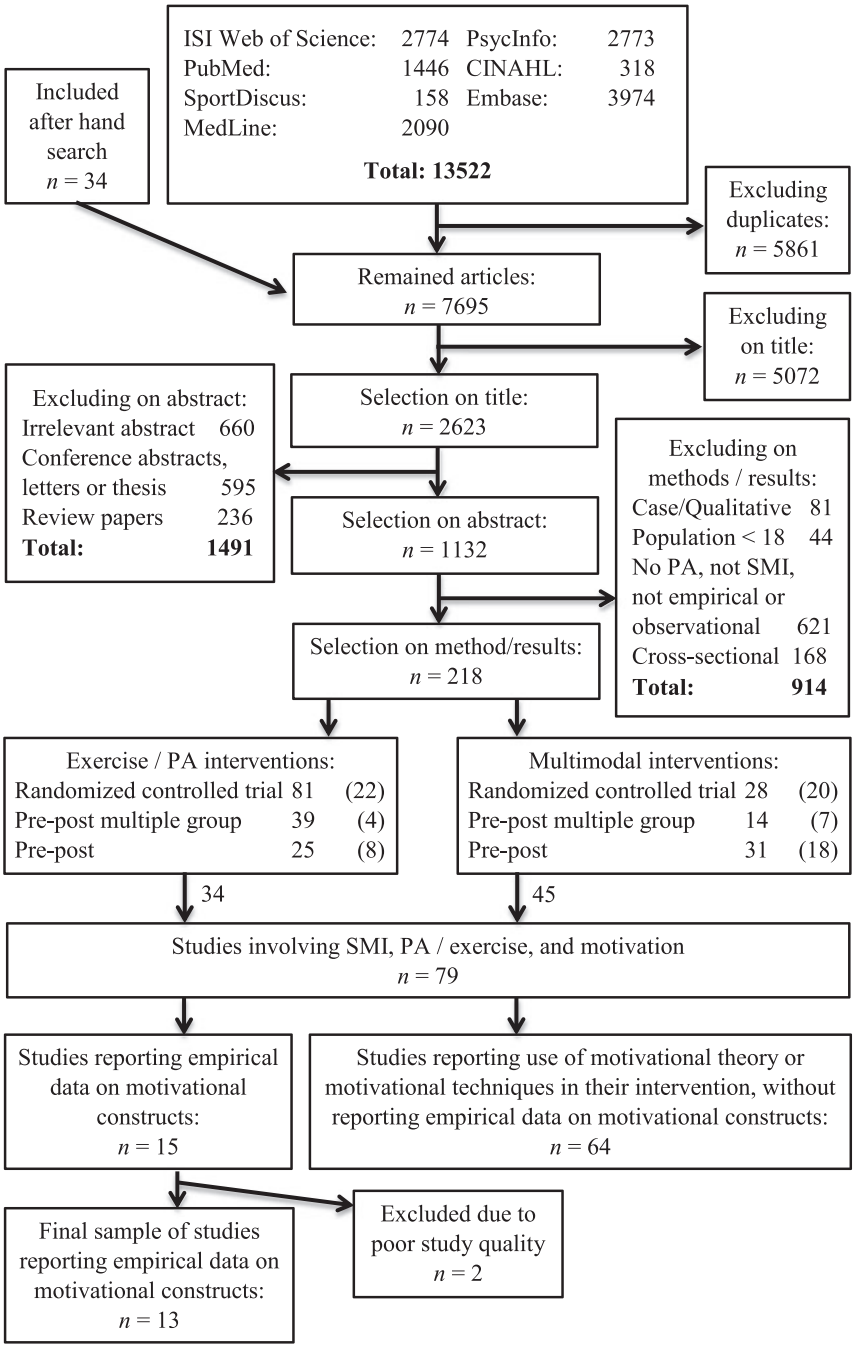

FIG. 1: *Flow chart of study selection. Note: brackets indicate number of studies including motivational constructs.*

Studies reporting empirical data on motivational constructs related to PA

Study characteristics

Thirteen intervention studies (describing 10 unique interventions) reported empirical data on motivational constructs related to PA. Among these six were randomized controlled trials (RCT; five PA and one multimodal intervention), one was a pre-post multiple group design (PA intervention) and three had pre-post design (one PA and two multimodal interventions). Overall, 599 participants (289 males and 310 females) completed baseline measurements. Among those, 120 dropped out. Across the 10 interventions 322 invited individuals declined to participate, resulting in a participation rate of 65% (see Table 1).

Synthesis of results

Only one of the interventions had its main aim of increasing motivation for PA (Beebe *et al.* 2010). This motivational intervention was based on Social Cognitive Theory (Bandura 1997) and examined the effect of four weekly hour-long educational group sessions. There was no significant group X time interaction effect for neither self-efficacy nor outcome expectations. However, after the intervention self-efficacy was higher and outcome expectation was lower in the intervention group compared with the control group. A successive article reported the results from a 16-week walking program for which both groups attended. Although intervention participants attended more walking groups, for more weeks, and walked more minutes than control participants did this not yield a significant group X time interaction effect (Beebe *et al.* 2011). To summarize, the design chosen was appropriate for separating the effect of the motivational intervention and a possible motivational effect of participating in physical activity classes. However, the trial yielded equivocal results with respect to both motivation and PA behaviour.

In the remaining nine interventions motivation was only a secondary outcome, with PA behaviour, and physical and mental health being the primary outcomes. Eight of these intervention studies analysed motivation without relating it to PA behaviour and the ninth found no association between exercise self-efficacy and exercise attendance (Daumit *et al.* 2011). There were mixed results with respect to changes in motivational variables. One RCT had no group X time interaction effect for confidence in changing eating and activity to control weight (Goldberg *et al.* 2013). In another RCT self-efficacy increased over time, but there was no group X time interaction effect (Singh *et al.* 2005). Two RCTs had mixed results, with self-efficacy increasing significantly for two types of activities (jogging and martial arts) while no increase occurred with several other activities (climbing, walking, stationary bicycling etc.) (Bodin & Martinsen 2004; Singh *et al.* 2001). The last RCT only reported baseline data for outcome expectation (Martiny *et al.* 2012). In studies without a control condition one reported positive change in readiness to exercise regularly (Van Citters *et al.* 2010), one study reported a negative change in one subscale of exercise self-efficacy (Daumit *et al.* 2011), but otherwise there were no significant changes. Finally, two studies examined associations between motivational variables and mental health outcomes (Bodin & Martinsen 2004; Singh *et al.* 2005), see Table 1 for further results.

Intervention studies reporting use of motivational theory or motivational techniques in their intervention, without reporting empirical data on motivational constructs

Interventions using motivational techniques

Forty-four interventions described in 51 articles incorporated motivational aspects in the intervention. Among them 21 were RCTs, six were pre-post multiple group design, and 17 were pre-post design. Further, 18 had PA interventions and 26 had multimodal interventions including PA. A broad spectre of motivational techniques was used in the 44 interventions, ranging from unstructured motivational prompts to a well-described motivational interviewing process. The most common techniques applied were goal-setting and different types of motivational counselling or interviewing, used in 22 and 15 interventions, respectively (see supplementary material, Tables , S2 and S5 for overview of studies and techniques used).

Interventions based on motivational theory

Eleven interventions described in 13 articles reported to base their intervention on motivational theory. Among them, six were RCTs, one was a cluster preference RCT, and four used a pre-post design. One pre-post and two RCT studies used PA intervention exclusively, whereas the rest of the studies used multimodal interventions. The most frequently used theoretical frameworks were Social Cognitive Theory (Bandura 1997) and The Transtheoretical Model (Prochaska & Velicer 1997), used six and five times, respectively. Additionally, Self-Determination Theory (Ryan & Deci 2002) was used twice. In general, these studies concluded that interventions were both feasible and produced health behaviour change. (See supplementary material, Table S3 for overview of studies).

Finally, even though applying standardized criteria for diagnoses was not an inclusion criterion, 72% of the

TABLE 1: *Intervention studies reporting empirical data on motivational construct related to PA or exercise*

Author/design	Participants	Intervention	Relevant measures	Findings	Study Quality
Beebe *et al.* (2010RCT – Ex.	*n* = 150 ➔ 97 (51/46) ÷ 22 Age: 46.9 ± 2.0	Intervention consisted of 4 weekly hour-long small group sessions based on SCT. Time and attention control for CG	Outcome expectations for exercise; self-efficacy for exercise	IG significantly higher self-efficacy and lower outcome-expectations at post-test compared to CG. Group X time interaction effect not significant for neither self-efficacy nor outcome expectations.	64
Beebe *et al.* (2011RCT – Ex.	*n* = 161 ➔ 97 (51/46) ÷ 18 Age: 46.9 ± 2.0	Both IG and CG offered a 16-week walking program. 3 days/week with increasing duration	Attendance (sessions attended/offered), persistence (weeks attending at least one session); Compliance (minutes walked each month)	No group X time interaction effect for any of the outcome variables. However, there was a time effect, attendance decreased, and persistence and compliance increased.	72
Beebe *et al.* (2013PPC – Ex.	*n* = 79 ➔ 24 (13/11) ÷ 2 Age: 48.1 ± 13.1	Participants from both groups wore a pedometer for a week	Pedometer counting daily-steps	No significant difference between groups in average steps/day	60
Bodin and Martinsen (2004RCT – Ex.	*n* = 18 ➔ 12 (4/8) ÷ 0 Age: 36.6 ± 9	One session of martial arts and one session of stationary bicycling with 30 min waiting control before each session	Self-efficacy for not slowing down or stop cycling during work-periods. Self-efficacy for remember and execution of martial art movements	Significant increase in self-efficacy in the martial art condition and no significant change in bicycle condition. Self-efficacy not associated with depression severity.	64
Daumit *et al.* (2011PP – MM	*n* = 98 ➔ 63 (28/35) ÷ 12 Age: 43.7 ± 10.8	6-month intervention with on-site healthy meals, group PA, and weight management counselling. Based on behavioural self-management and SCT.	General self-efficacy; self-efficacy in change of exercise habits	Exercise self-efficacy not associated with exercise attendance. Small negative change in the subscale "sticking to exercise" Observed participants motivating each other to join PA-groups. Believe social support was important for intervention success	63
Goldberg *et al.* (2013RCT – MM (education)	*n* = 227 ➔ 109 (88/21) ÷ 38 Age: 52 ± 9.1	Month 1 weekly individual sessions, month 2–4 weekly group sessions, month 5–6 group review sessions, month 2–6 monthly individual session	PA-behaviour, confidence in exercise, confidence to change eating and activity to control weight.	No group X time interaction in confidence of exercise total score or confidence to change eating and activity behaviour. Also no group X time interaction effect on PA or weight loss.	76
Haffmans *et al.* (2006PPC – Ex	*n* = 82 ➔ 60 (19/41) ÷ 19 Age: 39 ± ?	3 days/week X 6 or 12 weeks running or physiotraining. ⅓ control group first 6 weeks	Self-efficacy (not specified if exercise specific); physical self-efficacy	No baseline differences. Feelings of self-efficacy did not change in any group. Physical self-efficacy increased in physiotraining group.	52
Martiny *et al.* (2012RCT – Ex.	*n* = 75 ➔ 75 (31/44) ÷ 0 Age:IG: 48.5 ± 11.2 CG: 48.9 ± 12.6	Minimum 30 min daily exercise. Week 1 with supervision, week 2–8 at home with follow-up. CG: wake and light therapy	Outcome expectation of exercise treatment (0 = no improvement; 10 = without depression)	Mean outcome expectation for exercise group at baseline: 8.6 ± 1.5 (range 5–10). Not using outcome expectations in any analyses.	80
					63

(*Continues*)

TABLE 1: (Continued)

Author/design	Participants	Intervention	Relevant measures	Findings	Study Quality
McDevitt *et al.* (2005PP – Ex.	*n* = 24 ➔ 15 (7/8) ÷ 2 Age: 41.1 ± 12.1	3 days/week X 12 weeks Individualized exercise prescription. Increasing intensity and duration	Outcome expectancies for exercise; benefits and barriers for PA	Outcome expectancies were high at baseline and did not change. Perceived benefits outweighed barriers at baseline and program end and did not change	
Singh *et al.* (1997, 2001RCT – Ex.	*n* = 50 ➔ 32 (12/20) ÷ 2 Age: 70 ± 2	3 days/week X 10 weeks supervised strength training followed by 10 weeks unsupervised exercise. Time and attention CG	Physical self-efficacy (for jogging, walking climbing, push-ups, and lifting)	No change in self-efficacy with time or intervention at week 10. Self-efficacy for jogging improved significantly in IG at week 20. No change in self-efficacy for other activities.	80
Singh *et al.* (2005RCT – Ex.	*n* = 92 ➔ 60 (27/33) ÷ 6 Age: 69 ± 6	3 days/week X 8 weeks strength training. Three groups: IG high intensity (80% of 1 RM) IG low intensity (20% 1 RM) and CG.	Outcome expectations of exercise program on depression, self-efficacy for initiating, persistence facing adversity, and expend effort.	Outcome expectations related to reduction in depression in IG low, but not in IG high. Self-efficacy improved over time, but no effect on group assignment. Baseline/change scores not predicting antidepressant effect.	76
Van Citters *et al.* (2010PP – MM	*n* = 98 ➔ 76 (22/54) ÷ 19 Age: 43.5 ± 11.4	9 month individualized health promotion program. Meeting a health mentor once a week and free access to fitness facilities.	Self-reported PA-behaviour; readiness to engage in exercise behaviour	Readiness to exercise regularly increased significantly during intervention. PA increased after baseline. Not investigating associations between PA and readiness to engage in exercise	68

[1]1 RM, 1 repetition maximum; CG, control group; Ex., exercise intervention; IG, intervention group; MM, multimodal intervention including exercise/physical activity; *n*, possible participants ➔ participants at baseline (male/female) ÷ drop-outs during study; PPC, pre-post multiple group design; PP, pre-post design; SCT, Social Cognitive Theory.

included articles did so. In the remaining articles 20% described diagnoses obtained from various sources (e.g. chart review, physician set etc.) and 8% included participants from sources which implied that they had SMI (e.g. rehabilitation programs for SMI, psychiatric ward for SMI, etc.).

DISCUSSION

To the best knowledge of the authors, this is the first systematic review on motivation for PA among individuals with SMI. The findings demonstrate that there is an interest for including motivational aspects in interventions involving PA. In fact, nearly one-third of all trials did so. However, the greater part of these trials did not measure how the motivational techniques affected the participants.

Summary of evidence

The RCT conducted by Beebe *et al.* (2010, 2011) appears to be the only trial to examine the effects of a motivational intervention for PA for the SMI population. However, the intervention was not successful in creating a group X time interaction effect neither in exercise self-efficacy and exercise outcome expectancy, nor in PA behaviour. There can be several reasons for this. The motivational intervention was relatively short, only four weekly hour-long sessions. Also it did not include any actual PA during the motivational intervention. This is important because the most influential source of efficacy information is a first-person mastery experience (Bandura 1997). Furthermore, with the motivational intervention yielding equivocal results, it is logical not to find any group differences in the subsequent walking program. Unfortunately, neither of the two articles reported any data on the association between motivational variables and PA behaviour. This limitation is shared with all the other trials included in this review, except for the one conducted by Daumit *et al.* (2011). They examined the association between exercise self-efficacy and attendance of exercise sessions, but found none. On the other hand, they detected a significant decrease in one of the exercise self-efficacy subscales. Both these findings run contrary to what has been reported from the general population (McAuley & Blissmer 2000). It should be noted that the main aim for the trial was weight reduction and PA was merely one of the means used to reach this target. With self-efficacy thought to be context specific (Bandura 1997), this could explain the somewhat surprising results related to self-efficacy. However, these findings from the theory based trials are not exceptional, as several other trials reported mixed results with regards to change in motivational variables.

The comprehensive intervention of Van Citters *et al.* (2010) resulted in promising increases in readiness for regular PA and PA. This trial emphasized an individualized program with one-to-one meetings with a health mentor each week. Such an approach gives rich opportunities for social support. However, more motivational strategies were used, so we do not know what was the active agent in affecting participants' readiness for regular PA. The length of the interventions may also have had an influence.

There was a diversity as to theoretical framework and motivational constructs applied. This diversity is also mirrored by the various roles motivation played in the different studies. Self-efficacy can be used as an example: It has been used as a measured atheoretical construct (e.g. confidence), as a motivational technique (e.g. increasing exercise self-efficacy), as a theory based construct measured in interventions with or without a theoretical framework (e.g. with or without a strategy of affecting exercise self-efficacy), and not measured in intervention studies based on theory (e.g. with a strategy of affecting exercise self-efficacy). This is an important finding, because if we want further advancement in the field of motivation for PA in SMI it requires that interventions both have a strategy for increasing motivation and actually evaluate how well this strategy is working.

To summarize, the included intervention studies contained little empirical evidence on how to positively affect motivation for PA for individuals with SMI. This underscores the challenge facing health personnel when they try to promote PA for this group. It also demonstrates the need for more systematic approaches over longer time periods to overcome this challenge.

Clinical relevance

The important role of mental health nurses in promoting PA in mental health care has previously been highlighted (Happell *et al.* 2011). Arguably, motivating individuals with SMI to start and maintain PA is crucial to succeed in this task. Although multiple studies indicate that 30–50% of people with SMI have a desire, or a strong desire, to be more physically active (Archie *et al.* 2007; Ussher *et al.* 2007; Carpiniello *et al.* 2013), lack of motivation is viewed as a major barrier by nurses when promoting PA in this group (e.g. Happell *et al.* 2013; Leutwyler *et al.* 2013; Robson *et al.* 2013; Verhaeghe *et al.* 2013b). A possible explanation for this could be that "wanting to do something, is not the same as doing it", which can be described as the intention-behaviour gap (Sniehotta *et al.* 2005). To increase the chances of successfully bridging this gap a structured theory-based approach is recommended (Glanz & Bishop 2010). Results from the current review indicate that interventions typically don't apply such an approach with regards to affecting participants' motivation. In fact, the majority of the included studies were either descriptive, atheoretical,

or did not relate motivational outcomes to PA. This is noteworthy, because even though they can provide valuable knowledge, they cannot explain or identify the underlying motivational processes influencing PA involvement. Consequently, the included studies cannot give clear guidance on how to motivate individuals with SMI to engage in PA. However, this should not prevent mental health nurses from working with motivation for PA in a structured way in their clinical every day.

A motivational technique often used within wards and in interventions is tangible rewards or contingency management (e.g. food, coffee, vouchers, etc.) (Tidey 2012; Leutwyler *et al.* 2013). This motivational technique can produce beneficial short-term effects, but is known to undermine long-term adherence and intrinsic motivation (Deci *et al.* 1999). Hence, it is important to increase the awareness of how individuals with different readiness for PA need different motivational approaches, and to expand the motivational tool-box and develop a variety of practical strategies. This training could for instance be guided by recognized theoretical frameworks like Social Cognitive Theory, Self-Determination Theory or The Transtheoretical Model and could be part of training on how to help people with SMI to be more physically active, which a large proportion of mental health nurses are interested in (Happell *et al.* 2013). Finally, recent research on motivation in people with schizophrenia indicates that task-specific intrinsic motivation is not contingent on a general state of motivation (Choi *et al.* 2014). Consequently, it means that it is possible to enhance intrinsic motivation for PA in people with SMI even in the presence of a general lack of motivation.

Limitations and future directions

Several limitations to this review should be acknowledged. First, there is great diversity in the included studies with respect to several characteristics, for example, design, objectives or main focus, procedures, types of measurement, analyses conducted, participants, and how well the motivational aspect of the study is described. This diversity makes it difficult to synthesize results across studies. It was therefore considered inappropriate to conduct a meta-analysis of the reviewed studies. Second, restricting the literature search to include only articles in English means excluding relevant research published in other languages. Thirdly, the number of studies reported in this review using motivational techniques does not necessarily reflect all studies using such techniques. It is merely the number of studies that have reported to use motivational techniques, often anecdotally. Finally, even though study quality was assessed it is important to note that this only gives an indication of the overall study quality and not specifically how well motivation for PA was treated in the intervention.

The results of the current review point out some directions for future research and clinical work. First of all, there is a great need for further intervention studies focusing mainly on motivation for PA for this population. These future studies should be theory based. Secondly, there is a need to examine not only the process of motivation, but also constructs known to affect the process. The importance of this is demonstrated by the ambiguous result concerning self-efficacy. Clearly, examining the role of such constructs in the motivational process should be of high priority for future research. Next, future studies need to assess PA behaviour, by an objective method and not only self-reports, because changes in behaviour will be the ultimate test on whether a motivational intervention is successful. Finally, it would be interesting to compare how different motivational techniques affect PA behaviour. By doing this we could develop better and more sophisticated ways to help individuals with SMI start and/or maintain being physically active. Unfortunately, from a clinical point of view the results from the present review give little direction on how to best work with motivation for PA among people with SMI. This is based on the lack of studies focusing mainly on motivation, the poor description of motivational strategies used, the often atheoretical approach, and inadequate evaluation of effectiveness regarding the motivational aspects in the interventions. Hence, it could be informative to examine findings from cross-sectional studies to before giving research based recommendations on motivation for PA in this group. That being said, we encourage all mental health practitioners to have a systematic approach when working with patients' motivation and bear in mind that motivation is not static but a process subject to influence.

CONCLUSION

The current evidence base on motivation for PA among individuals with SMI is so far small and uncertain. Only 13 intervention studies measuring motivational constructs were identified. Among them only one study examined the effect of a motivational intervention. The remaining interventions focused primarily on change in PA or various health outcomes and motivation was only a secondary or tertiary outcome. The majority of these only reported change statistics on the motivational constructs, with mixed results. In addition we identified 55 interventions applying motivational theory or techniques. How the theory or techniques were used was generally very briefly described and no evidence of their effectiveness was reported. To summarize, this review shows that there is an interest for including

motivational aspects in interventions on PA among individuals with SMI. However, there is a clear lack of studies focusing mainly on motivation for PA. The studies contained little empirical evidence on how to positively affect motivation. This demonstrates a lack of evidence based strategies to promote PA, and an urgent need for further theory based research in order to develop effective strategies to increase PA in the SMI population. As a start of this line of inquiry it could be useful to closer examine the evidence base of observational studies.

CONTRIBUTIONS

The study was designed by AF and MS. AF and MS extracted data. AF wrote the first draft of the paper and MS commented and contributed to all subsequent revisions. Both authors have approved the final manuscript.

REFERENCES

Abdel-Baki, A., Brazzini-Poisson, V., Marois, F., Letendre, E. & Karelis, A. D. (2013). Effects of aerobic interval training on metabolic complications and cardiorespiratory fitness in young adults with psychotic disorders: A pilot study. *Schizophrenia Research*, *149*, 112–5.

Archie, S. M., Goldberg, J. O., Akhtar-Danesh, N., Landeen, J., McColl, L. & McNiven, J. (2007). Psychotic disorders, eating habits, and physical activity: Who is ready for lifestyle changes? *Psychiatric Services*, *58*, 233–9.

Archie, S., Wilson, J. H., Osborne, S., Hobbs, H. & McNiven, J. (2003). Pilot Study: Access to fitness facility and exercise levels in olanzapine-treated patients. *Canadian Journal of Psychiatry-Revue Canadienne de Psychiatrie*, *48*, 628–32.

Bandura, A. (1997). *Self-Efficacy*: *The exercise of control.* New York: Freeman.

Beebe, L. H., Smith, K., Burk, R., Dessieux, O., Velligan, D., Tavakoli, A. & Tennison, C. (2010). Effect of a motivational group intervention upon exercise self efficacy and outcome expectations for exercise in Schizophrenia Spectrum Disorders. *Journal of the Psychiatric Nurses Association*, *16*, 105–13.

Beebe, L. H., Smith, K., Burk, R., et al. (2011). Effect of a motivational intervention on exercise behavior in persons with schizophrenia spectrum disorders. *Community Mental Health Journal*, *47*, 628–36.

Beebe, L., Smith, K., Roman, M., et al. (2013). A pilot study describing physical activity in persons with schizophrenia spectrum disorders (SSDS) after an exercise program. *Issues in Mental Health Nursing*, *34*, 214–9.

Biddle, S. J. H. & Nigg, C. R. (2000). Theories of exercise behavior. *International Journal of Sport Psychology*, *31*, 290–304.

Bodin, T. & Martinsen, E. W. (2004). Mood and self-efficacy during acute exercise in clinical depression. A randomized, controlled study. *Journal of Sport & Exercise Psychology*, *26*, 623–33.

Bonfioli, E., Berti, L., Goss, C., Muraro, F. & Burti, L. (2012). Health promotion lifestyle interventions for weight management in psychosis: A systematic review and meta-analysis of randomised controlled trials. *BMC Psychiatry*, *12*, 78.

Bonsaksen, T. (2011). Participation in physical activity among inpatients with severe mental illness: A pilot study. *International Journal of Therapy & Rehabilitation*, *18*, 91–9.

Bradshaw, T., Lovell, K. & Harris, N. (2005). Healthy living interventions and schizophrenia: A systematic review. *Journal of Advanced Nursing*, *49*, 634–54.

Bradshaw, T. & Pedley, R. (2012). Evolving role of mental health nurses in the physical health care of people with serious mental illness. *International Journal of Mental Health Nursing*, *21*, 266–73.

Callaghan, P. (2004). Exercise: a neglected intervention in mental health care? *Journal of Psychiatric and Mental Health Nursing*, *11*, 476–83.

Carpiniello, B., Primavera, D., Pilu, A., Vaccargiu, N. & Pinna, F. (2013). Physical activity and mental disorders: A case–control study on attitudes, preferences and perceived barriers in Italy. *Journal of Mental Health*, *22*, 492–500.

Caspersen, C. J., Powell, K. E. & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, *100*, 126–31.

Choi, J., Choi, K.-H., Reddy, L. F. & Fiszdon, J. M. (2014). Measuring motivation in schizophrenia: Is a general state of motivation necessary for task-specific motivation? *Schizophrenia Research*, *153*, 209–213.

Daumit, G. L., Dalcin, A. T., Jerome, G. J., et al. (2011). A behavioral weight-loss intervention for persons with serious mental illness in psychiatric rehabilitation centers. *International Journal of Obesity*, *35*, 1114–23.

De Hert, M., Correll, C. U., Bobes, J., et al. (2011). Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. *World Psychiatry*, *10*, 52–77.

Deci, E. L., Koestner, R. & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulleting*, *125*, 627–68.

Ford, M. (1992). *Motivating humans*: *Goals emotions, and personal agency beliefs.* Boston, MA: Sage.

Glanz, K. & Bishop, D. B. (2010). The role of behavioral science theory in development and implementation of public health interventions. *Annual Review of Public Health*, *31*, 399–418.

Glover, C. M., Ferron, J. C. & Whitley, R. (2013). Barriers to exercise among people with severe mental illnesses. *Psychiatric Rehabilitation Journal*, *36*, 45–7.

Goldberg, R. W., Reeves, G., Tapscott, S., et al. (2013). "MOVE!": Outcomes of a weight loss program modified for veterans with serious mental illness. *Psychiatric Services*, *64*, 737–44.

Gorczynski, P. & Faulkner, G. (2010). Exercise therapy for schizophrenia. Cochrane Database of Systematic Reviews, (5), Art. No.: CD004412.

Haffmans, P. M. J., Kleinsman, A. C. M., van Weelden, C., Huijbrechts, I. P. A. M. & Hoencamp, E. (2006). Comparing running therapy with physiotraining therapy in the treatment of mood disorders. *Acta Neuropsychiatrica*, *18*, 173–6.

Happell, B., Davies, C. & Scott, D. (2012). Health behaviour interventions to improve physical health in individuals diagnosed with a mental illness: A systematic review. *International Journal of Mental Health Nursing*, *21*, 236–47.

Happell, B., Platania-Phung, C. & Scott, D. (2011). Placing physical activity in mental health care: A leadership role for mental health nurses. *International Journal of Mental Health Nursing*, *20*, 310–8.

Happell, B., Platania-Phung, C. & Scott, D. (2013). Survey of Australian mental health nurses on physical activity promotion. *International Journal of Mental Health Promotion*, *15*, 148–61.

Harding, S. L. (2013). Direct care staff perspectives related to physical activity in mental health group homes. *Journal of Psychosocial Nursing and Mental Health Services*, *51*, 38–43.

Hardy, S. & Gray, R. (2010). Adapting the severe mental illness physical health improvement profile for use in primary care. *International Journal of Mental Health Nursing*, *19*, 350–5.

Hodgson, M. H., McCulloch, H. P. & Fox, K. R. (2011). The experiences of people with severe and enduring mental illness engaged in a physical activity programme integrated into the mental health service. *Mental Health and Physical Activity*, *4*, 23–9.

Holley, J., Crone, D., Tyson, P. & Lovell, G. (2011). The effects of physical activity on psychological well-being for those with schizophrenia: A systematic review. *British Journal of Clinical Psychology*, *50*, 84–105.

Kane, I., Lee, H., Sereika, S. & Brar, J. (2012). Feasibility of pedometers for adults with schizophrenia: Pilot study. *Journal of Psychiatric and Mental Health Nursing*, *19*, 8–14.

Khaw, K. T., Wareham, N., Bingham, S., Welch, A., Luben, R. & Day, N. (2008). Combined impact of health behaviours and mortality in men and women: the EPIC-Norfolk prospective population study. *PLoS Medicine*, *5*, e12.

Leucht, S., Burkard, T., Henderson, J., Maj, M. & Sartorius, N. (2007). Physical illness and schizophrenia: A review of the literature. *Acta Psychiatrica Scandinavica*, *116*, 317–33.

Leutwyler, H., Hubbard, E. M., Jeste, D. V. & Vinogradov, S. (2013). "We're not just sitting on the periphery": A staff perspective of physical activity in older adults with schizophrenia. *Gerontologist*, *53*, 474–83.

Liu, N. H. & Spaulding, W. D. (2010). Pilot study of a health-focused day program on improving health behaviors, clinical functioning, and perceived wellness in individuals with severe mental illness. *Psychological Services*, *7*, 233–41.

Martiny, K., Refsgaard, E., Lund, V., et al. (2012). A 9-week randomized trial comparing chronotherapeutic intervention (wake and light therapy) to exercise in major depressive disorder patients treated with duloxetine. *Journal of Clinical Psychiatry*, *73*, 1234–42.

McAuley, E. & Blissmer, B. (2000). Self-efficacy determinants and consequences of physical activity. *Exercise and Sport Sciences Reviews*, *28*, 85–8.

McDevitt, J., Wilbur, J., Kogan, J. & Briller, J. (2005). A walking program for outpatients in psychiatric rehabilitation: A pilot study. *Biological Research for Nursing*, *7*, 87–97.

Nordentoft, M., Wahlbeck, K., Hallgren, J., et al. (2013). Excess mortality, causes of death and life expectancy in 270,770 patients with recent onset of mental disorders in Denmark, Finland and Sweden. *PloS One*, *8*, e55176.

Oertel-Knöchel, V., Mehler, P., Thiel, C., et al. (2014). Effects of aerobic exercise on cognitive performance and individual psychopathology in depressive and schizophrenia patients. *European Archives of Psychiatry and Clinical Neuroscience*, *264*, 589–604.

Ohlsen, R. I., Treasure, J. & Pilowsky, L. S. (2004). A dedicated nurse-led service for antipsychotic-induced weight gain: An evaluation. *Psychiatric Bulletin*, *28*, 164–6.

Prochaska, J. O. & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, *12*, 38–48.

Roberts, G. C. (2001). Understanding the dynamics of motivation in physical activity: The influence of achievement goals on motivational processes. In: Roberts, GC (Ed). *Advances in motivation in sport and exercise*. (pp 1–50)Champaign, IL: Human Kinetics.

Roberts, G. C., Treasure, D. C. & Conroy, D. (2007). Understanding the dynamics of motivation in sport and physical activity: An achievement goal interpretation. In: Tenebaum, G & Ecklund, R (Eds). *Handbook of research in sport psychology*. (pp 3–30) New York: Wiley.

Robson, D. & Gray, R. (2007). Serious mental illness and physical health problems: A discussion paper. *International Journal of Nursing Studies*, *44*, 457–66.

Robson, D., Haddad, M., Gray, R. & Gournay, K. (2013). Mental health nursing and physical health care: A cross-sectional study of nurses' attitudes, practice, and perceived training needs for the physical health care of people with severe mental illness. *International Journal of Mental Health Nursing*, *22*, 409–17.

Rosenbaum, S., Tiedemann, A., Sherrington, C., Curtis, J. & Ward, P. B. (2014). Physical activity interventions for people with severe mental illness: A systematic review and meta-analysis. *Journal of Clinical Psychiatry*, *75*, 964–74.

Roshanaei-Moghaddam, B. & Katon, W. (2009). Premature mortality from general medical illnesses among persons with bipolar disorder: A review. *Psychiatric Services*, *60*, 147–56.

Ryan, R. M. & Deci, E. L. (2002). Overview of self-determination: An organismic dialectical perspective. In: Deci, EL & Ryan, RM (Eds). *Handbook of self-determination research*. (pp 3–33) Rochester, NY: University of Rochester Press.

Scheewe, T. W., Takken, T., Kahn, R. S., Cahn, W. & Backx, F. J. (2012). Effects of exercise therapy on cardiorespiratory fitness in patients with schizophrenia. *Medicine & Science in Sports & Exercise*, *44*, 1834–42.

Scott, D. & Happell, B. (2011). The high prevalence of poor physical health and unhealthy lifestyle behaviours in individuals with severe mental illness. *Issues in Mental Health Nursing*, *32*, 589–97.

Singh, N. A., Clements, K. M. & Singh, M. A. F. (2001). The efficacy of exercise as a long-term antidepressant in elderly subjects: A randomized, controlled trial. *Journals of Gerontology Series A - Biological Sciences and Medical Sciences*, *56*, M497–504.

Singh, N. A., Stavrinos, T. M., Scarbek, Y., Galambos, G., Liber, C. & Fiatarone Singh, M. A. (2005). A randomized controlled trial

of high versus low intensity weight training versus general practitioner care for clinical depression in older adults. *Journals of Gerontology Series A - Biological Sciences and Medical Sciences*, *60*, 768–76.

Singh, N. A., Clements, K. M. & Fiatarone, M. A. (1997). A randomized controlled trial of progressive resistance training in depressed elders. *The Journals of Gerontology Series A - Biological Sciences and Medical Sciences*, *52*, M27–35.

Sniehotta, F. F., Scholz, U. & Schwarzer, R. (2005). Bridging the intention–behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology & Health*, *20*, 143–60.

Stanton, R. & Happell, B. (2014). Exercise for mental illness: A systematic review of inpatient studies. *International Journal of Mental Health Nursing*, *23*, 232–42.

Taylor, A. H. & Faulkner, G. (2014). Evidence and theory into practice in different health care contexts: A call for more translational science. *Mental Health and Physical Activity*, *7*, 1–5.

Tidey, J. W. (2012). Using incentives to reduce substance abuse and other health risk behaviors among people with serious mental illness. *Preventive Medicine*, *55*, S54–60.

Ussher, M., Stanbury, L., Cheeseman, V. & Faulkner, G. (2007). Physical activity preferences and perceived barriers to activity among persons with severe mental illness in the United Kingdom. *Psychiatric Services*, *58*, 405–8.

Van Ctters, A. D., Pratt, S. I., Jue, K., Williams, G., Miller, P. T., Xie, H. & Bartels, S. J. (2010). A pilot evaluation of the In SHAPE individualized health promotion intervention for adults with mental illness. *Community Mental Health Journal*, *46*, 540–52.

Vancampfort, D., De Hert, M., Vansteenkiste, M., et al. (2013). The importance of self-determined motivation towards physical activity in patients with schizophrenia. *Psychiatry Research*, *210*, 812–8.

Vancampfort, D., De Hert, M., Stubbs, B., Ward, P. B., Rosenbaum, S., Soundy, A. & Probst, M. (2015). Negative symptoms are associated with lower autonomous motivation towards physical activity in people with schizophrenia. *Comprehensive Psychiatry*, *56*, 128–32.

Verhaeghe, N., Clays, E., Vereecken, C., De Maeseneer, J., Maes, L., Van Heeringen, C. & Annemans, L. (2013a). Health promotion in individuals with mental disorders: A cluster preference randomized controlled trial. *BMC Public Health*, *13*, 657.

Verhaeghe, N., Maeseneer, J. D., Maes, L., Heeringen, C. V. & Annemans, L. (2013b). Health promotion in mental health care: Perceptions from patients and mental health nurses. *Journal of Clinical Nursing*, *22*, 1569–78.

Vreeland, B. (2007). Treatment decisions in major mental illness: Weighing the outcomes. *Journal of Clinical Psychiatry*, *68*, 5–11.

Paper II

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ORIGINAL ARTICLE

Motivation for physical activity and exercise in severe mental illness: A systematic review of cross-sectional studies

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ABSTRACT: *Individuals with severe mental illness (SMI) are less physically active than the general population. One important barrier contributing to this inactivity is lack of motivation. The aim of this paper is to systematically review all cross-sectional literature on motivation for physical activity among people with SMI and to use the results as basis for guidance on how mental health nurses can facilitate motivation for physical activity. Systematic searches of seven databases were conducted from database inception to February 2015. Studies were eligible if they included participants with SMI and reported data on motivation for physical activity. In total, 21 articles were included and over half them were published in 2011 or later. The present results indicate preliminary evidence of how the motivational processes do not differ between individuals with SMI and the general population, and that they are independent of diagnosis, medication, age, gender, and body mass index. Results from the current systematic review can give some tentative guidance on how to facilitate motivation for physical activity within mental health-care. However, there is still a great need for developing and examining practical strategies that can enhance adoption and adherence of physical activity among people with SMI.*

KEY WORDS: *exercise, motivation, observational study, physical activity, severe mental disorder.*

INTRODUCTION

The use of physical activity to promote physical and mental health is now widely recognized (Biddle *et al.* 2000; US Department of Health and Human Services *et al.* 1996; World Health Organization 2007). Until recently there has been significantly less research supporting a positive impact of physical activity on the health and well-being of people with severe mental illness (SMI), such as schizophrenia, bipolar disorder, and major depression (Fogarty & Happell 2005). Today there is emerging evidence of this relationship (e.g. Rosenbaum *et al.* 2014). In line with the advancement of the field, a more favourable view of physical activity is increasingly being adopted within the mental health-care context (Faulkner & Biddle 2002; Wand & Murray 2008). However, people with SMI in general engage in less physical activity when compared with the general population (Scott & Happell 2011; Soundy *et al.* 2013).

To be physically active can be experienced as challenging for many individuals with SMI and frequently reported barriers are side effects of medicine, illness symptoms, lack of support, and physical comorbidities (Glover *et al.* 2013; Hodgson *et al.* 2011; Johnstone *et al.* 2009). A final barrier often highlighted by individuals with SMI is lack of motivation (e.g. Verhaeghe *et al.* 2013a). This is congruent with mental health nurses' reporting motivational deficits to be a main obstacle when promoting physical activity in a clinical context (Happell *et al.* 2013; Leutwyler *et al.* 2013; Robson *et al.* 2013) and lack of motivation being a reason for dropping out of exercise interventions (Abdel-Baki *et al.* 2013; Oertel-Knöchel *et al.* 2014). As a result, there has been an increasing interest for examining the role of motivation in physical activity adoption and

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adherence among people with SMI (e.g. Beebe *et al.* 2010; Vancampfort *et al.* 2013a).

Mental health nurses are well positioned to enhance motivation for physical activity among people with SMI. Nurses constitute the largest professional group within the mental health workforce (Australian Institute of Health and Welfare 2012) and have the ability to develop trusting relationships with consumers that can provide vital insight into individual circumstances (Happell *et al.* 2011). The possible important contribution of nurses is also evident as they have been involved in several interventions aiming at increasing physical activity (e.g. Porsdal *et al.* 2010; Verhaeghe *et al.* 2013b).

A recent systematic review investigating motivation in physical activity interventions showed that although there is an interest for including motivational aspects in interventions, only one study had enhanced motivation as its main aim. Furthermore, it was concluded that theory-based research that could guide development of effective strategies to increase physical activity level in the SMI population was scarce (Farholm & Sørensen in press). Hence, the primary aim of the present systematic review is to summarize the evidence base from cross-sectional studies on motivation for physical activity among people with SMI. Secondary aims will be to investigate correlates of motivational constructs, and to use the findings as basis for guidance on how to work with motivation for physical activity within the mental health-care context.

MATERIALS AND METHODS

Eligibility criteria

Inclusion criteria were: (i) publications in peer-reviewed journals; (ii) cross-sectional design; (iii) participants being described with a generic term like SMI or psychoses or having a diagnosis like schizophrenia, bipolar disorder, or major depressive disorder; and (iv) reporting empirical data on motivational constructs related to physical activity/exercise. Studies included in this paper did not have to describe its population according to standardized criteria (e.g. DSM or ICD).

Information sources and search strategy

A systematic search strategy was conducted, and the following electronic databases were searched from its inception to February 2015: ISI Web of Science, PsycINFO, PubMed, CINAHL, SportDiscus, Embase, and MedLine. Search words used were "physical activity" OR "exercise" OR "motor activity" AND "mental illness" OR "mental disorder" OR "schizo*" OR "psychoses OR "psychosis" OR "bipolar disorder" OR "major depressive disorder" OR "major depression". Search words could be in the title, abstract, or key-words. Following the electronic search, manual searches were also conducted by searching the reference lists of included studies. The search was limited to articles in English and with human subjects above 18 years old.

Data extraction

Two independent assessors assessed the relevance of the articles and discrepancy was solved by discussion. The following procedure was used: Initially all duplicates were deleted before irrelevant studies were identified by a three-stepped approach. First, all titles were read and obvious irrelevant studies were excluded. Secondly, all abstracts were read and irrelevant articles were excluded, and thirdly, the method and result section of the remaining articles were read and articles fulfilling inclusion criteria 1–4 were included. Data were extracted using a predesigned template that included the following headings: Study reference information, participants, outcome measurements (relevant measurements of motivational constructs and if available physical activity measurements), and findings (relevant findings according to the aim of the review). In this systematic review it is not distinguished between physical activity and exercise even though exercise is usually defined as a particular subset of physical activity (Caspersen *et al.* 1985).

RESULTS

Study selection

The electronic database search resulted in 13522 hits. A hand search in reference lists identified 34 additional, potential eligible papers. After removal of duplicates (5861 papers) the remaining 7695 papers were screened for suitability based on title and abstract. This resulted in removing 6563 papers. Method and results section in the remaining 1132 papers were read and 21 cross-sectional studies reporting on motivational construct related to physical activity were identified (see Figure 1 for flow-chart).

Study characteristics

The final sample constituted of 21 studies describing 19 unique populations with a total of 1704 individuals (890 male and 810 female). Additionally, 228 people declined participation across ten studies. Hence, the response rate was at best around 90%, but it could be lower if there were people that declined without it being reported in the last nine studies. Finally, approximately half of the included studies (11 of 21) used standardized criteria for diagnoses when describing participants. Five studies used diagnoses obtained from various sources (e.g. chart review, physician set) and the last five studies included participants from

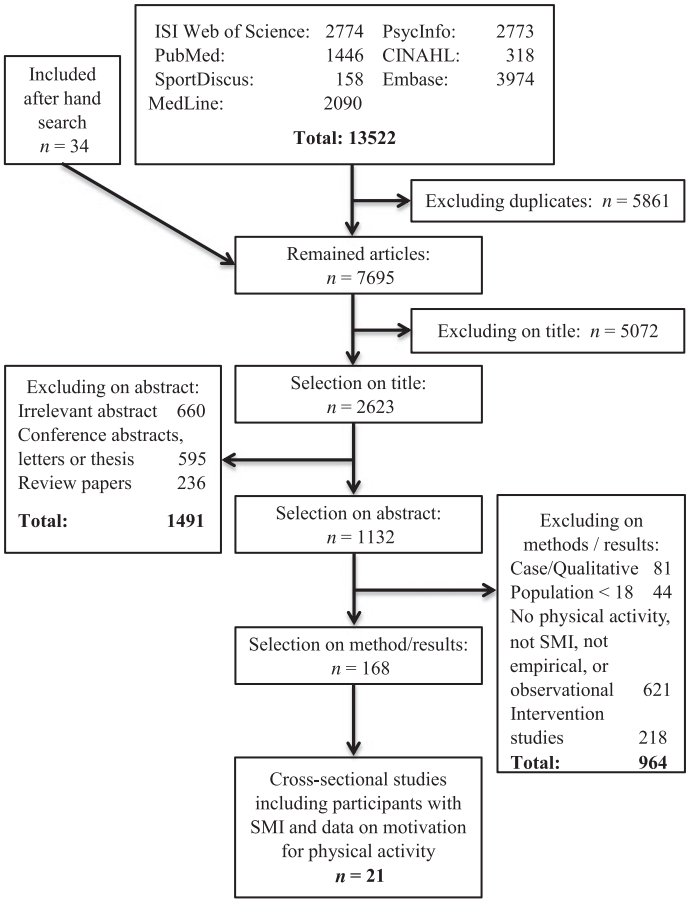

FIG. 1: *Flow chart of study selection.*

places that implied that they had SMI (e.g. psychiatric wards). Individual study characteristics and relevant findings are presented in Table 1.

Synthesis of results

Applicability of motivational theory and models

Three studies supported the applicability of the Transtheoretical Model (Prochaska & Velicer 1997) for understanding physical activity behaviour in this population (Bassilios *et al.* 2015; Bezyak *et al.* 2011; Gorczynski *et al.* 2010). Additionally, two studies reported action and maintenance stages being associated with increased physical activity (Archie *et al.* 2007; Lindamer *et al.* 2008) and a third reported a positive association between greater readiness to change exercise habits and more negative criticism from family for exercise behaviours (Aschbrenner *et al.* 2013). Furthermore, Leas and McCabe (2007) evaluated the utility of Protection Motivation Theory (Rogers 1983), and found that the model could predict 25% of the variance in current physical activity. There was also preliminary support for the reliability and validity of the Health Action Process Approach (Schwarzer 2008) in explaining moderate-to-vigorous physical activity (Arbour-Nicitopoulos *et al.* 2014).

Associations between motivational constructs and physical activity

Thirteen of the studies analyzed motivational constructs in relation to physical activity behaviour or physical fitness. Across the studies motivational construct were consistently associated with physical activity behaviour. Meaning that

TABLE 1: *Characteristics of the included studies and relevant findings*

Author	Participants	Relevant measures	Findings
Arbour-Nicitopoulos *et al.* (2014)	*n* = 28 ➔ 26 (16/10) Age: 41.5 ± 13.5	Readiness for PA, PA-behaviour, HAPA inventory: risk perceptions, outcome expectancy, task,- maintenance,- and recovery self-efficacy, behavioural intention, action planning, coping planning, action control	All but two scales were having good test-retest reliability and internal consistency (Chronbach α = .62-.98 and *r*s = .21-.96). Associations in the HAPA-model were as expected and together this provides preliminary support for the applicability of HAPA.
Archie *et al.* (2007)	*n* = 104 ➔ 101 (64/37) Age: 35 ± 10.5	Readiness for PA and diet, PA-behaviour	PC = 9, C/P = 54, A/M = 37. Positive association between SofC and moderate and vigorous PA
Aschbrenner *et al.* (2013)	*n* = X ➔ 158 (66/92) Age: 45.4 ± 11.5	Readiness to change PA (used as a measure of PA-behaviour), social support for PA	Significant positive correlation between exercise stage of change and criticism of exercise behaviour from family (r(64) = 0.29, $P < 0.05$)
Bassilios *et al.* (2014, 2015)	*n* = 86 ➔ 49 (35/14) Age: 39 ± not reported	PA-behaviour, readiness for PA, process of exercise change, exercise decisional balance, exercise self-efficacy, and intentions to engage or not in PA	Multiple regression with TTM measures explained 20% of the variance in SofC, but no significant independent predictor. SofC negatively associated with negative symptoms, self-rated health (low scores = better health), and caffeine consumption. Various physical, psychological, and other reasons engage or not in PA
Bezyak *et al.* (2011)	*n* = X ➔ 92 (71/24) Age: not reported	PA-behaviour, readiness for PA, process of exercise change, exercise self-efficacy, and decisional balance for exercise adoption	Multiple regression with all TTM measures could explain 27% of the variance in PA-behaviour. Logistic regression with TTM-constructs could differentiate between 2 out of 3 adjacent stages
Campion *et al.* (2005)	*n* = X ➔ 43 (26/17) Age: 52.6 ± 14.3 Matched controlled group *n* = 39 (13/26) Age: 48.6 ± 14.1	Perceived benefits of PA, barriers for PA, and potential cues to increase PA. Only 54% of the total sample answered the PA questions (the other 46% answered smoking questions).	69% of SMI responded that nothing would make them increase PA-level. Main reasons for increasing PA were doctors' advice (42%) and more opportunities (37%). Main barriers were expense (69%), no enjoyment (66%), and no benefit (58%).
Carpiniello *et al.* (2013)	*n* = 165 ➔ 138 (48/90) Age: 50 ± 11.8 Matched controlled group *n* = 138 (48/90) Age: 48 ± 12.1	Self-reported PA-level, different psychosocial predictors of exercise, including motivation, confidence, and social support. Also measuring barriers	Patients perceived significantly more barriers, were less confident about exercising when distressed, received less social support, and less motivated to exercise regularly. Help/advice from exercise instructor/doctor would increase their exercise level.
Faulkner *et al.* (2007)	*n* = X ➔ 109 (58/51) Age: 46.5 ± 10.9	Interest in assistance,- confidence,- and importance of becoming more physically active, advantages & disadvantages of PA.	Those interested in PA scored higher on advantages of PA and also some of the disadvantages compared with those not interested. Approximately half of the sample confident in becoming more active
Filia *et al.* (2011)	*n* = 48 ➔ 43 (25/18) Age: 36.3 ± 8.4	PA-behaviour, motivation and confidence of increasing PA, and readiness for PA	PC=9, C=16, P=15, A=2, M=0; Motivation = 6.0 (range 2–8); Confidence = 2.8 (range 1–4)
Gorczynski *et al.* (2010)	*n* = X ➔ 54 (36/18) Age: 46.7 ± 12.1	Readiness for PA, self-efficacy for PA, perceived barriers and benefits of PA	PC / C = 24.1%, P = 44.4%, and A / M = 31.5%; Individuals in A / M stage significantly higher self-efficacy and perceived benefits.
Jerome *et al.* (2012)	*n* = 169 ➔ 93 (22/71) + 18 peer leaders (four also regular	Aerobic fitness, exercise self-efficacy, general self-efficacy,	No associations between general self-efficacy and fitness, symptoms, or mental health. Exercise self-efficacy positively associated with fitness tests.

(*Continues*)

TABLE 1: *Continued*

Author	Participants	Relevant measures	Findings
	participants) Age: 47 ± 10.5		
Kane *et al.* (2012)	*n* = 14 ➔ 12 (5/7) Age: 43.3 ± 10.6	PA-level by pedometer, pedometer step log, and motives for PA	Descriptive results for five motives: interest, competence, appearance, fitness, and social motives.
Leas and McCabe (2007)	Schizophrenia: *n* = X ➔ 83 (50/33); age: 39.3 ± 10.3 Major depression: *n* = X ➔ 70 (19/51); age: 41.9 ± 12.2 General population: *n* = X ➔ 147 (50/97); age: 38.5 ± 13.1	Exercise self-efficacy, exercise response-efficacy, exercise intention, barriers of PA, current PA-behaviour. (Additional variables in the theoretical model: threat of heart disease, social support, psychiatric symptoms.)	A one-way between group MANOVA indicated differences in favour of general population. Multiple hierarchical regressions tested the PMT model in the psychiatric group. Self-efficacy and response-efficacy significantly predicted intentions, and intentions predicted PA-behaviour ($R^2 = 0.25$)
Lindamer *et al.* (2008)	*n* = X ➔ 54 (32/22); age: 50.7 ± 6.4 Comparison group *n* = 27 (16/11); age 52.2 ± 8.6	Self-reported PA-behaviour, objectively measured PA-behaviour, readiness for PA	Increase in PA-behaviour as a function of motivational readiness in the psychiatric group and fewer ended up in active and maintenance stage compared with the general population
Sørensen (2006)	*n* = X ➔ 109 (38/64) Age-groups: < 30 = 21.6%, 30–49 = 59.8%, 50–64 = 7.8%, > 65 = 10.8%	Exercise self-schema, self-determined motivation for PA, self-reported PA-level	IM for PA positively related to PA-level, opposite for extrinsic motives. IM and holding exercise self-schema gave odds ratio for being physically active rather than inactive of 20.0 and 6.1, respectively
Ussher *et al.* (2007)	*n* = 151 ➔ 120 (70/50) Age: 42.6 ± 16.1	Self-reported PA-level, different psychosocial predictors of exercise, including motivation, confidence, and social support. Also measuring barriers.	Low levels of social support and confidence. Half of the sample wants to exercise more. Self-efficacy was lower for women, outpatients, and depression compared with men, inpatients and other diagnosis.
Van de Vliet *et al.* (1999)	*n* = X ➔ 166 (86/80) Age: 37 ± 9.8	Physical fitness, perceived physical ability, a subscale of physical self-efficacy	Males scored better on perceived physical ability than females. Physical ability among males and females were associated with 4 of 10 and 6 of 10 fitness tests.
Vancampfort *et al.* (2013a, 2014)	*n* = 168 ➔ 129 (85/44) Age: 40.5 ± 12.7	Self-reported PA-level, self-determined motivation towards PA, readiness for PA	More self-determined motivation associated with higher PA-scores and less self-determined motivation and amotivation with lower PA-scores. Individuals in early stages of change are less autonomous in their motivation towards PA than those in later stages.
Vancampfort *et al.* (2015)	*n* = 61 ➔ 55 (38/17) Age: 35.2 ± 11.3	Self-determined motivation towards PA	Autonomous motivation negatively associated with negative symptoms. No other association between symptoms and motivation were significant

Only measures and results relevant to motivation are reported here. *n* = possible participants ➔ actual participants (male/female). A, Action stage; C, Contemplation stage; HAPA, Health Action Process Approach; IM, intrinsic motives; M, Maintenance stage; MANOVA, multivariate analyses of variance; P, Preparation stage; PA, physical activity; PC, Precontemplation stage; PMT, Protection Motivation Theory; TTM, Transtheoretical Theory.

higher levels of self-efficacy, autonomous motivation, and readiness for physical activity were positively related to increased physical activity.

Associations between motivational constructs and demographic, biological, and psychological variables

With the exceptions of men displaying higher self-efficacy in two studies (Ussher *et al.* 2007; Van de Vliet *et al.* 1999) and older age being negatively correlated to extrinsic motivation (Vancampfort *et al.* 2015), the variables body mass index (BMI), gender, age, and medication seems to be unrelated to motivational constructs. Also diagnosis seemed largely unrelated to motivational constructs. In studies including a comparison group, people with SMI scored lower on motivational constructs compared with the general population (Campion *et al.* 2005; Carpiniello *et al.* 2013; Leas & McCabe 2007). In the two studies comparing inpatients with outpatients there was a trend towards outpatients having less favourable motivation than inpatients ((e.g. lower self-efficacy and higher external motivation) Ussher *et al.* 2007; Vancampfort *et al.* 2013a). Finally, two studies found negative symptoms to be negatively related to autonomous motivation and readiness for physical activity, while for other psychiatric symptoms there was no significant relationship (Bassilios *et al.* 2015; Vancampfort *et al.* 2015).

In addition to the variables included in Table 2, readiness for physical activity was positively related to eating fruit and vegetables, readiness for a healthy diet, perceived body function, exercise criticism, self-rated health, self-determined motivation, and self-efficacy; unrelated to perceived body appearance; and negatively related to caffeine consumption (Archie *et al.* 2007; Aschbrenner *et al.* 2013; Bassilios *et al.* 2015; Gorczynski *et al.* 2010; Vancampfort *et al.* 2014). Self-efficacy was positively related to body acceptance, intention, and planning (Arbour-Nicitopoulos *et al.* 2014; Van de Vliet *et al.* 1999), while intention to be physically active was positively related to outcome expectations and planning, and unrelated to risk perceptions (Arbour-Nicitopoulos *et al.* 2014). Outcome expectations and action control were positively related to physical activity behaviour while planning and risk perceptions were unrelated to physical activity behaviour (Arbour-Nicitopoulos *et al.* 2014). Finally, autonomous motivation was positively associated with reporting to experience a decrease in symptoms during physical activity (Sørensen 2006).

TABLE 2: *Associates of motivational constructs*

	Self-efficacy	Autonomous motivation	Introjected motivation	Extrinsic motivation	Amotivation	Intention	Readiness for PA
PA-behaviour	+ +	+ +	x	÷ ÷	÷	+ +	+
PA vigorous intensity	–	+	x	x	÷	–	+ x
PA moderate intensity	–	+	x	–	÷	–	+
PA light intensity	–	+	x	x	÷	–	x
Fitness tests	+ + x	–	–	–	–	–	–
Self-schema for PA	–	+		÷	–	–	–
Barriers for PA	–	–	–	–	–	–	x x
Benefits of PA	–	–	–	–	–	–	+ +
General self-efficacy	+	–	–	–	–	–	x
Gender	+ +	x x	x x	x x	x x	x	x x
Age	x	x	x	÷	x	x	x x
BMI	–	x	x	x	x	–	x x
Diagnosis	+ x	–	–	–	–	x x	x
Medication	–	x	x	x	x	–	x
Inpatient VS outpatient	+	x	+	+	x	x	–
SMI VS control	+ +	–	–	–	–	+ +	–
Negative symptoms	–	÷	x	x	x	–	÷
Positive symptoms	–	x	x	x	x	–	x
Depression	–	x	x	x	x	–	x
Excitatory symptoms	–	x	x	x	x	–	–
Cognitive symptoms	–	x	x	x	x	–	–

x equals no association; + equals positive association; ÷ negative association; Associations that only would appear once in either a column or a row are not included in the table.

DISCUSSION

This systematic review of cross-sectional studies on motivation for physical activity among individuals with SMI is the first of its kind. Even though cross-sectional studies cannot provide information on cause and effect between motivation for physical activity and physical activity, they can provide valuable knowledge about factors associated with both variables. This knowledge can then give directions for clinical work and intervention development.

Summary of evidence

The literature search revealed 168 cross-sectional studies including SMI and physical activity. A large proportion of these studies only included physical activity level as an indicator of cardiovascular health and only 21 of them included measurements related to motivation for physical activity (PA). A theoretical framework guided a large proportion of the included studies. This stands in contrast to the findings in a recent systematic review that indicated that the majority of physical activity interventions including motivational aspects were not based on theory (Farholm & Sørensen in press). The consistent association between physical activity behaviour and self-efficacy, readiness for physical activity, intention, and autonomous motivation are in line with those from the general population (Marshall & Biddle 2001; McAuley & Blissmer 2000; Teixeira *et al.* 2012). These findings together with the results from the studies testing the application of various motivational theories suggest that motivational mechanisms as to physical activity do not differ between the general population and individuals with SMI. Consequently, theoretical frameworks like Social-Cognitive Theory, Self-Determination Theory, or the Transtheoretical Model could be valuable in directing clinical work and interventions aiming at increasing physical activity engagement in people with SMI. Nevertheless, to influence motivation in this population can be impeded by multiple barriers. Both barriers specific to people with SMI (e.g. side-effects of medicine, illness symptoms, and negative staff attitude) and those more general in nature (e.g. lack of confidence in being physically active, financial issues, and lack of structure and planning) should be taken into consideration when applying a theoretical framework. For instance, results from this review indicate a negative relationship between motivation for physical activity and negative symptoms (Bassilios *et al.* 2015; Vancampfort *et al.* 2015). This implies that more resources may be needed to enhance motivation for physical activity among patients with a high degree of negative symptoms.

An interesting finding in the present review is how age, gender, BMI, diagnosis, and medication were largely unrelated to motivation for physical activity. This preliminary result indicates that motivation for physical activity is invariant across several important demographic and biological determinants. Additionally, these findings are in line with two systematic reviews examining correlates of physical activity in people with schizophrenia and bipolar disorder (Vancampfort *et al.* 2012, 2013b). One surprising finding that deserves a comment is that higher activity level was positively associated with criticism of exercise behaviour from friends and family (Aschbrenner *et al.* 2013). This result is intriguing because social support has been positively related to physical activity behaviour in the general population (Teixeira *et al.* 2012). It is also in contrast to the fact that 42–63% of individuals with SMI thought that they would exercise more if given advice by their doctor (Campion *et al.* 2005; Carpiniello *et al.* 2013; Ussher *et al.* 2007).

Clinical relevance

As self-efficacy and autonomous motivation were associated with physical activity behaviour it is important for both mental health nurses and intervention developers to know how affect these constructs. However, the scarcity of empirical evidence on how to affect these motivational constructs in persons with SMI means that one must rely on evidence from the general population.

According to Bandura (1997) there are four main sources affecting self-efficacy, listed here from most to least important: (i) First-person mastery experience; (ii) role modelling or vicarious experiences; (iii) social persuasion; and (iv) physiological factors. In addition, two meta-analyses including obese individuals and healthy adults have identified several behaviour change techniques that are associated with higher self-efficacy effect sizes when present in physical activity interventions (Ashford *et al.* 2010; Olander *et al.* 2013). These techniques were action planning, time-management, prompt self-monitoring of outcomes related to physical activity, planning social support, and giving feedback on behaviour. Together this can point out some practical guidelines for enhancing self-efficacy.

First, it is important to arrange for physical activity conditions that ensure patients' experiencing mastery. Mental health nurses should also give feedback so that patients acknowledge their own success. Secondly, mental health nurses can use similar others as role models; "if they can do it, you can do it" or even persuade patients that they can manage being physically active if necessary. However, it has to be realistic; the backside of persuasion is that if it is not followed up by mastery experience it can lead to lowering of self-efficacy and discrediting of the persuader (Bandura 1977). Evidence from the general population also

emphasizes planning as an effective tool. This can, for instance, be helping individuals with SMI plan how, when and with whom to be physically active, but also how to elicit social support for overcoming obstacles. Mental health nurses should also prompt patients to monitor outcomes of physical activity. Such outcomes could be waist circumference or improved fitness, but it could also be noticing enjoyment during activity. Finally, explaining that when engaging in physical activity physiological responses like muscle tension, increased respiration and body temperature are normal (and wanted) and that they therefore should not be interpreted as signs of distress or anxiety can contribute to a more positive experience of physical activity.

In short, Self-Determination Theory proposes that satisfaction of the psychological needs of autonomy, competence, and relatedness through physical activity will facilitate autonomous motivation, while thwarting of the needs will lead to more controlled types of motivation (Ryan & Deci 2000). This means that mental health nurses should strive to create a physical activity environment that supports the satisfaction of these three needs. The following suggestions for supporting the three needs are just a selection and by no means an exhaustive list of possible strategies. Supporting the need for autonomy can be done through involving patients in decision-making and solution finding processes, providing rationales for decisions or suggestions made by practitioners, or provide patients with choices. These choices should be of relevance to the patients and they should perceive themselves as competent to make them. The most important strategy to support the need for competence is to facilitate for mastery experiences during physical activity. Other strategies can be to assist in realistic goal-setting, help patients to develop coping strategies for overcoming barriers, and providing positive feedback (Fortier *et al.* 2007; Haase *et al.* 2010; Ryan *et al.* 2011). Finally, the ability of mental health nurses to establish a therapeutic relationship with patients (Bradshaw & Pedley 2012; Happell *et al.* 2012; Stanton & Happell 2014) is an excellent starting point for supporting the need for relatedness. Supporting this need can be done through acknowledging and support patients' feelings, views and perspectives related to physical activity and by organizing physical activity so that patients can develop and strengthen attachment with others (Fortier *et al.* 2007; Haase *et al.* 2010; Ryan *et al.* 2011).

Social Cognitive Theory and Self-Determination Theory have been used in several randomized controlled trials aiming at health promotion or increasing physical activity among people with SMI (e.g. Beebe *et al.* 2010; Chalder *et al.* 2012; Daumit *et al.* 2013; Verhaeghe *et al.* 2013b). Although it has only been Beebe *et al.* (2010) that evaluated how the intervention affects motivation for physical activity, additional inspiration on how to implement these theoretical frameworks into clinical practice can be obtained from these trials. To summarize, both Social Cognitive Theory and Self-Determination Theory can give directions on how to affect motivation for physical activity among people with SMI. However, there is a great need for this knowledge to be translated into practical tools that can be applied in a clinical context.

Limitations

Several limitations to this review should be acknowledged. First, the included studies have cross-sectional design, which mean that we cannot draw any causal conclusions regarding the association between motivational constructs and physical activity. Secondly, the large majority of studies used convenience sampling when they recruited participants. With that in mind, and the fact that most of the studies had their focus on physical activity, recruitment of participants could be biased towards those holding more positive attitudes towards physical activity. Thirdly, except for the associations between physical activity and self-efficacy, readiness for physical activity and the different types of self-determined motivation, most of the associations reported are only found in one or two different studies. To better understand determinants and associates of both motivation for physical activity and physical activity it is important that future studies use appropriate statistics and report their findings in more detail.

CONCLUSION

The current evidence base of cross-sectional evidence on motivation for physical activity among people with SMI is still relatively small, but it is developing rapidly with over half of the included studies being published in 2011 or later. The large majority of included studies was based on motivational theory. This is very advantageous as theory based studies are better equipped than atheoretical ones to inform design of future intervention studies, as well as giving guidance in clinical work. Results from the present review indicate that the motivational processes related to physical activity do not differ between individuals with SMI and the general population. Furthermore, preliminary evidence suggests that motivation for physical activity is independent of age, gender, BMI, diagnosis, and medication. Finally, there are significant gaps in the literature with respect to motivation for physical activity. Future studies should focus on examining and developing strategies that are effective in influencing motivation for physical activity and translate

these findings into practical tools that are applicable in clinical contexts.

REFERENCES

Abdel-Baki, A., Brazzini-Poisson, V., Marois, F., Letendre, E. & Karelis, A. D. (2013). Effects of aerobic interval training on metabolic complications and cardiorespiratory fitness in young adults with psychotic disorders: A pilot study. *Schizophrenia Research*, *149*, 112–115.

Arbour-Nicitopoulos, K. P., Duncan, M., Remington, G., Cairney, J. & Faulkner, G. E. (2014). Development and reliability testing of a health action process approach inventory for physical activity participation among individuals with schizophrenia. *Frontiers in Psychiatry*, *5*, 68.

Archie, S. M., Goldberg, J. O., Akhtar-Danesh, N., Landeen, J., McColl, L. & McNiven, J. (2007). Psychotic disorders, eating habits, and physical activity: Who is ready for lifestyle changes? *Psychiatric Services*, *58*, 233–239.

Aschbrenner, K. A., Mueser, K. T., Bartels, S. J. & Pratt, S. I. (2013). Perceived social support for diet and exercise among persons with serious mental illness enrolled in a healthy lifestyle intervention. *Psychiatric Rehabilitation Journal*, *36*, 65–71.

Ashford, S., Edmunds, J. & French, D. P. (2010). What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? A systematic review with meta-analysis. *British Journal of Health Psychology*, *15*, 265–288.

Australian Institute of Health and Welfare (2012). Nursing and midwifery workforce 2011. National Health Workforce Series No. 2. Cat. No. HWL 48. Canberra.

Bandura, A. (1997). *Self-Efficacy: The exercise of control*New York: Freeman.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191–215.

Bassilios, B., Judd, F. & Pattison, P. (2014). Why don't people diagnosed with schizophrenia spectrum disorders (SSDs) get enough exercise? *Australasian Psychiatry*, *22*, 71–77.

Bassilios, B., Judd, F., Pattison, P., Nicholas, A. & Moeller-Saxone, K. (2015). Predictors of exercise in individuals with schizophrenia: A test of the transtheoretical model of behavior change. *Clinical Schizophrenia and Related Psychoses*, *8*, 173–182A.

Beebe, L. H., Smith, K., Burk, R. *et al.* (2010). Effect of a motivational group intervention upon exercise self efficacy and outcome expectations for exercise in Schizophrenia Spectrum Disorders. *Journal of the American Psychiatric Nurses Association*, *16*, 105–113.

Bezyak, J. L., Berven, N. L. & Chan, F. (2011). Stages of change and physical activity among individuals with severe mental illness. *Rehabilitation Psychology*, *56*(3), 182–190.

Biddle, S. J., Fox, K. R. & Boutcher, S. H. (2000). *Physical Activity and Psychological Well-Being*London: Routledge.

Bradshaw, T. & Pedley, R. (2012). Evolving role of mental health nurses in the physical health care of people with serious mental illness. *International Journal of Mental Health Nursing*, *21*, 266–273.

Campion, G., Francis, V., Preston, A. & Wallis, A. (2005). Health behaviour and motivation to change. *Mental Health Nursing*, *25*, 12–15.

Carpiniello, B., Primavera, D., Pilu, A., Vaccargiu, N. & Pinna, F. (2013). Physical activity and mental disorders: A case–control study on attitudes, preferences and perceived barriers in Italy. *Journal of Mental Health*, *22*, 492–500.

Caspersen, C. J., Powell, K. E. & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, *100*, 126–131.

Chalder, M., Wiles, N. J., Campbell, J. *et al.* (2012). Facilitated physical activity as a treatment for depressed adults: Randomised controlled trial. *BMJ [British Medical Journal]*, *344*, e2758.

Daumit, G. L., Dickerson, F. B., Wang, N. Y. *et al.* (2013). A behavioral weight-loss intervention in persons with serious mental illness. *New England Journal of Medicine*, *368*, 1594–1602.

Farholm, A. & Sørensen, M. (in press). Motivation for physical activity and exercise in severe mental illness: A systematic review of intervention studies. *International Journal of Mental Health Nursing*.

Faulkner, G. & Biddle, S. (2002). Mental health nursing and the promotion of physical activity. *Journal of Psychiatric and Mental Health Nursing*, *9*, 659–665.

Faulkner, G., Taylor, A., Munro, S., Selby, P. & Gee, C. (2007). The acceptability of physical activity programming within a smoking cessation service for individuals with severe mental illness. *Patient Education and Counseling*, *66*, 123–126.

Filia, S. L., Baker, A. L., Richmond, R. *et al.* (2011). Health behaviour risk factors for coronary heart disease (CHD) in smokers with a psychotic disorder: Baseline results. *Mental Health and Substance Use*, *4*, 158–171.

Fogarty, M. & Happell, B. (2005). Exploring the benefits of an exercise program for people with schizophrenia: A qualitative study. *Issues in Mental Health Nursing*, *26*, 341–351.

Fortier, M. S., Hogg, W., O'Sullivan, T. L. *et al.* (2007). The physical activity counselling (PAC) randomized controlled trial: Rationale, methods, and interventions. *Applied Physiology, Nutriotion, and Metabolism*, *32*, 1170–1185.

Glover, C. M., Ferron, J. C. & Whitley, R. (2013). Barriers to exercise among people with severe mental illnesses. *Psychiatric Rehabilitation Journal*, *36*, 45–47.

Gorczynski, P., Faulkner, G., Greening, S. & Cohn, T. (2010). Exploring the construct validity of the transtheoretical model to structure physical activity interventions for individuals with serious mental illness. *Psychiatric Rehabilitation Journal*, *34*, 61–64.

Haase, A. M., Taylor, A. H., Fox, K. R., Thorp, H. & Lewis, G. (2010). Rationale and development of the physical activity counselling intervention for a pragmatic TRial of Exercise and Depression in the UK (TREAD-UK). *Mental Health and Physical Activity*, *3*, 85–91.

Happell, B., Davies, C. & Scott, D. (2012). Health behaviour interventions to improve physical health in individuals diagnosed

with a mental illness: A systematic review. *International Journal of Mental Health Nursing*, *21*, 236–247.

Happell, B., Platania-Phung, C. & Scott, D. (2011). Placing physical activity in mental health care: A leadership role for mental health nurses. *International Journal of Mental Health Nursing*, *20*, 310–318.

Happell, B., Platania-Phung, C. & Scott, D. (2013). Survey of Australian mental health nurses on physical activity promotion. *International Journal of Mental Health Promotion*, *15*, 148–161.

Hodgson, M. H., McCulloch, H. P. & Fox, K. R. (2011). The experiences of people with severe and enduring mental illness engaged in a physical activity programme integrated into the mental health service. *Mental Health and Physical Activity*, *4*, 23–29.

Jerome, G. J., Dalcin, A. T., Young, D. R. *et al.* (2012). Rationale, design and baseline data for the activating consumers to exercise through peer support (ACE trial): A randomized controlled trial to increase fitness among adults with mental illness. *Mental Health and Physical Activity*, *5*, 166–174.

Johnstone, R., Nicol, K., Donaghy, M. & Lawrie, S. (2009). Barriers to uptake of physical activity in community-based patients with schizophrenia. *Journal of Mental Health*, *18*, 523–532.

Kane, I., Lee, H., Sereika, S. & Brar, J. (2012). Feasibility of pedometers for adults with schizophrenia: Pilot study. *Journal of Psychiatric and Mental Health Nursing*, *19*, 8–14.

Leas, L. & McCabe, M. (2007). Health behaviors among individuals with schizophrenia and depression. *Journal of Health Psychology*, *12*, 563–579.

Leutwyler, H., Hubbard, E. M., Jeste, D. V. & Vinogradov, S. (2013). "We're not just sitting on the periphery": A staff perspective of physical activity in older adults with schizophrenia. *Gerontologist*, *53*, 474–483.

Lindamer, L. A., McKibbin, C., Nonnan, G. J. *et al.* (2008). Assessment of physical activity in middle-aged and older adults with schizophrenia. *Schizophrenia Research*, *104*, 294–301.

Marshall, S. J. & Biddle, S. J. H. (2001). The transtheoretical model of behavior change: A meta-analysis of applications to physical activity and exercise. *Annals of Behaviora Medicine*, *23*, 229–246.

McAuley, E. & Blissmer, B. (2000). Self-efficacy determinants and consequences of physical activity. *Exercise and Sport Sciences Reviews*, *28*, 85–88.

Oertel-Knöchel, V., Mehler, P., Thiel, C. *et al.* (2014). Effects of aerobic exercise on cognitive performance and individual psychopathology in depressive and schizophrenia patients. *European Archives of Psychiatry and Clinical Neuroscience*, *264*, 589–604.

Olander, E. K., Fletcher, H., Williams, S., Atkinson, L., Turner, A. & French, D. P. (2013). What are the most effective techniques in changing obese individuals' physical activity self-efficacy and behaviour: A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *10*, 29.

Porsdal, V., Beal, C., Kleivenes, O. K. *et al.* (2010). The Scandinavian Solutions for Wellness – a two-arm observational study on the effectiveness of lifestyle intervention on subjective well-being and weight among persons with psychiatric disorders. *BMC Psychiatry*, *10*, 42.

Prochaska, J. O. & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, *12*, 38–48.

Robson, D., Haddad, M., Gray, R. & Gournay, K. (2013). Mental health nursing and physical health care: A cross-sectional study of nurses' attitudes, practice, and perceived training needs for the physical health care of people with severe mental illness. *International Journal of Mental Health Nursing*, *22*, 409–417.

Rogers, R. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In: B. L. Cacioppo & L. L. Petty (Eds). *Social psychophysiology: A sourcebook* (pp. 153–176). London: Guilford.

Rosenbaum, S., Tiedemann, A., Sherrington, C., Curtis, J. & Ward, P. B. (2014). Physical activity interventions for people with severe mental illness: A systematic review and meta-analysis. *Journal of Clinical Psychiatry*, *75*, 964–974.

Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*, 68–78.

Ryan, R. M., Lynch, M. F., Vansteenkiste, M. & Deci, E. L. (2011). Motivation and autonomy in counseling, psychotherapy, and behavior change: A look at theory and practice. *Counseling Psychologist*, *39*, 193–260.

Schwarzer, R. (2008). Modeling health behaviour change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology*, *57*, 1–29.

Scott, D. & Happell, B. (2011). The high prevalence of poor physical health and unhealthy lifestyle behaviours in individuals with severe mental illness. *Issues in Mental Health Nursing*, *32*, 589–597.

Soundy, A., Wampers, M., Probst, M., De Hert, M., Stubbs, B. & Vancampfort, D. (2013). Physical activity and sedentary behaviour in outpatients with schizophrenia: A systematic review and meta-analysis. *International Journal of Therapy and Rehabilitation*, *20*, 588–595.

Stanton, R. & Happell, B. (2014). Exercise for mental illness: A systematic review of inpatient studies. *International Journal of Mental Health Nursing*, *23*, 232–242.

Sørensen, M. (2006). Motivation for physical activity of psychiatric patients when physical activity was offered as part of treatment. *Scandinavian Journal of Medicine & Sience in Sports*, *16*, 391–398.

Teixeira, P. J., Carraca, E. V., Markland, D., Silva, M. N. & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *9*, 78.

US Department of Health and Human Services, Centers for Disease Control and Prevention, National Centers for Chronic Disease Prevention and Health Promotion & The President's Council on Physical Fitness and Sports (1996). Physical Activity and Health: A Report of the Surgeon General. [cited 1 Sep 2015]. Available from: URL: http://www.cdc.gov/nccdphp/sgr/pdf/sgrfull.pdf

Ussher, M., Stanbury, L., Cheeseman, V. & Faulkner, G. (2007). Physical activity preferences and perceived barriers to activity

among persons with severe mental illness in the United Kingdom. *Psychiatric Services*, *58*, 405–408.

Van de Vliet, P., Van Coppenolle, H. & Knapen, J. (1999). Physical measures, perceived physical ability, and body acceptance of adult psychiatric patients. *Adapted Physical Activity Quarterly*, *16*, 113–125.

Vancampfort, D., Correll, C. U., Probst, M. *et al.* (2013b). A review of physical activity correlates in patients with bipolar disorder. *Journal of Affective Disorders*, *145*, 285–291.

Vancampfort, D., De Hert, M., Vansteenkiste, M. *et al.* (2013a). The importance of self-determined motivation towards physical activity in patients with schizophrenia. *Psychiatry Research*, *210*, 812–818.

Vancampfort, D., De Hert, M., Stubbs, B. *et al.* (2015). Negative symptoms are associated with lower autonomous motivation towards physical activity in people with schizophrenia. *Comprehensive Psychiatry*, *56*, 128–132.

Vancampfort, D., Knapen, J., Probst, M., Scheewe, T., Remans, S. & De Hert, M. (2012). A systematic review of correlates of physical activity in patients with schizophrenia. *Acta Psychiatrica Scandinavica*, *125*, 352–262.

Vancampfort, D., Vansteenkiste, M., De Hert, M. *et al.* (2014). Self-determination and stage of readiness to change physical activity behaviour in schizophrenia. *Mental Health and Physical Activity*, *7*, 171–176.

Verhaeghe, N., Clays, E., Vereecken, C. *et al.* (2013b). Health promotion in individuals with mental disorders: A cluster preference randomized controlled trial. *BMC Public Health*, *13*, 657.

Verhaeghe, N., De Maeseneer, J., Maes, L., Van Heeringen, C. & Annemans, L. (2013a). Health promotion in mental health care: Perceptions from patients and mental health nurses. *Journal of Clinical Nursing*, *22*, 1569–1578.

Wand, T. & Murray, L. (2008). Let's get physical. *International Journal of Mental Health Nursing*, *17*, 363–369.

World Health Organization (2007). *A guide for population-based approaches to increasing levels of physical activity: Implementation of the WHO global strategy on diet, physical activity and health* Geneva: World Health Organization.

Paper III

Farholm, A., Sørensen, M., Halvari, H., & Hynnekleiv, T. Physical activity, motivation, apathy, and functioning in inhabitants with mental illness from a rural municipality: A cross-sectional study (in review)

Title:

Physical activity, motivation, apathy, and functioning in inhabitants with mental illness from a rural municipality: a cross-sectional study

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Abstract

Background: There is increasing evidence for physical activity (PA) having a positive impact on physical and mental health as well as illness symptoms in individuals with severe mental illness (SMI). However, individuals with SMI experience several barriers that makes it difficult to take advantage of the benefits associated with PA. One barrier consistently reported to impede PA is motivational issues. Thus, the main aim of the present study was to examine associations between PA and motivational variables specific for PA, clinical variables, and sociodemographic variables among individuals with SMI. This was conducted within a larger study aiming at including all inhabitants with SMI in one particular small, rural municipality.

Method: A total of 106 participants were recruited to the study. Questionnaire-based interviews conducted by two mental health nurses assessed self-reported physical activity, motivation and competence for physical activity, apathy, and mental and social functioning. Additionally, 71 participants accepted to wear an accelerometer-equipped wristwatch yielding an objective assessment of physical activity.

Results: Participants engaged in very little physical activity. However, they did not lack motivation, as over 90% state that they would like to be more active, and participants across physical activity level displayed high scores of a motivation reflecting that they valued the benefits of physical activity. Logistic regression analyses showed that higher self-reported physical activity level was associated with increased integrated motivation and perceived competence for physical activity, while apathy and functioning were not. In the subpopulation with objectively measured physical activity, integrated motivation for physical activity remained significantly associated with physical activity level, whereas low scores on functioning lowered the odds ratio for higher physical activity level.

Conclusion: The results show that PA specific motivation is associated with PA even when controlling for clinical variables like apathy and health and social functioning. This highlight the importance of facilitating context specific motivation (i.e., motivation for PA) and that health care practitioners should emphasise helping people with SMI develop more intrinsic forms of motivation.

Keywords: Physical activity; motivation; mental illness; apathy; mental and social functioning

Background

It is well established that people with severe mental illness (SMI) have increased mortality and morbidity compared with the general population. Their life expectancy is reduced by around 15 – 20 years, and they display disproportionally high prevalence of somatic diseases (1, 2). An increased risk of suicide explains part of the reduced life expectancy (3), but the major contributor is physical illness, in particular cardiovascular diseases (4-6). A large number of factors contribute to the poor physical health of people with SMI (7), including factors related to individual life-style choices, such as smoking, poor diet, excessive drinking, and physical inactivity (8). Use of physical activity (PA) to improve the health and wellbeing for the general population have long been well acknowledged (9-11). More recently, there is growing evidence of the beneficial effect of PA on both the physical and mental health also among people with SMI (12-16). Thus, it is unfortunate that individuals with SMI engage in little PA (17-19). There can be several reasons for this low PA engagement. Side effects of medicine, illness symptoms, and physical health comorbidities are consistently reported as major barriers for participating in PA (20-22). Another debilitating factor could be related to motivation. Health care practitioners and patients have reported lack of motivation to be a major obstacle for starting and maintaining PA (23-25). Hence, there is an increasing interest for examining the motivation for PA among individuals with SMI. However, there is still a great need for improving and refining motivational strategies employed with this population (26-28). A theoretical framework that have been applied to understand the role of motivation in general (29) and in PA in particular (28) is the Self-Determination Theory (SDT; 30).

In SDT, motivation is proposed to be multidimensional and residing along a continuum between amotivation (indicating a lack of motivation and intention for PA) and intrinsic motivation (performing PA for its own sake due to it being stimulating or enjoyable). Between those extremes, there are four more or less extrinsic motivational regulations. The

most extrinsic is external regulation, which means that one is physically active in order to avoid punishment or obtain tangible rewards. The next is introjected regulation where PA is performed due to internal pressure, such as guilt or contingent self-worth. The two last regulations are more volitionally oriented. In identified regulation the individual personally values the importance of PA, while in integrated regulation PA behaviour is in coherence with personally endorsed values, goals, and needs. Finally, a concept in SDT often used within the health care domain, is perceived competence. It refers to the ability to master a specific behaviour (31).

Competence or self-efficacy for PA and more intrinsic forms of motivation have been associated with increased PA engagement among people with SMI (28). However, to our knowledge there are no studies examining such associations that also take into account the influence of negative symptoms and functioning. It is imperative that this is investigated in future research because poorer functional outcome have been associated with reduced functional exercise capacity. Further, more negative symptoms have been associated with decreased PA participation and lower intrinsic forms of motivation for PA (32-34). With the demonstrated benefits of PA and the calls for developing improved programs for increasing PA engagement among people with SMI it is important to bring forth knowledge on the association between PA and motivation for PA, as well as indicators of negative symptoms and functioning.

Aims of the study

The primary aim of this study was to examine associations between physical activity level and sociodemographic, clinical, and motivational variables directed towards physical activity among all individuals identified with severe mental illness in a rural municipality. A secondary aim was to examine physical activity level using both self-report and objective measurement in participants taking part in a study primarily *not* focused on physical activity.

Methods

Design and procedure

The present study is part of a larger study examining the experience of the health care services of patients with SMI. This study aimed to include all inhabitants in one particular rural municipality (~14800 inhabitants) having SMI, that in the current study is understood as severe, long lasting, and recurrent dysfunctional mental problems. Furthermore, in the inclusion criteria SMI was operationalised as having frequent need of mental services, independent of diagnosis (i.e., at least two hospital stays every year during the last three years). However, participants could also be included if they fulfilled either of the two following conditions; not being able to maintain independent basic living conditions due to psychiatric disorders, or being followed up by local psychiatric services with a need of yearly hospital stays, but no admissions due to patients refusal or clinical expectations of little or no treatment effect. Participants were excluded if they were not able to give written consent.

A cross-sectional design was applied and data were collected through a questionnaire-based interview. Two trained mental health nurses conducted the interviews between May 2013 and April 2015. To ensure inter-rater reliability both mental health nurses conducted pilot interviews, which afterwards were presented, rated and discussed with the principal investigator of the whole project. The principal investigator is an experienced psychiatric clinician who is also a formally certificated research clinical rater with high interrater reliability scores for several of the clinical instruments used. Although no formal reliability analyses were performed, the pilot ratings were considered very satisfactory as they were identical or near-identical on all the crucial items, both between the mental health nurses and between the mental health nurses and the principal investigator.

The interviews lasted approximately two hours and were carried out at a place convenient for the participant, often in their own residence. If participants got tired during the

interview, it could be divided into two parts. After completion of the interview, participants were debriefed. If requested by the participant, or the interviewer considered it appropriate, participants were followed-up by competent health-care personnel. The study was approved by the Regional Committee for Medical and Health Research Ethics (approval number 2013/154), and participants gave written informed consent.

Participants

The mapping of all inhabitants with SMI in the municipality required a comprehensive identification process. Potential participants were identified through examining lists of individuals utilising mental health service in the municipality and the relevant mental hospital and outpatient clinics. This examination located 208 individuals satisfying the inclusion criteria. Of those, 61 declined to participate, typical reasons were lack of energy, interest, health problems, and no reason at all. Additionally, some initially accepted the invitation, but did not meet for the scheduled interview. Furthermore, 15 had moved to another municipality when contacted by the interviewers and were thus not eligible. Finally, the interviewers were not able to establish contact with 26 potential participants. This resulted in a total of 106 participants being interviewed in the study (i.e., 0.7% of the population of the municipality).

Measures

Physical activity

PA was assessed with both self-report and objective measurements as recommended by Lindamer and colleagues (35). Participants were also asked if they had any wish to increase their PA level. Self-reported vigorous, moderate, and walking PA during the last 7 days was measured with International Physical Activity Questionnaire short version (IPAQ: 36). At the very end of the interview, the participant was asked whether he or she would be willing to wear an accelerometer-equipped wristwatch (Polar Active, Polar Electro Oy, Kempele, Finland) to measure PA objectively. Polar Active measurement technology has been validated

by measuring energy expenditure using indirect calorimetry (37). Participants who accepted wore the Polar Active monitor in the consecutive week after the interview. Activity was measured in five different intensities: very easy (e.g. watching TV), easy (e.g. slow walking), moderate (e.g. gymnastics), vigorous (e.g. dancing), and vigorous+ (e.g. fast running). Only the three latter intensities are considered to be PA (38). Daily wear time was calculated as the sum of all five intensity zones. The days where activity monitors were distributed and collected were not included in the analyses. To be included for analysis participants had to have >600 minutes of wear time on at least 4 days.

Motivation for physical activity

Motivation for PA was measured by the Treatment Self-Regulation Questionnaire (39). Participants were presented the following stem "the reason I am physically active is…" and responded to statements assessing integrated regulation (three items, e.g. "because to be physically active have become an incorporated practice for me"), identified regulation (four items, e.g. "because I want to take responsibility for my own health"), introjected regulation (two items, e.g. "because I would not feel well if I'm not physically active"), external regulation (e.g. three items, "because I want other people to see that I can do it"), and amotivation (three items, e.g. "I really don't know why I should do it"). Responses were made on a 7-point scale ranging from 1 (*not true*) to 7 (*very true*).

Perceived competence for being in regular physical activity

Perceived competence for being in regular PA was assessed by the Perceived Competence Scale (40). The scale contains four items (e.g. "I manage to be in regular physical activity right now") and responses were made on a 7-point Likert scale ranging from 1 (*not true*) to 7 (*very true*).

Health and social functioning

The Health of the Nation Outcome Scale (HoNOS) was specifically developed to measure health and social functioning for people with SMI (41). The scale consists of 12 clinician rated items covering four domains: 1) behaviour (e.g. self-injury and problem drinking), 2) function / impairment (e.g. cognitive problems and physical illness), 3) symptoms (e.g. problems with depressed mood or delusions), and 4) social functioning (e.g. problems with relationships or activities of daily living). Each item is scored from 0 (no problem) to 4 (severe/very severe), yielding a total score ranging 0 to 48.

Apathy in life in general

Apathy was assessed based on Marin's (42) conceptualisation of apathy as "diminished motivation and goal directed behaviour, not attributed to diminished level of consciousness, general cognitive impairment, or emotional distress". In the present study we used a 12-item Short Version of the Apathy Evaluation Scale (SH-AES: 43). Example items are "It is important for me to get things done during the day" and "Someone has to tell me what to do every day (reversed)". Participants indicate how well this characterised them on a scale ranging from 1 (*very much*) to 4 (*not at all*).

Data analysis

All data were entered in EpiData Entry (EpiData, Odense, Denmark) and checked for accuracy by a repeated check. Continuous data were tested for normality using the Kolmogorov-Smirnov test and by visual inspection of Q-Q plots and data distribution in histograms. Altogether, these analyses indicated non-normally distribution of data in the majority of the scales. Internal consistency was measured with Cronbach's α. In the sub-scales introjected motivation and amotivation α were well below what is typically regarded as acceptable (44) and they were removed from further analyses. All other variables had acceptable α, ranging from 0.65 to 0.97.

For descriptive purposes, participants were stratified into groups of severity of impairment in function based on their HONoS scores on items 1-10, except item 5. The four groups were 'very severe' (more than one item's score >2), 'moderately severe' (one item's score >2), 'clinical' (at least one item's score of 2), and subclinical (score <2 on all items). This procedure is proposed by Lelliott (45) and later refined by Parabiaghi, Kortrijk and Mulder (46). The prevalence of clinical apathy was also estimated. A score of 27 in the SH-AES was used as cut-off value for indicating clinical apathy (47).

Afterwards, participants were grouped according to their PA level. For self-reported PA we followed established guidelines that categorise participants into groups of low, moderate and high activity level (48). In the present study we added a forth category called "no activity" for those participants reporting no activity during the last week. Furthermore, it was decided to collapse moderate and high activity level because so few participants ended in the high activity level group (n = 13). For objectively measured PA participants were divided into two groups: 1) <30 minutes of PA, and 2) ≥30 minutes of PA. This distinction was based on how typical guidelines for PA recommend doing at least 150 minutes of moderate PA each week (e.g. 30 minutes on most days) (49). To assess potential associations between variables we performed Kruskal-Wallis test or one-way analysis of variance ($_{ANOVA}$), as appropriate. If a main effect was present, this was followed by post-hoc procedure including Mann-Whitney U-test or independent t-test. For categorical variables chi-square tests were conducted. Statistical significance was set at $p < 0.05$ and Bonferroni corrections were applied in post-hoc procedure.

Finally, based on the results from comparing PA level groups, multinomial or binary logistic regression models were run. Following the same procedure as Jiménez et al. (50) all variables associated with PA level with a significance of $p < 0.10$ in either of the univariate comparisons were entered as independent variables. 'No activity' (self-report) and '<30

minutes' (objectively measured) were chosen as reference groups. All statistical analyses were conducted using IBM SPSS statistics for Windows, Version 21 (IBM Corp., Armonk, New York, USA).

Missing data in self-reported PA, apathy, health and social functioning, the three motivational regulations, and perceived competence were less than 4%. To increase statistical power we computed the average for the apathy, motivational regulations, and perceived competence scales if a participant had completed 67% of the items in the respective measure. Although an advantage of inserting mean values is that a participant's score remains unchanged such practice can decrease the variance in the data (51). It was deemed improper to impute mean values in the health and social functioning scale because each item measure different aspects of functioning that not necessarily have a transferable value between them. Likewise, in the self-reported PA measurement it is recommended to remove participants with missing data from analysis (48).

Results

Participants

The 106 individuals in the study had a mean age of 45.7 (SD 11.9), 65 (61.3%) were female, and 45 (42.5%) were in a relationship. Approximately $^{3}/_{4}$ of the individuals were raised either in the same municipality (n = 55 [51.9%]) or county (n = 22 [20.8%]) as the present study recruited participants from. The remaining participants were brought up either elsewhere in Norway (n = 24 [22.6%]) or abroad (n = 5 [4.7%]). The mean number of hospitalisations and years since first contact with mental health service were 7.3 (SD 13.0) and 13.1 (SD 6.1), respectively. Based on the predefined cut-off value of 27 for clinical apathy 51 (49.0%) of the participants rated themselves as being apathetic. Furthermore, following the procedures described earlier the clinicians rated 17 (16.7%) of participants to be in the 'very severe'

illness group, 58 (56.9%) in the 'moderately severe' group, 11 (10.8%) in the 'clinical' group, and 16 (15.7%) in the 'subclinical' group.

Seventy-one participants accepted to wear the accelerometer. Of those, 13 did not use the accelerometer enough to calculate a meaningful score of PA and three did not return it. We examined if there were any differences in sociodemographic, clinical, and motivational characteristics between participants with and without valid objective measurements of PA. The only significant difference was that participants using the accelerometer self-reported more PA minutes than those not using it (48.2 ± 55.6 versus 29.8 ± 47.4; $U = 861$, $z = -1.99$, $p = .046$).

Even though there were no differences in sociodemographic, clinical, or motivational characteristics between those with and without objective measurements of PA the two groups had clearly different patterns of associations (see Table 1). The associations between study variables were stronger for participants with objective data on PA in comparison to those without. Especially the associations between self-reported PA and apathy and health and social functioning are different between the two groups. This could indicate a moderating effect of accepting to wear the accelerometer on the association between self-report PA and apathy and health and social functioning. This was tested following the procedure of Cohen, Cohen, West, and Aiken (52). These analyses yielded significant interaction effects. More specifically, in the group who accepted to wear the accelerometer participants with less apathy and better health and social functioning reported more self-reported PA in comparison to those with increased apathy and worse health and social functioning. This was in contrast to participants *not* wearing the accelerometer, where level of apathy and health and social functioning had no influence on self-reported PA.

Insert Table 1 about here

Physical activity

The majority of participants were categorised into the 'no activity' (n = 21; 21%) or 'low active' (n = 43; 43%) groups. Only 13 (13%) of the individuals were in the 'high active' group while 12 (12%) were in the 'moderately active' group. In the subgroup with objectively measured PA, 25 (45.5%) were physically active less than 30 minutes a day and 30 (54.5%) were physically active 30 minutes or more each day. Furthermore, participants reported very little vigorous and moderate intensity PA (see Table 2). Additionally, 65 (63.7%) self-reported that they did not do any 10 minute bouts of vigorous or moderate PA during a typical week. According to the objective measurements, 40 (72.7%) did on average <10 minutes of moderate and vigorous PA each day. Finally, 94 (90.4%) of the participants reported that they would like to increase their level of PA.

Table 2. Minutes of self-report and objective measured physical activity

	n	Mean (SD)	Median	(25^{th} – 75th)
Self-reported physical activity				
Total min/day	95	39.3 (52.3)	20	(4–56)
Vigorous intensity	106	5.5 (15.6)	0	(0 – 0)
Moderate intensity	102	7.4 (20.4)	0	(0 – 1)
Walking	96	29.0 (40.7)	9	(0 – 40)
Objective reported physical activity				
Total min/day	55	44.9 (34.2)	34	(22 – 65)
Vigorous intensity	55	1.9 (3.4)	1	(0 – 2)
Moderate intensity	55	7.5 (9.7)	5	(2 – 8)
Low intensity	55	35.6 (24.3)	27	(18 – 53)

Univariate analysis

Comparison between three levels of self-reported physical activity. As described in Table 3, integrated motivation yielded a significant main effect across self-reported PA level while extrinsic and identified motivation did not. Post-hoc analyses showed that there were

significant differences between all three levels of PA with higher scores of integrated motivation as level of PA increased. The same pattern as for integrated motivation was evident for perceived competence for PA, with one exception. After correcting for multiple tests the difference between 'no physical activity' and 'low physical activity' became *non*-significant. There were no differences in sociodemographic or clinical variables between the three levels of PA. However, for apathy the Jonckheere-Terpstra test revealed a significant trend ($J = 1241.5$; $p = 0.020$) towards more active participants reporting less apathy even though the main effect was non-significant.

Insert Table 3 about here

Comparison between <30 minutes and ≥30 minutes of objectively measured physical activity. Also in the subgroup with valid objective measurement of PA the more active participants reported significantly higher levels of integrated motivation and perceived competence. Likewise, there was no difference between the groups in extrinsic motivation, but in this analysis the most active group scored significantly higher on identified motivation. Again, there were no differences in demographic variables and in the clinical variables with two important exceptions. The most active group had significantly better health and social functioning and less apathy than the less active group (see Table 4).

Table 4. Sociodemographic, clinical, and motivational characteristics according to degree of objective measured physical activity level

	< 30 min PA *n* = 25 Mean (SD)	≥ 30 min PA *n* = 30 Mean (SD)	χ^2 / *U* / *t*	*p*
Age*	46.2 (10.3)	44.7 (11.3)	0.497	0.621
Gender (female [%])	64.0%	73.3%	0.556	0.456
Marital status (relationship [%])	36.0%	40.0%	0.092	0.761
Years of contact*	13.4 (6.0)	15.5 (6.9)	1.198	0.236
Age at 1st admission (years)	32.8 (11.6)	29.2 (10.2)	307.5	0.253
Number of hospitalisations	7.68 (18.79)	7.80 (9.40)	292.5	0.161
Body mass index ($\frac{m^2}{kg}$)	30.35 (7.87)	28.38 (5.19)	317.5	0.435
Health and social functioning	9.86 (3.62)	4.93 (2.89)	80.0	**<0.001**
Apathy	28.89 (6.26)	22.83 (8.03)	205.0	**0.004**
Motivational regulations for PA				
Integrated regulation	2.52 (1.91)	5.38 (2.34)	133.5	**<0.001**
Identified regulation	5.01 (1.86)	6.02 (1.57)	200.0	**0.011**
Extrinsic regulation	1.79 (1.41)	1.52 (1.03)	306.0	0.535
Perceived competence for PA	4.20 (2.13)	6.37 (1.11)	135.5	**<0.001**

*Normally distributed variables. Bold types indicate significant test statistic.

Multivariate analysis:

Multinomial logistic regression model predicting self-reported physical activity level. The multinomial logistic regression model with 'no activity' as reference group showed that increased level of integrated motivation and perceived competence were significantly associated with increased PA level even when controlling for the other variables. The significant odds ratios were larger when predicting 'moderate/high physical activity' level compared to 'low physical activity' level (see Table 5). This model accounted for 46.4% of the variance in self-reported PA [χ^2 (10) = 47.61, $p < .001$, Nagelkerke pseudo $R^2 = 0.464$].

Binary logistic regression model predicting objectively measured physical activity. The binary logistic regression model with '<30 minutes of physical activity' as reference group showed that increased level of integrated motivation remained significantly associated with increased objective PA. In this analysis, unlike in the multinomial model, decreased level of health and social functioning significantly lowered the odds ratio for having increased level of PA (see Table 5). This model accounted for 76.8% of the variance in objectively measured PA [χ^2 (5) = 41.26, $p < .001$, Nagelkerke pseudo $R^2 = 0.768$].

Insert Table 5 about here

Discussion

To the best of our knowledge, this is a unique sample with regards to examining both PA level and motivation for PA among individuals with SMI. This is the first study combining a very comprehensive recruitment process, in which all potential participants in one municipality were actively approached, with the fact that participants were not biased to accept or decline participation based on their interest for PA because the main aim of the present study was *not* related to PA. Moreover, this is the first study examining PA and motivation that includes indicators of negative symptoms and functioning among the participants.

Participants engaged in very little PA and the large majority did not do any moderate or vigorous intensity PA. The same PA pattern was reflected in both type of measurements and the correlation between them (in total minutes of PA) is of similar magnitude as in a study validating the self-report questionnaire in outpatients with schizophrenia (53). The low PA level is not surprising based on previous research (17-19), and it underscores the importance of increasing the knowledge of barriers and facilitators associated with PA in this population.

The univariate analyses with self-report PA level as dependent variable show that integrated motivation and perceived competence for PA are significantly higher in the more active groups compared with less active groups. This is in line with research on both the general population and in people with SMI (28, 54). Interestingly, across the three PA groups participants scored very low on externally regulated motivation and there was no difference between the groups. This suggests that motivation based on rewards and punishment only plays a distal role in why individuals with SMI engage in PA. Furthermore, identified motivation was relatively high across all three groups with only a non-significant trend towards being higher in the most active group. This shows that, irrespective of PA level, participants were aware of, and valued the benefits of PA, but alone this type of motivation (i.e., identified) does not seem to be enough to transfer intentions into action. With respect to demographic and clinical variables, there were no differences across the three groups. The non-significant results regarding health and social functioning and apathy stand in contrast to previous studies that show negative associations between PA and these variables (32, 33).

The univariate analyses with objective PA as dependent variable yielded much of the same results as with self-report PA. For the motivational variables the only difference was that although both groups scored relatively high on identified motivation the most active group scored significantly higher. In the demographic variables and number of hospitalisations, length of contact, and age at first contact with mental health service, there was again no difference between the more and less active groups. However, for apathy, and health and social functioning, the results were contradicting the results from the self-report PA. Here, participants who were more active had significantly higher scores on apathy and health and social functioning, which is more in line with previous research (32, 33). An explanation for these opposing results can be that the design of the study have allowed us to recruit two distinct subpopulations, one with 'more interest' and one with 'less interest' for PA.

We therefore used 'wearing the accelerometer' as a behavioural measure of interest in PA to differentiate between the two groups. This method of differentiating is based on the assumption that participants with more interest in PA would be inclined to take on the extra "work load" of wearing the accelerometer for a week. Additionally, they self-reported more PA than those not wearing the accelerometer. Examining the two subpopulations yielded an interesting result. First, there were no demographic, clinical or motivational differences between the two groups, but there were obvious differences in the associations between study variables. Apathy and health and social functioning were associated with PA, integrated motivation for PA, and perceived competence for PA in the subgroup with 'more interest in PA' while they were not in the group with 'less interest in PA'. These differences in associations explain the opposing results regarding apathy and health and social functioning. To summarise from a clinical point of view, having better or worse functioning and more or less apathy does not influence whether participants were interested in PA, but among those interested in PA better health and social functioning and less apathy is associated with increased PA engagement.

In the multinomial logistic regression with self-reported PA as dependent variable increased scores of integrated motivation and perceived competence were associated with higher odds ratios for being more active. The lack of contribution from apathy, health and social functioning, and identified motivation is as expected based on their non-significant results in the univariate analyses. With that in mind, the binary logistic regression analyses of the subpopulation with valid objective measurement of PA yielded an interesting finding. In this model, integrated motivation for PA maintained a significant predictor of higher PA level even in the presence of variables significantly associated with PA-level in the univariate analyses. Health and social functioning became a significant predictor of higher PA level in the subpopulation with objective measurements. Finally, even though differences in apathy

was evident in the univariate analyses this effect was not significant once we controlled for the other variables. Altogether, the multivariate analyses indicate that PA specific motivation, in particular integrated motivation, is an important predictor of increased PA level, even when controlling for functioning and apathy.

An advantage of using a theoretical framework when examining motivation for PA is that evidence suggest that health promotion interventions based on social and behavioural science theories are more effective than those lacking a theoretical base (55). One particular benefit of applying SDT is that the multidimensional view on motivation allows one to examine how different qualities of motivation are associated with PA. In the present study, participants in general displayed high levels of identified motivation and over 90% reported that they would like to increase their PA level. However, it is only integrated motivation that is associated with increased PA across both univariate and multivariate analyses. This indicate that participants *are* motivated for PA, but for the majority of participants their type or quality of motivation (e.g. identified motivation) is not sufficient to start engaging in PA. Thus, participants may need help from family, friends, or mental health care practitioners to develop a more integrated style of motivation.

Implications

There is ample knowledge about how health practitioners can create an environment that facilitate change towards more intrinsic types of motivation among patients (31). In short, SDT proposes that satisfaction of the three psychological needs of autonomy, competence, and relatedness will facilitate more intrinsic forms of motivation (30). There are several strategies mental health practitioners can employ to support this process and the following are just a selected sample. Autonomy support can be given through involving patients in the decision-making process, providing rationales for decisions made by practitioners, and by giving relevant choices. An important aspect when supporting the competence need is to

adapt the PA context in a way that ensures patients have the opportunity to experience mastery, which is particularly important when introducing new activities. Helping with realistic goal-setting, providing positive feed-back, and suggesting coping strategies for overcoming barriers are other possibilities to support the competence need. Finally, the relatedness need can be supported through creating a warm and welcoming atmosphere, acknowledging patients' perspective, feelings, and values, and organising the activity so that patients can develop and strengthen attachment with others (56-58).

Limitations

This study is not without limitations. As always among psychiatric patients with severe problems, the response rate was not ideal. The cross-sectional design of the study does not make it possible to infer causality, only associations. There is a great need for intervention studies with the main aim of influencing motivation for PA in people with SMI (26, 28). As all cross-sectional studies this study is prone to common method bias (59). However, we have tried to minimise this bias by using both self-report and objective measurement of PA and clinician and participant evaluation with regards to health and social functioning and apathy. Finally, information about previous experience with PA could have added valuable insight.

Conclusion

With the acknowledged positive benefits PA have on mental and physical health in people with SMI it is imperative to develop the knowledge of factors that promote and impede PA engagement in this population. This study adds to that body of knowledge by showing that PA specific motivation is associated with PA even when controlling for health and social functioning and apathy in this sample recruited from one municipality.

Abbreviations

PA: Physical activity; SMI: Severe mental illness

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Availability of data and material

The dataset analysed during the current study are not publicly available due to the main study, from which the present study obtained data from, still analysing data and preparing manuscripts for publication, but are available from the corresponding author on reasonable request

Competing interest

The authors' declare that they have no competing interests

Author Contribution

TH, AF, and MS designed the study TH organised data collection. AF and HH analysed the data. AF drafted the manuscript. MS, TH, and HH commented and contributed to all subsequent revisions. All authors approved the final manuscript

Consent for publication

Not applicable

Ethics approval and consent to participate

The study was approved by the Norwegian Regional Committee for Medical and Health Research Ethics (approval number 2013/154), and participants gave written informed consent.

References

1. De Hert M, Correll CU, Bobes J, Cetkovich-Bakmas M, Cohen D, Asai I, et al. Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. World Psychiatry. 2011;10:52-77.
2. Nordentoft M, Wahlbeck K, Hallgren J, Westman J, Osby U, Alinaghizadeh H, et al. Excess mortality, causes of death and life expectancy in 270,770 patients with recent onset of mental disorders in Denmark, Finland and Sweden. Plos One. 2013;8.
3. Nordentoft M, Mortensen PB, Pedersen CB. Absolute risk of suicide after first hospital contact in mental disorder. Arch Gen Psychiatry. 2011;68:1058-64.
4. Crump C, Winkleby MA, Sundquist K, Sundquist J. Comorbidities and mortality in persons with schizophrenia: a Swedish national cohort study. Am J Psychiatry. 2013;170:324-33.
5. Crump C, Sundquist K, Winkleby MA, Sundquist J. Comorbidities and mortality in bipolar disorder - a Swedish national cohort study. Jama Psychiatry. 2013;70:931-9.
6. Laursen TM, Wahlbeck K, Hallgren J, Westman J, Osby U, Alinaghizadeh H, et al. Life expectancy and death by diseases of the circulatory system in patients with bipolar disorder or schizophrenia in the Nordic countries. Plos One. 2013;8.
7. Robson D, Gray R. Serious mental illness and physical health problems: a discussion paper. Int J Nurs Stud. 2007;44:457-66.
8. Scott D, Happell B. The high prevalence of poor physical health and unhealthy lifestyle behaviours in individuals with severe mental illness. Issues Ment Health Nurs. 2011;32:589-97.
9. Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Med Sci Sports Exerc. 2007;39:1423-34.
10. Landers DM, Arent SM. Physical activity and mental health. In: Tenebaum G, Eklund RC, editors. Handbook of Sport Psychology. Hoboken,NJ: John Wiley & Sons, INC.; 2007. p. 469-91.

11. Warburton DER, Nicol CW, Bredin SSD. Health benefits of physical activity: the evidence. CMAJ. 2006;174:801-9.

12. Rosenbaum S, Tiedemann A, Sherrington C, Curtis J, Ward PB. Physical activity interventions for people with mental illness: a systematic review and meta-analysis. J Clin Psychiatry. 2014;75:964-U171.

13. Firth J, Cotter J, Elliott R, French P, Yung AR. A systematic review and meta-analysis of exercise interventions in schizophrenia patients. Psychol Med. 2015;45:1343-61.

14. Josefsson T, Lindwall M, Archer T. Physical exercise intervention in depressive disorders: meta-analysis and systematic review. Scand J Med Sci Sports. 2014;24:259-72.

15. Dauwan M, Begemann MJ, Heringa SM, Sommer IE. Exercise improves clinical symptoms, quality of life, global functioning, and depression in schizophrenia: a systematic review and meta-analysis. Schizophr Bull. 2016;42:588-99.

16. Kvam S, Kleppe CL, Nordhus IH, Hovland A. Exercise as a treatment for depression: a meta-analysis. J Affect Disord. 2016;202:67-86.

17. Nyboe L, Lund H. Low levels of physical activity in patients with severe mental illness. Nord J Psychiatry. 2013;67:43-6.

18. Janney CA, Fagiolini A, Swartz HA, Jakicic JM, Holleman RG, Richardson CR. Are adults with bipolar disorder active? Objectively measured physical activity and sedentary behavior using accelerometry. J Affect Disord. 2014;152-154:498-504.

19. Stubbs B, Firth J, Berry A, Schuch FB, Rosenbaum S, Gaughran F, et al. How much physical activity do people with schizophrenia engage in? A systematic review, comparative meta-analysis and meta-regression. Schizophr Res. 2016; doi: 10.1016/j.schres.2016.05.017

20. Hodgson MH, McCulloch HP, Fox KR. The experiences of people with severe and enduring mental illness engaged in a physical activity programme integrated into the mental health service. Ment Health Phys Act. 2011;4:23-9.

21. Glover CM, Ferron JC, Whitley R. Barriers to exercise among people with severe mental illnesses. Psychiatr Rehabil J. 2013:45-7.

22. Johnstone R, Nicol K, Donaghy M, Lawrie S. Barriers to uptake of physical activity in community-based patients with schizophrenia. J Ment Health. 2009;18:523-32.

23. Happell B, Platania-Phung C, Scott D. Survey of Australian mental health nurses on physical activity promotion. Int J Men Health Promot. 2013;15:148-61.

24. Soundy A, Stubbs B, Probst M, Hemmings L, Vancampfort D. Barriers to and facilitators of physical activity among persons with schizophrenia: a survey of physical therapists. Psychiatr Serv. 2014;65:693-6.

25. Fraser SJ, Chapman JJ, Brown WJ, Whiteford HA, Burton NW. Physical activity attitudes and preferences among inpatient adults with mental illness. Int J Ment Health Nurs. 2015;24:413-20.

26. Farholm A, Sørensen M. Motivation for physical activity and exercise in severe mental illness: a systematic review of intervention studies. Int J Ment Health Nurs. 2016;25:194-205.

27. Vancampfort D, Stubbs B. Physical activity and metabolic disease among people with affective disorders: Prevention, management and implementation. J Affect Disord. 2016; doi: 10.1016/j.jad.2016.07.042.

28. Farholm A, Sørensen M. Motivation for physical activity and exercise in severe mental illness: a systematic review of cross-sectional studies. Int J Ment Health Nurs. 2016;25:116-26.

29. Gard DE, Sanchez AH, Starr J, Cooper S, Fisher M, Rowlands A, et al. Using self-determination theory to understand motivation deficits in schizophrenia: the 'why' of motivated behavior. Schizophr Res. 2014;156:217-22.

30. Deci EL, Ryan RM. The "what" and "why" of goal pursuits: human needs and the self-determination of behavior. Psychol Inq. 2000;11:227-68.

31. Ng JYY, Ntoumanis N, Thogersen-Ntoumani C, Deci EL, Ryan RM, Duda JL, et al. Self-determination theory applied to health contexts: a meta-analysis. Perspect Psychol Sci. 2012;7:325-40.

32. Vancampfort D, Probst M, Scheewe T, Knapen J, De Herdt A, De Hert M. The functional exercise capacity is correlated with global functioning in patients with schizophrenia. Acta Psychiatr Scand. 2012;125:382-7.

33. Vancampfort D, Knapen J, Probst M, Scheewe T, Remans S, De Hert M. A systematic review of correlates of physical activity in patients with schizophrenia. Acta Psychiatr Scand. 2012;125:352-62.

34. Vancampfort D, De Hert M, Stubbs B, Ward PB, Rosenbaum S, Soundy A, et al. Negative symptoms are associated with lower autonomous motivation towards physical activity in people with schizophrenia. Compr Psychiatry. 2015;56:128-32.

35. Lindamer LA, McKibbin C, Nonnan GJ, Jordan L, Harrison K, Abeyesinhe S, et al. Assessment of physical activity in middle-aged and older adults with schizophrenia. Schizophr Res. 2008;104:294-301.

36. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003;35:1381-95.

37. Brugniaux JV, Niva A, Pulkkinen I, Laukkanen RM, Richalet JP, Pichon AP. Polar Activity Watch 200: a new device to accurately assess energy expenditure. Br J Sports Med. 2010;44:245-9.

38. Polar Electro Inc. Polar Active user manual http://support.polar.com/e_manuals/Active/Polar_Active_user_manual_English/Polar_Active_user_manual_English/Polar%20_Active_user_manual_EN.pdf. Accessed 31 May 2016.

39. Levesque CS, Williams CG, Elliot D, Pickering MA, Bodenhamer B, Finley PJ. Validating the theoretical structure of the treatment self-regulation questionnaire (TSRQ) across three different health behaviors. Health Educ Res. 2007;22:691-702

40. Williams G, Freedman Z, Deci E. Supporting autonomy to motivate patients with diabetes for glucose control. Diabetes Care. 1998;21:1644-1651.

41. Wing J, Beevor A, Curtis R, Park S, Hadden S, Burns A. Health of the Nation Outcome Scales (HoNOS). Research and development. Br J Psychiatry. 1998;172:11-8.

42. Marin RS. Differential diagnosis and classification of apathy. Am J Psychiatry. 1990;147:22-30.

43. Faerden A, Nesvag R, Barrett EA, Agartz I, Finset A, Friis S, et al. Assessing apathy: the use of the Apathy Evaluation Scale in first episode psychosis. Eur Psychiatry. 2008;23:33-9.

44. Kline P. The handbook of psychological testing. 2nd ed. ed. London: Routledge; 1999.

45. Lelliott P. Defenition of severe mental illness. In: Charlwood P, Mason A, Goldacre M, Cleary R, Wilkinson E, editors. Health outcome indicators: severe mental illness. Oxford: National Centre for Health Outcomes Development, 1999.

46. Parabiaghi A, Kortrijk HE, Mulder CL. Defining multiple criteria for meaningful outcome in routine outcome measurement using the Health of the Nation Outcome Scales. Soc Psychiatry Psychiatr Epidemiol. 2014;49:291-305.

47. Faerden A, Friis S, Agartz I, Barrett EA, Nesvag R, Finset A, et al. Apathy and functioning in first-episode psychosis. Psychiatr Serv. 2009;60:1495-503.

48. IPAQ. Guidelines for data processing and analysis of the international physical activity questionnaire (IPAQ) - Short and long forms. 2005. www.ipaq.ki.se. Accessed 2 May 2016.

49. World Health Organization. Global recommendations on physical activity for health. Geneva: World Health Organization; 2010.

50. Jimenez E, Arias B, Mitjans M, Goikolea JM, Ruiz V, Brat M, et al. Clinical features, impulsivity, temperament and functioning and their role in suicidality in patients with bipolar disorder. Acta Psychiatr Scand. 2016;133:266-76.

51. Tabachnick BG, Fidell LS. Using Multivariate Statistics. Fifth Edition ed. Boston, MA: Pearson Education; 2007.

52. Cohen J, Cohen P, West SG, Aiken LS. Applied multiple regression/correlation analysis for the behavioral sciences. Third ed. New York: Routledge; 2003.

53. Faulkner G, Cohn T, Remington G. Validation of a physical activity assessment tool for individuals with schizophrenia. Schizophr Res. 2006;82:225-31.

54. Teixeira PJ, Carraca EV, Markland D, Silva MN, Ryan RM. Exercise, physical activity, and self-determination theory: a systematic review. Int J Behav Nut Phys Act. 2012;9:78.

55. Glanz K, Bishop DB. The role of behavioral science theory in development and implementation of public health interventions. Annu Rev Public Health. 2010;31:399-418.

56. Fortier MS, Hogg W, O'Sullivan TL, Blanchard C, Reid RD, Sigal RJ, et al. The physical activity counselling (PAC) randomized controlled trial: rationale, methods, and interventions. Appl Physiol Nutr Metab. 2007;32:1170-85.

57. Haase AM, Taylor AH, Fox KR, Thorp H, Lewis G. Rationale and development of the physical activity counselling intervention for a pragmatic TRial of Exercise and Depression in the UK (TREAD-UK). Ment Health Phys Act. 2010;3:85-91.

58. Ryan RM, Lynch MF, Vansteenkiste M, Deci EL. Motivation and autonomy in counseling, psychotherapy, and behavior change: a look at theory and practice. Couns Psychol. 2011;39:193-260.

59. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J Appl Psychol. 2003;88:879-903.

Table 1. Spearman correlation between PA, motivation for PA, and clinical variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. PA self-report (categorical)	1	---	.58***	.18	.03	.33*	.17	.01	.90***
2. PA objective (categorical)	.30*	1	---	---	---	---	---	---	---
3. Integrated motivation for PA	.54***	.53***	1	.45**	.01	.25	-.09	-.24	.64***
4. Identified motivation for PA	.21	.36**	.36 **	1	-.01	.13	-.21	-.21	.14
5. Extrinsic motivation for PA	-.06	-.09	-.20	.23	1	-.32*	.07	.31*	.06
6. Perceived competence for PA	.61***	.56***	.54***	.27	-.38**	1	-.17	-.27	.38*
7. Health and social functioning	-.37**	-.65***	-.39**	-.28	.06	-.41**	1	.41**	.09
8. Apathy	-.49***	-.39**	-.46***	-.10	.09	-.57***	.62***	1	-.02
9. PA self-report (continuous)	.91***	.31*	.55***	.23	-.04	.53***	-.44**	-.49***	1
10. PA objective (continuous)	.29*	.86***	.37**	.24	-.06	.53***	-.59***	-.42***	.32*

Note: Below the diagonal participants *with* objective PA measurement; above the diagonal participants *without* objective PA measurement; PA variables labeled continuous are PA measured by total minutes of PA; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 3. Sociodemographic, clinical, and motivational characteristics according to degree of self-report PA level

	No PA (A)	Low PA (B)	Mod/high PA (C)					
	n = 21	*n* = 43	*n* = 36	χ^2 / *F* / *H*	*p*	*p*		
	Mean (SD)	Mean (SD)	Mean (SD)			A vs. B	A vs. C	B vs. C
Age*	46.8 (13.7)	45.1 (11.7)	45.9 (10.9)	0.149	0.862			
Gender (female [%])	47.6%	60.5%	69.5%	2.665	0.264			
Marital status (relationship [%])	52.4%	39.5%	38.9%	1.179	0.555			
Years of contact*	14.1 (5.5)	13.2 (5.1)	14.4 (7.1)	0.386	0.681			
Age at 1st admission (years)	32.7 (14.9)	31.9 (11.2)	31.5 (10.0)	0.045	0.978			
Number of hospitalisations	3.62 (3.57)	7.60 (11.82)	9.42 (17.65)	1.851	0.396			
Body mass index ($\frac{m^2}{kg}$)	26.69 (5.11)	29.64 (5.13)	29.68 (6.87)	3.434	0.180			
Accelerometer data (yes[%])	38.1%	48.8%	63.9%	3.838	0.147			
Health and social functioning	7.85 (5.10)	7.02 (3.73)	6.42 (3.86)	0.976	0.614			
Apathy	28.52 (7.71)	26.05 (8.42)	23.51 (7.38)	5.385	0.068			
Motivational regulations for PA								
Integrated regulation	1.58 (1.12)	3.50 (2.48)	5.40 (2.20)	30.023	**<0.001**	**0.003**	**<0.001**	**<0.001**
Identified regulation	4.88 (2.00)	5.75 (1.44)	5.88 (1.39)	4.824	0.090			
Extrinsic regulation	1.39 (.05)	1.85 (1.29)	1.50 (1.04)	3.983	0.136			
Perceived competence for PA	4.10 (2.28)	5.46 (1.78)	6.46 1.17	18.790	**<0.001**	0.022†	**<0.001**	**0.004**

*Normally distributed variables. Bold types indicate significant test statistic. † *not* significant after Bonferroni correction.

Table 5. Multivariate logistic regression of factors associated with PA level

	Self-reported PA						Objective measured PA		
	Low level PA			High/moderate level PA			≥30 minutes of PA		
	Wald	*p*	OR (95%CI)	Wald	*p*	OR (95%CI)	Wald	*p*	OR (95%CI)
Integrated regulation for PA	5.059	0.025	**2.03** (1.10-3.78)	9.847	0.002	**2.80** (1.47-5.31)	4.014	0.045	**1.63** (1.01-2.62)
Identified regulation for PA	1.756	0.185	1.34 (0.87-2.06)	0.360	0.548	1.17 (0.71-1.93)	0.035	0.853	0.94 (0.48-1.84)
Perceived competence for PA	5.623	0.018	**1.62** (1.09-2.41)	7.792	0.005	**2.06** (1.24-3.41)	1.792	0.181	1.77 (0.77-4.07)
Health and social functioning	1.189	0.275	1.11 (0.92-1.32)	1.490	0.222	1.14 (0.92-1.41)	7.913	0.005	**0.38** (0.20-0.75)
Apathy	0.240	0.624	1.03 (0.92-1.16)	0.201	0.654	1.03 (0.90-1.17)	1.206	0.272	1.11 (0.92-1.34)

Bold types indicate significant OR. 'no physical activity' is reference group for self-reported PA and '<30 minutes of PA' is reference group for objective measured PA.

Paper IV

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Motivational factors associated with physical activity and quality of life in people with severe mental illness

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Background: There has been increasing interest for investigating the role of motivation in physical activity among people with severe mental illness (SMI). Autonomous motivation has been suggested to have a potentially important role in adoption and maintenance of physical activity. However, the knowledge about factors that facilitate autonomous motivation among people with SMI is scarce.
Aim: The aim of this study was to examine factors associated with motivation for physical activity as well as the relationships between motivation, physical activity and health-related quality of life in individuals with SMI that were currently physically active.
Methods: A cross-sectional design was used, and 88 participants were recruited from a public health network promoting physical activity for people with SMI. They answered a questionnaire package consisting of scales measuring psychological need support – psychological need satisfaction – and motivation for physical activity, physical activity and health-related quality of life.
Results: The majority of participants reported to be in regular physical activity. Associations between variables were tested according to the self-determination theory process model. Structural equation modelling yielded good fit of the process model to the data. Specifically, a need-supportive environment was positively associated with psychological need satisfaction, while psychological need satisfaction was positively associated with autonomous motivation and mental health-related quality of life, and negatively associated with controlled motivation and amotivation. Physical activity was positively associated with autonomous motivation and physical health-related quality of life, and negatively associated with amotivation.
Conclusion: This study indicates that individuals with SMI can be regularly physically active when provided with suitable opportunities. Furthermore, the present results suggest that it is vital for health-care practitioners to emphasise creating a need-supportive environment when organising physical activity because such an environment is associated with both increased autonomous motivation for physical activity and mental health-related quality of life.

Keywords: mental disorder, self-determination, physical activity, well-being, motivation, psychological need support, psychological need satisfaction.

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Introduction

Over the last 40–50 years, there has been a change in ideology and organisation in mental health care. From inpatient treatment towards community-based care and from symptom control towards a greater emphasise on helping individuals manage their illness, become independent, achieve success in relationships and participate in meaningful community activities (1, 2). As a consequence of the changes in mental health care, preventive actions have become more important for improving the health of people with severe mental illness (SMI) (3). In Norway, the significance of both preventive and community health care is emphasised in a recent large health sector reform and public health law (4, 5). A type of add-on treatment that can make a valuable contribution within this organisation of mental health care is physical activity. Physical activity can be an arena for establishing social relationships and obtaining mastery experiences (6), and it can be organised as low-cost group activities. The latter aspect may be particularly prominent in community settings that have limited resources and infrastructure. Finally, the evidence of the beneficial effects of regular physical activity and exercise on both mental and physical health, as well as on quality of life in individuals with SMI, are well documented (7, 8).

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Unfortunately, people with SMI engage in little physical activity (9, 10). This low involvement may be due to several barriers. Structural factors such as access to effective interventions and lack of physical health-care provision can be part of the explanation (1, 11). Likewise, individual barriers such as illness symptoms, side effects of medication, physical comorbidities and lack of support can also contribute to the low levels of physical activity (12–14). Another reason could be related to motivation, which has been reported as a major barrier by health-care staff when introducing physical activity as an adjunct part of treatment (15). Recently, there has been increasing interest for investigating the role of motivation in treatment outcomes in general (16–18) and for physical activity in particular (19). One prominent macrotheory of motivation that can be used as a framework to understand human behaviour and help to identify environmental factors affecting motivation is self-determination theory (SDT: 20, 21).

Self-determination theory

A central aspect in SDT is the distinction between autonomous and controlled motivation. Autonomous motivation refers to when the individual either identifies with the value of the activity or, ideally, have integrated it into their sense of self. When people are autonomously motivated, they exhibit volition and self-initiation in their actions. On the other hand, when people are motivated for controlled reasons, their behaviour is influenced by external contingencies such as reward and punishment or internal sources such as avoidance of shame and approval motives. Finally, amotivation is standing in contrast to both autonomous motivation and controlled motivation. Amotivation refers to a *lack* of motivation to act, either because the person does not value the activity or outcome, they do not see a reliable link between a valued outcome and a specific behaviour, or they do not feel competent to achieve a valued outcome (22). According to SDT, autonomous motivation is facilitated through satisfaction of basic psychological needs. The three basic needs are the need for autonomy, competence and relatedness, and they are described as 'innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being' (20: p. 229). Consequently, if people are physically active in an environment that is perceived as *need supportive*, they are more likely to be autonomously motivated and experience increased levels of well-being. On the other hand, if physically active in need thwarting conditions, ill-being and more controlled types of motivation would be expected.

In SDT, a need-supportive environment is characterised by encouraging personal initiation, supporting real opportunities for choice, being responsive to patients' thoughts, questions and initiative, and by taking the other individuals perspective (23).

There is extensive evidence for the usefulness of SDT in understanding the motivational mechanisms of physical activity and exercise in the general population (24). More recently, studies have started to examine the role of motivation for physical activity in people with SMI. Autonomous motivation for physical activity has been positively associated with physical activity and positive effect, and negatively associated with negative effect. Amotivation and controlled motivation have been reported to be negatively associated with physical activity and positive affect and positively associated with negative affect (25–27). To the authors' knowledge, no studies have previously examined the relationship between the perceptions of a need-supportive environment and need satisfaction among people with SMI. One study has examined the relationship between short-term goals in daily living and the underlying reasons for these goals (28). Using ecological momentary assessment, Gard and colleagues found that, compared to healthy participants, individuals with schizophrenia reported goals that were less directed towards satisfying the needs for autonomy and competence, but equally directed towards satisfying the need for relatedness. Additionally, there are indications of need satisfaction being associated with quality of life in individuals with first-episode psychosis (29).

The aim of the present study

The primary aim of this study was to examine associations between the perceptions of need support, need satisfaction and motivation for physical activity as well as the relationships between motivation, physical activity and health-related quality of life in individuals with SMI that were currently physically active. The associations were tested according to a sequential model proposed by SDT (see Fig. 1). The model is thought to be causal and to precede lasting behaviour change and beneficial psychological well-being (30). A secondary aim was to describe the level of physical activity among participants.

Methods

Participants and procedures

A cross-sectional design was used. Participants were recruited through a public health network promoting physical activity for individuals with SMI. The network is a collaboration between a regional psychiatric hospital, ten associated municipalities and one regional psychiatric centre. The network is coordinated through the hospital, and each municipality has one contact person. The aim of the network was to improve the provision of physical activity for individuals with SMI. This is accomplished through an

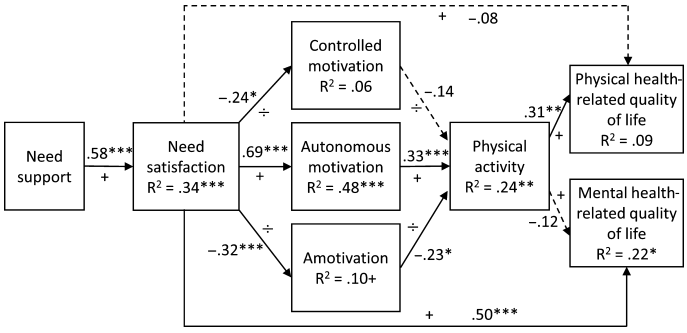

Figure 1 Hypothesised associations according to the SDT process model are depicted as + and ÷. Standardised parameter estimates depicting the relations in the SDT process model. Dotted lines indicate nonsignificant paths. $^{+}p < 0.1$; $*p < 0.05$; $**p < 0.01$; $***p < 0.001$.

increase in interaction between primary and secondary health care, and enhancement of competence and knowledge exchange. The network is open for all individuals with SMI, independent of diagnose, and organises weekly exercise sessions at local gyms and monthly arrangements adapted to the season, such as skiing events in the winter and water events in the summer.

The policy of the network is to not register any diagnoses. However, in this study, participants self-reported their main diagnose and comorbid diagnoses if they had any. Over a six-month period (October 2013–March 2014), individuals affiliated with the network and participating in their activities were invited to partake in the study.

Measures

Perceived need support in physical activity. The modified Health Care Climate Questionnaire (31) is a six-item questionnaire that assesses need support from significant others towards physical activity. Participants were asked to specify whether this/these significant other(s) was/were family, friend(s), treatment personnel or other. A sample item is 'This/these person(s) encourages me to ask questions related to physical activity'.

Psychological need satisfaction in physical activity. The Basic Psychological Needs in Exercise Scale (32) assesses satisfaction of the needs for autonomy, competence and relatedness in an exercise context. We adapted the questionnaire by replacing the term 'exercise' with 'physical activity' because this term better reflects the activities organised by the network. Each need was assessed by four items, and sample items include 'My physical activity is highly compatible with my choices and interests' (autonomy need), 'I feel that I execute my physical activity in an efficient way' (competence need) and 'I feel very much at ease with the other physical activity participants' (relatedness need).

Motivational regulations for physical activity. The Behavioral Regulation Exercise Questionnaire [BREQ-2: (33)] is a 19-item questionnaire designed to capture reasons for physical exercise varying along a continuum of self-determination. We adapted the questionnaire by replacing the term 'exercise' with 'physical activity'. The BREQ-2 includes the following subscales: 1) intrinsic motivation (four items; sample item: 'I am physically active because it is fun'), identified regulation (four items; sample item: 'It is important to me to be regularly physically active'), introjected regulation (three items; sample item: 'I feel guilty if I am not physically active'), external regulation (four items; sample item 'I feel pressure from others to be physically active') and amotivation (four items; sample item: 'I don't see any point in being physically active'). Aligned with SDT and past research (22, 34), we averaged the intrinsic motivation and identified regulation subscales to form a score for autonomous motivation, whereas a controlled motivation score was created by averaging the subscales of introjected and external regulations.

Physical activity. Physical activity was measured with the Stages of Physical Activity Change (35). For this study, regular physical activity was defined as activities that make you breathe harder than normally, lasts at least 30 minutes and is conducted on most days of the week. Starting with the stem 'are you in regular physical activity according to the definition above?' participants chose one of five options: (i) No, and I have no intention of starting with physical activity (precontemplation), (ii) No, but I have considered starting with physical activity (contemplation), (iii) No, but I have a plan of starting with physical activity (preparation), (iv) Yes, but for less than 6 months (action) and 5) Yes, and I have been for more than 6 months (maintenance).

Health-related quality of life. Health-related quality of life (HRQoL) was assessed with the Medical Outcomes Study Short Form version 2 [SF-12v2: (36)]. Scoring was conducted according to established guidelines and yields a mental component score and a physical component score (37). Sample items are 'How much of the time during

the past 4 weeks did you have a lot of energy' and 'In general, would you say your health is:' Scores are norm-based with a mean of 50 ± 10. Higher scores indicate better health functioning.

Ethical considerations

The study procedure was approved by the Norwegian Social Science Data Services (No. 35087). All participants gave their written informed consent. No incentive was provided for participation.

Data analysis

Statistical analyses were conducted by using IBM SPSS statistics 21 (IBM Corp., Armonk, NY, USA) and M*plus* version 7.31 (Muthén & Muthén, Los Angeles, CA, USA). The total amount of missing data was 1.0%, ranging from a low of 0.5% for controlled motivation to a high of 2.3% in physical activity. Missing data during model testing were treated with a full information maximum likelihood procedure using the MLR estimator in Mplus. Full information maximum likelihood is one of the preferred methods for handling missing data (38, 39).

Results

Characteristics of the sample

A total of 88 individuals participated in the study. Of those, 70% were women, 19% were ≤ 35 years old, 33% were between 36 and 50 years old, 48% were ≥ 51 years old and 46% were living alone. Their main diagnoses were affective disorder (21.5%), psychotic disorder (17%), anxiety disorder (21.5%) and other types of psychiatric disorder (24%). Sixteen per cent did not state their main diagnose, while 58% stated that they had a comorbid psychiatric disorder. We used independent t-tests and one-way ANOVA to investigate whether gender, residential status and age groups influenced quality of life, physical activity behaviour and motivational variables. Bonferroni correction was used for *post hoc* analysis, and a corrected p-value <0.017 was considered significant. Three significant differences emerged. Specifically, individuals living alone reported more controlled motivation for physical activity [$t(83) = 2.91$, $p = 0.005$], and the one-way ANOVA analyses yielded significant differences between the three age groups for need satisfaction [$F(2,84) = 3.26$, $p = 0.044$] and mental HRQoL [$F(2,81) = 4.60$, $p = 0.013$]. Post hoc comparisons using independent t-test indicated that the youngest age group had significant decreased need satisfaction (4.30 ± 1.25) compared with the middle age group (5.29 ± 1.26, $p = 0.014$) and that the youngest age group reported significantly lower mental HRQoL (36.7 ± 11.1) compared with the oldest age group (44.8 ± 10.6, $p = 0.012$).

Participants were generally physically active, with 59% indicating being physically active 30 minutes on most days of the week for more than 6 months and 17% for less than 6 months. The remaining participants either considered starting with regular physical activity (5%) or had a plan of doing so (19%). According to the norm-based standards of SF-12v2, participants had significantly lower mental HRQoL [$t(83) = -7.42$, $p < 0.001$] and physical HRQoL [$t(83) = -4.79$, $p < 0.001$] than the general population. Participants reported high levels of need support, need satisfaction and autonomous motivation, and low levels of controlled motivation and amotivation (see Table 1).

Primary analysis

The pattern of associations between the study variables was mainly in line with our hypotheses, meaning that need satisfaction was positively associated with need support and autonomous motivation, negatively associated with controlled motivation and amotivation and positively associated with mental HRQoL, while not associated with physical HRQoL. Furthermore, physical activity was positively associated with autonomous motivation and physical HRQoL, negatively associated with amotivation and not associated with controlled motivation and

Table 1 Range, mean, standard deviation, Cronbach alpha and bivariate correlations in all variables

	Range	*M*	*SD*	*α*	*1.*	*2.*	*3.*	*4.*	*5.*	*6.*	*7*	*8*
1. Need support	1–7	5.15	1.39	0.87								
2. Need satisfaction	1–7	5.06	1.40	0.95	0.56***							
3. Autonomous motivation	0–4	2.74	0.87	0.91	0.45***	0.65***						
4. Controlled motivation	0–4	1.40	0.82	0.79	−0.19^{+}	−0.25*	−0.02					
5. Amotivation	0–4	0.40	0.70	0.77	−0.22^{+}	−0.33**	−0.33**	0.16				
6. Physical activity	1–5	4.31	0.94	na	0.25*	0.38***	0.41***	−0.13	−0.36***			
7. Physical health QoL	0–100	44.4	10.7	0.83	0.14	−0.05	0.22*	−0.06	−0.23*	0.28*		
8. Mental health QoL	0–100	41.3	10.8	0.81	0.17	0.49***	0.32**	−0.01	0.02	0.07	−0.11	

*p < 0.05; **p < 0.01; ***p < 0.001.

mental HRQoL (see Table 1). The hypothesised model was analysed using structural equation modelling (SEM) with M*plus*. To permit an acceptable participant-to-estimated parameter ratio, we conducted a path analysis rather than a full latent variable analysis of the hypothesised model. The fit of the proposed model to the data was evaluated using the two-index presentation strategy proposed by Hu and Bentler (40). This approach recommends the use of the standardised root mean square residual (SRMR) coupled with one or more incremental or absolute index of fit. In the present work, we therefore also present the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). For incremental indices such as CFI, values of over 0.90 represent an acceptable fit, whereas values close to (or above) 0.95 indicate excellent fit between the model and data. Values close to or lower than 0.08 and 0.06 indicate well-specified models for the SRMR and RMSEA, respectively (40).

The path model yielded a good fit of the model to the data [χ^2 (16) = 19.30, p = 0.25; χ^2/df = 1.21; SRMR = 0.058; RMSEA [90% CI] = 0.048 [0.000, 0.115]; CFI = 0.975], and standardised parameter estimates are depicted in Fig. 1. The model suggests that participants reporting more need support experienced greater need satisfaction during physical activity. Higher levels of need satisfaction was in addition associated with increased level of autonomous motivation, lower levels of controlled motivation and amotivation and improved mental HRQoL, while it was not associated with physical HRQoL. Further, in the model, increased autonomous motivation and decreased amotivation were associated with more physical activity engagement. In contrast, there was no association between level of controlled motivation and physical activity. Finally, the model proposes that the more physically active participants experienced greater physical HRQoL, while mental HRQoL was not associated with physical activity level. To examine indirect relationships, a bias-corrected bootstrapping procedure was performed. The standardised indirect point estimates and the upper and lower 95% confidence intervals are reported in Table 2. In total, the proposed model included 15 indirect relationships. Eight of these indirect relationships were significant (e.g. need support having an indirect relationship with autonomous motivation and need support having an indirect relationship with physical activity through need satisfaction and the three types of motivation). Additionally, indirect relationships passing through multiple variables can take several pathways (e.g. one path through autonomous motivation and another through controlled motivation). Only three of 20 of such pathways were significant, and those three are reported in Table 2.

Discussion

To our knowledge, this is the first study to examine the entire SDT process model in a population with SMI. The present results lend support to the applicability of SDT in explaining physical activity behaviour among individuals with SMI. Twenty-five per cent of the variance in physical activity behaviour was explained in the hypothesised model. It was only autonomous motivation and amotivation that significantly predicted physical activity in the

Table 2 Standardised parameter estimates of indirect effects in Figure 1

Parameter	*β*	*Bootstrap bias-corrected 95% CIs (lower, upper)*
1. Need support → Autonomous motivation	0.40***	0.27, 0.53
2. Need support →Controlled motivation	−0.14*	−0.27, −0.01
3. Need support → Amotivation	−0.19**	−0.32, −0.06
4. Need support → Physical activity (total)	0.20***	0.09, 30
4a. through autonomous motivation	0.13**	0.03, 0.23
5. Need support → Physical health QoL (total)	0.01	−0.12, 0.15
6. Need support → Mental health QoL (total)	0.27***	0.14, 0.39
6a. through need satisfaction	0.29***	0.15, 0.43
7. Need satisfaction → Physical activity (total)	0.34***	0.19, 0.48
7a. through autonomous motivation	0.23**	0.08, 0.37
8. Need satisfaction → Physical health QoL (total)	0.10*	0.01, 20
9. Need satisfaction → Mental health QoL (total)	−0.04	−0.11, 0.03
10. Autonomous motivation → Mental health QoL	−0.04	−0.11, 0.03
11. Autonomous motivation → Physical health QoL	0.10*	0.001, 0.20
12. Controlled motivation → Mental health QoL	0.02	−0.02, 06
13. Controlled motivation → Physical health QoL	−0.04	−0.11, 0.03
14. Amotivation → Mental health QoL	0.03	−0.03, 09
15. Amotivation → Physical health QoL	−0.07	−0.16, 01

*p < 0.05; **p < 0.01; ***p < 0.001.

model, although both need support and need satisfaction had indirect effects on physical activity through autonomous motivation. Our finding of a positive association between autonomous motivation and physical activity is in line with previous research among people with SMI (25, 26). The result of the present study extends these findings by highlighting the crucial roles of need support and psychological needs in facilitating autonomous motivation. This has some important implications for health practitioners. Practitioners can facilitate patients' autonomous motivation for physical activity by creating an environment that supports the three psychological needs of autonomy, competence and relatedness (23). Once patients participate in physical activity, supporting the need for autonomy can be done through using autonomy-supportive language like 'could' and 'choose' instead of controlling language like 'should' and 'must', offering relevant choices, supporting patients' own initiatives, giving meaningful rationales and avoiding extensive use of external rewards. Mastery and successful experiences in various physical activities are important when supporting the need of competence. Hence, it is essential to tailor the activities to the capabilities of the patients, give sufficient instructions and time to practice and focus on individual development rather than social comparison. Finally, showing genuine interest in the patients, as well as trying to take their perspective, is essential in supporting the need for relatedness (41).

A recent systematic review and meta-analysis report that physical activity can improve quality of life among individuals with SMI (7). Results from the present study are in line with this as physical activity was positively associated with physical HRQoL. Additionally, we found that psychological need satisfaction during physical activity was positively associated with mental HRQoL. These results are interesting, as they indicate that not only higher levels of physical activity are associated with better quality of life, but also the content of physical activity (e.g. satisfaction of the three psychological needs) is associated with better quality of life. These results are in line with findings that need satisfaction in general life is positively associated with quality of life among individuals with first-episode psychosis (29) and that need satisfaction during physical activity is associated with change in mental HRQoL (but not in physical HRQoL) among young adults with a disability attending inpatient rehabilitation (42). The present findings underline the importance of organising physical activity so that it supports the participants' need for autonomy, competence and relatedness.

A second important finding is the relatively high physical activity level among the participants. This contrasts with typical findings of low levels of physical activity among people with SMI (9). However, this is not surprising because the participants were recruited through a public health network promoting physical activity. Notably, comparable physical activity level has been reported among participants in the network in a previous study (43). The high level of physical activity in this group suggests that programmes offering physical activity tuned to the terms and needs of individuals with SMI have great potential. Thus, similar programs can benefit from taking into consideration well-documented barriers for physical activity like illness symptoms, side effects of medication, physical comorbidities, lack of support and negative staff attitudes, safety concerns and low confidence in being active (13, 44, 45).

Limitations

This study has a number of limitations. First, the cross-sectional design means that we cannot draw any causal conclusions regarding the associations between the variables. On the other hand, the time sequence of the variables in the hypothesised model is based on both theory and extensive experimental research (24, 30). Secondly, data are self-reported. Relying on self-reported physical activity can be problematic, as this method is prone to both systematic and random errors (46). Thirdly, although the sample size is similar, or larger, to other studies examining motivation for physical activity, it was not large enough to conduct a full latent variable analysis of the hypothesised model. Finally, because participants were recruited through a public network promoting physical activity, it is very likely that the present sample is a selected subgroup of people with SMI who have interest, experience and available opportunities to be physically active. Thus, the present results might not be generalizable towards people with SMI in general.

Conclusion

The importance of autonomous motivation for physical activity among people with SMI has been highlighted in previous research (25, 26). However, within this population there are few studies examining factors that can affect motivation for physical activity. This cross-sectional study is the first to demonstrate the associations between need support, need satisfaction and autonomous motivation for physical activity in people with SMI. Furthermore, this study indicates that individuals who make use of the public health network are regularly physically active and that physical HRQoL is associated with physical activity, while mental HRQoL is associated with psychological need satisfaction. These findings have two important practical implications. First, it shows that people with SMI can be regularly physically active if the activity they are offered is adapted to their needs and challenges. Secondly, the present results suggest that it is vital for health-care practitioners to emphasise creating a

need-supportive environment when organising physical activity because such an environment is associated with both increased autonomous motivation for physical activity and mental HRQoL.

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Author contributions

Anders Farholm was involved in designing the study, data collection, analysing data and drafting the manuscript. Marit Sørensen was involved in designing the study, analysing data, supervision and critical revisions of the manuscript. Hallgeir Halvari was involved in analysing data and critical revisions of the manuscript. The authors declare that they have no conflict of interests related to the study.

Ethical approval

The study procedure was approved by the Norwegian Social Science Data Services (No. 35087).

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References

1 Drake RE, Green AI, Mueser KT, Goldman HH. The history of community mental health treatment and rehabilitation for persons with severe mental illness. *Community Ment Health J* 2003; 39: 427–40.
2 Rössler W. Psychiatric rehabilitation today: an overview. *World Psychiatry* 2006; 5: 151–57.
3 Salokangas RK. Medical problems in schizophrenia patients living in the community (alternative facilities). *Curr Opin Psychiatry* 2007; 20: 402–5.
4 Folkehelseloven. Lov om folkehelsearbeid [Law on public health work]. 2011, https://lovdata.no/dokument/NL/lov/2011-06-24-29 (last accessed 25 April 2016)
5 Norwegian Ministry of Health and Care Services. St.meld. nr. 47 (2008-2009) Samhandlingsreformen. [The Coordination Reform]
6 Carless D, Douglas K. Narrative, identity and mental health: how men with serious mental illness restory their lives through sport and exercise. *Psychol Sport Exerc* 2008; 9: 576–94.
7 Rosenbaum S, Tiedemann A, Sherrington C, Curtis J, Ward PB. Physical activity interventions for people with mental illness: a systematic review and meta-analysis. *J Clin Psychiatry* 2014; 75: 964–74.
8 Firth J, Cotter J, Elliott R, French P, Yung AR. A systematic review and meta-analysis of exercise interventions in schizophrenia patients. *Psychol Med* 2015; 45: 1343–61.
9 Soundy A, Wampers M, Probst M, De Hert M, Stubbs B, Vancampfort D. Physical activity and sedentary behaviour in outpatients with schizophrenia: a systematic review and meta-analysis. *Int J Ther Rehabil* 2013; 20: 588–96.
10 Nyboe L, Lund H. Low levels of physical activity in patients with severe mental illness. *Nord J Psychiatry* 2013; 67: 43–6.
11 Lawrence D, Kisely S. Inequalities in healthcare provision for people with severe mental illness. *J Psychopharmacol* 2010; 24(4 Suppl): 61–8.
12 Hodgson MH, McCulloch HP, Fox KR. The experiences of people with severe and enduring mental illness engaged in a physical activity programme integrated into the mental health service. *Ment Health Phys Act* 2011; 4: 23–9.
13 Roberts SH, Bailey J. Incentives and barriers to lifestyle interventions for people with severe mental illness: a narrative synthesis of quantitative, qualitative and mixed methods studies. *J Adv Nurs* 2011; 67: 690–708.
14 Glover CM, Ferron JC, Whitley R. Barriers to exercise among people with severe mental illnesses. *Psychiatr Rehabil J* 2013; 36: 45–7.
15 Happell B, Platania-Phung C, Scott D. Survey of Australian mental health nurses on physical activity promotion. *Int J Ment Health Promot* 2013; 15: 148–61.
16 Nakagami E, Xie B, Hoe M, Brekke JS. Intrinsic motivation, neurocognition and psychosocial functioning in schizophrenia: testing mediator and moderator effects. *Schizophr Res* 2008; 105: 95–104.
17 Foussias G, Mann S, Zakzanis KK, van Reekum R, Remington G. Motivational deficits as the central link to functioning in schizophrenia: a pilot study. *Schizophr Res* 2009; 115: 333–37.
18 Gard DE, Fisher M, Garrett C, Genevsky A, Vinogradov S. Motivation and its relationship to neurocognition, social cognition, and functional outcome in schizophrenia. *Schizophr Res* 2009; 115: 74–81.
19 Farholm A, Sørensen M. Motivation for physical activity and exercise in severe mental illness: a systematic review of cross-sectional studies. *Int J Ment Health Nurs* 2016. doi:10.1111/inm.12217.
20 Deci EL, Ryan RM. The "what" and "why" of goal pursuits: human needs and the self-determination of behavior. *Psychol Inq* 2000; 11: 227–68.
21 Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol* 2000; 55: 68–78.
22 Deci EL, Ryan RM. Self-determination theory: a macrotheory of human motivation, development, and health. *Can Psychol* 2008; 49: 182–85.
23 Deci EL, Ryan RM. Facilitating optimal motivation and psychological well-being across life's domain. *Can Psychol* 2008; 49: 14–23.
24 Teixeira PJ, Carraca EV, Markland D, Silva MN, Ryan RM. Exercise, physical activity, and self-determination

theory: a systematic review. *Int J Behav Nutr Phys Act* 2012; 9: 78.
25 Sørensen M. Motivation for physical activity of psychiatric patients when physical activity was offered as part of treatment. *Scand J Med Sci Sports* 2006; 16: 391–98.
26 Vancampfort D, De Hert M, Vansteenkiste M, De Herdt A, Scheewe TW, Soundy A, Stubbs B, Probst M. The importance of self-determined motivation towards physical activity in patients with schizophrenia. *Psychiatry Res* 2013; 210: 812–18.
27 Vancampfort D, Madou T, Moens H, De BT, Vanhalst P, Helon C, Naert P, Rosenbaum S, Stubbs B, Probst M. Could autonomous motivation hold the key to successfully implementing lifestyle changes in affective disorders? A multicentre cross sectional study. *Psychiatry Res* 2015; 228: 100–6.
28 Gard DE, Sanchez AH, Starr J, Cooper S, Fisher M, Rowlands A, Vinogradov S. Using self-determination theory to understand motivation deficits in schizophrenia: the 'why' of motivated behavior. *Schizophr Res* 2014; 156: 217–22.
29 Breitborde NJK, Kleinlein P, Srihari VH. Self-determination and first-episode psychosis: associations with symptomatology, social and vocational functioning, and quality of life. *Schizophr Res* 2012; 137: 132–36.
30 Ng JYY, Ntoumanis N, Thogersen-Ntoumani C, Deci EL, Ryan RM, Duda JL, Williams GC. Self-determination theory applied to health contexts: a meta-analysis. *Perspect Psychol Sci* 2012; 7: 325–40.
31 Williams GC, Grow VM, Freedman ZR, Ryan RM, Deci EL. Motivational predictors of weight loss and weight-loss maintenance. *J Pers Soc Psychol* 1996; 70: 115–26.
32 Vlachopoulos SP, Michailidou S. Development and initial validation of a measure of autonomy, competence, and relatedness in exercise: the basic psychological needs in exercise scale. *Meas Phys Educ Exerc Sci* 2006; 10: 179–201.
33 Markland D, Tobin V. A modification to the behavioural regulation in exercise questionnaire to include an assessment of amotivation. *J Sport Exerc Psychol* 2004; 26: 191–96.
34 Standage M, Sebire SJ, Loney T. Does exercise motivation predict engagement in objectively assessed bouts of moderate-intensity exercise? A self-determination theory perspective. *J Sport Exerc Psychol.* 2008; 30: 337–52.
35 Wester A, Wahlgren L, Wedman I, Ommundsen Y. Å bli fysisk aktiv [To become physically active]. In *Aktivitetshåndboken: Fysisk aktivitet i forebygging og behandling [Handbook of activity: Physical activity in prevention and treatment]*. (Bahr R ed.), 2008, Helsedirektoratet, Oslo, 84–102.
36 Ware J, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care* 1996; 34: 220–33.
37 Ware JE, Kosinski M, Turner-Bowker DM, Gandek B. *User's manual for the SF-12v2® health survey with supplement documenting SF-12® health survey*. 2002, QualityMetric Incorporated; Lincoln, RI.
38 Enders CK, Bandalos DL. The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Struct Equ Modeling* 2001; 8: 430–57.
39 Olinsky A, Chen S, Harlow L. The comparative efficacy of imputation methods for missing data in structural equation modeling. *Eur J Oper Res* 2003; 151: 53–79.
40 Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Equ Modeling* 1999; 6: 1–55.
41 Ryan RM, Lynch MF, Vansteenkiste M, Deci EL. Motivation and autonomy in counseling, psychotherapy, and behavior change: a look at theory and practice. *Couns Psychol* 2011; 39: 193–260.
42 Sæbu M. *Physical activity and motivation in young adults with a physical disability* [Doctoral thesis], 2011, Norwegian School of Sport Sciences, Oslo, Norway.
43 Kristiansen J. *Motivasjon for fysisk aktivitet blant personer med psykiske lidelser* [Motivation for physical activity among individuals with mental illness]. 2010, Norwegian School of Sport Sciences, Department of Coaching and Psychology, Oslo.
44 Johnstone R, Nicol K, Donaghy M, Lawrie S. Barriers to uptake of physical activity in community-based patients with schizophrenia. *J Ment Health* 2009; 18: 523–32.
45 Beebe LH, Smith K, Burk R, McIntyre K, Dessieux O, Tavakoli A, Tennison C, Velligan D. Effect of a motivational intervention on exercise behavior in persons with schizophrenia spectrum disorders. *Community Ment Health J* 2011; 47: 628–36.
46 Vanhees L, Lefevre J, Philippaerts R, Martens M, Huygens W, Troosters T, Beunen G. How to assess physical activity? How to assess physical fitness? *Eur J Cardiovasc Prev Rehabil* 2005; 12: 102–14.

Paper V

Farholm, A., & Sørensen, M. Increasing physical activity in patients at a psychiatric hospital through implementing a short educational intervention among staff: A feasibility study (manuscript in preparation)

Title:

Increasing physical activity in patients at a psychiatric hospital through implementing a short educational intervention among staff: A feasibility study

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Abstract:

Background: Individuals with severe mental illness (SMI) engage in very little physical activity (PA) and there has been several calls for developing novel interventions to counteract this.

Purpose: To examine the feasibility of increasing PA level among inpatients with SMI through implementing a short educational intervention among staff at a psychiatric hospital.

Method: A 7-hour educational intervention on how to motivate inpatients to increase PA level was conducted among staff working at three psychiatric wards. The intervention was guided by Self-Determination Theory and The Transtheoretical Model. The wards had 28 beds and treated mainly patients with affective and psychotic disorders. PA was assessed by direct observation on three occasions, each lasting four or five weeks; pre-intervention (T1), post-intervention (T2), and 16 week follow-up (T3). Staff motivation and self-efficacy for promoting PA in patients were assessed at T1 and T2.

Results: There was no significant difference between the time points in the proportion of patients being active (~30%). However, active patients at T2 engaged in significantly shorter bouts of PA than patients at T1. Across the three time points, increased PA was associated with weekdays rather than weekend days and clear sky rather than rainy weather. The intervention did not yield any change in staff motivation or self-efficacy.

Conclusion: This feasibility study indicates that conducting a short educational intervention among staff working at psychiatric wards is not sufficient in order to increase PA among inpatients with SMI. This suggests that more comprehensive interventions are needed to increase PA level among inpatients.

Keywords: Inactivity, physical activity, severe mental illness, motivation, intervention, mental health practitioners

Introduction

There is consistent evidence for individuals with severe mental illness (SMI) engaging in little physical activity (PA) and less than the general population (Burton et al., 2013; Melo, Daher Ede, Albuquerque, & de Bruin, 2016; Stubbs et al., 2016). The PA level have even been described as hazardously low (Nyboe & Lund, 2013). This statement must be seen in view of physical inactivity being identified as the fourth leading risk factor for global mortality as well as being an independent risk factor several somatic disorders (Aadahl, Kjaer, & Jorgensen, 2007; Biswas et al., 2015; Wilmot et al., 2012; World Health Organization, 2009). Thus, physical inactivity have the potential to exacerbate the already disproportionally high prevalence of physical health illnesses displayed by individuals with SMI (Allison et al., 2009; De Hert et al., 2011; Vancampfort et al., 2013b; 2014; 2016a). These physical illnesses, and in particular cardiovascular disorders, are the major contributors to an excess mortality rate that translates into 15 – 20 years shorter life expectancy for individuals with SMI compared to the general population (Nordentoft et al., 2013; Wahlbeck, Westman, Nordentoft, Gissler, & Laursen, 2011). On the other hand, PA have long been widely acknowledged to improve physical and mental health in the general population (Biddle, Fox, & Boutcher, 2000; Warburton, Nicol, & Bredin, 2006). The potential of PA is highlighted in a meta-epidemiological study finding PA broadly as effective as pharmacological treatment in preventing mortality caused by cardiovascular diseases (Naci & Ioannidis, 2013). More recently, an increasing body of research demonstrates that PA can improve mental health as well as reducing psychiatric symptoms in people with SMI (e.g., Dauwan, Begemann, Heringa, & Sommer, 2016; Kvam, Kleppe, Nordhus, & Hovland, 2016; Rosenbaum, Tiedemann, Sherrington, Curtis, & Ward, 2014). Accordingly, there are strong arguments for reducing sedentary time and increasing or maintaining PA level in individuals with SMI.

The low PA engagement in people with SMI is probably due to multifactorial reasons (Johnstone, Nicol, Donaghy, & Lawrie, 2009; Soundy et al., 2014a; Vancampfort et al., 2013a; Verhaeghe, De Maeseneer, Maes, Van Heeringen, & Annemans, 2013). However, one major barrier reported by both individuals with SMI, and very often highlighted as *the* most important obstacle by mental health care practitioners, is related to motivation, or lack thereof (Fraser, Chapman, Brown, Whiteford, & Burton, 2015; Happell, Scott, Platania-Phung, & Nankivell, 2012; Soundy, Stubbs, Probst, Hemmings, & Vancampfort, 2014b). Indeed, how to best enhance motivation for PA have been brought up as one of the top ten PA research questions in SMI (Vancampfort et al., 2016b, 2016c). A recent systematic review shows that although many studies incorporate motivational techniques in their PA intervention, very few do it with a procedure that is both systematic and theory based (Farholm & Sorensen, 2016b). The potential of working systematically towards enhancing PA motivation is supported by variables like self-efficacy and autonomous motivation being consistently associated with increased PA, both in the general population and among individuals with SMI (Bauman et al., 2012; Farholm & Sorensen, 2016a; Teixeira, Carraca, Markland, Silva, & Ryan, 2012). In accordance with the body of research demonstrating the benefits of PA in individuals with SMI repeated calls have been made for developing novel approaches to increase PA engagement (e.g., Gorczynski & Faulkner, 2010). Arguably, a structured approach towards enhancing PA motivation should be part of such novel approaches (Beebe, 2008; Liu & Spaulding, 2010). In line with research showing that theoretically informed programs are more effective in changing health behaviour than programs that are not informed by theory (Painter, Borba, Hynes, Mays, & Glanz, 2008) one way of structuring 'motivational work' is through applying motivational theory. Thus, the educational intervention in the present study was based on Self-Determination Theory (SDT: Ryan & Deci, 2000) and The Transtheoretical Model (TTM: Prochaska & Velicer, 1997). The intervention was implemented among staff

working at a psychiatric hospital and concerned with how staff can enhance PA motivation among inpatients with SMI.

Self-Determination Theory

There are two main concepts in SDT. The first aspect is how SDT distinguish between qualitatively different forms of motivation (Ryan & Deci, 2000). These different forms of motivation lies along a continuum of self-determination. The least self-determined form is *external* regulation, which epitomise the classic form of extrinsic motivation where people are motivated by avoiding punishment or obtaining rewards. The next is *introjected* regulation, which describes performing PA to avoid shame and guilt or to maintain a feeling of self-worth. Further self-determined is *identified* regulation, which concerns behaving based valuing the activity as personally important. Finally, the most self-determined form of motivation is *intrinsic* motivation, which reflects doing an activity because it is inherently interesting and enjoyable. In contrast to all these motivational regulations stands *amotivation*, which in SDT refers a lack of motivation to act (Ryan & Deci, 2002). There is a plethora of evidence supporting how the more self-determined (identified and intrinsic motivation) rather than the less self-determined motivational regulations (introjected and external regulation) are associated with a range of positive outcomes, such as greater long-term persistence in PA (Ng et al., 2012; Teixeira et al., 2012). Consequently, it is important to facilitate more self-determined motivation for PA. According to SDT this can be accomplished through supporting the basic psychological needs of autonomy, competence, and relatedness. The basic psychological needs are the second core concept in SDT and is described as "innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being" (Deci & Ryan, 2000, p. 229). When these needs are satisfied, it is predicted that people will experience increased well-being and demonstrate more integrated and self-

determined forms of motivation. Whereas, if the social context leads to thwarting of the needs, ill-being and more controlled forms of motivation is expected (Deci & Ryan, 2000).

The Transtheoretical Model

The TTM is a theoretical model of behaviour change emerging from treatment of addictive behaviour (Prochaska & DiClemente, 1983). A core aspect in TTM is the temporal dimension in which change occurs through series of stages. Five stages have been proposed and they are characterised by different "readiness to change". The stages have been labelled *Precontemplation* (no intention to become physically active), *Contemplation* (thinking about starting to become physically active), *Preparation* (making small changes in behaviour, but still not meeting the criterion for being physically active), *Action* (recently meeting the criterion for being physically active), and *Maintenance* (meeting the criterion for being physically active for >6 months). Stage progression is assumed to be a cyclical rather than a developmental process, implying that people can progress and regress between the stages with different leaps (Prochaska & Velicer, 1997). Three factors are proposed to mediate change between the stages. These are an individual's self-efficacy for change, the decisional balance of perceived advantages and disadvantages of change, anf ten basic processes of change (Marshall & Biddle, 2001). Self-efficacy derives from Social Cognitive Theory and describes and describe individuals' judgements about their capability of mastering a specific task or behaviour in a specific context (Bandura, 1997). Next, the assumption of behaviour change involving a systematic evaluation of pros and cons related to the new behaviour is based on a conflict model of decisions making (Janis & Mann, 1977; Marcus, Rakowski, & Rossi, 1992). Finally, the ten basic processes of change describe techniques and strategies that individuals use to modify their feelings, thoughts, and behaviour (Prochaska & Velicer, 1997). These processes can be organised into two higher order constructs; five experiential processes (e.g., environmental re-evaluations) and five behavioural processes (e.g., stimulus control).

Although the applicability of TTM within the PA context is supported in several systematic reviews (e.g., Marcus & Simkin, 1994; Marshall & Biddle, 2001), it is has also been subject to criticism. This criticism is mainly concerned with TTM not being attuned to the complexity of PA, not including the real determinants of PA, and lack of validation of stage algorithms (Adams & White, 2005).

In line with how the core constructs of TTM increase across stages (i.e., individuals in later stages reporting increased self-efficacy compared to individuals in earlier stages), studies have shown that more self-determined motivation is associated with later stages in both the general population (Mullan & Markland, 1997) and among individuals with SMI (Vancampfort, Stubbs, Venigalla, & Probst, 2015).

Purpose of the study

The present study examined the feasibility of increasing PA engagement among inpatients with SMI through implementing a short educational intervention among staff working at a psychiatric hospital. Thus, the main aim of the study was to examine if there was any differences in PA among inpatients before and after the intervention. Secondary aims of the study were: I) to examine if external factors like weather and day of the week influenced the PA pattern among the inpatients, and II) to examine whether staff motivation and self-efficacy for promoting PA was different before and after the intervention .

Method

Setting and procedure

The intervention was conducted at a psychiatric hospital located in a rural part of Norway. The catchment area population of the hospital was approximately 200 000 inhabitants that were spread over about 25 000 km^2. An outline of the educational intervention was first presented for the hospital director and later for the entire management group. At the presentation, it was explicitly explained that the implementation of the intervention could be

adapted to best fit the needs of each potential ward. After the management group presentation two closed wards and one open ward decided to participate.

The first closed ward had 11 beds, patients were mainly hospitalised due to psychotic disorders, and the average hospitalisation duration was about 80 days. The second closed ward was a subacute ward with nine beds, patients were largely hospitalised due to affective disorders, and the average hospitalisation duration was about 58 days. The open ward was an early intervention ward for young individuals with psychotic disorders with eight beds and the average hospitalisation duration was about 85 days. In total, the three wards had 70 full time equivalents (FTEs) which was divided on 97 employees (70 had a FTE $\geq$ 75%).

The wards allocated eight hours for the intervention and in collaboration with the ward-leaders it was decided on a program consisting of a one 1-hour information meeting, two 3-hour session of education, and a one 1-hour booster-session. Except for the information meeting, each session was given twice on the same day so that a greater share of the staff could take part without having to summon substitute staff or deteriorating the treatment for the patients. Furthermore, the intervention was implemented as part of the staff's professional development plan. For an overview of measurement points and timing of education sessions see the timeline in Figure 1.

The information meeting included a short presentation of the aims and content of the intervention and described guidelines for what type of PA that should be registered. The staff questionnaire was pilot tested on two individuals having long experience of working with PA within the mental health context (Stenersen, 2016). It was further decided that only staff working a FTE $\geq$ 75% and following a shift that included day duty should answer the questionnaire. Furthermore, it was *not* necessary to answer the questionnaire in order to take part in the educational sessions. PA among the patients were assessed by direct observation on three occasions: baseline (T1), post intervention (T2), and follow-up (T3). The first author

delivered the intervention. Norwegian Social Science Data Services (No. 44045) approved the study and staff gave written informed consent when answering the questionnaire package.

The intervention

The core principles of the intervention that guided the planning were that: I) it could be implemented and have the potential to be effective within the everyday clinical practice at a psychiatric, II) it should target staff working at the ward and enhance their ability to motivate patients to engage in PA, and III) it should promote PA in its broadest sense (e.g., daily living activities, structured PA, and reducing sedentary time) by taking advantage of the already existing PA opportunities.

The first intervention session started with a short introduction of different aspects related to PA (e.g., difference between PA and exercise, health benefits of PA, benefits of reducing sedentary time, and "defusing" physical activity as something that requires expensive equipment and well-developed ability). At this point it was stressed that the target should not necessarily be to help patients so start exercising but to help them reduce sedentary time and be more physically active as part of their daily living.

The stages of change concept from TTM was familiar for most of the staff based on previous training in Motivational Interviewing (Miller & Rollnick, 2002). Thus, the different motivational strategies were organised according to the different stages. In each stage, the motivational strategies were geared towards achieving one main aim. These main aims and a sample of motivational strategies are listed in Table 1. Although the intervention content was mainly directed towards motivational strategies that could be applied on an individual level, a topic throughout the interventions was how these strategies could be used so that the ward had a more structured and coherent approach towards motivating for PA. A short summary section was carried out after each stage. These sections were used discuss which of the proposed strategies that were most relevant and how to best apply them in the wards. Moreover, these

summary sections were the basis for a condensed, reader-friendly booklet was developed in the timespan between session two and the booster-session. The booklet was designed to give guidance on applying motivational strategies independent of the reader's previous knowledge on the topic or participation in the educational intervention.

The SDT contribution in the intervention was three folded. First, strategies aiming at supporting the three need were explicitly described under the action and maintenance stage. In the three preceding stages motivational strategies were presented from a SDT perspective, but without explicitly mentioning how the motivational strategy would also contribute to supporting patients' psychological needs. For instance, the importance of involving patients in the decision making process was stressed, emphasising taking a patient perspective of PA adoption, and highlighting to use self-reference rather than external reference with respect to PA. Finally, efforts were made to present the intervention content in a need supportive way. The needs were supported through several strategies, such as acknowledging staff's perspective of barriers for promoting PA and giving rationales for the structure and content of the intervention (autonomy need). Other strategies were expanding their repertoire of tools to influence motivation as well as emphasizing that they already had knowledge of many of the motivational strategies (competence need). Lastly, the need for relatedness was supported by trying to create a warm and welcoming atmosphere and making promotion of PA a group project involving the whole ward rather than an individual task for the particularly interested. To ensure SDT-fidelity when delivering the intervention a PhD-level exercise psychologist with intimate knowledge of SDT attended the first session and gave feedback on the intervention delivery.

Measurements

Physical activity

PA conducted by the patients was measured by direct observation from the staff at the three wards. Staff were instructed to note all PA lasting more than 10 min that patients did throughout the day on a predesigned form placed in the staff room. PA was defined according to Caspersen, Powell, and Christenson (1985, p. 126) as *"any bodily movement produced by skeletal muscles that results in energy expenditure*". The PA registration came over and above all regular work assignments, because of this a very simple form was developed in an attempt to make the registrations as manageable as possible for the staff. The form included one column for specifying the type of activity and one column for each day of the week. If a patient went swimming, this was noted in the type of activity column and the duration of the activity was noted under the correct weekday. The direct observation were performed over periods of five and four weeks in an effort to account for external events that could influence the activity at the ward. Additionally, the exercise therapist arranging twice-weekly ballgame sessions open for all patients and staff at the hospital took attendance at each session during the physical activity assessment periods. Although all staff were intended to register PA, one or two at each ward had an extra responsibility for following up the registration.

Motivation to work with promoting PA

Staff motivation towards promoting PA among their inpatients was assessed with the Multidimensional Work Motivation Scale (Gagne et al., 2015). In the current study we excluded three items assessing external regulations based on material reasons (e.g., risk losing job if I don't put enough effort in it). They were deemed improper because participants' work assignments were not directly related to promoting PA and they would neither be rewarded nor sanctioned in material ways for their efforts (or lack of) in promoting PA. The stem "At work I would put effort in promoting PA for individuals with mental disorder because" was

presented before items like "because I have fun doing it" (intrinsic motivation; three items), "because I personally consider it important to put effort in it" (identified regulation; three items), "because it makes me feel proud of myself" (introjected regulation; four items), "to get others' approval" (extrinsic regulation; three items), and "I do little because I don't think this work is worth putting effort into" (amotivation; three items). Participants responded to a 7-point Likert scale ranging from "*not at all*" through "*moderate*" to "*completely*". The internal consistency, measured by Cronbach Alpha, was above .88 for all motivational regulations.

Self-efficacy towards promoting PA among the inpatients

Staff self-efficacy for promoting PA among the inpatients was measured with four items developed specifically for this study. This is in line with Bandura (2006) arguing for the importance of developing self-efficacy measurements designed specifically for a given behaviour and population. The four items were answered on a horizontal 100 mm visual analogue scale (VAS) anchored with "absolutely unsure" and "absolutely sure". The four items were as follows: 1) I am **not** in position to influence the use of PA at my work place. 2) I have the spirit (willingness) needed to use PA as part of the treatment for individuals with SMI. 3) If I want I can manage to promote PA among individuals with SMI 4) I have the knowledge needed to use PA as part of the treatment for individuals with SMI. An exploratory factor analysis (EFA) yielded a single factor (maximum likelihood with varimax rotation; factor loadings from .32, 68, 71, and .91, and 57% explained variance). A subsequent EFA without item 1 (which had the lowest factor loading) also yielded a single factor (maximum likelihood with varimax rotation; factor loadings from .69, .69, and .78, and 68% explained variance). The removal of item 1 also increased the internal consistency, measured by Cronbach Alpha, from .67 to .76.

Weather and temperature

Data on the weather and temperature was obtained every morning before 09.00 from the weather forecast on the official webpage of the Norwegian Meteorological Institute (www.yr.no). Weather data was collected between 09.00 and 21.00 and based on the weather symbols in the hour-to-hour weather forecast. The weather symbols were given ascending numbers starting from 1 (heavy rain and thunder) to 16 (clear sky). These numbers were then averaged over the 13-hour time period to give an indication of the typical weather on that day. A similar procedure was used to calculate the average temperature in °C. Appendix 1 shows the 16 weather symbols with the explanation of the symbol used by the Norwegian Meteorological Institute.

Data analysis

Data were entered in SPSS version 24 (IBM Corp., Armonk, New York, USA) and all subsequent analyses were conducted in SPSS. Total amount of missing data in staff questionnaire at T1 and T2 was 2.5%. Little 's MCAR test on missing data showed that the data was completely missing at random at both T1 (Little's MCAR test: χ^2 (12) = 6.82, p = .869) and T2 (Little's MCAR test: χ^2 (35) = 32.20, p = .604). To obtain a complete data set an expectation maximum algorithm was performed. Normality distribution of data were tested with the Kolmogorov-Smirnov test, checking skewness and kurtosis, and visually inspecting Q-Q plots and data distribution in histograms. Skewness and kurtosis were within the range of what is suggested to be acceptable (Hair, Anderson, Tatham, & Black, 1995; Kline, 2011). However, the Kolmogorov-Smirnov test and visual inspection of data distribution indicated some deviation from a normality distribution of data. Due to this and the small sample size, all statistical tests were performed using both parametric and non-parametric procedures. Only parametric results are reported as both types of tests yielded similar results.

Results

The total number of beds for the three wards were 28, but the mean number of patients at T1, T2, and the T3 were 24.4, 22.0, and 23.9., respectively. This difference was caused due to patients being granted leave, admission and discharge of patients not necessarily occurring on the same day, and one ward did not register PA in the last two weeks at T2.

Attendance at the first, second and third (booster-session) intervention sessions were 45, 42, and 41, respectively. This means that approximately 60% of the staff with a FTE >75% were attending each intervention session.

Physical activity among the inpatients

Table 2 summarises six indicators describing the PA pattern of the patients for the three different time points. Approximately the same percentage of patients (~30%) were physically active in at least one 10 minute bout during the day at each time point, but active patients at T1 engaged in significantly longer activity bouts than patients at T2. Consequently, patients at T1 were observed to engage in significantly more PA than patients at T2. Furthermore, there were no significant differences in amount of time walking, but for patients at T2 and T3 walking constituted a significantly greater share of their overall PA time than it did for patients at T1. This tendency of patients at T1 to engage in more PA than patients from T2 and T3 is supported by at least five patients from T1 accumulating 16 attendances at the twice-weekly ballgame sessions while only one patient from T2 and T3 attended once.

A secondary aim of the study was to examine how the external factors "day of the week" and "weather" influenced the PA pattern of the patients. Figure 2a-c shows that weekdays were associated with increased PA, a greater share of patients engaging in PA, and longer duration of PA among active patients. Independent *t*-tests examining the differences between weekdays (Mon-Fri) and weekend days (Sat-Sun) (for all measurement points collapsed) yielded significant results in favour of weekdays in minutes of PA, share of active

patients, and duration of PA among active patients. Although considered a weekday, the Friday pattern of PA seemed to have more in common the weekend days rather than the other weekdays. Friday was significantly different from the other weekdays in both minutes of PA and share of active patients, and was borderline significant for duration of PA among active patients. In contrast, there was no difference between Friday and weekend days in any of the three PA indicators.

There were no significant differences between the three time points with respect to weather forecast (T1: 13.5 ± 2.2, T2: 13.3 ± 1.5, T3: 13.3 ± 1.8). However, it was significantly colder at T2 (-4.0 °C ± 4.9) compared to T1 [14.5 °C ± 3.5; t (68) = 18.23, p > 0.001] and T3 [16.1 °C ± 3.1; t (61) = 18.88, p > 0.001]. The temperature difference between T1 and T3 was borderline significant [t (61) = 1.83, p < 0.072].

There were positive significant associations between the weather forecast and PA, percentage of patients being active, and duration of PA among active patients. Similarly, temperature was positively associated with PA and duration of PA among active patients, while unrelated to percentage of patients being active. All associations using data from weekdays only (Mon-Fri) were stronger than associations using the entire week (Mon-Sun). For exact values, see Table 4.

Staffs motivation and self-efficacy for promoting physical activity

In total, 47 of the staff responded to the questionnaire at either T1 (n = 37), T2 (n = 23) or both (n = 13). One of the wards did not distribute the questionnaire at T2 to the staff due to a misunderstanding. The majority of the respondents were female (n =34) and approximately half were 50 years or older (n = 23) or between 31 – 49 years old (n = 21). Only three of the participants were 30 years old or younger. The most typical occupation was nurse (n = 21) while auxiliary nurse (n = 5), milieu therapist (n = 5) and administrative position were next (n = 4). Thirty-two of the participants were working full time. At T1, there was no significant

association between demographic and occupational variables and motivational variables. Drop-out from T1 to T2 was not significantly associated with any of the variables measured in the study except percentage of FTE. Participants responding at both times had a higher FTE (99.2% ± 2.8%) than those responding only at T1 [90.7% ± 11.9%; t (24.7) = 3.21, p = 0.004].

As can be seen in Table 5, staff were clearly more motivated to promote PA among patients for autonomous reasons (intrinsic and identified regulations) than controlled reasons (introjected and external reasons). Amotivated reasons seemed to contribute little. Their self-efficacy towards promoting PA was relatively high. Self-efficacy was positively associated with intrinsic motivation (r = .55), identified regulation (r = .47), and external regulation (r = .41). Details on associations can be obtained from the first author. There were no significant changes from T1 to T2 in neither motivational regulations nor self-efficacy (see Table 5). This applied for both the 13 participants that responded at both time points (paired samples t-test) and for comparing participants responding at T2 (n=23) with the T1 responses to the remaining participants (n=24) (independent samples t-test). The last approach involved using only the T2 scores of the 13 participants responding at both T1 and T2.

Discussion

The results from the current feasibility study suggests that offering staff at psychiatric wards a 7-hour educational intervention on "how to enhance PA motivation among patients with SMI" is not sufficient in order to produce a meaningful change in PA pattern among patients. Likewise, the intervention seemed to have little influence on staff motivation and self-efficacy for promoting PA among patients. However, there are several aspects and experiences deriving from this feasibility study that future intervention studies can take advantage of.

First, using direct observation of patient PA over as much as five consecutive weeks entailed both advantages and disadvantages. One unexpected aspect was that staff several times during the intervention emphasised that observing and registering patient PA at baseline

increased their awareness regarding patient PA level and encouraged them to promote PA among patients. This unintended effect may have inflated the baseline measurement. Next, in accordance to advice from the hospital it was decided to assess PA over a prolonged period to account for events within the ward and variability of illness that could influence the PA pattern of the patients. In deciding the length of this period, it was necessary to find a balance between a long enough assessment period to obtain a trustworthy picture of the PA pattern and a short enough period for not tiring the staff with a registration task coming in addition to their regular work assignments. Indeed, staff anecdotally reported time-constraints, shortage of staff, fluctuation in illness symptoms among other patients, and external events like reorganization of the hospital to undermine the opportunities to facilitate physical activity. This anecdotal feedback is consonant with qualitative findings on the views held by among mental health on physical activity (Happell et al., 2012). The value of a prolonged assessment period was highlighted by allowing establishing that PA was associated with both weather and weekday. In extension of this, future studies involving inpatients, especially at locked wards, should consider assessing PA over time because of the multitude of external factors (often beyond patient's control) influencing PA behaviour.

The PA registration in itself contributed with valuable knowledge on the PA pattern of hospitalised individuals with SMI. First, it is striking that approximately 70% of the patients were doing less than one 10 min bout of activity each day on all three time points. This illustrates that there is certainly room for improvement when it comes to promotion of PA among inpatients at psychiatric wards. Next, patients engaged in significantly less PA in the weekends compared to the weekdays. This is the opposite pattern of what that is found among overweight and obese individuals without SMI (Young, Jerome, Chen, Laferriere, & Vollmer, 2009). A potential explanation for this is that the staff per patient ratio is lower in the weekend and this may reduce staff's opportunities to engage patients in PA. However, the

staff per patient ratio cannot explain why patients are less active on Fridays compared with the other weekdays (Mon-Thu). In line with previous research (Carpiniello, Primavera, Pilu, Vaccargiu, & Pinna, 2013; Daumit et al., 2005), walking constituted the majority of PA conducted by the patients. Finally, although there is an increasing body of knowledge on the PA level and pattern among individuals with SMI, very few studies have examined this in inpatients only (Stubbs et al., 2016). Thus, this study make an important contribution in describing the PA pattern of inpatients with SMI.

As with patient PA level, the intervention seemed unable to influence staff motivation and self-efficacy for promoting PA among patients. There can be several reasons for this. First, the intervention was primarily directed at enhancing staff's competence for motivating their patients to engage in PA rather than changing the staff's own motivation for doing this. Next, it might also be optimistic to expect that seven hours of educational intervention would greatly influence the motivation of the staff to carry out a work assignment that is not actually part of their job description while at the same time nothing else nothing in their work context changed (Torrey et al., 2001). On the other hand, it would be more realistic to expect an increase in staff self-efficacy if the intervention was successful. This is because self-efficacy encompasses an individuals' judgements about their capability of mastering a specific task or behaviour in a specific context (Bandura, 1997). Indeed, if the intervention was successful in enhancing staff competence for motivating patients it would be reasonable that staff self-efficacy reflected this. However, the lack of change in self-efficacy should be interpreted in in light of the small proportion answering the questionnaire at both times compared to the proportion attending the intervention sessions.

Limitations

There are several limitation in the present feasibility study that should be recognized. First, the proportion of staff participating in the educational intervention was about 60%. This

participation rate was a compromise between the wards sending as many staff as possible to the interventions sessions without going on expense of patient care. It can be challenging to reach all, or nearly all, of the staff at psychiatric wards due to shift work and many not holding full time positions, and use of short- and long-term substitute staff. Although the data from the staff questionnaire indicate little or no change in staff motivation and self-efficacy the low response rate impedes the opportunity to make strong inferences. The design of the pilot study where the intervention was at staff level, the main outcome was at patient level, and patients' being admitted and discharged throughout the study period entailed that it was not possible to examine intra-individual in PA between the three time points. Thus, we only examined inter-individual PA difference in patients' pre- and post-intervention. As reflected by staff often discussing that groups of patients being admitted at different times varied greatly in their motivation, preferences, and engagement towards PA the inter-individual approach runs the danger of comparing "apples with oranges". However, pooling PA data collected over several weeks from three wards would hopefully to some degree mitigate this problem. Lastly, the reliability and validity of the direct observation of PA was not assessed. In that regard, patient PA level could be underestimated or overestimated if staff missed out or registered too much PA, respectively.

Future directions

Although this feasibility study seemed unable to influence patient PA, there are still strong arguments for developing future interventions that could successfully accomplish this. Future studies could benefit from using a more comprehensive approach in which at least three additional components should be considered. First, instead of offering the same intervention package to the entire staff one could design split the intervention in two. One basic package for all staff to ensure a common understanding regarding PA promotion and a more comprehensive package for a group of individuals with inclined interest for PA. The latter

group would then later have an extended responsibility of promoting and carrying out PA with the patients. The intervention content could also benefit from including more practical tasks and practice sessions rather than just theoretical education and discussions. The second component is related to the organisational structure at the wards. It is of little use to have a well-equipped toolbox for promoting PA if the organisational structure does not allow to use it. However, it is understandable that promoting and engaging patients in PA is down prioritised in a busy work schedule if it is not part of the designated work assignments. Thus, one could consider incorporating PA in the work assignments among some selected staff members. The third and final component could be to intervene at both staff level and patient level. Two recent theory based trials have shown promising results regarding increased PA among inpatients after a motivational intervention (Gohner, Dietsche, & Fuchs, 2015; Sailer et al., 2015).

Conclusion

This feasibility study indicate that conducting a short educational intervention among staff working at psychiatric wards seemed to be insufficient in order to increase PA among inpatients with SMI. This suggests that more comprehensive interventions is needed to reduce the alarming high proportion (~70%) of inpatients being inactive each day.

References

Aadahl, M., Kjaer, M., & Jorgensen, T. (2007). Influence of time spent on TV viewing and vigorous intensity physical activity on cardiovascular biomarkers. The Inter 99 study. *European Journal of Cardiovascular Prevention and Rehabilitation, 14*, 660-665.

Adams, J., & White, M. (2005). Why don't stage-based activity promotion interventions work? *Health Education Research, 20*, 237-243.

Allison, D. B., Newcomer, J. W., Dunn, A. L., Blumenthal, J. A., Fabricatore, A. N., Daumit, G. L., . . . Alpert, J. E. (2009). Obesity among those with mental disorders: a National Institute of Mental Health meeting report. *American Journal of Preventive Medicine, 36*, 341-350.

Bandura, A. (1997). *Self-Efficacy: The exercise of control*. New York: Freeman.

Bandura, A. (2006). Guide for constructing self-efficacy scales. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307-337). Greenwich, CT: Information Age Pubishing.

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J., Martin, B. W., & Lancet Physical Activity Series Working, G. (2012). Correlates of physical activity: why are some people physically active and others not? *Lancet, 380*, 258-271.

Beebe, L. H. (2008). Obesity in schizophrenia: Screening, monitoring, and health promotion. *Perspectives in Psychiatric Care, 44*, 25-31.

Biddle, S. J. H., Fox, K. R., & Boutcher, S. H. (2000). *Physical Activity and Psychological Well-Being*. London: Routledge.

Biswas, A., Oh, P. I., Faulkner, G. E., Bajaj, R. R., Silver, M. A., Mitchell, M. S., & Alter, D. A. (2015). Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults: a systematic review and meta-analysis. *Annals of Internal Medicine, 162*, 123-132.

Burton, C., McKinstry, B., Szentagotai Tatar, A., Serrano-Blanco, A., Pagliari, C., & Wolters, M. (2013). Activity monitoring in patients with depression: a systematic review. *Journal of Affective Disorders, 145*, 21-28.

Carpiniello, B., Primavera, D., Pilu, A., Vaccargiu, N., & Pinna, F. (2013). Physical activity and mental disorders: a case-control study on attitudes, preferences and perceived barriers in Italy. *Journal of Mental Health, 22*, 492-500.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical Fitness: Definitions and distinctions for health-related research. *Public Health Reports, 100*, 126-131.

Daumit, G. L., Goldberg, R. W., Anthony, C., Dickerson, F., Brown, C. H., Kreyenbuhl, J., . . . Dixon, L. B. (2005). Physical activity patterns in adults with severe mental illness. *Journal of Nervous and Mental Disease, 193*, 641-646.

Dauwan, M., Begemann, M. J., Heringa, S. M., & Sommer, I. E. (2016). Exercise improves clinical symptoms, quality of life, global functioning, and depression in xchizophrenia: A systematic review and meta-analysis. *Schizophrenia Bulletin, 42*, 588-599.

De Hert, M., Correll, C. U., Bobes, J., Cetkovich-Bakmas, M., Cohen, D., Asai, I., . . . Leucht, S. (2011). Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. *World Psychiatry, 10*, 52-77.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227-268.

Farholm, A., & Sørensen, M. (2016a). Motivation for physical activity and exercise in severe mental illness: A systematic review of cross-sectional studies. *International Journal of Mental Health Nursing, 25*, 116-126.

Farholm, A., & Sørensen, M. (2016b). Motivation for physical activity and exercise in severe mental illness: A systematic review of intervention studies. *International Journal of Mental Health Nursing, 25*, 194-205.

Fraser, S. J., Chapman, J. J., Brown, W. J., Whiteford, H. A., & Burton, N. W. (2015). Physical activity attitudes and preferences among inpatient adults with mental illness. *International Journal of Mental Health Nursing, 24*, 413-420.

Gagne, M., Forest, J., Vansteenkiste, M., Crevier-Braud, L., van den Broeck, A., Aspeli, A. K., . . . Westbye, C. (2015). The Multidimensional Work Motivation Scale: Validation evidence in seven languages and nine countries. *European Journal of Work and Organizational Psychology, 24*, 178-196.

Gohner, W., Dietsche, C., & Fuchs, R. (2015). Increasing physical activity in patients with mental illness - A randomized controlled trial. *Patient Education and Counseling, 98*, 1385-1392.

Gorczynski, P., & Faulkner, G. (2010). Exercise therapy for schizophrenia. *Cochrane Database of Systematic Reviews*.

Hair, J. E., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data analysis with readings*. Englewood Cliffs, New Jersey: Prentice-Hall.

Happell, B., Scott, D., Platania-Phung, C., & Nankivell, J. (2012). Nurses' views on physical activity for people with serious mental illness. *Mental Health and Physical Activity, 5*, 4-12.

Janis, I. L., & Mann, L. (1977). *A psychological analysis of conflict choice and commitment*. New York: Collier Macmillan.

Johnstone, R., Nicol, K., Donaghy, M., & Lawrie, S. (2009). Barriers to uptake of physical activity in community-based patients with schizophrenia. *Journal of Mental Health, 18*, 523-532.

Kline, R. B. (2011). *Principles and practices of structural equation modeling* (2nd edition ed.). New York: The Guilford Press.

Kvam, S., Kleppe, C. L., Nordhus, I. H., & Hovland, A. (2016). Exercise as a treatment for depression: A meta-analysis. *Journal of Affective Disorders, 202*, 67-86.

Liu, N. H., & Spaulding, W. D. (2010). Pilot study of a health-focused day program on improving health behaviors, clinical functioning, and perceived wellness in individuals with severe mental illness. *Psychological Services, 7*, 233-241.

Marcus, B. H., Rakowski, W., & Rossi, J. S. (1992). Assessing motivational readiness and decision-making for exercise. *Health Psychology, 11*, 257-261.

Marcus, B. H., & Simkin, L. R. (1994). The transtheoretical model: Applications to exercise behavior. *Medicine and Science in Sports and Exercise, 26*, 1400-1404.

Marshall, S. J., & Biddle, S. J. (2001). The transtheoretical model of behavior change: A meta-analysis of applications to physical activity and exercise. *Annals of Behavioral Medicine, 23*, 229-246.

Melo, M. C., Daher Ede, F., Albuquerque, S. G., & de Bruin, V. M. (2016). Exercise in bipolar patients: A systematic review. *Journal of Affective Disorders, 198*, 32-38.

Miller, W. R., & Rollnick, S. (2002). *Motivational Interviewing: Preparing people for change* (2nd ed. ed.). New York, NY: Guilford Press.

Mullan, E., & Markland, D. (1997). Variations in self-determination across the stages of change for exercise in adults. *Motivation and Emotion, 21*, 349-362.

Naci, H., & Ioannidis, J. P. (2013). Comparative effectiveness of exercise and drug interventions on mortality outcomes: metaepidemiological study. *BMJ, 347*, f5577.

Ng, J. Y. Y., Ntoumanis, N., Thogersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-determination theory applied to health contexts: A meta-analysis. *Perspectives on Psychological Science, 7*, 325-340.

Nordentoft, M., Wahlbeck, K., Hallgren, J., Westman, J., Osby, U., Alinaghizadeh, H., . . . Laursen, T. M. (2013). Excess mortality, causes of death and life expectancy in 270,770 patients with recent onset of mental disorders in Denmark, Finland and Sweden. *Plos One, 8*, e55176.

Nyboe, L., & Lund, H. (2013). Low levels of physical activity in patients with severe mental illness. *Nordic Journal of Psychiatry, 67*, 43-46.

Painter, J. E., Borba, C. P. C., Hynes, M., Mays, D., & Glanz, K. (2008). The use of theory in health behavior research from 2000 to 2005: A systematic review. *Annals of Behavioral Medicine, 35*, 358-362.

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*, 390-395.

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*, 38-48.

Rosenbaum, S., Tiedemann, A., Sherrington, C., Curtis, J., & Ward, P. B. (2014). Physical activity interventions for people with mental illness: A systematic review and meta-analysis. *Journal of Clinical Psychiatry, 75*, 964-974.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68-78.

Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination: An organismic dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3-33). Rochester, NY: University of Rochester Press.

Sailer, P., Wieber, F., Propster, K., Stoewer, S., Nischk, D., Volk, F., & Odenwald, M. (2015). A brief intervention to improve exercising in patients with schizophrenia: A controlled pilot study with mental contrasting and implementation intentions (MCII). *BMC Psychiatry, 15*, 211.

Soundy, A., Freeman, P., Stubbs, B., Probst, M., Coffee, P., & Vancampfort, D. (2014a). The transcending benefits of physical activity for individuals with schizophrenia: A systematic review and meta-ethnography. *Psychiatry Research, 220*, 11-19.

Soundy, A., Stubbs, B., Probst, M., Hemmings, L., & Vancampfort, D. (2014b). Barriers to and facilitators of physical activity among persons with schizophrenia: A survey of physical therapists. *Psychiatric Services, 65*, 693-696.

Stenersen, M. H. (2016). *Ansatte sitt forhold til bruk av fysisk aktivitet som del av behandlingen i psykisk helsevern [Mental health care practitioners perceptions towards using physical activity as part of treatment in mental health care]*. (MSc), Norwegian School of Sports Sciences, Oslo.

Stubbs, B., Firth, J., Berry, A., Schuch, F. B., Rosenbaum, S., Gaughran, F., . . . Vancampfort, D. (2016). How much physical activity do people with schizophrenia engage in? A systematic review, comparative meta-analysis and meta-regression. *Schizophrenia Research*, 431-440.

Teixeira, P. J., Carraca, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 78

Torrey, W. C., Drake, R. E., Dixon, L., Burns, B. J., Flynn, L., Rush, A. J., . . . Klatzker, D. (2001). Implementing evidence-based practices for persons with severe mental illnesses. *Psychiatric Services, 52*, 45-50.

Vancampfort, D., Correll, C. U., Probst, M., Sienaert, P., Wyckaert, S., De Herdt, A., . . . De Hert, M. (2013a). A review of physical activity correlates in patients with bipolar disorder. *Journal of Affective Disorders, 145*, 285-291.

Vancampfort, D., Vansteelandt, K., Correll, C. U., Mitchell, A. J., De Herdt, A., Sienaert, P., . . . De Hert, M. (2013b). Metabolic syndrome and metabolic abnormalities in bipolar disorder: a meta-analysis of prevalence rates and moderators. *American Journal of Psychiatry, 170*, 265-274.

Vancampfort, D., Correll, C. U., Wampers, M., Sienaert, P., Mitchell, A. J., De Herdt, A., . . . De Hert, M. (2014). Metabolic syndrome and metabolic abnormalities in patients with major depressive disorder: a meta-analysis of prevalences and moderating variables. *Psychological Medicine, 44*, 2017-2028.

Vancampfort, D., Stubbs, B., Venigalla, S. K., & Probst, M. (2015). Adopting and maintaining physical activity behaviours in people with severe mental illness: The importance of autonomous motivation. *Preventive Medicine, 81*, 216-220.

Vancampfort, D., Correll, C. U., Galling, B., Probst, M., De Hert, M., Ward, P. B., . . . Stubbs, B. (2016a). Diabetes mellitus in people with schizophrenia, bipolar disorder and major depressive disorder: A systematic review and large scale meta-analysis. *World Psychiatry, 15*, 166-174.

Vancampfort, D., Rosenbaum, S., Probst, M., Connaughton, J., du Plessis, C., Yamamoto, T., & Stubbs, B. (2016b). What are the top 10 physical activity research questions in schizophrenia? *Disability and Rehabilitation, 38*, 2235-2243.

Vancampfort, D., Rosenbaum, S., Probst, M., Connaughton, J., du Plessis, C., Yamamoto, T., & Stubbs, B. (2016c). Top 10 research questions to promote physical activity in bipolar disorders: A consensus statement from the International Organization of Physical Therapists in Mental Health. *Journal of Affective Disorders, 195*, 82-87.

Verhaeghe, N., De Maeseneer, J., Maes, L., Van Heeringen, C., & Annemans, L. (2013). Health promotion in mental health care: Perceptions from patients and mental health nurses. *Journal of Clinical Nursing, 22*, 1569-1578.

Wahlbeck, K., Westman, J., Nordentoft, M., Gissler, M., & Laursen, T. M. (2011). Outcomes of Nordic mental health systems: life expectancy of patients with mental disorders. *British Journal of Psychiatry, 199*, 453-458.

Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal, 174*, 801-809.

Wilmot, E. G., Edwardson, C. L., Achana, F. A., Davies, M. J., Gorely, T., Gray, L. J., . . . Biddle, S. J. (2012). Sedentary time in adults and the association with diabetes, cardiovascular disease and death: Systematic review and meta-analysis. *Diabetologia, 55*, 2895-2905.

World Health Organization. (2009). *Global health risks: mortality and burden of disease attributeable to selected major risks*. Geneva: World Health Organizatoin.

Young, D. R., Jerome, G. J., Chen, C., Laferriere, D., & Vollmer, W. M. (2009). Patterns of physical activity among overweight and obese adults. *Preventing Chronic Disease, 6*, A90.

Table 1. Selection of motivational strategies from each stage

Pre-contemplation stage
Main aim: To evoke interest and curiosity towards PA so that patients at least would consider PA
1. Passing knowledge on PA to the patients
- PA is more than typical exercise as running, aerobics, and weight-training, it can also be gardening, snow shovelling, and walking
2. Bringing PA into the ward agenda
- Asking about experiences with PA, both recent and older experiences.
3. Talking about benefits of PA
- Try to personalise potential benefits
4. Helping patients to be aware of how other people relates to PA
- How would other people react if you started with PA
Contemplation stage
Main aim: To help patients decide on trying PA
1. Information on how to introduce PA
- Emphasise that a little activity is better than nothing
2. Identify and write down pros and cons related to PA
- Help finding pros and work on how to overcome barriers
3. Increasing self-efficacy
- Increasing a patients self-efficacy towards PA by using social role models (e.g., other patients being in a similar situation who have succeeded)
4. Establishing social support for being physically active
- Help patients be aware of which individuals that have positive or negative influence towards their potential PA participation

Preparation stage

Main aim: To increase regularity of PA behaviour

1. Strengthening an identity as a physically active person

- To talk about the activity before and after it is performed and encourage patients to tell other people of the activities

2. Actively using SMART goals

- Help patients to set a Specific, Measureable, Attainable, Relevant, and Time-bound (SMART) goals

3. Increasing self-efficacy

- Emphasise effort, practice, and participation rather than performance and skill

4. Feedback on PA

- Give feedback where you use the person as a reference rather than peers

Action and Maintenance stage

Main aim: To help patients maintain being physically active due to more internal reasons

1. Supporting the need for autonomy

- Giving patients relevant and meaningful choices that they feel competent to take

2. Supporting the need for competence

- Provide patients with a structured and predictable PA environment

3. Supporting the need for relatedness

- Taking part in the activities themselves

Table 2. PA among the inpatients at baseline, post-intervention, and follow-up

	T1	T2	T3	T1→T2	T1→T3	T2→T3
	Mean ± SD	Mean ± SD	Mean ± SD	*T*	*T*	*T*
PA	21.0 ± 13.1	14.5 ± 8.8	17.2 ± 13.8	**2.44***	1.10	0.97
Share active†	0.34 ± 0.13	0.31 ± 0.13	0.31 ± 0.18	0.94	0.84	0.07
Bouts / active patient	1.33 ± 0.27	1.30 ± 0.28	1.21 ± 0.22	0.46	1.79	1.28
Walking	7.5 ± 6.6	8.3 ± 6.7	10.2 ± 8.3	0.50	1.40	0.97
Share walking	0.36 ± 0.24	0.60 ± 0.25	0.65 ± 0.23	**3.97*****	**4.79*****	0.90
Duration‡	57.8 ± 19.6	42.6 ± 20.0	49.0 ± 21.0	**3.21****	1.72	1.22

†Percentage of patients doing at least one 10 min bout of PA; ‡PA duration among active patients; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 3. Differences in PA indicators across days of the week

	Mon-Fri (1)	Mon-Thu (2)	Fri (3)	Sat-Sun (4)	1 vs 4	2 vs 3	3 vs 4
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	*T*	*T*	*T*
PA	21.0 ± 12.6	23.2 ± 12.4	12.0 ± 9.2	9.0 ± 4.5	6.92***	3.19**	1.13
Share active†	0.36 ± 0.14	0.39 ± 0.13	0.23 ± 0.13	0.21 ± 0.09	6.06***	4.29***	0.43
Duration‡	54.4 ± 21.7	56.6 ± 20.6	45.2 ± 24.3	38.7 ±13.8	4.25***	1.80	1.11

†Percentage of patients doing at least one 10 min bout of PA; ‡PA duration among active patients;** $p < 0.01$; *** $p < 0.001$

Table 4. Pearson correlation between PA indicators and weather / temperature

	Weather		Temperature	
	Mon-Sun	Mon-Fri	Mon-Sun	Mon-Fri
PA	.24*	.33*	.21*	.28*
Share active†	.23*	.32*	.09	.11
Duration‡	.22*	.30*	.24*	.29*

†Percentage of patients doing at least one 10 min bout of PA; ‡PA duration among active patients; * $p < 0.05$

Table 5. Staff motivation and self-efficacy for promoting PA in patients

	T1 (*n*=37)	T1 (*n*=13)	T2 (*n*=23)	T2 (*n*=13)	T1→T2	T1→T2
	M ± SD	M ± SD	M ± SD	M ± SD	Δ(*n*=13†)	Δ(*n*=47‡)
Intrinsic	5.26 ± 0.99	5.46 ± 1.08	5.20 ± 0.90	5.46 ± 1.00	-0.02	0.20
Identified	5.08 ± 1.09	5.38 ± 1.03	4.87 ± 1.14	5.05 ± 1.07	1.54	-0.15
Introjected	3.34 ± 1.35	3.65 ± 1.72	3.35 ± 1.41	3.54 ± 1.62	0.33	0.51
External	2.61 ± 1.48	3.00 ± 1.70	2.96 ± 1.35	2.85 ± 1.35	0.44	1.42
Amotivation	1.75 ± 1.19	1.61 ± 1.13	1.72 ± 1.26	1.51 ± 1.15	0.47	-0.25
Self-efficacy	7.09 ± 1.67	7.06 ± 1.38	7.01 ± 2.04	6.99 ± 1.78	0.10	-0.15

†paired samples *t*-tests with participants responding at both T1 and T2, ‡independent *t*-tests comparing participants responding at T2 (*n*=23) with the T1 responses to the remaining participants (*n*=24).

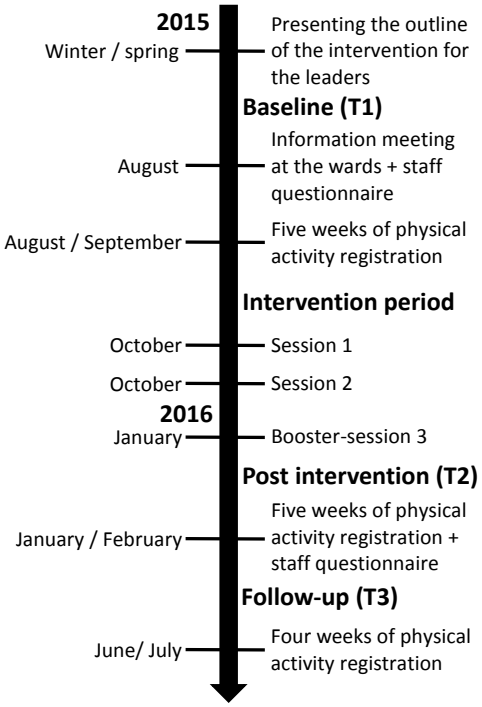


Figure 1. Timeline over the study

Fig 2a MEAN MIN OF PHYSICAL ACTIVITY

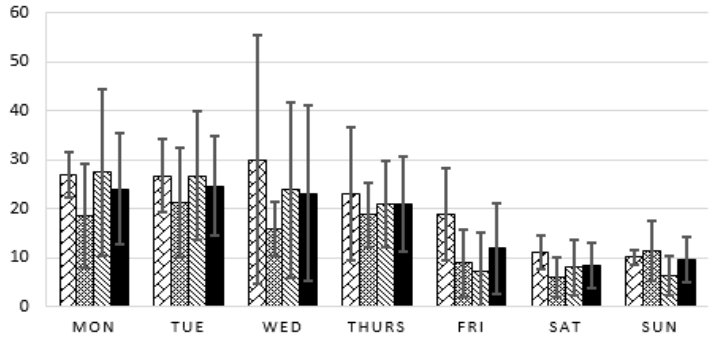


Fig 2b SHARE OF PATIENTS IN PHYSICAL ACTIVITY

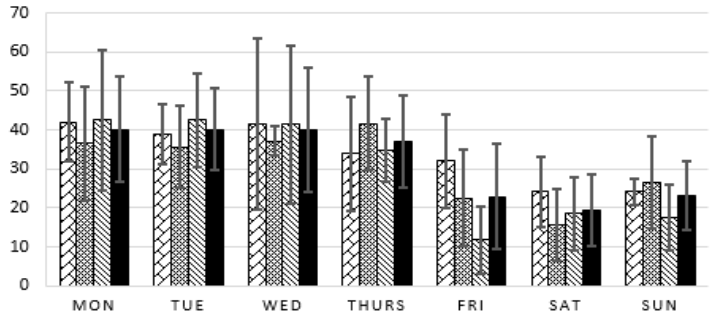


Fig 2c DURATION OF PHYSICAL ACTIVITY IN ACTIVE PATIENTS

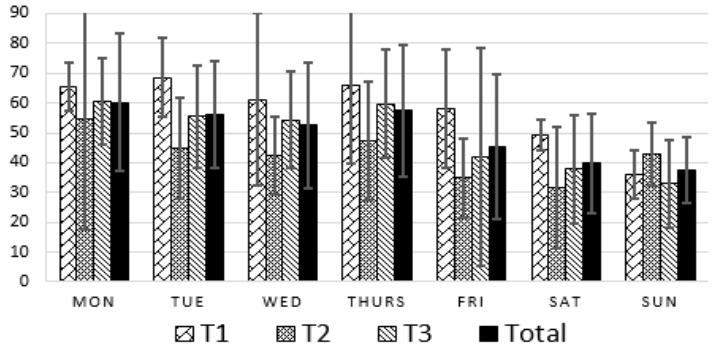
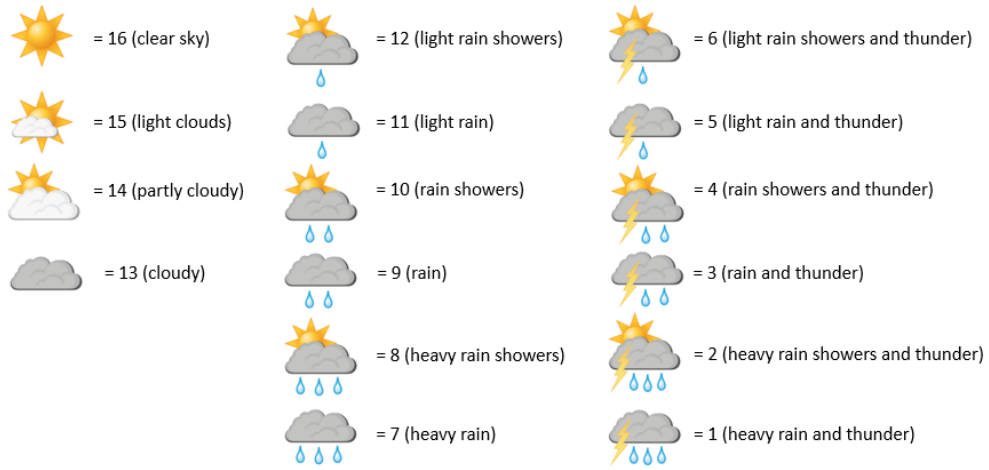


Figure 2a-c. The average min of PA conducted by patients, percentage of patients doing at least one 10 min bout of PA, and duration of PA among active patients

Appendix 1.

Scoring system for weather forecast



APPENDIX A

Overview of effect sizes, confidence intervals, number of studies and participants, and heterogeneity in meta-analyses referenced on pages 11-14

Overview of effect sizes, confidence intervals, number of studies and participants, and heterogeneity in meta-analyses referenced on pages 11-12

Study name	Analysis	Outcome	*k*	*n*	Effect size	95% CI	I^2 (%)	Comment
Rethorst et al, 2009	Main	Depression	58	2982	**-0.80**	-0.92, -0.67	84%	Exercise VS control
	Moderator	Depression	17	574	**-1.03**			Clinically depressed participants
	Moderator	Depression	40	2408	**-0.59**			Non-clinical participants
Krogh et al, 2011	Main	Depression	13	687	**-0.40**	-0.66, -0.14	57%	Exercise VS control
	Sensitivity	Depression	4	243	-0.47	-1.13, 0.18	79%	Recruited from clinical settings
	Sensitivity	Depression	3	239	-0.19	-0.70, 0.31	68%	Only trials with robust methodology
	Sensitivity	Depression	5	338	-0.01	-0.28, 0.26	23%	Only trials with long term follow-up
Cooney et al, 2013	Main	Depression	35	1356	**-0.61**	-0.81, -0.42	63%	Exercise VS no treatment or control
	Sensitivity	Depression	6	464	-0.18	-0.47, 0.11		Only trials with robust methodology
	Sensitivity	Depression	8	377	**-0.33**	-063, -0.03	49%	Only trials with long term follow-up
	Sensitivity	Depression	7	189	-0.03	-0.31, 0.26	none	Exercise VS psychological treatment
	Sensitivity	Depression	4	300	-0.11	-0.34, 0.12	none	Exercise VS pharmacological treatment
Josefsson et al, 2014	Main	Depression	13	721	**-0.77**	-1.14, -0.41	78%	Exercise VS control
	Sensitivity	Depression	2	106	-0.43	-1.07, 0.21	54%	Only trials with robust methodology
	Sensitivity	Depression	11	368	**-0.97**	-1.40, -0.54	72%	Exercise VS no treatment or placebo
Kvam et al. 2016	Main	Depression	23	977	**-0.68**	-0.92, -0.44	68%	Exercise VS control
	Sensitivity	Depression	7	348	-.022	-0.53, 0.09	47%	Only trials with long term follow-up
	Sensitivity	Depression	6	461	-0.26	-0.61, 0.08	69%	Only trials with robust methodology
	Sensitivity	Depression	4	77	**-1.24**	-1.83, -0.65	33%	Exercise VS no intervention
	Sensitivity	Depression	4	180	**-0.48**	-0.80, -0.16	16%	Exercise VS usual care
	Sensitivity	Depression	3	79	-0.22	-0.65, 0.21	0%	Exercise VS psychological treatment
	Sensitivity	Depression	3	236	-0.08	-0.33, 0.18	0%	Exercise VS pharmacological treatment
Schuch et al, 2016a	Main	Depression	25	1487	**-0.98**	-1.28, -0.68	82%	Exercise VS control
	Sensitivity	Depression	9	384	**-1.14**	-1.81, -0.46	89%	Major depression only
	Sensitivity	Depression	14	1034	**-0.80**	-1.11, -0.49	68%	Depressive symptoms
	Sensitivity	Depression	4	821	**-0.88**	-1.54, -0.22	90%	Only trials with robust methodology
Stubbs et al., 2016c	Main	Depression	41	1122	**-0.92**	-1.11, -0.73	93%	Control group response in exercise RCTs
	Sensitivity	Depression	11		**-1.43**	-1.77, -1.09	81%	Only trials with robust methodology
	Sensitivity	Depression	18	464	**-1.25**	-1.59, -0.91	94%	Major depression only
Schuch et al, 2016b	Main	Quality of life	5	175	**0.53**	0.22, 0.84	0%	Physical health related quality of life
	Main	Quality of life	5	175	**0.54**	0.22, 0.86	5%	Mental health related quality of life

Overview of effect sizes, confidence intervals, number of studies and participants, and heterogeneity in meta-analyses referenced on pages 13-14

Study name	Analysis	Outcome	*k*	*n*	Effect size	95%CI	I^2 (%)	Comment
Firth et al. 2015	Main	Clinical symptoms	8	357	-0.16	-0.51, 0.18	54%	Only RCTs
	Sensitivity	Positive symptoms	4	97	**-0.54**	-0.95, -0.13	0%	Only trials with mod/vig. intensity
	Sensitivity	Negative symptoms	5	140	**-0.44**	-0.78, -0.09	0%	Only trials with mod/vig. intensity
Dauwan et al, 2016	Main	Positive symptoms	15	641	**-0.32**	-0.14, -0.50	50%	Mixed design
	Main	Negative symptoms	17	750	**-0.49**	-0.33, -0.66	47%	Mixed design
	Main	Depression	6	277	**-0.64**	-0.27, -1.02	70%	Mixed design
	Main	Global functioning	5	276	**-0.32**	-0.11, -0.53	0%	Mixed design
	Main	Quality of life	10	259	**0.47**	0.30, 0.64	29%	Mixed design
Firth et al, 2016	Main	Global cognition	10	385	**0.33**	0.13, 0.53	0%	Controlled trials / RCTs
	Sensitivity	Global cognition	7	297	**0.41**	0.19, 0.64	0%	Only RCTs

APPENDIX B

Paper I

Supplementary information

Supplementary information

Supplementary Table 1

Design and publication year of published studies fulfilling criteria 1 – 4.

Supplementary Table 2

Studies that describe use of some motivational aspect in their intervention without reporting any empirical data on motivation.

Supplementary Table 3

Studies that incorporate a motivational theory as a background for their intervention without reporting any empirical data on motivation.

Supplementary Table 4.

Overview of theoretical framework and constructs used across design

Supplementary Table 5.

Overview of motivational techniques used in intervention studies not reporting any empirical data or motivational theory

References of studies included in Supplementary Table 2 and Supplementary Table 3

Supplementary Table 1.

Design and publication year of published studies fulfilling criteria 1 – 4

Year	PP exercise	PPC exercise	RCT exercise	PP multimodal	PPC multimodal	RCT multimodal	**Total**
←1979	-	6	1	-	-	-	**7**
1980s	4	2	4	-	-	1	**11**
1990-94	3	1	2	-	-	-	**6**
1995-99	-	-	2	-	-	-	**2**
2000	-	1	1	-	-	-	**2**
2001	1	-	2	-	1	-	**4**
2002	-	-	-	-	-	-	**0**
2003	1	1	-	2	2	-	**6**
2004	-	1	2	1	1	-	**5**
2005	2	1	4	4	-	1	**12**
2006	1	1	-	1	1	5	**9**
2007	1	3	5	1	-	1	**11**
2008	1	1	4	3	2	1	**12**
2009	1	1	4	5	1	1	**13**
2010	2	5	3	4	3	3	**20**
2011	3	3	11	5	-	2	**24**
2012	-	3	10	1	1	2	**17**
2013	4	4	13	-	2	7	**30**
2014	1	5	12	4	-	3	**25**
2015*	-	-	1	-	-	1	**2**
Total	**25**	**39**	**81**	**31**	**14**	**28**	**218**

Note: PP = pre-post design; PPC = pre-post design multiple groups; RCT = randomized controlled trial; * literature search conducted in February 2015.

Supplementary Table 2.

Studies that describe use of some motivational aspect in their intervention without reporting any empirical data on motivation

Author	**Design**	**Motivational technique used**
Abdel-Baki et al., (2013)	PP Ex	Non structured motivational prompts, reports lack of motivation to be one of the reasons for dropping out of exercise-program
Álvarez-Jimenéz et al., (2006; 2010)	RCT MM	Motivational counseling techniques; goal-setting; activity scheduling; coping strategies. Second paper is 2-years follow-up results.
Archie et al., (2003)	PP Ex.	No motivational technique used, but reports lack of motivation to be main reason for dropping out of exercise-program
Attux et al., (2013)	RCT MM - edu	One session for self-esteem and motivation
Baker et al., (2009)	PP MM	Motivational interviewing, decisional balance, goal-setting, rewards for achievement,
Baker et al., (2014)	PP MM	Goal-setting, motivational interviewing, contingency management
Bartels et al., (2013)	RCT MM	Used goal-setting, health-mentors trained in motivational interviewing,
Battaglia et al., (2013)	RCT Ex.	Inclusion criteria was motivation to play soccer
Bombardier et al., (2013)	RCT Ex – edu	MI-counseling, goal-setting,
Brown & Chan (2006)	RCT MM - edu	Using techniques like motivational interviewing
Brown & Smith (2009)	RCT MM - edu	Using techniques like motivational interviewing
Brown et al., (2006)	PPC MM	Goal setting, and social and instrumental support
Brown et al., (2011; 2014)	RCT MM	Social and instrumental support, and goal-setting

Busch et al., (2013)	RCT MM	Same intervention as Pagoto et al., 2013
Chastain et al., 1987	PP Ex.	Varied levels of motivation, from expressed eagerness to marked resistance. Some patients needed firm encouragement and support to attend sessions due to compromised energy and motivation. Maintaining high staff energy and morale was a serious challenge.
Chen et al., (2009)	PP MM	Motivational counseling techniques were utilized.
Craft et al., (2007)	RCT Ex.	Goal-setting, bi-weekly brief supportive follow-up by telephone to encourage continued exercise participation (social support)
Danielsson et al., (2014)	RCT Ex.	Participants reported they needed scheduling appointments and "someone to be expecting them" to overcome lack of motivation
De Groot et al., (2012)	PP MM	Exercise goals, weekly contacts and personalized instruction (social support), to facilitate adherence to exercise goals a toolbox with adherence strategies. Inspired by The Diabetes Prevention Program[1]
Forsberg et al., (2008; 2010)	Cluster RCT MM	Study material comprised of a book focusing on motivation, food content, stress, and fitness. Same sample in both paper, one reporting on physical health the other on mental health outcomes
Giannopoulou et al., (2014)	PP MM	Goal-setting
Gillhoff et al., (2010)	RCT MM	Intervention included motivational strategies and goal-attainment scaling
Gomes et al., (2014)	PPC Ex.	Different strategies to increase adherence: small groups, positive feed-back, establish trusting relationship
Jones et al., (2009)	PP MM	One session of motivation and goal-setting

[1] The Diabetes Prevention Program (DPP) Research Group (2002). *Diabetes Care, 25,* 2165-2171

Lovell et al., (2014)	RCT MM	Intervention contained motivational component, patient-led action plans, patient-centered goals
Ludman et al., (2009)	PPC MM	Goal-setting, self-monitoring of PA
Maggouritsa et al., (2014)	RCT Ex.	Reward (token) system to improve attitudes towards exercise and prevent drop-out
Menza et al., (2004)	PPC MM	Behavioral strategies like self-monitoring of PA and social support. Motivational counseling techniques
Methapatara et al., (2011)	RCT Ex. - edu	Motivational interviewing, SMART criteria goal-setting, self-regulation principles for coping with lapse and relapse
Nik Jaafar et al. (2014)	PP MM	Inclusion criteria was being (or having a family member) motivated for weight control
Oertel-Knöchel et al. (2014)	RCT Ex.	Motivation exercises in warm-up session. 12% of participants were categorized to drop-out due to motivational reasons.
Ohlsen et al., (2004)	PP MM - edu	They included three sessions of motivational interviewing
Pagoto et al., (2008)	PP MM	Self-monitoring activities, goal-setting, PA intended to generate mastery and/or pleasure, feedback
Pagoto et al., (2013)	RCT MM	Used The Diabetes Prevention Program (footnote 1). Exercise goals, self-monitoring, support by lifestyle coach, several sessions including motivation.
Pajonk et al., (2010)	RCT Ex.	Using small groups to increase motivation to adhere to exercise intervention
Pendlebury et al., (2005)	PP MM - edu	Motivation one of the topics in group session.
Rethorst et al., (2013a; 2013b)	RCT Ex.	Same intervention as Trivedi et al., 2011.

Ström et al., (2013)	RCT Ex – edu	Well-described guided self-help program including several motivational techniques: SMART goal-setting, increasing exercise self-efficacy, motivational balance, stages of change, planning exercise, overcoming relapse and setbacks. Intervention inspired by TREAD-UK (Chalder et al., 2012)
Sylvia et al., (2011)	PP MM - edu	Motivational interviewing, adaptive rewards for motivation, goal-setting, validating obstacles for reaching goals
Tetlie et al., (2008)	PP Ex.	Fun and enjoyable activities to increase motivation, staff instructed to give personal acknowledgement to increase participants self-efficacy
Torres-Carbajo et al., (2005)	PPC Ex.	The exercise was organized to be motivating (both the warm-up session and the soccer-session)
Toups et al., (2011)	RCT Ex.	Same intervention as Trivedi et al., 2011.
Trivedi et al., (2011)	RCT Ex.	Behavioral strategies for adherence: adherence feedback from staff and web-site (social support), exercise skill training, self-monitoring exercise, and planning exercise.
Unger et al., (1992)	PP Ex.	Setting exercise goal
Vreeland et al., (2003)	PPC MM	Used motivational interviewing
Warren et al., (2011)	PP Ex.	A 5-Kilometer event as a goal for an exercise-program. Rewards (lunch voucher after each exercise session).
Weber et al., (2006)	RCT MM - edu	Motivational scaling, goal-setting, risk vs. benefits comparisons, discussions on barriers to change

Note: edu. = intervention based on some sort of education; Ex. = Exercise intervention; MM = multimodal intervention; PP = pre-post design; PPC = pre-post design multiple groups; RCT = randomized controlled trial.

Supplementary Table 3.

Studies that incorporate a motivational theory as a background for their intervention without reporting any empirical data on motivation.

Author	**Design**	**Theoretical framework**	**Other notes to study**
Beebe & Smith (2010)	PP exercise	SCT	Feasibility study of intervention based on SCT to enhance exercise, only measuring attendance
Bradshaw et al. (2010)	PP MM - edu	TTM	Based on UK Medical Research Council 3-step framework for developing complex health interventions
Chalder et al., (2012)	RCT exercise	SDT	Devised a manual with various MI-techniques and behavioural strategies which PA facilitators could employ to promote PA.
Daumit et al., (2013)	RCT MM	SCT and behavioral self-regulation theories	Monitor key behavior with simple tracking tool, points for attendance which could be traded for small rewards. Measures self-efficacy and social support for exercise, but not reported.
Green et al., (2014; 2015)	RCT MM	TTM, SCT	Utilise Motivational Interviewing to enhance self-efficacy
Lee et al., (2014)	RCT exercise - edu	SCT	Telephone-delivered physical activity intervention.
McKibbin et al., (2006;2010)	RCT MM - edu	SCT	Understanding motivation part of basic education Second paper is 6-month follow-up analysis
Perlman et al., (2010)	PP MM - edu	TTM	Uses stages of change in the spirit of motivational interviewing
Tse et al., (2011)	PP MM - edu	TTM	Uses stages of change as part of the motivational interviewing.
Usher et al., (2013)	RCT MM	TTM	Spirit of motivational interviewing incorporated in each session.

Verhaeghe et al., 2013	Cluster preference RCT MM	SCT, SDT, and Control Theory	Intervention aimed at influencing mediating variables of knowledge, attitude, skill, self-efficacy, and motivational regulation. Describes different strategies for doing this.

Note: edu. = intervention based on some sort of education; MM = Multimodal intervention; PP = Pre-Post single group design; RCT = Randomized Controlled Trial; SCT = Social Cognitive Theory; TTM = Transtheoretical Theory; SDT = Self-Determination Theory.

Supplementary Table 4.

Overview of theoretical framework and constructs used across design

Theory / Theoretical construct	IMMC	IUMT	**Total**
Social Cognitive Theory	2	6	**8**
Self-efficacy / confidence	9		**9**
Outcome expectations	4		**4**
Transtheoretical Model		5	**5**
Decisional balance/ benefit/barriers	1		**1**
Stages of change	2		**2**
Self-Determination Theory		2	**2**
Control Theory		1	**1**
Health Promotion Model	1		**1**
Behavioural Self-Management	1	1	**2**

Note: IMMC= Interventions measuring motivational constructs; IUMT = Interventions using motivational theory; several of the motivational construct are used in multiple theoretical frameworks (e.g. self-efficacy)

Supplementary Table 5.

Overview of motivational techniques used in intervention studies not reporting any empirical data or motivational theory

Motivational technique used	N studies
Goal-setting	22
Motivational interviewing / counselling	15
Social and/or instrumental support	9
Coping strategies / planning	8
Session(s) with motivation as theme	6
Activities organised to be fun, motivating or mastery oriented	3
Self-monitoring	4
Increasing self-efficacy / skill training	3
Decisional balance	3
Validating barriers/obstacles	2
Rewards	5
Motivational scaling	1
Unstructured motivational prompts	1
Using small groups	2
Stages of change	1

References

Abdel-Baki, A., Brazzini-Poisson, V., Marois, F., Letendre, E., & Karelis, A. D. (2013). Effects of aerobic interval training on metabolic complications and cardiorespiratory fitness in young adults with psychotic disorders: A pilot study. *Schizophrenia Research, 149*, 112-115.

Alvarez-Jimenez, M., Gonzalez-Blanch, C., Vazquez-Barquero, J. L., Perez-Iglesias, R., Martinez-Garcia, O., Perez-Pardal, T., … Crespo-Facorro, B. (2006). Attenuation of antipsychotic-induced weight gain with early behavioral intervention in drug-naive first-episode psychosis patients: A randomized controlled trial. *Journal of Clinical Psychiatry, 67,* 1253-1260.

Alvarez-Jimenez, M., Martinez-Garcia, O., Perez-Iglesias, R., Ramirez, M. L., Vazquez-Barquero, J. L., & Crespo-Facorro, B. (2010). Prevention of antipsychotic-induced weight gain with early behavioural intervention in first-episode psychosis: 2-year results of a randomized controlled trial. *Schizophrenia Research, 116,* 16-19.

Attux, C., Martini, L. C., Elkis, H., Tamai, S., Freirias, A., Camargo, M., … Bressan, R. A. (2013). A 6-month randomized controlled trial to test the efficacy of a lifestyle intervention for weight gain management in schizophrenia. *BMC Psychiatry, 13,* 60.

Baker, A., Richmond, R., Castle, D., Kulkarni, J., Kay-Lambkin, F., Sakrouge, R., … Lewin, T. J. (2009). Coronary heart disease risk reduction intervention among overweight smokers with a psychotic disorder: Pilot trial. *Australian and New Zealand Journal of Psychiatry, 43,* 129-135.

Baker, A. L., Turner, A., Kelly, P. J., Spring, B., Callister, R., Collins, C. E., … Lewin, T. J. (2014). 'Better Health Choices' by telephone: A feasibility trial of improving diet and physical activity in people diagnosed with psychotic disorders. *Psychiatry Research, 220,* 63-70.

Bartels, S., Pratt, S., I, Aschbrenner, K., Barre, L., Jue, K., Wolfe, R., … Mueser, K. T. (2013). Clinically significant improved fitness and weight loss among overweight persons with serious mental illness. *Psychiatric Services, 64,* 729-736.

Battaglia, G., Alesi, M., Inguglia, M., Roccella, M., Caramazza, G., Bellafiore, M., & Palma, A. (2013). Soccer practice as an add-on treatment in the management of individuals with a diagnosis of schizophrenia. *Neuropsychiatric Disease and Treatment, 9,* 595-603.

Beebe, L. H. & Smith, K. (2010). Feasibility of the walk, address, learn and cue (WALC) intervention for schizophrenia spectrum disorders. *Archives of Psychiatric Nursing, 24,* 54-62.

Bombardier, C. H., Ehde, D. M., Gibbons, L. E., Wadhwani, R., Sullivan, M. D., Rosenberg, D. E., & Kraft, G. H. (2013). Telephone-based physical activity counseling for major depression in people with multiple sclerosis. *Journal of Consulting and Clinical Psychology, 81*, 89-99.

Bradshaw, T., Lovell, K., Bee, P., & Campbell, M. (2010). The development and evaluation of a complex health education intervention for adults with a diagnosis of schizophrenia. *Journal of Psychiatric and Mental Health Nursing, 17,* 473-486.

Brown, C., Goetz, J., & Hamera, E. (2011). Weight loss intervention for people with serious mental illness: A randomized controlled trial of the RENEW program. *Psychiatric Services, 62,* 800-802.

Brown, C., Goetz, J., Hamera, E., & Gajewski, B. (2014). Treatment response to the RENEW weight loss intervention in schizophrenia: Impact of intervention setting. *Schizophrenia Research, 159,* 421-425.

Brown, C., Goetz, J., Van Sciver, A., Sullivan, D., & Hamera, E. (2006). A psychiatric rehabilitation approach to weight loss. *Psychiatric Rehabilitation Journal, 29,* 267-273.

Brown, S. & Chan, K. (2006). A randomized controlled trial of a brief health promotion intervention in a population with serious mental illness. *Journal of Mental Health, 15,* 543-549.

Brown, S. & Smith, E. (2009). Can a brief health promotion intervention delivered by mental health key workers improve clients' physical health: A randomized controlled trial. *Journal of Mental Health, 18,* 372-378.

Busch, A. M., Whited, M. C., Appelhans, B. M., Schneider, K. L., Waring, M. E., DeBiasse, M. A., … Pagoto, S. L. (2013). Reliable change in depression during behavioral weight loss treatment among women with major depression. *Obesity (Silver Spring), 21,* E211-E218.

Chalder, M., Wiles, N. J., Campbell, J., Hollinghurst, S. P., Haase, A. M., Taylor, A. H., … Lewis, G. (2012). Facilitated physical activity as a treatment for depressed adults: Randomised controlled trial. *BMJ: British Medical Journal, 344,* e2758.

Chastain, P. B. & Shapiro, G. E. (1987). Physical fitness program for patients with psychiatric disorders. A clinical report. *Physical Therapy, 67,* 545-548.

Chen, C. K., Chen, Y. C., & Huang, Y. S. (2009). Effects of a 10-week weight control program on obese patients with schizophrenia or schizoaffective disorder: A 12-month follow up. *Psychiatry and Clinical Neurosciences, 63,* 17-22.

Craft, L. L., Freund, K. M., Culpepper, L., & Perna, F. M. (2007). Intervention study of exercise for depressive symptoms in women. *Journal of Womens Health, 16*, 1499-1509.

de Groot, M., Doyle, T., Kushnick, M., Shubrook, J., Merrill, J., Rabideau, E., & Schwartz, F. (2012). Can lifestyle interventions do more than reduce diabetes risk? Treating depression in adults with type 2 diabetes with exercise and cognitive behavioral therapy. *Current Diabetes Reports, 12,* 157-166.

Danielsson, L., Papoulias, I., Petersson, E. L., Carlsson, J., & Waern, M. (2014). Exercise or basic body awareness therapy as add-on treatment for major depression: A controlled study. *Journal of Affective Disorders, 168,* 98-106.

Daumit, G. L., Dickerson, F. B., Wang, N. Y., Dalcin, A., Jerome, G. J., Anderson, C. A. M., … Appel, L. J. (2013). A behavioral weight-loss intervention in persons with serious mental illness. *New England Journal of Medicine, 368,* 1594-1602.

Ludman, E., Simon, G. E., Ichikawa, L. E., Operskalski, B. H., Arterburn, D., Linde, J. A., … Finch, E. A. (2010). Does depression reduce the effectiveness of behavioral weight loss treatment? *Behavioral Medicine, 35,* 126-134.

Forsberg, K. A., Bjorkman, T., Sandman, P. O., & Sandlund, M. (2008). Physical health: A cluster randomized controlled lifestyle intervention among persons with a psychiatric disability and their staff. *Nordic Journal of Psychiatry, 62,* 486-495.

Forsberg, K. A., Bjorkman, T., Sandman, P. O., & Sandlund, M. (2010). Influence of a lifestyle intervention among persons with a psychiatric disability: A cluster randomised controlled trail on symptoms, quality of life and sense of coherence. *Journal of Clinical Nursing, 19,* 1519-1528.

Giannopoulou, I., Botonis, P., Kostara, C., & Skouroliakou, M. (2014). Diet and exercise effects on aerobic fitness and body composition in seriously mentally ill adults. *European Journal of Sport Science, 14,* 620-627.

Gillhoff, K., Gaab, J., Emini, L., Maroni, C., Tholuck, J., & Greil, W. (2010). Effects of a multimodal lifestyle intervention on body mass index in patients with bipolar disorder: A randomized controlled trial. *Primary Care Companion to the Journal of Clinical Psychiatry, 12,* 2010-20e8.

Gomes, E., Bastos, T., Probst, M., Ribeiro, J. C., Silva, G., & Corredeira, R. (2014). Effects of a group physical activity program on physical fitness and quality of life in individuals with schizophrenia. *Mental Health and Physical Activity, 7*, 09-162.

Green, C. A., Janoff, S. L., Yarborough, B. J. H., & Yarborough, M. T. (2014). A 12-week weight reduction intervention for overweight individuals taking antipsychotic medications. *Community Mental Health Journal, 50*(8), 974-980.

Green, C. A., Yarborough, B. J. H., Leo, M. C., Yarborough, M. T., Stumbo, S. P., Janoff, S. L., … Stevens, V. J. (2015). The STRIDE weight loss and lifestyle intervention for individuals taking antipsychotic medications: A randomized trial. *American Journal of Psychiatry, 172*(1), 71-81.

Jones, A., Benson, A., Griffith, S., Berk, M., & Dodd, S. (2009). 'Mind and Body': A lifestyle programme for people on antipsychotic medication. *Journal of Evaluation in Clinical Practice, 15*, 276-280.

Lee, H., Kane, I., Brar, J., & Sereika, S. (2014). Telephone-delivered physical activity intervention for individuals with serious mental illness: A feasibility study. *Journal of the American Psychiatric Nurses Association, 20*, 389-397.

Lovell, K., Wearden, A., Bradshaw, T., Tomenson, B., Pedley, R., Davies, L. M., … Marshall, M. (2014). An exploratory randomized controlled study of a healthy living intervention in early intervention services for psychosis: The INTERvention to encourage ACTivity, improve diet, and reduce weight gain (INTERACT) study. *Journal of Clinical Psychiatry, 75*, 489-505

Maggouritsa, G., Kokaridas, D., Theodorakis, I., Patsiaouras, A., Mouzas, O., Dimitrakopoulos, S., & Diggelidis, N. (2014). The effect of a physical activity programme on improving mood profile of patients with schizophrenia. *International Journal of Sport & Exercise Psychology, 12*, 273-284.

McKibbin, C. L., Golshan, S., Griver, K., Kitchen, K., & Wykes, T. L. (2010). A healthy lifestyle intervention for middle-aged and older schizophrenia patients with diabetes mellitus: A 6-month follow-up analysis. *Schizophrenia Research, 121*, 203-206.

McKibbin, C. L., Patterson, T. L., Norman, G., Patrick, K., Jin, H., Roesch, S., … Jeste, D. V. (2006). A lifestyle intervention for older schizophrenia patients with diabetes mellitus: A randomized controlled trial. *Schizophrenia Research, 86*, 36-44.

Menza, M., Vreeland, B., Minsky, S., Gara, M., Radler, D. R., & Sakowitz, M. (2004). Managing atypical antipsychotic-associated weight gain: 12-month data on a multimodal weight control program. *Journal of Clinical Psychiatry, 65*, 471-477.

Methapatara, W. & Srisurapanont, M. (2011). Pedometer walking plus motivational interviewing program for Thai schizophrenic patients with obesity or overweight: A 12-week, randomized, controlled trial. *Psychiatry and Clinical Neurosciences, 65,* 374-380.

Nik Jaafar, N. R., Midin, M., Mahadevan, R., Sinniah, A., Rahman, A. H., Ming, W., … Sidi, H. (2014). Waist circumference and not body mass index as the outcome of a group weight intervention for patients with severe mental illness. *Comprehensive Psychiatry, 55,* S60 – S64.

Oertel-Knochel, V., Mehler, P., Thiel, C., Steinbrecher, K., Malchow, B., Tesky, V., … Hansel, F. (2014). Effects of aerobic exercise on cognitive performance and individual psychopathology in depressive and schizophrenia patients. *European Archives of Psychiatry and Clinical Neuroscience, 264,* 589-604.

Ohlsen, R., Treasure, J., & Pilowsky, L. (2004). A dedicated nurse-led service for antipsychotic-induced weight gain: An evaluation. *Psychiatric Bulletin, 28,* May-166.

Pagoto, S., Bodenlos, J. S., Schneider, K. L., Olendzki, B., & Spates, C. (2008). Initial investigation of behavioral activation therapy for co-morbid major depressive disorder and obesity. *Psychotherapy, 45,* 410-415.

Pagoto, S., Schneider, K., Whited, M., Oleski, J., Merriam, P., Appelhans, B., … Crawford, S. (2013). Randomized controlled trial of behavioral treatment for comorbid obesity and depression in women: the Be Active Trial. *International Journal of Obesity, 37,* 1427-1434.

Pajonk, F. G., Wobrock, T., Gruber, O., Scherk, H., Berner, D., Kaizl, I., … Falkai, P. (2010). Hippocampal Plasticity in Response to Exercise in Schizophrenia. *Archives of General Psychiatry, 67,* 133-143.

Pendlebury, J., Haddad, P., & Dursun, S. (2005). Evaluation of a behavioural weight management programme for patients with severe mental illness: 3 year results. *Human Psychopharmacology-Clinical and Experimental, 20,* 447-448.

Perlman, L. M., Cohen, J. L., Altiere, M. J., Brennan, J. A., Brown, S. R., Mainka, J. B., & Diroff, C. R. (2010). A multidimensional wellness group therapy program for veterans with comorbid psychiatric and medical conditions. *Professional Psychology-Research and Practice, 41,* 120-127.

Rethorst, C., Sunderajan, P., Greer, T., Grannemann, B., Nakonezny, P., Carmody, T., & Trivedi, M. H. (2013a). Does exercise improve self-reported sleep quality in non-remitted major depressive disorder? *Psychological Medicine, 43,* 699-709.

Rethorst, C. D., Toups, M. S., Greer, T. L., Nakonezny, P. A., Carmody, T. J., Grannemann, B. D., … Trivedi, M. H. (2013b). Pro-inflammatory cytokines as predictors of antidepressant effects of exercise in major depressive disorder. *Molecular Psychiatry, 18,* 1119-1124.

Ström, M., Uckelstam, C.-J., Andersson, G., Hassmen, P., Umefjord, G., & Carlbring, P. (2013). Internet-delivered therapist-guided physical activity for mild to moderate depression: A randomized controlled trial. *PeerJ, 2013*, e178.

Sylvia, L., Nierenberg, A., Stange, J., Peckham, A., & Deckersbach, T. (2011). Development of an integrated psychosocial treatment to address the medical burden associated with bipolar disorder. *Journal of Psychiatric Practice, 17,* 224-232.

Tetlie, T., Eik-Nes, N., Palmstierna, T., Callaghan, P., & Nottestad, J. A. (2008). The effect of exercise on psychological & physical health outcomes: Preliminary results from a Norwegian forensic hospital. *Journal of Psychosocial Nursing & Mental Health Services, 46,* 38-43.

Torres-Carbajo, A., Olivares, J. M., Merino, H., Vázquez, H., Díaz, A., & Cruz, E. (2005). Efficacy and effectiveness of an exercise program as community support for schizophrenic patients. *American Journal of Recreation Therapy, 4,* 41-47.

Toups, M. S., Greer, T. L., Kurian, B. T., Grannemann, B. D., Carmody, T. J., Huebinger, R., … Trivedi, M. H. (2011). Effects of serum brain derived neurotrophic factor on exercise augmentation treatment of depression. *Journal of Psychiatric Research, 45*, 1301-1306.

Trivedi, M. H., Greer, T. L., Church, T. S., Carmody, T. J., Grannemann, B. D., Galper, D. I., … Blair, S. N. (2011). Exercise as an augmentation treatment for nonremitted major depressive disorder: a randomized, parallel dose comparison. *Journal of Clinical Psychiatry, 72,* 677-684.

Tse, J., Chow, E., Sultana-Cordero, R., Titus-Prescott, M., Chiles, R., Cleek, A., & Cleek, E. (2011). Motivation-based interventions for obesity in serious mental illness. *Psychiatric Annals, 41,* 473-477.

Unger, K. V., Skrinar, G. S., Hutchinson, D. S., & Yelmokas, A. M. (1992). Fitness: A viable adjunct to treatment for young adults with psychiatric disabilities. *Psychosocial Rehabilitation Journal, 15,* 21-28.

Usher, K., Park, T., Foster, K., & Buettner, P. (2013). A randomized controlled trial undertaken to test a nurse-led weight management and exercise intervention designed for people with serious mental illness who take second generation antipsychotics. *Journal of Advanced Nursing, 69,* 1539-1548.

Van Coppenolle, H., Pieters, G., Knapen, J., & Peuskens, J. (1993). Psychomotor therapy in depressive patients. *Issues in Special Education & Rehabilitation, 8,* 29-34.

Verhaeghe, N., Clays, E., Vereecken, C., De Maeseneer, J., Maes, L., Van Heeringen, C., Annemans, L. (2013). Health promotion in individuals with mental disorders: A cluster preference randomized controlled trial. *Bmc Public Health, 13,* 657.

Vreeland, B., Minsky, S., Menza, M., Radler, D. R., Roemheld-Hamm, B., & Stern, R. (2003). A program for managing weight gain associated with atypical antipsychotics. *Psychiatric Services, 54,* 1155-1157.

Warren, K. R., Ball, M. P., Feldman, S., Liu, F., McMahon, R. P., & Kelly, D. L. (2011). Exercise program adherence using a 5-kilometer (5K) event as an achievable goal in people with schizophrenia. *Biological Research for Nursing, 13,* 383-390.

Weber, M. & Wyne, K. (2006). A cognitive/behavioral group intervention for weight loss in patients treated with atypical antipsychotics. *Schizophrenia Research, 83,* 95-101.

APPENDIX C

Paper III

Approval letter from the Regional Committee for Medical and Health Research Ethics (No. 2013/154)

Information letter and informed consent

Questionnaire (only scales used in Paper III are attached)

Written information on the Polar Active FA20

REK
REGIONALE KOMITEER FOR MEDISINSK OG HELSEFAGLIG FORSKNINGSETIKK

Region:	Saksbehandler:	Telefon:	Vår dato:	Vår referanse:
REK sør-øst	Tor Even Svanes	22845521	16.04.2013	2013/154/REK sør-øst C
			Deres dato:	**Deres referanse:**
			19.03.2013	

Vår referanse må oppgis ved alle henvendelser

Torfinn Hynnekleiv
Sykehuset Innlandet

2013/154 Psykiatriske rehabiliteringspasienters helse, livskvalitet og bruk av samhandlende helsetjenester

Prosjektleder**: Torfinn Hynnekleiv**

Forskningsansvarlig**: Sykehuset Innlandet**

Prosjektomtale:

Dette forskningsprosjektet springer ut av et fagutviklingsprosjekt for kartlegging og utprøving av modeller for samhandling om pasienter med gjerne langvarig og alvorlige psykisk sykdom og som er vanskelige å nå med ordinære tjenester. Det er behov for økt kunnskap om kompleks samhandling hos pasienter som trenger omfattende tjenester. Det er erfaringsmessig ulike symptomdiagnostiske grupper som utgjør denne i så måte heterogene gruppe. Dette forskningsprosjekt har utvidet perspektivet for å identifisere også andre dimensjoner hos denne ofte kronifiserte gruppe, slik som gruppens fysiske helse samt grad av sårbarhet for livshendelser/traumer. Vi ønsker således å beskrive samhandlingsfunksjonen i forhold til livskvalitet og organisasjon men også pasientenes fysiske aspekter og traumehistorikk sett fra en etiologisk stress-sårbarhets-hypotese som mulig (del.)forklaring på dysfunksjon. Vi vil derfor anvende både ulike kliniske og biologiske tilnærminger.

Saksgang
Komiteen behandlet prosjektet første gang i møtet 14.02.2013, og godkjente den gang ikke studien. Bakgrunnen for avslaget bero på flere årsaker; dels var det omsøkte prosjektet for upresist beskrevet, dels viet søknaden lite oppmerksomhet omkring deltakernes velferd og rettigheter. Til det siste vektla komiteen dessuten at det i liten grad var beskrevet beredskap for deltakerne.

Prosjektleder påklaget vedtaket 13.03.2013. Det vises i den forbindelse også til utstrakt telefonkontakt mellom prosjektleder og sekretariatet i REK sør-øst. Etter prosjektleders ønske ble klagen behandlet i ordinært komitémøte 14.03.2013.

Klagens innhold
I klagen presiseres forholdet mellom de ulike delene av prosjektet. Det er redegjort for prosjektets Modul 1 som systematisk kartlegging av kroniske psykiatrisk syke samhandlingstrengende pasienter. Det er presisert hvilke spørreskjemaer og instrumenter som vil inngå i denne delen, og det fremkommer nå klarere at det er denne delen av prosjektet man vil samarbeide med Norges Idrettshøyskole om. Således er mål og hypoteser relatert til fysisk aktivitet, en nøkkelkomponent i Modul 1.

Modul 2 er relatert til stress-sårbarhets hypoteser, og det fremkommer også her tydeligere at formålet med denne delen er identifikasjon av sammenheng mellom psykotraumehistorikk og genetisk sårbarhet. De genetiske undersøkelsene man ønsker å gjennomføre er grunngitt, og også prioritert av prosjektleder, det siste som et resultat av komiteens merknader knyttet til stort kildemateriale.

Prosjektleder har i klagen belyst hvilken beredskap som ligger til grunn i prosjektet. Dette var en vesentlig mangel i opprinnelige søknad, og en hovedgrunn til at komiteen mente prosjektet ikke tilfredsstilte de kravene til forsvarlighet som gjelder etter helseforskningslovens § 5.

Det anføres at alle pasienter vil følges opp enten i sykehus i nærområdet, i DPS eller i den kommunale helsetjenesten. Intervjuerne er erfarne psykiatriske sykepleiere, som er trenet til å identifisere vanskelige følelser underveis i intervjusettingen, og som kan henvise videre. Denne beredskapen lå i prosjektet fra starten, men var ikke kommunisert til komiteen.

Etter komiteens avslag har prosjektgruppen nå utarbeidet en egen kriseplan ved mistanke om retraumatisering eller suicidproblematikk.

K**omiteens vurdering av klagen i sin helhet**
I sum mener komiteen at klagen frembringer så vidt mange nye momenter i forhold til hovedsøknaden, at både Modul 1 og Modul 2 nå kan godkjennes.

Komiteens vurdering av beredskap
Komiteen mener prosjektgruppen har tatt på alvor de innvendinger komiteen hadde til prosjektet ved førstegangsbehandling. Det gjelder særlig i forhold til å belyse hvilke beredskapsplaner- og rutiner som er innbakt i studien. Komiteen mener den beredskapen som nå er skissert er god. Med det er også komiteens viktigste ankepunkt til prosjektet tilfredsstillende besvart.

Komiteens vurdering av Modul 1
I sin førstegangsbehandling vurderte komiteen at den delen av prosjektet som omtales som Modul 1 i klagen, trolig ikke ville komme inn under bestemmelsene i helseforskningsloven. Slik Modul 1 er beskrevet i klagen, vil denne delen likevel måtte sies å falle inn under bestemmelsene i helseforskningslovens § 2, jf. helseforskningslovens § 4. Modul 1 er derfor også realitetsbehandlet som en del av klagevurderingen.

Komiteen mener denne delen av prosjektet nå fremstår som godt beskrevet.

Komiteens vurdering av Modul 2
Komiteen mener Modul 2 stadig fremstår som en ganske omfangsrik delstudie. Det er ingen kontrollgruppe i Modul 2, og de reviderte styrkeberegningene tilsier også at det vil være vanskelig å konkludere mot prosjektets angitte mål. Selv om prosjektleder stadig mener denne delen vil kunne si noe om årsakssammenhenger, mener komiteen det er mer nærliggende å betrakte delen som hypotesegenererende.

Som for prosjektets øvrige deler, er imidlertid også Modul 2 langt bedre beskrevet i klagen enn hva den var i hovedsøknaden. Fordi beredskapen nå er presisert, er komiteen trygg på at deltakerne ikke løper noen utilbørlig risiko ved deltakelse. Deskriptive studier av denne typen kan ha et viktig iboende potensial, og kan i mange tilfeller berede grunnen for videre forskning innenfor temakomplekset.

På bakgrunn av dette mener komiteen at også Modul 2 nå anses som tilfredsstillende.

De genetiske undersøkelsene man ønsker å gjøre som et ledd av Modul 2, er imidlertid i liten grad utdypet. Komiteen gir derfor i denne omgang tillatelse til å teste ut polymorfismene i genene for monoaminooksydase og BDNF. Skulle det bli aktuelt med ytterligere testing i Modul 2, vil dette måtte søkes REK som en prosjektendring, i tråd med helseforskningslovens § 11.

Det var heller ikke vedlagt revidert protokoll i forhold til de endringer i prosjektet som beskrives i klagen. Komiteen ber derfor om at revidert protokoll sendes inn til orientering. Protokollen skal være justert i forhold til klagens innhold.

Forskningsbiobank
Det søkes om å opprette en spesifikk forskningsbiobank med navn Psykiatriske langtidspasienters helse, livskvalitet og bruk av samhandlende helsetjenester i prosjektet.

Ansvarshavende for forskningsbiobanken er Torfinn Hynnekleiv. Forskningsansvarlig er Sykehuset Innlandet.

Biobanken vil bestå av blodprøver.

Biobanken planlegges å vare til 31.12.2020. Deretter skal materialet behandles i henhold til helseforskningslovens § 30.

Det vil ikke være aktuelt med utførsel av materialet til utlandet. Dersom slik utførsel blir aktuelt vil dette kreve søknad til REK, jf. Helseforskningslovens § 29.

Ut fra det ovennevnte setter komiteen følgende vilkår for prosjektet:

1. Andre genetiske tester enn anført i dette vedtaket, må søkes REK som en prosjektendring, i tråd med helseforskningslovens § 11.
2. Revidert protokoll, som reflekterer de endringer i prosjektet klagen innebærer, skal sendes komiteen til orientering.

Vedtak
Komiteen omgjør sitt vedtak av 14.02.2013 med hjemmel i forvaltningslovens § 34.

Prosjektet godkjennes under forutsetning av at ovennevnte vilkår oppfylles, jf. helseforskningslovens §§ 9 og 33.

Komiteen godkjenner opprettelse av forskningsbiobanken Psykiatriske langtidspasienters helse, livskvalitet og bruk av samhandlende helsetjenester, i tråd med det som er angitt i prosjektsøknaden. Biobankregisteret vil bli underrettet ved kopi av dette brev.

I tillegg til vilkår som fremgår av dette vedtaket, er tillatelsen gitt under forutsetning av at prosjektet gjennomføres slik det er beskrevet i søknaden og protokollen, justert i forhold til klage av 13.03.2013, og de bestemmelser som følger av helseforskningsloven med forskrifter.

Tillatelsen gjelder til 31.12.2020. Opplysningene skal deretter slettes eller anonymiseres, senest innen et halvt år fra denne dato.

Komiteens avgjørelse var enstemmig.

Forskningsprosjektets data skal oppbevares forsvarlig, se personopplysningsforskriften kapittel 2, og Helsedirektoratets veileder for Personvern og informasjonssikkerhet i forskningsprosjekter innenfor helse og omsorgssektoren.

Vi ber om at alle henvendelser sendes inn med korrekt skjema via vår saksportal: http://helseforskning.etikkom.no. Dersom det ikke finnes passende skjema kan henvendelsen rettes på e-post til: post@helseforskning.etikkom.no.

Sluttmelding og søknad om prosjektendring
Prosjektleder skal sende sluttmelding til REK sør-øst på eget skjema senest 22.06.2021, jf. hfl.
12. Prosjektleder skal sende søknad om prosjektendring til REK sør-øst dersom det skal gjøres vesentlige

endringer i forhold til de opplysninger som er gitt i søknaden, jf. hfl. § 11

Med vennlig hilsen

Arvid Heiberg
prof. dr.med
leder REK sør-øst C

Tor Even Svanes
seniorrådgiver

Kopi til: kjersti.oistensen@sykehuset-innlandet.no

nina.hovland@fhi.no, postmottak@sykehuset-innlandet.no

Østre Toten kommune – SI: DPS Gjøvik,
poliklinikk Toten og post 1D Avd. for akutt- og korttidspsykiatri

Forespørsel om deltakelse i et forskningsprosjekt

Psykiatriske rehabiliterings-pasienters helse, livskvalitet og bruk av samhandlende helsetjenester

Hensikt og bakgrunn

Vi henvender oss til deg for å spørre om du vil delta i en forskningsstudie.
I området der du bor, foregår det for tiden et fagutviklingsprosjekt for å bedre samarbeidet om helsetilbudet til personer med langvarige psykiske problemer. Målet er å gjøre helsetjenestene bedre og mer tilgjengelige. Sykehuset Innlandet, Reinsvoll og DPS/poliklinikken vil i samarbeid med kommunen nå gjøre en forskningsbasert studie for å få kunnskap om hvordan den psykiske helsetjeneste fungerer i ditt område og samhandlingen mellom tjenestene. Vi er også interessert i din livskvalitet og både psykiske og fysisk helse, og også forhold som kan ha bidratt til at du har fått psykiske problemer.

Hva innebærer studien for deg?
Ved deltakelse i studien vil vi få tilgang til opplysninger som de samhandlende helsetjenestene har om deg. Det vil være opplysninger om din helse/sykdoms- og livssituasjon. Opplysningene vil bli hentet fra din pasientjournal av de som har eller har hatt ansvaret for behandlingen din. Du vil også bli spurt om hvordan du opplever helsetilbudet. Konkret ønsker vi først og fremst å intervjue deg, slik du er vant til fra tidligere samtaler med helsetjenesten, men vil her gjøre det mer systematisk samt fylle ut skjemaer om helse, sykdom og livsforhold.

Vi ber også om å få samle litt blod da vi ønsker å undersøke særlig forhold som har med din kroppslige helse samt arvestoff som vi vil oppbevare i en såkalt biobank på sykehuset med sikte på en samlet undersøkelse etter at datainnsamlingsperioden er ferdig.Ved din deltakelse her vil du gi et bidrag også til å forstå mer om hva som kan tenkes å være medvirkende til dine plager.

Etter dette, vil du spørres særskilt om du kunne tenke deg å få målt ditt kroppslige/fysiske aktivitetsnivå. Dette skjer i så fall ved at du låner en klokke som har en aktivitetsmåler. Denne forespørselen kan du gjerne avslå uten at det påvirker den øvrige undersøkelsen som vi da allerede har gjort av deg Det som vil kreves, er at du bærer denne klokken på armen de påfølgende syv dagene. Vi henter deretter denne klokken på et passende sted for deg.

Mulige fordeler og ulemper
Resultatene skal brukes til å gjøre behandlingen/samhandlingen for personer med langvarige psykiske problemer best mulig. Men det meste av det vi gjør her, vil ikke gi umiddelbar nytte-effekt men øke kunnskapen vår om lidelser som du har. Vi har grunn til å tro at denne undersøkelsen ikke skal kunne gi deg andre ulemper enn at du bruker din tid på prosjektet og et sprøytestikk (som du naturligvis også kan si nei til). Et sprøytestikk, slik vi gjennomfører det, kan i sjeldne tilfelle, hos noen få, gi en liten irritasjon i huden som fort går over
Forsikringsmessig er du fullt ut dekket av pasientskadeerstatningsloven på vanlig måte.

Ang. datasikkerhet og Biobank: Hva skjer med informasjonen om deg?
Alle opplysningene vil bli behandlet uten navn, fødselsnummer eller andre direkte

gjenkjennbare opplysninger I vår forskningsmappe om deg vil det ikke bli overført noe som kan knytte din identitet til materialet hvis du blir med på studien. Vi vil således hverken bruke navn eller personnummer men bare et eget forskningsnummer som holdes totalt adskilt. Koden – dvs. hvem forskningsinformasjonen gjelder for – vil være bak låste dører og nedlåst i et eget arkiv på vår sykehusavdeling og vil ikke være tilgjengelig for andre enn oss i ledelsen av prosjektet. De dataene som omhandler din lidelse vil derfor ikke kunne spores tilbake til deg. Du vil ikke kunne bli identifisert i noen rapporter eller artikler. Du har rett til å se informasjon som er samlet om deg. Det er ledelsen ved Sykehuset Innlandet som er ansvarlig for undersøkelsen og biobanken med blodprøver, ledet av legene Jon Elling Whist,ved laboratoriet, og prosjektleder som også er lege. Disse data vil kunne behandles uten noen mulighet for kobling til personidentitet av våre forsknings-samarbeidspartnere ved Norges Idrettshøgskole og Universitetene i Oslo og Bergen..
Du har rett til å få fullt innsyn i hvilke opplysninger som er registrert om deg, og
du har rett til å få korrigert eventuelle feil som vi har registrert i din forskningsmappe.
Dersom du trekker deg fra studien, kan du også kreve at alle de innsamlede opplysninger blir slettet.
Du har rett til å få informasjon om resultatet av studien.

Prosjektgodkjenninger og prosjektslutt
Prosjektet er vurdert og godkjent av Regional Etisk Komite Helse SørØst. Personvernombudet har gitt tillatelse til å håndtere opplysningene. Biobanken er godkjent og kan bare brukes etter godkjenning fra Regional komite for medisinsk og helsefaglig forskningsetikk (REK).
Prosjektet avsluttes i 2020, og alle persondata vil bli slettet innen 2 år etter at studien er ferdig. Vi ber om tillatelse til å henvende oss til deg for ytterligere spørsmål og detaljer ved videre faser i prosjekt, og at innsamlede opplysninger også kan benyttes i de videre fasene. Du kan senere bli kontaktet av oss for oppfølgingsarbeid som du også kan svare nei til.

Frivillig deltakelse
Deltakelsen er fullt ut frivillig. Du kan når som helst trekke deg. Du trenger ikke å oppgi noen grunn for det, og det vil heller ikke ha noen innvirkning på behandlingstilbudet ditt om du ikke lenger skulle ønske å delta. Hvis du bestemmer deg for å bli med på undersøkelsen, ber vi deg om å undertegne arket nedenfor og gi dette til den du har kontakt med i helsetjenesten. Dersom du senere skulle ønske å trekke deg, er det bare å kontakte en av oss som underskriver dette brevet nedenfor.

Ved samtykke til deltakelse i studien:
Jeg har mottatt skriftlig og muntlig informasjon om hva prosjektet går ut på og hva det innebærer for meg. Jeg har lest informasjonsskrivet og har hatt anledning til å stille spørsmål Jeg samtykker i å delta og vil delta i studien

Tusen takk for hjelpen.

Med vennlig hilsen

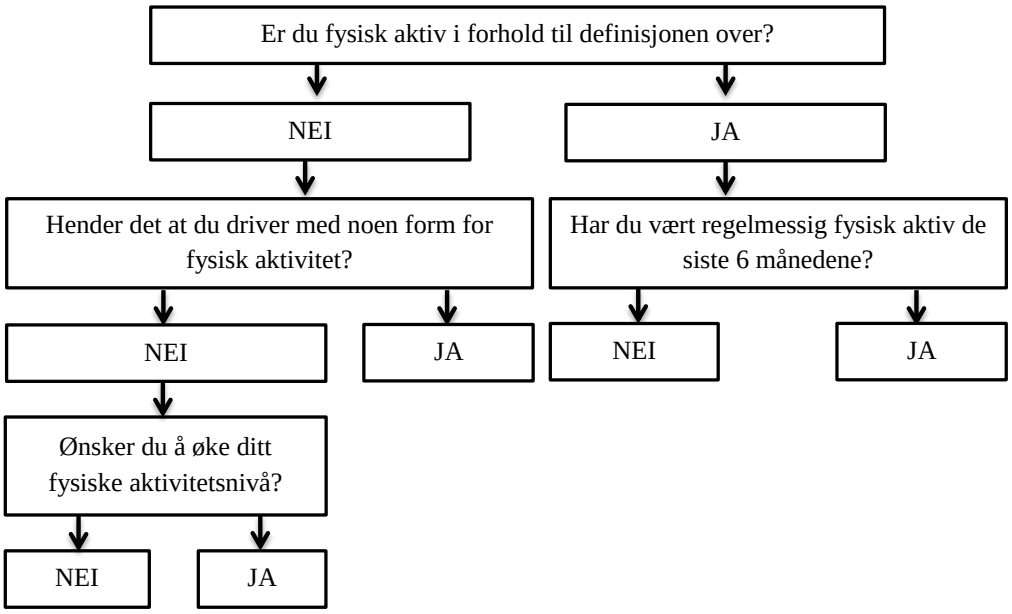
Torfinn Hynnekleiv — Prosjektleder Tlf.41548309
Ann-Mari Kvalvik — Prosjektkoordinator Tlf. 61147300
Sykehuset Innlandet, Div. Psykisk Helse, Avd. for akutt- og korttidspsykiatri, 2840 Reinsvoll

Samtykkeerklæring: Jeg er villig til å delta i studien	Jeg bekrefter å ha gitt informasjon om studien:
---------- (Signert av prosjektdeltaker, dato)	---------- ----- (Signert, rolle i studien, dato)

.

Hvor fysisk aktiv er du?

Med regelmessig fysisk aktivitet (f.eks rask gange, jogging, sykling, svømming, roing, aerobics etc.) mener vi her aktivitet som fører til at du puster mer enn vanlig og varer tilsammen 30 minutter hver dag og som blir gjennomført på de fleste dager i uken. Følg pilene og marker ved det som for deg er riktig svar på spørsmålene under.



Tenk på all **meget anstrengende aktivitet** du har drevet med de **siste 7 dagene. Meget anstrengende** aktivitet er aktivitet som krever hard innsats og får deg til å puste mye mer enn vanlig. Ta bare med aktiviteter som varer minst 10 minutter i strekk.

1. Hvor mange dager i løpet av de **siste 7 dagene** har du drevet med **meget anstrengende** fysisk aktivitet som tunge løft, gravearbeid, aerobics, løp eller rask sykling?

   ____dager

   ☐ Ingen meget anstrengende aktivitet → *Gå til spørsmål 3*

2. Hvor lang tid brukte du vanligvis på **meget anstrengende** fysisk aktivitet på en av disse dagene?

   _____ timer per dag

   _____ minutter per dag

   ☐ Vet ikke / usikker

Tenk på all **middels anstrengende** aktivitet du har drevet med de **siste 7 dagene**. **Middels anstrengende** aktivitet er aktivitet som krever moderat innsats og får deg til å puste litt mer enn vanlig. Ta bare med aktiviteter som varer mer enn 10 minutter i strekk.

3. Hvor mange dager i løpet av de siste 7 dagene har du drevet med middels anstrengende fysisk aktivitet som å bære lette ting, jogge eller sykle i moderat tempo? Ikke ta med gange.

____dager

☐ Ingen middels anstrengende aktivitet ⟶ *Gå til spørsmål 5*

4. Hvor lang tid brukte du vanligvis på middels anstrengende fysisk aktivitet på en av disse dagene?

____ timer per dag

____ minutter per dag

☐ Vet ikke / usikker

Tenk på tiden du har brukt på å **gå** de **siste 7 dagene**. Dette inkluderer gange på jobb og hjemme, gange fra et sted til et annet eller gange som du gjør på tur eller som trening på fritiden.

5. Hvor mange dager i løpet av de **siste 7 dagene** gikk du minst 10 minutter i strekk?

____dager

☐ Gikk ikke ⟶ *Gå til spørsmål 7*

6. Hvor lang tid brukte du vanligvis på å gå på en av disse dagene?

____ timer per dag

____ minutter per dag

☐ Vet ikke / usikker

Dette spørsmålet omfatter all tid du tilbrakte **sittende** på ukedagene i løpet av de **siste 7 dagene**. Inkluder tid du har brukt på å sitte på jobb, hjemme, på kurs og på fritiden. Dette kan tilsvare tiden du sitter ved et arbeidsbord, hos venner, mens du leser, eller sitter eller ligger for å se på TV.

7. Hvor lang tid brukte du på å **sitte** på en vanlig hverdag i løpet av de **siste 7 dagene**?

____timer per dag

____minutter per dag

☐ Vet ikke / usikker

Motivasjon for fysisk aktivitet:
Følgende spørsmål handler om dine grunner til å enten begynne med regelmessig fysisk aktivitet eller fortsette å gjøre det. Ulike personer har ulike grunner for å gjøre det, og vi ønsker å vite *hvor sanne* hver av følgende grunner er for deg. Det finnes ingen riktige eller gale svar. *Det er dine grunner som er viktige å få vite noe mer om.* Bruk skalaen og sett ring rundt det alternativet du mener passer best for hver av påstandene.

Grunnen til at jeg er fysisk aktiv er:	Slett ikke sant			Noe sant			Meget sant
1. Fordi jeg vil ta ansvar for min egen helse	1	2	3	4	5	6	7
2. Fordi jeg vil føle skyld eller skam hvis jeg ikke er regelmessig fysisk aktiv	1	2	3	4	5	6	7
3. Fordi jeg personlig tror det er det beste å gjøre for min helse	1	2	3	4	5	6	7
4. Fordi andre vil bli skuffet over meg om jeg ikke gjorde det	1	2	3	4	5	6	7
5. Det er blitt en naturlig innarbeidet vane for meg å være fysisk aktiv	1	2	3	4	5	6	7
6. For å være helt ærlig, jeg tenker virkelig ikke så mye på å være fysisk aktiv.	1	2	3	4	5	6	7
7. Fordi jeg har tenkt nøye over det og tror det er meget viktig for store deler av mitt liv	1	2	3	4	5	6	7
8. Fordi jeg ikke vil ha det bra med meg selv om jeg ikke er regelmessig fysisk aktiv	1	2	3	4	5	6	7
9. Fordi det er et viktig valg som jeg virkelig ønsker å gjøre	1	2	3	4	5	6	7
10. Fordi det er lettere for meg å gjøre det jeg blir fortalt å gjøre, enn selv å måtte tenke på hvordan være fysisk aktiv	1	2	3	4	5	6	7
11. Fordi jeg ønsker å bli godtatt av andre	1	2	3	4	5	6	7
12. Å være regelmessig fysisk aktiv har blitt en naturlig vane for meg	1	2	3	4	5	6	7
13. Fordi jeg ønsker at andre skal se at jeg kan gjøre det	1	2	3	4	5	6	7
14. Jeg vet virkelig ikke hvorfor jeg skal gjøre det	1	2	3	4	5	6	7
15. Fordi det har blitt en naturlig innarbeidet vane for meg å være fysisk aktiv	1	2	3	4	5	6	7

Vær så snill å svare på følgende påstander i forhold til hvor sanne de er for deg.
Sett en ring rundt det svar som passer best.

	PASSER						
	Ikke Sant			Noe sant			Helt sant
1. Jeg føler meg trygg på mine ferdigheter til å være regelmessig fysisk aktiv	1	2	3	4	5	6	7
2. Jeg føler meg i stand til å mestre det å være i regelmessig fysisk aktivitet nå	1	2	3	4	5	6	7
3. Jeg klarer å være i regelmessig fysisk aktivitet nå	1	2	3	4	5	6	7
4. Jeg føler meg i stand til å kunne møte utfordringen om å være i regelmessig fysisk aktivitet	1	2	3	4	5	6	7

HoNOS – Health of the Nation Outcome Scales

Norsk versjon april 2002 (korrigert desember 2002)

Oppsummering av instruksjon for skåring

1) Skår hver skala (problemområde) i rekkefølge fra 1 til 12.
2) Ikke ta med informasjon som er skåret på et tidligere punkt, med unntak av punkt 10 som skåres ut fra en samlet vurdering.
3) Skår det MEST ALVORLIGE problem som har forekommet i løpet av perioden som skåres (de siste to ukene, om ikke annet er bestemt)
4) Alle skalaene har denne graderingen:
   0= Ingen problem
   1= Lite problem som ikke krever tiltak
   2= Mildt problem, men avgjort tilstede
   3= Moderat alvorlig problem
   4= Alvorlig til svært alvorlig problem
   Skriv 9 hvis ukjent

1. Overaktiv, aggressiv, forstyrrende eller agitert atferd

- *Inkluder slik atferd uansett årsak (f.eks. rusmiddel, alkohol, demens, psykose, depresjon etc.)*
- *Inkluder ikke bisarr atferd som skal skåres på skala 6.*

0 Ingen slike problemer i perioden som skåres.
1 Irritabilitet, krangler, rastløshet etc. som ikke krever noe tiltak.
2 Inkluder aggressive fakter, dytting eller plaging av andre, trusler eller verbal aggresjon, mindre skade på gjenstander (f.eks. knust kopp eller vindu); atferd som er markert overaktiv eller agitert.
3 Fysisk aggressiv mot andre eller dyr (mindre enn ved 4), truende atferd, mer alvorlig overaktiv atferd eller ødeleggelse av ting.
4 Minst ett alvorlig fysisk angrep på andre eller på dyr, ødeleggelse av ting (f.eks. ildspåsetting), alvorlig skremmende eller uanstendig atferd.

2. Selvskade som ikke skyldes uhell

- *Inkluder ikke selvskade ved uhell (f.eks. på grunn av demens eller psykisk utviklingshemning). Det kognitive problemet skal skåres på skala 4 og skaden på skala 5.*
- *Inkluder ikke sykdom eller skade som er en direkte konsekvens av stoff/alkohol-bruk skåret på skala 3 (f.eks. leverkirrose eller skade på grunn av fyllekjøring skal skåres på skala 5).*

0 Ingen slike problemer i perioden som skåres.
1 Flyktige tanker om å gjøre slutt på alt, men liten risiko; ingen selvskade.
2 Mild risiko i perioden; inkluderer ufarlig selvskade (f.eks. risping på håndleddet).
3 Moderat til alvorlig fare for forsettelig selvskade i perioden; inkluderer forberedelser (f.eks. samle opp tabletter).
4 Alvorlig selvmordsforsøk og/eller alvorlig forsettelig selvskade i perioden.

3. Problemdrikking eller bruk av rusmiddel

- Inkluder ikke aggressiv/destruktiv atferd som skyldes alkohol eller rusmiddel, skåret på skala 1.
- Inkluder ikke fysisk sykdom eller handikap som skyldes bruk av alkohol eller rusmiddel, som skal skåres på skala 5.

0 Ingen slike problemer i perioden som skåres.
1 Noe overdreven bruk, men innen sosiale normer.
2 Tap av kontroll over drikking eller bruk av rusmiddel, men ikke alvorlig tilvenning.
3 Markert trang til eller avhengighet av alkohol eller rusmiddel med hyppig tap av kontroll, tar risker når påvirket.
4 Ufør på grunn av alkohol/rusmiddelproblem.

4. Kognitive problemer

- *Inkluder problem med hukommelse, orienteringsevne og forståelse uansett hva slags lidelse de er forbundet med: psykisk utviklingshemming, demens, schizofreni etc.*
- *Inkluder ikke forbigående problem (f.eks. bakrus) fra bruk av alkohol/rusmiddel, som skal skåres på skala 3.*

0 Ingen slike problemer i perioden som skåres.
1 Mindre problem med hukommelse eller forståelse (f.eks. glemmer navn av og til).
2 Milde men klare problem (f.eks. har gått seg bort på et kjent sted eller ikke kjent igjen en person en kjenner); i blant forvirret overfor enkle beslutninger.
3 Betydelig desorientert for tid, sted eller person; forvirret av dagligdagse hendelser; talen er noen ganger usammenhengende.
4 Alvorlig desorientert (f.eks. ikke i stand til å kjenne igjen slektninger); risiko for ulykker; uforståelig tale; tåkete eller stuporøs.

5. Problemer med fysisk sykdom eller funksjonshemming

- *Inkluder sykdom eller funksjonshemming uansett grunn som begrenser eller hindrer bevegelse, svekker syn eller hørsel, eller på annen måte forstyrrer personlig fungering.*
- *Inkluder bivirkninger av medikamenter; virkninger fra bruk av stoff/alkohol; fysiske handikap som resultat av ulykker eller selvskade i forbindelse med kognitive problemer, promillekjøring etc.*
- *Inkluder ikke mentale eller atferdsmessige problem, skåret på skala 4.*

0 Ingen fysiske helseproblemer av betydning i perioden som skåres.
1 Mindre helseproblemer i perioden (f.eks. forkjølelse, ufarlig fall etc.)
2 Fysisk helseproblem som medfører mild innskrenkning i bevegelighet og aktivitet.
3 Moderat grad av innskrenket aktivitet på grunn av fysiske helseproblemer.
4 Fullstendig eller alvorlig grad av uførhet på grunn av fysiske helseproblemer.

6. Problemer forbundet med hallusinasjoner og vrangforestillinger

- *hallusinasjoner og vrangforestillinger uansett diagnose.*
- *Inkluder merkelig og bisarr atferd forbundet med hallusinasjoner eller vrangforestillinger.*
- *Inkluder ikke aggressiv, destruktiv eller overaktiv atferd som skyldes hallusinasjoner eller vrangforestillinger, skåret på skala 1.*

0 Ingen tegn til hallusinasjoner eller vrangforestillinger i perioden.
1 Noe merkelige eller besynderlige overbevisninger som ikke er i samsvar med kulturelle normer.
2 Vrangforestillinger eller hallusinasjoner (f.eks. stemmer, syner) er tilstede, men er i liten grad plagsomme for pasienten eller manifestert i bisarr atferd, dvs. klinisk tilstede men mildt.
3 Markert opptatt av vrangforestillinger eller hallusinasjoner, forårsaker mye plager og/eller viser seg i åpenbar bisarr atferd. dvs. moderat alvorlig klinisk problem.
4 Mental tilstand og atferd er på en alvorlig og negativ måte påvirket av vrangforestillinger eller hallusinasjoner, med alvorlig innvirkning på pasienten.

7. Problem med senket stemningsleie

- *Inkluder ikke overaktivitet og agitasjon, skåret på skala 1.*
- *Inkluder ikke selvmordstanker eller selvmordsforsøk, skåret på skala 2.*
- *Inkluder ikke vrangforestillinger eller hallusinasjoner, skåret på skala 6.*

0 Ingen problemer forbundet med senket stemningsleie i perioden som skåres.
1 Tungsindig; eller mindre endringer i stemningsleie.
2 Mildt men avgjort deprimert og plaget (f.eks. skyldfølelse, tap av selvfølelse).
3 Depresjon med urimelig selvbebreidelse, opptatt av følelse av skyld.
4 Alvorlig eller svært alvorlig depresjon, med skyldfølelse eller anklager mot seg selv.

8. Andre mentale eller atferdsmessige problem

- *Skår bare det mest alvorlige kliniske problemet som ikke er vurdert på skalaene 6 og 7:*
- *Spesifiser type problem ved å skrive rett bokstav: A fobi, B angst, C tvangslidelse, D mentalt stress/spenninger, E dissosiativ, F somatoform, G spiseproblemer, H søvnvansker, I seksuelt problem, J annet problem (spesifiser)*

0 Ingen tegn til noen av disse problemene i perioden som skåres.
1 Bare mindre problemer.
2 Et problem er klinisk tilstede i mild grad (f.eks. pasienten har en grad av kontroll).
3 Av og til alvorlige anfall eller plager, med tap av kontroll (f.eks. må unngå helt angstskapende situasjoner, tilkalle en nabo for hjelp etc.), dvs. moderat alvorlig grad av problem.
4 Alvorlig problem som dominerer de fleste aktiviteter.

9. Problemer med forhold til andre

- *Skår pasientens mest alvorlige problem forbundet med aktiv eller passiv tilbaketrekning fra sosiale relasjoner, og/eller ikke-støttende, destruktive eller selv-ødeleggende relasjoner.*

0 Ingen slike problemer av betydning i perioden som skåres.
1 Mindre ikke-kliniske problemer.
2 Klare problemer med å etablere eller opprettholde støttende relasjoner: pasienten klager og/eller problemene er åpenbare for andre.
3 Vedvarende store problem på grunn av aktiv eller passiv tilbaketrekning fra sosiale relasjoner, og/eller på grunn av relasjoner som gir liten eller ingen trøst eller støtte.
4 Alvorlig og plagsom sosial isolasjon på grunn av manglende evne til å kommunisere sosialt og/eller tilbaketrekning fra sosiale relasjoner.

10. Problemer med dagliglivets aktiviteter

- *Skår funksjonsnivået innen dagliglivets aktiviteter (ADL) samlet sett (f.eks. problemer med grunnleggende aktiviteter innen egenomsorg som spising, vasking, kle på seg, bruk av toalett; og komplekse ferdigheter som budsjettering, organisere hvor en skal bo, arbeid/beskjeftigelse og rekreasjon, bevegelighet og bruk av transportmidler, handling, egenutvikling etc).*
- *Inkluder eventuell manglende motivasjon for å bruke muligheter for egenhjelp, siden dette bidrar til et generelt lavere funksjonsnivå.*
- *Inkluder ikke manglene muligheter for å gjøre bruk av intakte evner og ferdigheter, som skal skåres på skalaene 11-12.*

0 Ingen problemer i perioden som skåres; god evne til å fungere på alle områder.
1 Kun mindre problemer (f.eks. ustelt, uryddig).
2 Adekvat egenomsorg, men større mangel på evnen til å utføre en eller flere komplekse ferdigheter (se ovenfor).
3 Store problem innen ett eller flere områder av egenomsorg (spising, vasking, kle på seg, bruk av toalett) så vel som stor mangel på evner til å utføre flere komplekse ferdigheter.
4 Alvorlig svikt eller manglende funksjonsevne på alle eller nesten alle områder for egenomsorg og komplekse ferdigheter.

11. Problemer med boligforhold

- *Skår det generelle nivået av problemer med kvaliteten på boligforhold og daglig husholdningsrutine.*
- *Er de grunnleggende nødvendigheter tilfredsstillende (varme, lys hygiene)? Finnes det hjelp til å mestre handikap og muligheter til å bruke ferdigheter og utvikle nye?*
- *Skår ikke selve funksjonsnivået, som er skåret på skala 10.*
- ***N.B: Skår pasientens vanlige boligforhold. Hvis pasienten er i en akuttavdeling, skal en skåre den boligen pasienten har utenfor institusjonen. Hvis en ikke har informasjon om dette, skårer en 9 (ukjent).***

0 Bolig og boligforhold er akseptable; er til hjelp for å holde eventuelt handikap skåret på skala 10 på et lavest mulig nivå, og gir støtte for selvhjelp.
1 Boligen er rimelig akseptabel selv om det er mindre eller forbigående problemer (f.eks. ikke ideell beliggenhet, ikke den boligtype en foretrekker, liker ikke maten).
2 Problemer av betydning med ett eller flere aspekter ved boligen og/eller systemet (f.eks. begrenset utvalg; personale eller de en bor sammen med har liten forståelse for hvordan en kan begrense handikap eller hvordan en kan hjelpe til å bruke og utvikle nye eller intakte ferdigheter).
3 Plagsomt mange alvorlige problem med boligen (f.eks. noen grunnleggende nødvendigheter mangler); boligen har minimale eller ingen hjelpemidler for å bedre pasientens uavhengighet.
4 Boligen er uakseptabel (f.eks. mangel på grunnleggende nødvendigheter, pasienten er i fare for å bli kastet ut, "uten tak over hodet", eller boligforholdene er på andre måter utålelige) og gjør pasientens problem verre.

12. Problemer med yrke og aktiviteter

- *Skår det generelle nivået av problemer med kvalitet på omgivelsene på dagtid. Finnes det hjelp til å mestre handikap, og muligheter for å vedlikeholde og forbedre ferdigheter i forhold til arbeid og fritidssysler? Vurder faktorer som stigma, mangel på kvalifisert personale, tilgang på støttende tilbud (f.eks. bemanning og utstyr på dagsentre, arbeidssentre, sosiale klubber o.l.)*
- *Skår ikke selve funksjonsnivået , som er skåret på skala 10.*
- ***N.B: Skår pasientens vanlige situasjon. Hvis på akutt-avdeling, skåres aktivitetene i perioden før innleggelsen. Hvis informasjon ikke er tilgjengelig, skårer en 9.***

0 Pasientens omgivelser på dagtid er akseptable: til hjelp for å holde handikap skåret på skala 10 på et lavest mulig nivå, og med støtte for selvhjelp.
1 Mindre eller forbigående problemer (f.eks. sen utbetaling av penger); gode hjelpemidler er tilgjengelige men ikke alltid på ønskelig tidspunkt etc.
2 Begrenset utvalg av aktiviteter, f.eks. mangel på rimelig toleranse (f.eks. urettferdig nekting av adgang til offentlige bibliotek eller svømmehall etc.); handikap i form av mangel på fast adresse; utilstrekkelig støtte fra omsorgspersoner eller fag-folk; eller nyttig dagtilbud som bare er tilgjengelig i noen få timer.
3 Markert mangel på tilgjengelige gode tjenester som kan bidra til å begrense nivået av eksisterende handikap; ingen muligheter for å bruke intakte ferdigheter eller legge til nye; ufaglært pleie som er vanskelig å vurdere.
4 Mangel på noen som helst muligheter for aktiviteter på dagtid gjør pasientens problemer verre.

J Wing, RH Curtis, and A Beevor: Health of the Nation Outcome Scales (HoNOS). Glossary for HoNOS score sheet. Br J Psychiatry 174: 432-434.
Norsk oversettelse av Torleif Ruud (1996, 2002) godkjent av Royal College of Psychiatrists Research Unit, London.

Psykiatriske rehabiliteringspasienters helse, livskvalitet og bruk av samhandlende tjenester

Dato:_____
Pasient løpenr:_____
Klinikers initialer:_____

AES

(12-items kortversjon av Apati evaluerings skala)

Instruksjon:

For hvert spørsmål vil jeg be deg sirkle rundt det svaret som best angir dine tanker, følelser og aktiviteter de siste 2 ukene.

Spørsmålene skal besvares på følgende måte:

1: Slett ikke karakteristisk for meg.

2: Litt karateristisk for meg.

3: En del karakteristisk for meg.

4: Svært god karakteristikk av meg.

		Slett ikke	Litt	En del	Svært god
1	Jeg er interessert i ting.				
2	Jeg får gjort ting i løpet av dagen.				
4	Jeg er opptatt av å oppleve nye ting.				
5	Jeg er interessert i å lære nye ting.				
6	Jeg yter en innsats i forhold til nye ting.				
7	Jeg nærmer meg livet med intensitet.				
9	Jeg bruker tid på å gjøre ting som interesserer meg.				
10	Noen må fortelle meg hva jeg skal gjøre hver dag.				
14	Jeg blir glad når det skjer noe hyggelig.				
16	Det er viktig for meg å få gjort det jeg skal i løpet av dagen.				
17	Jeg tar initiativ.				
18	Jeg er motivert / har motivasjon.				

(Assessing apathy: The use of the Apathy Evaluation Scale in first episode psychosis Ann Faerden a,*, Ragnar Nesva°g b, Elizabeth Ann Barrett c, Ingrid Agartz b,d,Arnstein Finset e, Svein Friis a,d, Jan Ivar Rossberg a,d, Ingrid Melle European Psychiatry 2008)

Informasjon om Polar klokke som måler dagligdags fysisk aktivitet

Denne klokken klarer å registrere din daglige fysiske aktivitet. Med fysisk aktivitet mener vi all aktivitet hvor du bruker kroppen. Dette kan være alt fra å gå til butikken, gjøre rent huset, rydde i hagen eller jogge en tur. Klokken registrer altså all aktivitet og du trenger ikke å bli sliten av aktiviteten for at klokken skal registrere den. Klokka registrerer også omtrent hvor mange skritt du går i løpet av en dag. Klokka er vanntett og du kan både dusje og bade med den. Det eneste klokken måler er bevegelse (altså at du rører på deg), den kan ikke si noe om hvor du er eller hva du gjør!

En stund etter at du har levert inn klokken vil du få en tilbakemelding på hvor mye aktivitet du har vært i når du brukte klokken. I denne tilbakemeldingen vil det være en totaloversikt over hele uken og en som viser aktiviteten din dag for dag. Den vil også fortelle deg omtrent hvor mange skritt du har gått hver dag.

Under ser du et bilde av klokken som viser hva de ulike tallene og symbolene betyr.

Denne figuren kan sitte, stå, gå eller løpe og gir et bilde på aktiviteten din for øyeblikket. Det tar noen sekunder fra du har begynt å gå til figuren starter å gå

Dette viser hvilken dag og dato det er

Dette viser hva klokken er for øyeblikket

Denne søylen vil fylles opp når en er i aktivitet. Hver av strekene er det samme som 15 minutter aktivitet. Når hele søylen er full har du vært i aktivitet 1 time

Dette tallet viser hvor mange minutter og timer du har vært i aktivitet denne dagen. Her har personen vært aktiv i 19 minutter

Ta gjerne kontakt med Anders Farholm fra Idrettshøgskolen på telefon 23 26 24 32 eller e-post anders.farholm@nih.no hvis du har spørsmål.

APPENDIX D

Paper IV

Approval letter from the Norwegian Social Science Data Services (No. 35087)

Information letter and informed consent

Questionnaire (only scales used in Paper IV are attached)

Norsk samfunnsvitenskapelig datatjeneste AS
NORWEGIAN SOCIAL SCIENCE DATA SERVICES

Harald Hårfagres gate 29
N-5007 Bergen
Norway
Tel: +47-55 58 21 17
Fax: +47-55 58 96 50
nsd@nsd.uib.no
www.nsd.uib.no
Org.nr. 985 321 884

Anders Farholm
Seksjon for coaching og psykologi
Norges idrettshøgskole
Postboks 4014 Ullevål Stadion
0806 OSLO

Vår dato: 14.08.2013 Vår ref:35087 / 3 / LT Deres dato: Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 09.08.2013. Meldingen gjelder prosjektet:

35087	*Motivasjon for fysisk aktivitet blant personer med psykiske lidelser*
Behandlingsansvarlig	*Norges idrettshøgskole, ved institusjonens øverste leder*
Daglig ansvarlig	*Anders Farholm*

Personvernombudet har vurdert prosjektet, og finner at behandlingen av personopplysninger vil være regulert av § 7-27 i personopplysningsforskriften. Personvernombudet tilrår at prosjektet gjennomføres.

Personvernombudets tilråding forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, ombudets kommentarer samt personopplysningsloven og helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/meldeplikt/skjema.html. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, http://pvo.nsd.no/prosjekt.

Personvernombudet vil ved prosjektets avslutning, 01.08.2016, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Vigdis Namtvedt Kvalheim

Lis Tenold

Kontaktperson: Lis Tenold tlf: 55 58 33 77
Vedlegg: Prosjektvurdering

Forespørsel om deltakelse i forskningsprosjektet

"Motivasjon for fysisk aktivitet blant personer med psykiske lidelser"

Nyere forskning har vist at fysisk aktivitet kan fungere som et viktig supplement i behandlingen av personer med psykiske lidelser. Fysisk aktivitet har vist seg å ha en positiv effekt på både fysisk og mental helse. For å utnytte potensialet fysisk aktivitet har er det viktig å ha kunnskap om hvilke faktorer som kan være med å fremme eller hemme fysisk aktivitet, dette er det dessverre liten kunnskap om. Formålet med denne studien er derfor å undersøke faktorer som er knyttet til fysisk aktivitet. Vi ønsker derfor å undersøke om det er noen sammenhenger mellom hvor fysisk aktiv du er og hvilke erfaringer og opplevelser du har med fysisk aktivitet.

Denne undersøkelsen er en del av en doktorgradsstudium ved Norges Idrettshøgskole som undersøker motivasjon for fysisk aktivitet blant personer med psykiske lidelser. Prosjektet samarbeider med Sykehuset Innlandet – Reinsvoll og Kulturnettverket.

Du har blitt spurt om å delta i undersøkelsen fordi du har deltatt på ett eller flere av Kulturnettverkets arrangerte aktiviteter. Dette betyr at du har kunnskap og erfaring som kan være med å bidra til å øke kunnskapen om hvordan vi kan øke aktivitetsnivået blant personer med psykiske lidelser.

Hvis du ønsker å delta i studien vil du få utlevert et spørreskjema. Det vil ta ca 15-20 minutter å besvare spørreskjemaet. Når du er ferdig kan du legge spørreskjemaet i den vedlagte konvolutten. Spørsmålene vil omhandle hvor ofte du er fysisk aktiv, hva slags motivasjon for fysisk aktivitet du har, om det er noen rundt deg som støtter deg i å være aktiv, hvor trygg du er på å være i aktivitet, hva som hindrer og/eller legger til rette for at du skal være i aktivitet, erfaringer du har med fysisk aktivitet og til slutt noen spørsmål om livskvalitet knyttet til helsen din.

All innsamlet data i undersøkelsen er på gruppenivå (f.eks aldersgruppe 40-49 år) slik at enkeltpersoner ikke kan identifiseres. Resultatene fra undersøkelsen vil også bli publisert på gruppenivå slik at enkelt personer heller ikke her kan gjenkjennes. Prosjektet skal etter planen avsluttes 1. august 2016 og koblingsnøkkel vil da bli slettet.

Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli slettet. Hvorvidt du velger å delta i undersøkelsen eller ikke, har ingen betydning for din videre deltagelse i Kulturnettverket eller andre tilbud. Det vil kun være prosjektgruppen på Idrettshøgskolen (meg og mine to veiledere) som har tilgang til data som vi samler inn. Denne informasjonen vil bli behandlet konfidensielt.

Studien er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste AS.

Hvis du har spørsmål knyttet til studien, ta kontakt med Anders Farholm på telefon 415 75 012 eller e-post anders.farholm@nih.no. Dersom du ønsker å delta i undersøkelsen er det fint om du signerer den vedlagte samtykkeerklæringen.

Med vennlig hilsen
Anders Farholm
Norges Idrettshøgskole, Seksjon for Coaching og Psykologi

Samtykke til deltakelse i studien

Jeg har mottatt informasjon om studien, og er villig til å delta

---

(Signert av prosjektdeltaker, dato)

ID-nummer:_____

Kort informasjon til deg som skal svare på dette spørreskjemaet

Når du svarer på spørsmålene i dette skjemaet, så gjelder det hele veien at det ikke finnes noen rette eller gale svar og det er ingen lurespørsmål. Det er dine erfaringer og meninger vi er ute etter. Prøv å svare så åpent og ærlig du kan. På forhånd takk!

HVOR FYSISK AKTIV ER DU?

Med fysisk aktivitet tenker vi på aktiviteter du gjør i det daglige, f.eks., som en del av hus- og hagearbeid, på jobb, forlytte deg fra et sted til et annet og fritidsaktiviteter som rask gange, sykling og ulike idrett / sportsaktiviteter.

Med regelmessig fysisk aktivitet mener vi aktiviteter som fører til at du puster mer enn vanlig, varer til sammen 30 min hver dag og blir gjennomført på de fleste dager i uken.

Er du i regelmessig fysisk aktivitet i forhold til definisjonen over? Kryss av for det utsagnet som passer best for deg.

Nei, og jeg har ingen hensikt om å starte med fysisk aktivitet ☐

Nei, men jeg har vurdert å begynne å være fysisk aktiv…….. ☐

Nei, men jeg har en plan om å begynne med fysisk aktivitet….. ☐

Ja, men i mindre enn 6 måneder……... ☐

Ja, og jeg har vært det i over 6 måneder…… ☐

ID-nummer ___

HVORDAN ANDRE PERSONER STØTTER DEG I Å VÆRE FYSISK AKTIV

Her er vi interessert i å undersøke hvordan den/de viktigste person(ene) i din omgangskrets vanligvis forholder seg til deg når du er i fysisk aktivitet.

Hvem anser du som den/de viktigste personen(e) for deg med tanke på fysisk aktivitet?
Sett et kryss

Familie…… ☐
Venner……. ☐
Behandlingspersonell…. ☐
Andre…….. ☐

Ta utgangspunkt i den eller de personen(e) som er viktigst for deg med tanke på fysisk aktivitet når du svarer på spørsmålene under.

	Svært uenig			**Nøy-tral**			**Svært enig**
1. Jeg opplever at personen (e) har gitt meg muligheter til å velge ulik former for fysisk aktivitet	1	2	3	4	5	6	7
2. Jeg føler denne/disse personen(e) forstår hvordan jeg vurderer ting som har å gjøre med min fysiske aktivitet	1	2	3	4	5	6	7
3. Denne/disse personen (e) uttrykker tillit til at jeg klarer å være fysisk aktiv på en god måte	1	2	3	4	5	6	7
4. Personen(e) lytter til hvordan jeg tenker å gjøre ting som vedrører min fysiske aktivitet	1	2	3	4	5	6	7
5. Personen(e) oppmuntrer meg til å stille spørsmål om fysisk aktivitet	1	2	3	4	5	6	7
6. Personen(e) prøver å forstå mitt syn på fysisk aktivitet før han/hun foreslår noen endringer eller nye måter å gjøre ting på	1	2	3	4	5	6	7

ID-nummer ___

HVA FØLER DU NÅR DU ER I FYSISK AKTIVITET?

Noen ganger kan du være fysisk aktiv alene, andre ganger sammen med andre. Bruk skalaen og sett ring ved det alternativet du mener passer for hver av påstandene.

Jeg føler…	**Slett ikke sant**					**Noe sant**	**Meget sant**
1. …at min fysiske aktivitet i stor grad er forenlig med mine valg og interesser	1	2	3	4	5	6	7
2. …meg veldig bekvem sammen andre som er med i fysisk aktivitet	1	2	3	4	5	6	7
3. …jeg har stor fremgang i forhold til målet mitt med fysisk aktivitet	1	2	3	4	5	6	7
4. …sterkt at min aktivitet passer måten jeg vil være aktiv på	1	2	3	4	5	6	7
5. …jeg kan omgås andre under fysisk aktivitet på en vennlig måte	1	2	3	4	5	6	7
6. …jeg utfører min fysiske aktivitet veldig effektivt	1	2	3	4	5	6	7
7. …at min fysiske aktivitet er helt klart et utrykk for hvordan jeg ønsker at aktivitet skal være	1	2	3	4	5	6	7
8. …jeg har god og åpen kommunikasjon med andre som deltar under fysisk aktivitet	1	2	3	4	5	6	7
9. …jeg får til å være i fysisk aktivitet meget bra	1	2	3	4	5	6	7
10. …sterkt at jeg har mulighet til å gjøre valg i forhold til min aktivitet	1	2	3	4	5	6	7
11. …meg veldig komfortabel med de andre som deltar sammen med meg i min fysiske aktivitet	1	2	3	4	5	6	7
12. …jeg kan klare øvelsene i min fysiske aktivitet på en god måte	1	2	3	4	5	6	7

ID-nummer ___

HVORFOR VELGER DU Å VÆRE FYSISK AKTIV ELLER IKKE?

Vi interessert i bakgrunn for hvorfor du velger å være fysisk aktiv eller ikke. Vi ønsker bare å vite mer om hva du tenker om å være fysisk aktiv. Marker for hvor godt utsagnene passer for deg.

	Slett ikke sant		**Noe sant**		**Meget sant**
1. Jeg er fysisk aktiv fordi andre sier at jeg bør være det	0	1	2	3	4
2. Jeg får dårlig samvittighet hvis jeg ikke er fysisk aktiv	0	1	2	3	4
3. Jeg verdsetter gevinstene av å være fysisk aktiv	0	1	2	3	4
4. Jeg er fysisk aktiv fordi det er gøy	0	1	2	3	4
5. Jeg ser ingen grunn til å være fysisk aktiv	0	1	2	3	4
6. Jeg er fysisk aktiv fordi venner/familie sier at jeg bør være det	0	1	2	3	4
7. Jeg skammer meg hvis jeg ikke er fysisk aktiv	0	1	2	3	4
8. Det er viktig for meg å være i regelmessig fysisk aktivitet	0	1	2	3	4
9. Jeg skjønner ikke hvorfor jeg skulle bruke tid på å være fysisk aktiv	0	1	2	3	4
10. Jeg liker å være i fysisk aktivitet	0	1	2	3	4
11. Jeg er fysisk aktiv fordi andre ville vært misfornøyd med meg hvis jeg ikke var det	0	1	2	3	4
12. Jeg ser ikke noe poeng i være fysisk aktiv	0	1	2	3	4
13. Jeg føler meg mislykket hvis jeg ikke har vært fysisk aktiv på en stund	0	1	2	3	4
14. Jeg synes det er viktig å legge ned innsats i være i regelmessig fysisk aktivitet.	0	1	2	3	4
15. For meg er fysisk aktivitet lystbetont	0	1	2	3	4
16. Jeg føler press fra andre for å være fysisk aktiv	0	1	2	3	4
17. Jeg blir rastløs hvis ikke er i regelmessig fysisk aktivitet	0	1	2	3	4
18. Jeg blir glad og tilfreds hvis jeg er i fysisk aktivitet	0	1	2	3	4
19. Jeg synes fysisk aktivitet er å kaste bort tiden	0	1	2	3	4

ID-nummer ___

HVORDAN ER HELSEN DIN?

Avslutningsvis ønsker vi kort litt informasjon om hvordan du oppfatter din egen helse.

1. **Stort sett, vil du si at din helse er** (sett ett kryss):

Utmerket ☐ Meget god ☐ God ☐ Nokså god ☐ Dårlig ☐

2. De neste spørsmålene handler om aktiviteter du kanskje utfører i løpet av en vanlig dag. Er din helse slik at den begrenser deg i utførelsen av disse aktivitetene nå? Hvis ja, hvor mye?

	Ja, begrenser meg mye	Ja, begrenser meg litt	Nei, ikke i hele tatt
Moderate aktiviteter, som å flytte på et bord, støvsuge, gå en tur eller drive hagearbeid	1	2	3
Gå opp trappen flere etasjer	1	2	3

3. I løpet av de siste 4 ukene, hvor ofte har din fysiske helse ført til at du har opplevd følgende problemer under hverdagsaktiviteter eller på jobb?

	Hele tiden	Mesteparten av tiden	Noe av tiden	Litt av tiden	Ikke noe av tiden
Utrettet mindre enn du hadde ønsker	1	2	3	4	5
Vært hindret i å utføre visse typer arbeid eller gjøremål	1	2	3	4	5

4. I løpet av de 4 siste ukene, hvor ofte har din psykiske helse ført til at du har opplevd følgende problemer under hverdagsaktiviteter eller på jobb

	Hele tiden	Mesteparten av tiden	Noe av tiden	Litt av tiden	Ikke noe av tiden
Utrettet mindre enn du liker	1	2	3	4	5
Gjennomført aktiviteter mindre grundig enn vanlig	1	2	3	4	5

5. **I løpet av de 4 siste ukene, hvordan har smerter påvirket hverdagen din (både på jobb og hjemme)**? (sett et kryss)

Svært mye ☐ Mye ☐ En del ☐ Litt ☐ Ikke i det hele tatt ☐

ID-nummer ___

6. **Hvordan du har følt deg og hvordan det har gått med deg i de 4 siste ukene?**

	Hele noe tiden	Mesteparten av tiden	Noe av tiden	Litt av tiden	Ikke av tiden
Har du følt deg rolig og harmonisk	1	2	3	4	5
Har du hatt mye overskudd	1	2	3	4	5
Har du følt deg deprimert og nedfor	1	2	3	4	5

7. I løpet av de 4 siste ukene, hvor ofte har enten din fysiske eller psykiske helse hindret deg i dine sosiale aktiviteter (som å besøke venner eller familie)? (sett et kryss)

Hele tiden ☐ Mye av tiden ☐ En del av tiden ☐ Litt av tiden ☐ Ikke noe av tiden ☐

LITT KORT INFORMASJON OM DEG

For å kunne undersøke om det er noen forskjell i hvordan alder, kjønn, bosituasjon og psykisk lidelse påvirker fysisk aktivitet håper vi dere vil fylle ut litt kort informasjon om dere selv

1. **Er du mann eller kvinne?** Mann ☐ Kvinne ☐

2. **Hvor gammel er du?**
35 år eller yngre ☐
36 – 50 år ☐
51 – 65 år ☐
66 år eller eldre ☐

3. **Hva er din sivile status?**
Alene (singel, enkemann, enke, skilt, separert, etc) ☐
I et forhold (gift, samboer, kjæreste, etc) ☐

4. **Hva er din bosituasjon?**
Bor sammen med noen (familie, venner, etc)… ☐
Bor alene…… ☐
Bor på institusjon…… ☐

5. **Bor du i en by eller rett i nærheten (mindre enn 5 min med bil) eller bor du lengre unna en by?**
By / rett ved ☐
Ikke by / landlig ☐

ID-nummer ___

I hvilken gruppe passer din diagnose best? Sett ett kryss på hoveddiagnose, hvis du har flere lidelser krysser du av for eventuelle tilleggsdiagnoser.

	Hoveddiagnose	Tilleggsdiagnose
Affektive lidelser……..	☐	☐
Ulike angstlidelser ……...	☐	☐
Ulike psykose lidelser……..	☐	☐
Psykiske lidelser relatert til bruk av rusmidler	☐	☐
Personlighet og atferdsforstyrrelser……	☐	☐
Andre psykiske lidelser……..	☐	☐
Annen type lidelse……..	☐	☐
Ønsker ikke å oppgi noen diagnose……	☐	☐

Se under for eksempler på diagnoser som hører hjemme i de ulike gruppene

Affektive lidelser

- Manisk episode
- Bipolar affektiv lidelse
- Depressiv periode
- Mild/moderat depresjon
- Alvorlig depresjon
- Dystymi
- Tilbakevendende Depressiv lidelse

Ulike angstlidelser

- Fobiske angstlidelser
- Panikklidelser
- Sosial angst
- Tvangslidelse
- Posttraumatisk stress-lidelse
- Dissosiativ lidelse

Ulike psykose lidelser

- Schizofreni
- Schizotyp lidelse
- Paranoide psykose
- Schizoaffektiv lidelse
- Ikke-organiske psykoser
- Akutte og forbigående psykoser

Psykiske lidelser relatert til bruk av rusmidler

- Alkohol
- Legemidler
- Narkotika
- Tobakk
- Flere stoffer

Personlighet og atferdsforstyrrelser

- Personlighetsforstyrrelser
- Impuls og vaneforstyrrelser
- Blandede og andre personlighetsforstyrrelser
- Andre forstyrrelser av voksen personlighet og atferd

Andre psykiske lidelser

Psykiske lidelser eller diagnoser som ikke passer i de andre gruppene.

TAKK FOR HJELPEN!

ID-nummer ___

APPENDIX E

Paper V

Approval letter from the Norwegian Social Science Data Services (No. 44045)

Information letter and informed consent

Questionnaire (only scales used in Paper V are attached)

Registration form for direct observation of physical activity

Norsk samfunnsvitenskapelig datatjeneste AS
NORWEGIAN SOCIAL SCIENCE DATA SERVICES

Harald Hårfagres gate 2
N-5007 Bergen
Norway
Tel +47-55 58 21 17
Fax +47 55 58 96 50
nsd@nsd.uib.no
www.nsd.uib.no
Org.nr. 985 321 884

Marit Sørensen
Seksjon for coaching og psykologi
Norges idrettshøgskole
Postboks 4014 Ullevål Stadion
0806 OSLO

Vår dato: 12.08.2015 Vår ref:44045 / 3 / LT Deres dato: Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 10.07.2015. Meldingen gjelder prosjektet:

44045	*Helsepersonells innstilling til og motivasjon for bruk av fysisk aktivitet som en del av psykiatrisk behandlingen*
Behandlingsansvarlig	*Norges idrettshøgskole, ved institusjonens øverste leder*
Daglig ansvarlig	*Marit Sørensen*
Student	*Magne Hem Stenersen*

Personvernombudet har vurdert prosjektet og finner at behandlingen av personopplysninger er meldepliktig i henhold til personopplysningsloven § 31. Behandlingen tilfredsstiller kravene i personopplysningsloven.

Personvernombudets vurdering forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, ombudets kommentarer samt personopplysningsloven og helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema http://www.nsd.uib.no/personvern/meldeplikt/skjema.html. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, http://pvo.nsd.no/prosjekt.

Personvernombudet vil ved prosjektets avslutning, 01.06.2016, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Bjørn Henrichsen

Lis Tenold

Lis Tenold tlf: 55 58 33 77
Vedlegg: Prosjektvurdering
Kopi: Magne Hem Stenersen, Vækerøveien 210, 0751 OSLO

Kort informasjon til deg som skal svare på dette spørreskjemaet

Når du svarer på spørsmålene i dette skjemaet, så gjelder det hele veien at det ikke finnes noen rette eller gale svar og det er ingen lurespørsmål. Det er dine erfaringer, opplevelser og meninger vi er ute etter. Les spørsmålene nøye og vær vennlig og besvar alle spørsmålene. Prøv å svare så åpent og ærlig du kan. På forhånd takk!

I spørreskjemaet vil **fysisk aktivitet** være definert som enhver kroppslig bevegelse initiert av skjelettmuskulatur som resulterer i en vesentlig økning i energiforbruket utover hvilenivå (Helsedirektoratet, 2015). Med dette menes for eksempel lek, mosjon, idrett, trening, gange og friluftsliv. Med å **fremme** fysisk aktivitet mener vi å anbefale, gjennomføre og gi råd om fysisk aktivitet.

For at vi ikke skal trenge å registrere navn, ber vi deg om å lage din unike personlige kode og skrive den på spørreskjema. Koden lages av følgende informasjon som kun du kan kjenne, men som kan hjelpe oss å holde personer fra hverandre:

- Andre bokstav i ditt fornavn
- Tredje bokstav i ditt etternavn
- De to siste tallene i ditt fødselsår
- Første bokstav på skolen du gikk på i 1.klasse
- Din skostørrelse (laveste hele tall)

Kode: _____

Jeg bekrefter herved at jeg har fått informasjon om hensikten med denne spørreskjema undersøkelsen

Ja ○

Jeg bekrefter herved at jeg besvarer denne spørreskjema undersøkelsen frivillig og at jeg kan trekke meg

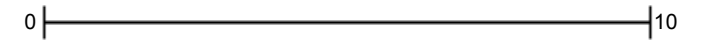
Ja ○

8. Ranger fra 0 – 10 hvor sikker du er på påstandene under og bruk linjene til å sette et kryss.

Jeg er **ikke** i posisjon til å påvirke bruken av fysisk aktivitet på mitt arbeidssted:

Helt usikker **Helt sikker**

Jeg har det pågangsmotet som skal til for å bruke fysisk aktivitet som en del av behandlingen for personer med psykiske lidelser:



Helt usikker **Helt sikker**

Hvis jeg ønsker klarer jeg å fremme fysisk aktivitet for personer med psykiske lidelser:

Helt usikker **Helt sikker**

Jeg har den kunnskapen som trengs for å bruke fysisk aktivitet som en del av behandlingen for personer med psykiske lidelser:

Helt usikker **Helt sikker**

Del VII: Hva vil jeg gjøre for å fremme fysisk aktivitet i psykisk helsevern

De følgende spørsmålene handler om hvorfor du vil eller ikke vil gjøre en innsats i å fremme fysisk aktivitet for personer med psykiske lidelser i din jobb. Sett et kryss for hvert spørsmål.

9. Jeg vil gjøre en jobb for å fremme fysisk aktivitet for personer med psykiske lidelser fordi:

	Ikke i det hele tatt	Veldig lite	Lite	Moderat	Mye	Veldig mye	Fullstendig
Andre vil da verdsette meg høyere (for eksempel sjef, kollegaer, familie, pasienter)	○	○	○	○	○	○	○
Andre vil respektere meg mer (for eksempel sjef, kollegaer, familie, pasienter)	○	○	○	○	○	○	○
Jeg vil unngå å bli kritisert av andre (for eksempel sjef, kollegaer, familie, pasienter)	○	○	○	○	○	○	○
Jeg må bevise for meg selv at jeg kan	○	○	○	○	○	○	○
Det gjør meg stolt av meg selv	○	○	○	○	○	○	○
Ellers ville jeg følt meg skamfull	○	○	○	○	○	○	○
Ellers ville jeg ikke hatt det bra med meg selv	○	○	○	○	○	○	○
Jeg personlig vurderer det viktig å legge en innsats i dette	○	○	○	○	○	○	○
Det å legge en innsats i denne jobben sammenfaller med mine personlige verdier	○	○	○	○	○	○	○
Det å legge en innsats i denne jobben er av personlig verdi for meg	○	○	○	○	○	○	○
Jeg trives når jeg gjør denne jobben	○	○	○	○	○	○	○
Jeg synes det er spennende	○	○	○	○	○	○	○
Det er interessant/meningsfullt	○	○	○	○	○	○	○
Jeg legger ikke innsats i dette fordi jeg føler at jeg kaster bort tiden min	○	○	○	○	○	○	○
Jeg gjør lite fordi jeg ikke synes denne jobben er verdt å legge noen innsats i	○	○	○	○	○	○	○
Jeg vet ikke hvorfor jeg gjør denne jobben, den er meningsløs	○	○	○	○	○	○	○

Del VIII: Demografi

Sett kryss bak de svaralternativene som passer for deg

10. Alder

- ◯ < 30 år
- ◯ 31 - 49 år
- ◯ > 50 år

11. Kjønn

- ◯ Kvinne
- ◯ Mann
- ◯ Annet

12. Yrkesgruppe

- ◯ Idrettspedagog
- ◯ Fysioterapeut
- ◯ Ergoterapeut
- ◯ Vernepleier
- ◯ Sykepleier
- ◯ Adminisrativ stilling
- ◯ Miljøterapeut
- ◯ Psykolog
- ◯ Lege
- ◯ Annet (spesifiser under): _____

14. Stillingsprosent (skriv inn): _____

Takk for din deltakelse!

Registrering av fysisk aktivitet inne på avdeling - Uke

Navn	Id nr	Aktivitet	Inn / Ut	MAN	TIRS	ONS	TORS	FRE	LØR	SØN	ANNET