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## European Master in Health and Physical Activity

**Master's Thesis (30 ECTS)**

**Psychosocial and Physical Predictors of  
Stages of Change in Physical Activity**

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## ABSTRACT

**Background:** The need of effective intervention programs for promoting physical activity is an important aspect in public health practice. Psychosocial factors' role on behavior change have received much attention in the exercise domain, and seems to be central in determining people's exercise habits. In terms of exercise adherence, there seems to rule uncertainty in determining long-time effects of psychosocial status in people's day-to-day life in a non-interventional setting. Despite common awareness of the negative consequences associated with increased BMI and poor psychological health for exercise adherence, the relative importance of these factors compared to psychosocial status seems to be unclear. The contributions of psychosocial factors for predicting physical activity status and progression in a natural context remains unknown, thus warranting the current research.

**Purpose:** The primary purpose of this study was: 1) investigate to what extent psychosocial factors (including psychological health) and BMI could predict status of physical activity in a non-interventional setting. 2) investigate to what extent psychosocial factors (including psychological health) and BMI predict a *change* (progression) of physical activity in a non-interventional setting.

**Methods:** A sample consisting of 565 inhabitants from a low socio-economic status environment in Oslo, Norway, acting as control group in the "Romsaas in Motion" intervention study, provided questionnaire data in 2000 (time 1) and 2003 (time 2). BMI was measured at time 1, and the questionnaires were identical at both surveys. A valid and reliable tool, stages of change of physical activity, was applied to detect levels of physical activity. BMI and psychosocial predictor indices derived from different theories measured at time 1 were analyzed to detect whether or not they could predict physical activity status and/or progression at time 2.

**Results:** Psychosocial indices at time 1 predicted 28 % of stages of change *status* at time 2 (controlled for BMI and psychological health). Time 1 self-efficacy in overcoming psychological barriers, affective attitude towards physical activity, and physical activity identity was significant predictors of time 2 status in physical activity. Controlling for BMI and psychological health, psychosocial factors predicted 4 % of progression in physical activity stages of change from time 1 to time 2. Affective attitude towards physical activity

and physical activity identity stood out as significant predictors of physical activity stage of change progression.

**Conclusion:** If people find physical activity easy, pleasant, and interesting at some point in their adult life, it will likely influence their future physical activity. People who identify themselves as exercisers, who cares about their body, see themselves as interested in physical activity, and interested in being physical fit, also enhance the possibility of being more physical active than people with low perceived physical activity identity. Likewise, people who believe they can overcome barriers of a psychological nature, such as being tired, stressed or worried are likely to belong to a higher stage of change in physical activity in the future. This is true regardless of BMI status and psychological health. However, psychosocial factors as well as BMI and psychological health, only explained a small portion of physical activity progression from time 1 to time 2.

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## 1.0 INTRODUCTION

Due to the prominent burden of lifestyle-related chronic conditions, such as cardiovascular diseases, type 2-diabetes, cancer, and mental health problems (Stene-Larsen, 2006; WHO, 1999), promoting physical activity in the population is an important aspect in today's society. In addition to taking their toll on human life expectancy, the aforementioned conditions are often accompanied by a decreased quality of life for those affected as well as their families (Satterfield et al., 2003). Population surveys indicate that 60 percent of adults in modern western societies do not exercise on a regular basis (Seefeldt, Malina, & Clark, 2002). Norwegian national surveys indicate that the prevalence of the adult population who are sedentary in their leisure time range between 19 and 50 percent (Søgaard, Bø, Klungland, & Jacobsen, 2000). An equally worrying trend develops amongst those who manages to take up exercise, where only 50 percent are likely to sustain active within a year (Sallis & Owen, 1999). In addition, people of low socioeconomic status (SES) seem to be more prone to inadequate levels of physical activity compared to people of higher SES (Ford et al., 1991; USDHHS, 2010). Due to the inadequate levels of physical activity, especially two questions are important 1) how to influence sedentary people to become more physical active, and 2) how to make them remain active in the future.

Designing effective intervention programs relies on changing behaviors of the targeted population consistently over time. Population based intervention programs might contribute to making people initiate or increase their current exercise levels, and such interventions are therefore considered a vital element in public health practice. In order to affect the health of a population, it is essential to reach out to large groups of people (Sallis & Owen, 1999). In this case, even a modest improvement in health status will have a large impact on public health.

There seems to be confusion on how to promote physical exercise most efficiently. Previous interventions with a "one-size-fits-all" concept has shown limited success, given the participants lack of psychological readiness to change their current behavior. In a recent literature review, the authors found a positive modest effect of physical activity intervention programs measured by self-reported physical activity and cardio-respiratory fitness. However, the authors concluded that there was not sufficient evidence to be drawn on individual components of the interventions (Foster, Hillsdon, Thorogood, & Wedatilake, 2005). Similar

findings were found concerning mass media campaigns, where the authors concluded that these initiatives may not reduce sedentary behavior or lead to recommended levels of overall physical activity (Abioye, Hajifathalian, & Danaei, 2013). Given its complex and multi-dimensional structure, promoting exercise participation is difficult to comprehend, yet essential to understand in order to ensure effective exercise promoting interventions in the future. The current study investigates this gap of knowledge, by focusing on the promising field of *psychosocial mediators* of human behavior.

## **2.0 THEORETICAL BACKGROUND**

### **2.1 Physical activity as a mediator of health**

Physical activity is defined as “any bodily movement that results in an increase in energy expenditure above resting level” (Caspersen, Powell, & Christenson, 1985). Thus, physical activity is a wide term, but is normally divided between the five dimensions of volume, frequency, duration, intensity, and mode (Riddock & McKenna, 2003). As the definition suggests, the physical activity does not have to be a planned activity, as long as it requires energy levels above resting metabolism. Physical activity can be carried out as part of one’s work or day-to-day living, for instance by doing housework, climbing a ladder, working in the garden, using the stairs, as well as more traditional planned physical activities, such as jogging, swimming, and strength training (Marttila et al., 1998).

There is consensus amongst scientists that physical activity plays an important role in preventing, and to a larger extent reversing a number of lifestyle-related conditions (e.g. cardiovascular diseases, type-2 diabetes, cancer, and hypertension), as well as increasing life expectancy and quality of life (Warburton, Nicol, & Bredin, 2006). In fact, studies suggest that there is an inverse dose-response relationship between volume of physical activity and all-cause mortality (Nocon, Hiemann, Müller-Riemenschneider, Thalau, Roll, & Willich, 2008; Lee, & Skerrett, 2001).

Physical activity is a complex behavior that can be affected by a diversity of factors. Several theories have proposed that especially *psychosocial factors* may act as prominent predictors of adapting physical activity behavior (Prochaska & Velicer, 1997; Bandura, 1977; Ajzen & Madden, 1986).

## **2.2 Psychosocial factors as determinants of physical activity behavior**

While genetic, demographic, and socio-economic factors are reported to be somewhat stable determinants of physical activity (Seefeldt, Malina, & Clark, 2002), psychosocial factors and their mechanics on behavior seems to offer a pivotal role in the process of altering people's behavior (e.g. Sallis & Owen, 1999; Sallis, Grossman, Pinski, Patterson, & Nader, 1987; Ajzen & Madden, 1986; Anderson & Cychosz, 1994). A commonly used definition of "psychosocial" is, the influence of social factors on an individual's mind or behavior, and to the interrelation of behavioral and social factors (Martikainen, Bartley, & Lahelma, 2002), thus giving rise to the term psychosocial (*psychological + sociological*). This understanding of the term implies that psychosocial factors can be seen as 1), mediating the effects of social structural factors as the "social being" on individual exercise outcomes (accounted for by social support in this study). Or 2), conditioned and modified by the social structures and contexts in which they exists (accounted for by attitude towards behavior, self-efficacy in the face of barriers, identity, psychological health, and BMI in this study). When operationalizing the concept of psychosocial, it is important to be aware that there are influences acting between the fully social and the fully individual level, being neither one nor the other.

### **2.2 Stages of change**

In order to understand behavioral change in health, a vast amount of research has been conducted in recent years. Unlike linear models of behavioral change, (e.g. the self-determination theory), stage models of behavior reflect the dynamic, nonlinear process of behavior change (Buckworth et al., 2013, p. 356). According to stage theories of health behavior, a person will progress through a limited number of categories or *stages* of behavioral change before potentially obtaining the final stage of internalizing a certain behavior. Several causal factors influences the stage transitions. Depending on the influential effects of these factors, people will progress to the next stage of change. However, moving through the stages of health behavior is not necessarily continually progressive. Often, people who try to change a health behavior get stuck in a stage. Indeed, people might go backward, forward, recycle through stages or make a varied rate of progression. The influential factors or constructs of which stage transitions are determined upon are independent variables, while the

stages should be considered as dependent variables (Sutton, 2005). Stage theories assumes that stage movement depends on these factors, and that they play an important role at different stages. For instance, factors influencing the stage of change from the initial stage to the next, does not necessarily influence the relationship of later stages. However, some of the factors overlap in the transition of stages (Sutton, 2005).

One of the most commonly used models for describing exercise behavioral change, is the transtheoretical model (TTM), often simply referred to as the *stages of change model*, due to the model's nature of stage based behaviors (both terminology's will be used). The TTM is a general model for intentional behavioral change, and was first applied to unhealthy behavior cessation by Prochaska and DiClemente in the late 1970s and later implemented to exercise behavior in the early 1990s by Marcus and Simkin (Buckworth et al., 2013, p. 358). As of 2013, more than 100 studies has applied the TTM to exercise and physical activity (Buckworth et al., 2013, p. 358), which sets up for a valid tool also in this domain. Researchers from The University of Rhode Island has identified several important elements of the TTM, such as confidence and temptation and the pros and cons of changing (together known as *decisional balance*).

An essential construct of the TTM is the assumption of peoples weighing of advantages and disadvantages towards decision making of behavior change. If the advantages (pros) outweighs the disadvantages (cons), it increases the likeliness of behavior change. In the opposite case, where the cons outweighs the pros, the likeliness of behavior change decreases. Marshall and Biddle (2001) demonstrated this relationship in their meta-analyses. The authors found convincing effects of perceived pros and cons to exercise and exercise behavior change between adjacent stages in the TTM. The pros of changing were all positive and significant, with the exception of the contemplation stage to the preparation stage, while the cons of changing showed significant decreases across successive stages (Marshall & Biddle, 2001).

Assessing the factors affecting the process of stage changing in the TTM theory has been fundamental in this study. Based on empirical analyses, the model consists of five distinct changes that are relatively consistent in the way people change (Buckworth et al., 2013, p. 358).

Pre-contemplation stage: People are inactive and have no intention to start exercising. They deny need of change when confronted, and have little or no amount of intention to change the inactive behavior within the next six months.

Contemplation stage: People are inactive, but intend to start regular exercise within the next six months.

Preparation stage: People are engaged in some physical activity, but on an irregular basis. They intend to become more active within the next 30 days.

Action stage: At this point, people has consistently performed the desired exercise behavior for less than six months. The perceived benefits outweighs the perceived cost. However, this is also the least stable stage, and people are at the greatest risk of a relapse to previous stages.

Maintenance stage: People have been engaged in exercise for a period longer than six months. Exercise behavior is established, and the risk of relapse is low.

**Table 1. The physical activity “Stages of change” scale\* according to Prochaska and Marcus (1994).**

Stage number	Questionnaire response categories	Stages: Motivational readiness for change
1	‘I am currently not physical active and I do not intend to engage in physical activity in the next 6 months’	Pre-contemplation
2	‘I am currently not physical active, but I am thinking about getting more physical active in the next 6 months’	Contemplation
3	‘I currently do some physical activity, but not regularly’	Preparation
4	‘I am currently regularly physically active, but I have only begun doing so within the last 6 months’	Action
5	‘I am currently regularly physically active and have done so for more than 6 months’	Maintenance

\*Subjects are asked to pick the response category that most accurately describes their current physical activity behavior or their interest for physical activity.

## **2.3 Potential predictors of stages of change**

### **2.3.1 Body mass index**

Body mass index (BMI) is an approximate of fat tissue based on a person's weight and stature, and increases with body density. The method has shown consistency in determining people's health. A recent meta-analysis by Flegal, Kit, Orpana, & Graubard (2013) investigated 2.88 million individuals and more than 270,000 deaths. Their findings revealed that, relative to normal weight, obesity was associated with significantly higher all-cause mortality. BMI is a superficial measuring tool for body composition on an individual level, and does not distinguish between fat mass, muscle mass, bone mass, and many surveys excludes the elements of age and gender in their estimates. It is nonetheless considered a reliable method in population based surveys overall (Booth, Hunter, Gore, Bauman &, Owen, 2000).

Longitudinal studies has provided evidence that BMI is associated with lower levels of physical activity participation (e.g., Delahanty, Conroy, & Nathan, 2006; Hjort et al., 2013). Data from the United States indicate that only one-fifth of overweight (BMI  $\geq 25$  kg/ m<sup>2</sup>) report that they perform the minimum recommended amount of activity. Among obese (BMI  $\geq 30$  kg/m<sup>2</sup>), this number was even more pronounced, with 17.5 % of the population reported to meet the guidelines (MMWR, 1998). Dishman and Getman's (1980) findings indicated that body fat percentage and body weight, discriminated significantly between eventual adherers and dropouts in cardiovascular and muscular endurance training programs. Tryon, Goldberg, & Morrison (1992) points out that there is an empirical relationship between percentage overweight and degree of ambulatory activity. In a two year follow-up intervention, the group of overweight individuals assigned to a group-based exercise program were the least likely to adhere to the program at the end of the study (King, Kiernan, Oman, Kraemer, Hull, & Ahn, 1997).

In a three-year follow up study on diabetes patients, the authors found that lower BMI correlated with higher levels of baseline physical activity with similar patterns at 1 year and at the end of the study (Delahanty, Conroy, & Nathan, 2006). Similarly, Hjort and colleagues (2013) found that a high fat mass index among children was associated with more sedentary time after 200 days. However, their findings also reviled that there was a one-way relationship, that physical activity and sedentary time poorly predicted fat mass index (Hjort

et al., 2013). Their results suggested that adiposity is a better predictor of physical activity and sedentary behavior than the other way around (Hjort et al., 2013).

In light of these findings, one can only assume that people's BMI somewhat sets up for a predictive outcome of exercise participations. That is, the higher the BMI score, the lower the expected outcome score on stages of change, and due to seemingly unambiguous trends in the causality of BMI on exercise behavior in previous research, one can expect a negative correlation between high BMI and physical activity stages of change, or no correlation at all.

### **2.3.2 Psychological health and physical activity**

Research addressing the relationship between psychological health and the ability to foresee exercise behavior appears to be sparse. People suffering from poor psychological health (often termed *mental distress*) who are not diagnosed with a medical illness, are often exhibiting some of the symptoms described in psychiatry, such as anxiety and depression (ADEC, 2003) The following sections will highlight the existing knowledge of psychological health and exercise by looking at the constructs of anxiety and depression.

Depression is difficult to define, because it includes several types of mood disorders with opposite symptoms (e.g., increase or decrease in sleep, increase or decrease in appetite) (Buckworth et al., 2013, p. 188). There is a well-documented correlation between depression and low levels of exercise regardless of physical illness, sex, age and social class in cross-sectional studies (Stephens, 1988; Weyerer, 1992). This is also confirmed in a follow-up study where a group of women were followed for 8 years. The rate of depression among sedentary Caucasian women who were not depressed at the start of the study and remained inactive, was twice that of women who said they participated in a moderate amount of physical activity and remained active (Farmer, Locke, Mościcki, Dannenberg, Larson, & Radloff, 1988). The authors also found that Caucasian men who were depressed and inactive and who remained inactive were 12 times more likely to be depressed after 8 years than those who were initially depressed, but who had become physical active (Farmer et al., 1988).

However, in order to understand whether mental distress can predict long-term physical activity behavior outcome, it seems compelling to investigate the nature of

depression as a mental illness and its prognosis. This task is challenging on its own, given the limited information available from the HSCL-10 item of which the data was extracted, and the complex multi-dimensional nature of depression. Based on symptoms of depression, one can assume that severe levels of depression corresponds with decreased levels of physical activity. For instance, major depression is associated with either or both “depressed mood most of the day, nearly every day” and “markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day” (Buckworth et al., 2013, p. 193). Further criterion of major depression includes insomnia/hypersomnia and fatigue/loss of energy. Findings from the 2006 Behavioral Risk Factor Surveillance Survey, consisted of more than 217,000 participants, where symptoms of depression was assessed. Inactive people, regardless of age, were three times more likely to have current depression symptoms and 50% more likely to have a lifetime diagnosis of depression (Strine, Mokdad, Balluz, Gonzalez, Crider, Berry, & Kroenke, 2008).

Anxiety was also included in the same index of the HSCL-10, assessing whether participants suffered from symptoms commonly associated with anxiety. Anxiety is a state of worry, apprehension, or tension that often occurs in the absence of real or obvious danger (Buckworth et al., 2013, p. 161). Anxiety is considered a disorder when its symptoms are so frequent or severe that they cause pain or they impair normal physical or social functioning (Buckworth et al., 2013, p. 161). Physical activity’s impact on reducing anxiety has been equivocal in the past. While early studies erroneously suspected exercise for elicit anxiety symptoms, there is now a consensus in the research literature about exercise’s beneficial effects in treatment (Conn, 2010; Long & van Stavel, 1995; Wipfli, Rethorst, & Landers, 2008) and prevention of anxiety symptoms (Goodwin, 2003; Hassmen, Koivula, & Uutela, 2000; Stephens, 1988; Ströle et al., 2007). Although, some studies argues there is a lack of causal relationship between anxiety and exercise (De Moor, Boomsma, Stubbe, Willemsen, & de Geus, 2008). Nevertheless, the 2006 Behavioral Risk Factor Surveillance Survey found that, regardless of age, inactive people were 40% more likely to have a lifetime anxiety disorder. Research on panic disorder and generalized anxiety disorder shows that the course of anxiety disorders is often characterized by a certain chronicity that manifests itself in residual symptoms and mild impairment in social roles even after many years and is frequently complicated with depression (Angst, & Vollrath, 1991). The authors further argue, “the best predictors are severity and duration of symptoms, as well as comorbidity with depression” (Angst, & Vollrath, 1991). Further, Utschig, Otto, Powers, & Smits (2013, p. 111), argue that



anxiety may in fact result in physical inactivity. The authors posit that individuals with significant anxiety generally find physical activity aversive, much attributed to a theory suggesting people with high anxiety sensitivity may experience strenuous physical activity exceeding ventilatory threshold/lactate threshold resulting in a more negative affect (Ekkekakis, 2003). Research examining affective states during exercise supports this hypothesis (Lind, Joens-Matre, & Ekkekakis, 2005; Parfitt, Rose, & Burgess, 2006; Rose & Parfitt, 2007, 2008).

### **2.3.3 Social support in physical activity**

In Bandura's social cognitive theory, reciprocal determinism explains a person's internal psychological factors and his or her behavior and interaction with the environment. External observable factors, in the shape of social modeling and social support, are according to Bandura considered to be important standards when people evaluate their behavior (Bandura, 1977). Social support can be defined as "aid and assistance exchanged through social relationships and interpersonal transactions" (Heaney & Isreal, 1997, p. 181). Social support is typically related to tasks or steps that significant others take to facilitate behavior. Examples of this include instrumental social support: giving a non-driver a ride to an exercise class, informational support: telling a neighbor about a community exercise program, emotional support: calling a friend to see how their exercise program is going, or appraisal support: providing encouragement or reinforcement for learning a new activity or skill (Isreal & Schuman, 1990).

Social support may be obtained with guidance of several sources, including neighbors, co-workers, doctors, health professionals, family, and friends (Janben & Pfaff, 2005). The latter two have received much attention in the field of exercise behavior and have shown consistent and positive relations to adult physical activity (e.g. Booth et al., 2000; Fahrenwald & Walker, 2003).

Eyler, Brownson, Donatelle, King, Brown, & Sallis (1999) assessed the association of physical activity-related social support on several measures of physical activity in a US national sample of minority women. Their findings revealed that the women who had high levels of social support from friends were significantly less likely to be sedentary than those with low support. Likewise, Sharma, Sargent, & Stacy (2005) examined the extent to which

social support from friends were related to the duration of leisure-time physical activity in African American women, and found frequency of social support from friends to be a significant predictor for physical activity (Sharma et al, 2005).

Despite earlier research pointing to the more profound significance of family support (e.g. Gottlieb & Green, 1987), this is believed to require teaching of the family members of the person providing the support (Baranowski et al., 1982). Nevertheless, higher degree of spousal emotional social support might contribute to increased levels of activity (e.g. O'Reilly, & Thomas, 1989; Wallace, Raglin, & Jastremski, 1995). Eyler and co-workers (1999) found that there was no significant difference between the contributions of friend support versus family support. In any case, the group categorized as “regular exercisers” appeared to be less reliant on social support to maintain their behavior (Eyler et al., 1999). Less reliance of support in more advanced stages of the TTM, may be explained by a higher degree of self-regulated support.

Some studies have been investigating the more specific relation between social support and its manifestation on physical activity stages of change. Plotnikoff, Brez, & Hotz (2000) investigated the factors associated with exercise behavior among adults with diabetes during a 6-month follow-up. The authors found that social support were significantly higher for those in the action stage than those in the pre-action stages of exercise readiness (Plotnikoff, et al., 2000). Courneya, Plotnikoff, Hotz, & Birkett (2000) tested the stage-based utility of social support in a population-based community sample of 1,557 adults as applied in the theory of planned behavior. The findings revealed that social support was such an important and superior contributor that the authors went as far as suggesting to replace the construct of subjective norm with social support (Courneya et al., 2000).

The relative contribution of social support from friends and family in previous research thus seems to be equivocal. Although, based on the before-mentioned studies of minority –and African American women (Eyler et al., 1999; Sharma et al, 2005), there are reasons to suspect that similar findings will manifest in the current study.

### **2.3.4 Self-efficacy and perceived barriers**

The concept of self-efficacy was derived from Canadian psychologist Albert Bandura's initial social learning theory, and has been subject to a substantial body of research since its emergence in the late 1970s. It remains one of the most influential variables in terms of behavior change, and the most important factor of behavior change among several in Bandura's (1977) social cognitive theory. In fact, Sallis & Owen (1999) claim that self-efficacy appears to be the strongest correlate of physical activity in practically every study that includes it. The concept of self-efficacy seeks to explain the prominent role of social modeling in human motivation, thought, and action. It is reflected in the confidence one experiences in performing a specific behavior despite being confronted with difficult situations. Self-efficacy as a human agency manifests in a variety of different cultural and social contexts. According to Bandura (1977), self-efficacy expectations are likely to influence peoples' physical activity preferences, the effort expended in those activities, and the degree of persistence exhibited in the face of barriers. It is further described as a person's confidence in his or her ability to do specific physical activities in specific circumstances (Sallis & Owen, 1999).

Interestingly, people who have a high sense of efficacy take a future time perspective in structuring their lives (Bandura, 1997). Some studies shows that the stronger the perceived self-efficacy, the higher the goals people set for themselves (Bandura & Wood, 1989; Locke & Latham, 1990). Although future states cannot be causes of current motivation, the projected future can be brought into the present through planning. People with a high sense of efficacy tends to view barriers as opportunities rather than obstacles, making it easier to realize potential goals. Those who consider themselves as inefficacious construe uncertain situations as risky and are likely to visualize failure scenarios (Krueger & Dickson, 1994). Most human behavior is cognitive regulated, and people guide their actions in the persuasion of achieving their goal, which again is closely related to efficacy beliefs (Bandura, 1997). Ultimately, visualizing successful actions improves performances, while imaging faulty ones impairs them (Powell, 1973).

Thus, one can assume that people experience a strong sense of self-efficacy when participating in regular physical activity in contrast to their inactive peers. For instance, Sallis, Howel, Hofstetter, & Barrington (1992), showed that baseline self-efficacy was a strong predictor of subsequent physical activity, indicating that self-efficacy does not merely reflect

past physical activity. The authors also found that changes in self-efficacy were associated with changes in physical activity during a two-year follow up (Sallis et al., 1992).

An important function of internal thought processes is to enable people to predict the likely outcomes of different courses of action, and to create the environment for exercising control over what affects their life. The assessable measures of efficacy expectations in this work consists of questions detecting these cognitive processes. For instance, the psychological barriers of feeling tired, staying inside because of bad weather, or watching an interesting TV show.

As pointed out, self-efficacy provides for a salient determinant of physical activity behavior. However, being more specific by breaking down the concept of self-efficacy by examining the explicit domains of the concept might increase the accuracy of the prediction.

Perceived barriers of physical activity are expected to influence the degree of persistence of physical activity (Bandura, 1977). The set of prediction variables concerning the construct of self-efficacy are commonly determined by the two domains of psychological and practical perceived barriers to physical activity. Pender (1996) exemplifies internal (or psychological) barriers as lack of motivation, time constraints, and boredom; and environmental (or practical) barriers as the lack of exercise facilities, equipment, and bad weather. Although the latter may arguably be considered a psychological barrier. Some of the most common practical barriers in respect to adherence in physical activity are lack of facilities, childcare, household duties and lack of time (Dishman, Sallis, & Orenstein, 1985; Johnson, Corrigan, Dubbert, & Gramling, 1990).

A study conducted by Stetson and colleagues (1997) asked a group of women to keep track of their stressful life events, perceived stress, and exercise sessions for two months. The authors found that incidents of stressful events and perceived stress were associated with lower levels of physical activity (Stetson, Rahn, Dubbert, Wilner, & Mercury, 1997). The variables of stress resemble the ones presented in the current study concerning psychological barriers to physical activity ("I feel stressed"). Although one should keep in mind that the term "stress" is somewhat obscure, and can be considered a practical barrier because of competing demands. McAuley (1992,1993) examined the role of self-efficacy at different phases in an exercise adoption process. Self-efficacy was measured several times during a 5-month program, and 4 months after the cessation of the program. McAuley hypothesized that

the perceived barriers to physical activity was at the initiation of the program, when exercise was adopted, and post program, when participants were making the transition to exercise on their own. The findings showed that exercise self-efficacy at the initiation of the program predicted exercise during the first two months of the program. Exercise self-efficacy assessed post program predicted exercise over the 4 months of follow up (McAuley, 1993). A study by Simonavice and Wiggans (2008) examined students in various stages of change relative to exercise adherence and its relationship with perceived self-efficacy and barriers to exercise. Findings suggested that people who do not exercise or exercise sporadically perceive more barriers to exercise than those who exercise regularly (Simonavice & Wiggans, 2008). People who exercise regularly rate their confidence higher in terms of self-efficacy to overcome obstacles to exercise (Simonavice & Wiggans, 2008). Essentially, due to the voluminous research history of self-efficacy's impact on health and exercise behavior, the assumption that perceived barriers hampers self-efficacy and then in turn, physical activity, merits prediction expectations in the current study.

### **2.3.5 Attitude towards physical activity participation**

Ajzen & Madden's (1986) intention driven model of behavior change, the theory of planned behavior (TPB), has shown promise in the field of physical activity (Courneya, Nigg, & Estabrooks, 1998; Courneya & Bobick, 2000). As the name suggests, the model postulates that the most proximal determinants of behavior are people's intention to engage in a certain behavior, and their perception of control over that behavior. Even though the model operates with three sets of constructs (attitude, subjective norm, and perceived control), the construct of attitude is highlighted in this study, partly due to promising findings of this construct (Courneya, 1995; Lechner & Devries, 1995), and because it directly measures appraisals of one's intention to exercise, which in turn is interesting to assess in relation to the TTM. Perceived behavioral control is also relevant to physical activity behavior, but is excluded in this paper because of its conceptual resemblance to self-efficacy (Norman & Smith, 1995), which is already discussed in the previous chapter.

Specifically, attitude reflects one's positive or negative evaluation of enacting in a particular behavior (Ajzen & Madden, 1986). The theory is based on the person's belief system, and that a certain behavior will lead to specific outcomes.

Interestingly, an important element of attitude, the weighting of positive and negative evaluation of initiating a behavior, concords with that of decisional balance in the TTM, providing fertile ground for assessment of this variable. A number of studies have been investigating the relationship between attitudes and its predicting ability of physical activity behavior. Theodorakis (1994) examined the attitude-exercise behavior relationship according to the TPB, as well as attitude strength and role-identity. A group of women (n=395) aged 10 to 50, were followed over the course of 2 months while participating in physical fitness programs. Attitudes toward behavior successfully predicted both intention to exercise and actual exercise behavior. The TPB model was even more successful in predicting exercise when attitude strength and role-identity was included in the analyses (Theodorakis, 1994).

More specifically, the TPB has been applied in a number of studies regarding changes on the TTM. Along with perceived behavioral control, the construct of attitude appears to repeatedly stand out as a predicting factor of intention and behavior (Park et al., 2009; Courneya, 1995; Walcott-McQuigg & Prohaska, 2001). Moreover, findings suggest that attitude towards activity increases with advancing stages on the TTM (e.g., Courneya, Nigg, & Esabrooks, 1998; Courneya & Bobic, 2000; Kearney, de Graaf, Damkjaer, & Engstrom, 1999).

The questionnaire items applied in this study allowed for specific detection of attitudes across a range of different situations divided between instrumental components of attitude, also known as evaluative attitude, and affective attitude to exercise behavior. The affective component of attitude refers to emotions and drives engendered by the prospect of performing a behavior. It reflects the value given to a feeling state (Batson, Shaw, & Oleson, 1992) This is in contrast to the evaluative component of attitude, which reflects cognitive considerations of the extent to which performing a behavior would be advantageous (Breckler & Wiggins, 1989). In domains such as attitude towards abortion (Breckler & Wiggins, 1991), and blood donation (Breckler & Wiggins, 1989), the authors found differences in cognitive persuasions towards attitude originating from both evaluative and affective attitudes. Since affective attitude is contributed to emotional responses and feelings and evaluation refers to rational thoughts, beliefs, and judgments about an attitude object, these notions may suggest that this distinction could also be applied to exercise behavior. Evaluative and affective attitude responses are therefore included as two separate variables in the current study.

### **2.3.6 Physical activity identity**

In order to understand the self-concept and its implications on how it might be an influential determinant in predicting long-term behavior, it is necessary to provide a further understanding of the meaning of self, and why scientists have paid so much attention to this field.

The construct of identity, and more specifically the consciousness of the self, was first described by American psychologist William James at the start of last century. James pointed out that people's feelings and thoughts about themselves were important determinants for their behavior. In recent years, the self-concept has received an explosive attention, also in light of health, exercise and well-being (e.g., Anderson & Cychosz, 1995; Anderson, 2004; Plotnikoff et al., 2000). However, the term "self" in its own right is difficult to conceptualize and define. There are at least 75 self-related expressions describing the "self" and identity (Leary & Tangney, 2003), each of which referring and sometimes overlapping a diversity of constructs, processes, and phenomena. An important element is to endeavor the correct usage and implications for the use of identity. The directing self organizes the self in action into a coherent structure, which is commonly termed "self-concept" by social psychologists or "identity" by clinical psychologists and psychiatrists (Fox, 2000). For the remainder of this thesis, the terms "identity" and "self-concept" are both warranted as terms describing the same concept. The assessment of identity in this thesis is derived from questions trying to detect a personal self-concept. Nevertheless, one should acknowledge the difficulty of precisely detecting the construct of identity, and be aware of biased interpretation of this construct. For instance, questions like "being physically active is part of being the person I am", and "I think of myself as a person who cares about my body", raise questions of the actual awareness of the person's ability to pinpoint his or her core identity. Essential for the data derived from the questions about identity, is that they provide substantial meaning and core values and that one can make assumptions that the concept of identity convey continuity in a prolonged period. While it seems apparent that behavior can change with time, thus providing fertile conditions for people's mindset to change as well, identity and self-concept appears to carry a more profound meaning of the self.

Wilkinson-Ryan & Westen (2000) points out some important components of identity and self-concept:

- A sense of personal sameness or continuity over time and across situations
- A sense of inner agency
- A commitment to certain self-representations as self-defining
- A commitment to certain roles as self-defining
- Acknowledgment of one's role commitments and views of self by significant others
- A commitment to a set of core values and ideal self-standards
- Commitment to a worldview that gives life meaning

Buckworth et al. (2013) conceptualize self-concept as an objective accounting of who we are, and that it is multidimensional and hierarchical in its nature (Buckworth et al., 2013, p. 297,298). Derived from these notions of identity and self-concept, one can assume that these components provide meaning and value to peoples past behavior and provide a direction for future behavior.

Identity as physical active has previously been shown to reflect one's physical activity behavior. Anderson & Cychosz (1994, 1995), developed an exercise identity scale to investigate the relationship between an individual's behavior as an exerciser and exercise identity, to the degree to which exercise was viewed as characteristic of one's self-concept. The findings revealed a significant correlation between exercise identity and exercise behavior, and the authors concluded that people often tend to exhibit behaviors, which strengthen their role-identity as exerciser (Anderson & Cychosz, 1995). Anderson (2004) found that four subscales of exercise identity correlated positively and significantly with exercise behavior, as measured by stages of exercise behavior and frequency of exercise (Anderson, 2004).

Moreover, Strachan et al. (2009) examined whether strength of exercise identity would relate to individuals' perception of the extent to which they had behaved consistently with their identity, and recent frequency of exercise. The authors found that individuals who strongly endorsed their exercise identity might be more likely to perceive that they have behaved consistently with their exercise identity meaning (Strachan et al., 2009). Individuals who judged themselves as having behaved consistently with their identity as an exerciser reported a higher level of perceived behavioral consistency and more frequent exercise



behavior (Strachan et al., 2009). Plotnikoff and colleagues found that scores on the construct of self-concept in its relation to exercise behavior were significantly higher in those in the action stages of the TTM, than for those in the pre-action stages (Plotnikoff et al., 2000).

The importance of identity in the face of body satisfaction has also previously been showed in a study in relatedness to the TTM (Johnson et al., 2013). Results indicated that body satisfaction significantly explained 2-8% of variance in the TTM constructs responsible for promoting stage movement, and that this affected both short (< 6 months) and long-term (> 5 years) engagement to physical activity (Johnson et al., 2013). The instruments that were applied in the study resemble the ones applied in the current study, for instance: “I think of myself as a person who cares about my body”, assuming that caring for one’s body translates to body satisfaction.

## **2.4 Research objectives**

The goal of this study is to provide further information on how BMI, psychological health, and psychosocial factors may act as predictors of physical activity behavior change among people not\_receiving any intervention. As outlined above, BMI and psychological health represent predictors expected to be more constant in their nature, while the psychosocial are believed to be more modifiable. This is an important topic to highlight, because it may uncover the meaning of people’s present psychosocial and physical status and to what extent it will actually predict future behavior. The current study will contribute to future physical activity intervention programs, and could potentially offer useful information in people’s day-to-day life, by raising awareness of how current internal thought processes, external influences in the shape of social support, and physical features may facilitate future exercise behavior. This study will contribute to current knowledge by inquiring BMI, psychological health, and the psychosocial variables that lies behind physical activity behavior *status* and/or *progression* in a long-term, non-interventional context. The following research questions are postulated:

### 2.4.1 Research questions

1. To what extent do psychosocial factors, psychological health, and BMI predict exercise behavior?
2. To what extent do psychosocial factors, psychological health, and BMI predict a progression in the stages of change from time 1 to time 2?

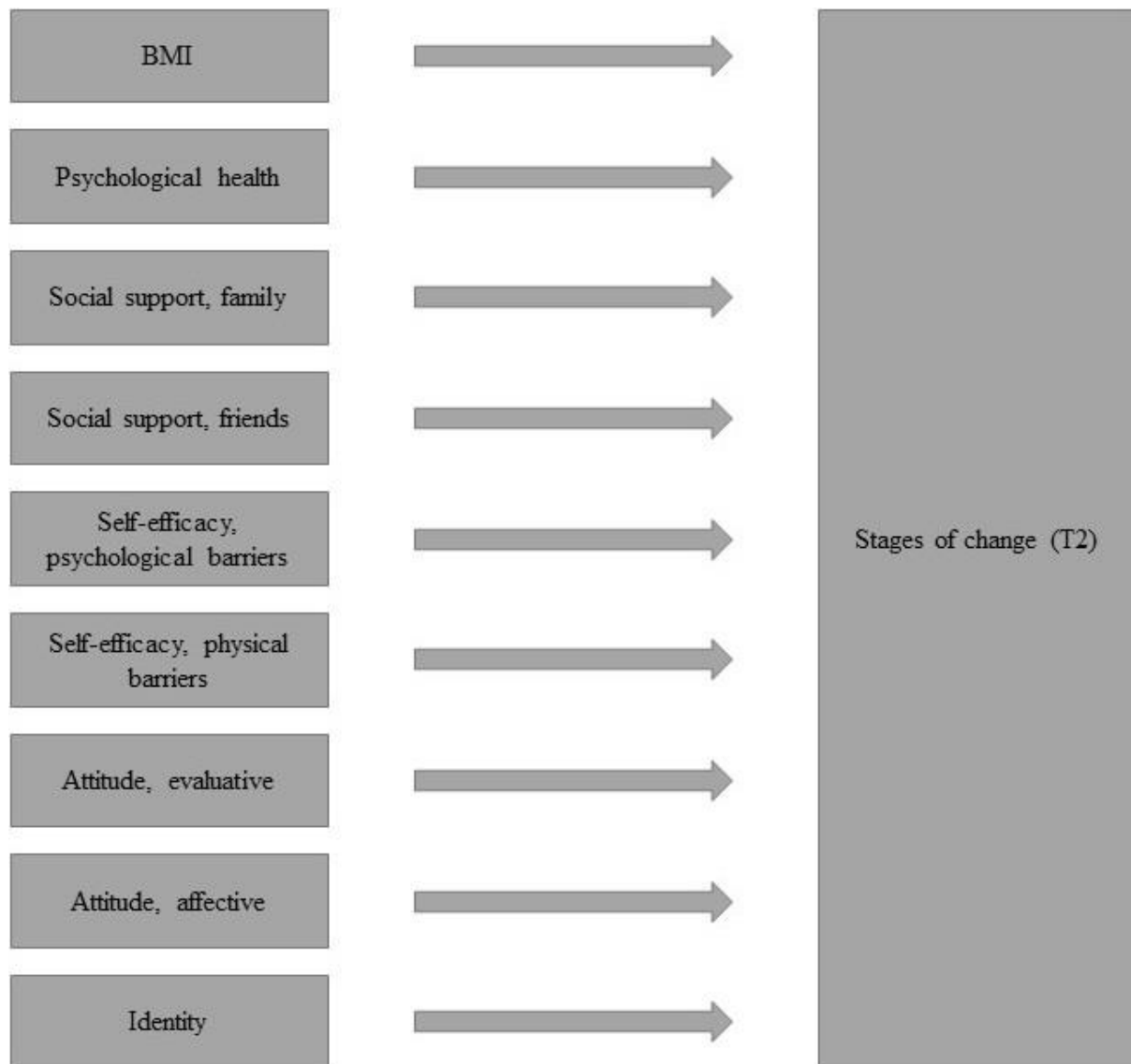


Figure 1: Schematic overview of potential predictors at time 1 of stages of change at time 2.

## 3.0 METHODS

### 3.1 Design

The present study is investigating data extracted from the “Romsås in Motion” project that took place in two districts of Oslo over the course of three years, from 2000 to 2003 (Jenum et al., 2003). The initial project was designed as a non-randomized controlled community-based intervention. Both the Romsås group, which served as the intervention group, and the Furuset group, which served as the control group, are known as low-income and multi-ethnic suburban districts. Assessments were made at pre- and post- study at both districts. Several intervention procedures were applied to the intervention group. However, the control group was not given any further attention during the course of the study, thus providing a data material that originates from a natural progress in Furuset from 2000 to 2003.

The current study is based on the control group of the original project. This study is designed as a non-randomized controlled study, and takes a retrospective view and investigates the predicting abilities of psychosocial and physical factors (BMI) on stages of change of physical activity in a non-interventional context. The potential predictors of physical activity status and/or progression in the current study are selected because they posit unclear prediction abilities in this particular context.

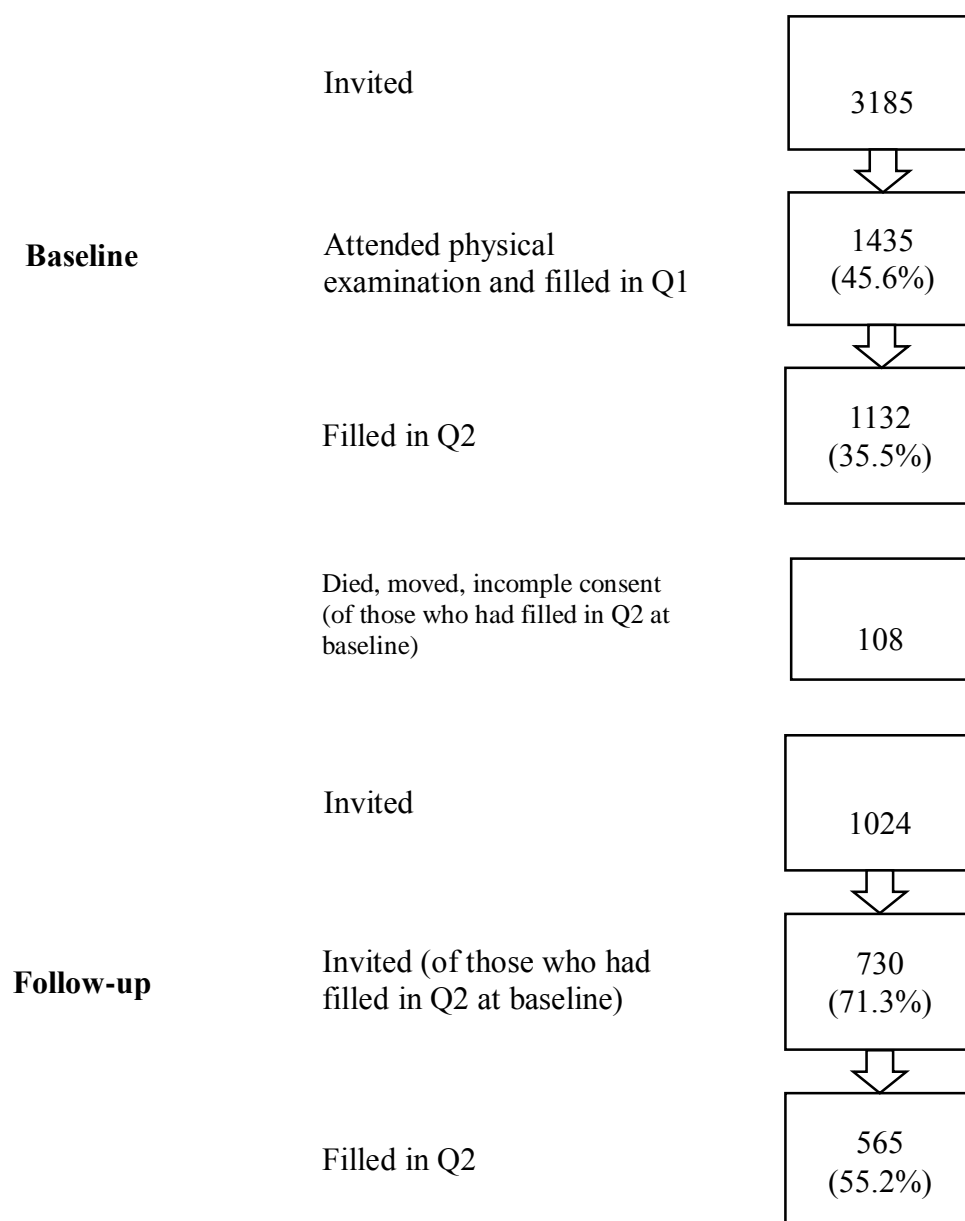
### 3.2 Study participants

Targeted individuals for the baseline assessment included inhabitants in the age ranging between 30 and 67 years at time 1. The age range was set to target a population at risk of premature death from cardiovascular diseases (Sans, Kesteloot, & Kromhout, 1997). Targeted individuals for the follow-up assessments were those of the baseline-targeted individuals who were still alive and living in the Oslo area.

The 565 participants of the current study were those in the Furuset group who provided sufficient data at baseline and follow up, derived by the selection procedure as described below.

Of the 3,185 control group participants who were invited to the baseline health survey, 1,453 (45.6%) attended and filled in at least Q1. 1,132 (35.2%) of the initial baseline

attendants also filled in Q2 providing stages of change data. At follow-up in 2003, 108 of the initial baseline attendants had either died, moved, or had not provided a complete consent. The remaining participants (1,024) were re-invited to participate in the follow-up. Out of these, 730 (71.3%) attended physical examinations and filled in Q1, and 565 (55.2%) filled in Q2. Figure 2 provides an overview of attendance and response rates from baseline and follow-up assessments.



**Figure 2. Flow chart of response rates at baseline and follow-up assessment.**

### 3.3 Instruments

#### 3.3.1 Stages of change in physical activity

Stages of change in physical activity behavior were measured using an adapted version of Marcus and Simkin's (1993) model of the TTM. Respondents were asked to fill in the single statement that corresponded most accurately to their exercise participation and exercise interest to detect what category of physical activity readiness they currently belonged to. Stages of change were divided between the five separate categories of: 1) Pre-contemplation, "I am currently not physical active and I do not intend to engage in physical activity in the next 6 months". 2) Contemplation, "I am currently not physically active, but I am thinking about getting more physically active in the next 6 months". 3) Preparation, "I currently do some physical activity, but not regularly". 4) Action, "I am currently regularly physically active, but I have only begun doing so within the last 6 months". 5) Maintenance, "I am currently regularly physically active and have done so for more than 6 months". Physical activity was operationalized as "all physical activity other than activity carried out as part of your job", and did not distinguish between type of physical activity, duration, intensity, regularity, or frequency.

#### 3.3.2 BMI and psychological health

Both BMI and psychological health were expected to be less susceptible to alter from time 1 to time 2, due to the relative stable nature of overweight (e.g., Delahanty, Conroy, & Nathan, 2006; Hjort et al., 2013) and psychological health (Strine et al., 2008) in longitudinal studies.

BMI ( $\text{kg}/\text{m}^2$ ) was the designated anthropological measure, and was measured and calculated using an electronic height and weight scale (DS 102, Arctic Heading, Norway) at time 1. Standardized BMI cut-off points between the categories were utilized according to the WHO guidelines: underweight =  $< 18.5$ , normal range =  $18.5 - 24.9$ , overweight =  $25 - 29.9$ , obese =  $30 - 34.9$  and obese class II =  $> 35$ . Participants did not wear shoes and were light clothed at the time of measurement. 564 participants provided valid data on the BMI variable.

Psychological health was assessed using The Hopkins Symptom Check List (HSCL), which has previously demonstrated good sensitivity and specificity for detecting psychological symptomatology and mental distress compared with the widely used HSCL-25 (Strand, Dalgard, Tambs, & Rognerud 2003). The participants were asked to pinpoint the most accurate state in a diversity of problems on a 4-point scale during the last week, including that present day. For instance, one of the items was formulated “Suddenly feel frightened or anxious”. Baseline Cronbach’s alpha value for this subscale was 0.88.

### **3.3.3 Psychosocial predictors**

The psychosocial factors that were tested of whether they could positively predict physical activity behavior consisted of physical activity identity, overcoming psychological – and practical barriers to physical activity, a positive evaluative – and affective attitude towards physical activity, social support from friends/acquaintances/colleagues (hereafter referred to only as *friends*), and social support from family. The abovementioned psychosocial variables were measured using different scales, in which a mean score was calculated. With the exception of mental distress, higher scores on the psychosocial indices denoted a greater psychological readiness for physical activity. In order to obtain reliable information from the psychosocial indices, a certain minimum of data from each question item were required. Only subjects who fulfilled the respective item requirements in each subscale were included when computing the mean scores. An overview of variable indices, number of participants fulfilling the criteria, and their respective index inclusion criteria is provided in table 2.

Identity was measured using a 4-item measure modified from the Exercise Identity Scale developed by Anderson and Cychosz (1994), which has been considered to have acceptable reliability and validity. The participants were asked to consider the statement and mark the most accurate answer on a 5-point scale with respect to physical activity. An example of one of the items was “Being physically active is part of being the person I am”. An internal consistency test of baseline data revealed a Cronbach’s alpha value of 0.92 on the identity subscale.

Self-efficacy in the face of barriers was assessed by a 12-item scale, which has previously been validated by Fuchs & Schwarzer (1994). Lorentzen, Ommundsen, & Holme

(2007) found that two factors, in the shape of *practical barriers* (7 items) and *psychological barriers* (5 items) branched at baseline, and is thus treated as two separate indices in the analysis. Participants were asked whether they could perform the planned physical activity despite being faced with obstacles of practical nature, such as “I cannot find anyone to take exercise with” and of psychological nature, such as “I am cross about something”. Baseline Cronbach’s alphas revealed an internal consistency of 0.82 and 0.93 for practical and psychological barriers respectively.

Attitude towards physical activity was measured using a seven-point bipolar adjective scale of eight items, in which the participants evaluated a statement towards physical activity in the course of the upcoming month. The measurement scale has been suggested by Ajzen and Fishbein (1980) and was applied in later studies with promising results (e.g. Courneya & Bobick, 2000; Norman & Smith, 1995). Principal variance analysis with varimax rotation revealed two factors representing 5 *evaluative* items and 3 *affective* items at baseline (Lorentzen, Ommundsen, & Holme, 2007) and is therefore divided as two separate indices. For instance, evaluative attitude towards physical activity was whether the participants considered physical exercise as “Useless – useful”. An item addressing affective attitude was whether the participant found physical exercise to be “Unpleasant – pleasant”. Baseline Cronbach’s alphas were 0.91 for evaluative attitude and 0.85 for affective attitude.

Social support was measured using two identical 11-item scales: one for *friends*, and one for *family* (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). Participants rated how often, over the previous 3 months, that their family and friends had been supportive of them being physically active. Participants were asked to give the most accurate answer on a 5-point scale. As a supplementary option, participants could also answer “does not apply to me”, which was treated as missing data in the analysis. For instance, one of the items was whether the participant’s family/friends had “discussed physical activity with me”. Baseline Cronbach’s alpha for friends support was 0.93, and 0.92 for family support.

A complete list of the indices as they appeared in the questionnaires is provided in the appendix section at the end of this paper.

**Table 2. Participants who fulfilled the variable index inclusion criteria. Percentage of minimum response rate criteria in brackets.**

<b>Variable</b>	Identity	Barriers, psychological	Barriers, practical	Attitude, evaluative	Attitude, affective	Social support, friends	Social support, family	Mental distress
<b>Index inclusion criteria</b>	3, 4/4 items (>75%)	6, 7/7 items (>85.7%)	5, 6/6 items (>80%)	4, 5/5 items (>80%)	3/3 (100%) items	9, 10, 11/ 11 items (>81.8%)	9, 10, 11/11 items (>81.8)	10/10 items (100%)
<b>N</b>	550	537	541	531	525	483	499	492

### 3.4 Data collection procedure

The Norwegian Institute of Public Health (NIPH) were responsible for obtaining pre-study data in 2000 (time 1), and post-study data in 2003 (time 2), which included physical examination (i.e. BMI) and two questionnaires. Questionnaire 1 (Q1) involved socio-demographic information and psychological health. Questionnaire 2 (Q2) encompassed self-reported measures of physical activity participation (stages of change) and psychosocial indices concerning physical activity. The questionnaires were identical at baseline and follow up and synchronized so that each participant had a set of data from both time 1 and time 2.

Residential addresses and personal identity numbers were obtained from the Norwegian Registry of Vital Statistics. Approximately two weeks before pre- and post-assessment, targeted individuals received a personal letter with invitation to participate and a suggested appointment time for the physical examination. In addition to the invitation, the recipients were also required to fill in Q1 in order to attend the examination. Participants were informed that questionnaires were available in other languages in addition to Norwegian (English, Vietnamese, Tamil, Urdu, and Turkish), thereby covering most of the written languages in the area. The letter also contained a pamphlet describing the main outlines of the project, and that the project protocol had been approved by The Norwegian Data Inspectorate and by The Regional Ethics Committee. All participants were informed that the project was voluntary, anonymous, and free of any cost, and that participants who completed the



examination would automatically attend a raffle for a 1000 NOK prize. Posters and brochures announcing the health surveys were displayed in public places in the district.

Participants signed an informed consent upon arrival, and were asked to fill out the Q2, with the possibility of bringing it home together with a stamped envelope and instructions to return it by mail. Participants were offered counseling in filling in Q2 and any missing parts of Q1. The process of filling out Q1 and Q2 took about 20 to 30 minutes and 30 to 45 minutes respectively. The session finished off with physical examinations, which took approximately 15 minutes.

Two reminders were sent to those who did not attend the baseline health survey, and one reminder was sent to those who did not attend the follow-up survey and examinations. In addition, a telephone call was made a few days before follow-up to maximize participation.

### **3.5 Statistical analyses**

In order to address the research questions appropriately, time 1 values of the psychosocial indices and BMI were compared with each participant's corresponding level of physical activity stages of change at time 2. The stage of change model allows detection of any predicting power of the psychosocial variables and BMI from time 1 to time 2. Different procedures were used to measure the genuine impact of psychosocial and BMI's prediction of status of stages of change from time 1 to time 2 (status-predictors), and the genuine impact of psychosocial and BMI's prediction of progression in stage of change (progression-predictors). The data was based on questionnaires and objective measurement of BMI. Detailed methodology procedures are described in the following paragraphs.

All analysis were performed with the Statistical Package for the Social Sciences, (SPSS) version 21. Analysis of stages of change at time 1 and time 2, BMI, psychosocial health, and psychosocial variables indices were described using descriptive and frequency analysis (table 3). Pearson's correlation coefficients were outlined for all variables (table 6). The significance level for all analyses was set at  $p < .05$ , accepting a 5% probability of committing a type 1 error.

Stages of change in physical activity acted as the dependent variable in both analyses, and were measured at time 2 in 2003. All other variables were measured at time 1 in 2000

(including stages of change in physical activity at time 1). Thus, the following analyses provide the genuine predictive abilities of the variables included in this study. Due to assumptions that the variables of BMI and psychological health are relatively stable over time, they are inserted in the first steps in the regression models.

### **BMI, psychological health, and psychosocial predictors of exercise behavior status at time 2**

The first analysis is a two-step regression model. Stages of change on time 2 acts as the dependent variable. Step 1 includes the variables of BMI and psychological health at time 1. Step 2 adds the psychosocial variables self-efficacy in the face of practical barriers, self-efficacy in the face of psychological barriers, affective attitude, instrumental attitude, family social support, friends' social support, and identity (all measured at time 1), thus controlling for the factors in step 1.

### **BMI, psychological health, and psychosocial predictors of progression in exercise behavior from time 1 to time 2**

The second analysis is a three-step model. The first step includes stages of change on time 1 to detect the genuine predicting effect of previous physical activity behavior. Further, in step 2, the predictive abilities of BMI and psychological health were entered. In step 3 the remaining psychological factors; self-efficacy in the face of practical barriers, self-efficacy in the face of psychological barriers, affective attitude, instrumental attitude, family's social support, friends' social support, and identity were entered. Thus, by controlling for stages of change at time 1 in step 1, the second analysis opens for testing the influence of BMI, psychological health, and the remaining set of psychosocial predictors on forward transition in stages of change.

## 4.0 RESULTS

### 4.1 Descriptive statistics

Of the 565 participants who provided valid data on both time 1 and time 2, 55.6 % (n=314) were women. The mean age of the sample in 2000 (time 1) was 49. At time 1, 13.6 % of the sample ranged between the age of 31 – 40, 26 % between 41 – 50, 44.6 % between 51 – 60, and 15.8 % in the age group of 60 years and older. The study population consisted of 91 % western-born (the United States, Canada, or Western or Southern Europe), with the remaining 9 % distributed between the Eastern Europe, the Mediterranean Area, Sub-Saharan Africa, the Indian subcontinent, the Eastern Asia, and the Middle - and South America.

Stages of change distributions at time 1 were as follows: pre-contemplation 13.5%, contemplation 14.7%, preparation 29.9%, action 6.5%, and maintenance 35.4%

Stages of change distributions at time 2 were as follows: pre-contemplation 9.4%, contemplation 15.8%, preparation 29.6%, action 4.6%, and maintenance 40.7%.

At both time 1 and time 2, the majority of the sample belonged to the maintenance category, followed by preparation, contemplation, pre-contemplation, and action. There was a slight increase in maintenance of physical activity from time 1 to time 2, as well as a lower portion of pre-contemplators.

At time 1, the BMI distribution were as follows: 0.4 % of the study population belonged in the underweight range (< 18.5), 38.2 % in the normal range (18.5 – 24.9), 45.3 % in the overweight range (25.0 – 29.9) 11.9 % in the obese range (30.0 – 34.9), and 4.1 % in the obese class II range (> 35). 1 subject (0.2 %) was missing from the assessment.

Table 3 provides descriptive data of the psychosocial variables and mental health status at time 1 with respective number of respondents. Response rates varied on the different variables from 483 (social support from friends) to 550 (identity). Identity, affective and evaluative attitude, and self-efficacy in the face of psychological barriers accounted for relatively high mean scores, whereas psychological health, practical barriers, and social support from friends and family accounted for lower mean scores.

**Table 3. Descriptive statistics of psychosocial variables, item scale ranging and corresponding respondents. Standard deviation in brackets.**

Variable	Scale ranging	Mean	(sd)	N
Psychological health	1-7	1.28	(0.40)	492
Social support, family	1-5	2.19	(0.81)	499
Social support, friends	1-5	2.01	(0.82)	483
Psychological barriers	1-7	4.73	(1.66)	537
Practical barriers	1-7	3.76	(1.33)	541
Attitude, evaluative	1-7	6.25	(1.08)	531
Attitude, affective	1-7	5.15	(1.36)	525
Identity	1-5	3.36	(1.71)	550

## 4.2 Correlation coefficients

Pearson's correlation coefficients revealed a weak negative relationship between psychological health ( $r = -.15$ ,  $p < .01$ ) at time 1, and status of stages of change in physical activity at time 2. Correlation coefficients further revealed a weak positive relationship between family support ( $r = .21$ ,  $p < .01$ ) and friend support ( $r = .29$ ,  $p < .01$ ) at time 1, and status of stages of change in physical activity at time 2. A moderate positive relationship was found between practical barriers ( $r = .35$ ,  $p < .01$ ) and evaluative attitude ( $r = .30$ ,  $p < .01$ ) at time 1, and status of stages of change in physical activity at time 2. Psychological barriers ( $r = .41$ ,  $p < .01$ ), affective attitude ( $r = .40$ ,  $p < .01$ ) and identity ( $r = .50$ ,  $p < .01$ ) at time 1 represented a strong positive relationship with status of physical activity stages of change at time 2. The relationship between BMI at time 1 and physical activity stages of change status at time 2 appeared to be weak or negligible ( $r = -.10$ ,  $p = < .05$ ). Complete correlation matrix is provided in table 6.

## 4.3 Regression analysis

In the first analysis, two steps of predictor variables were included. In the first step BMI and psychological health revealed a negative prediction value of  $-.10$ ,  $p < .05$ ) and  $-.15$  ( $p < .01$ ) respectively. However, accounting for the psychosocial variables (social support from friends, social support from family, self-efficacy in the face of psychological and practical barriers, evaluative and affective barriers, and identity) in the next step of the analysis, BMI and psychological health lost their predictive value.

Altogether, BMI, psychological health, and the psychosocial predictor variables accounted for 31 % of the variance of physical activity stages of change from time 1 to time 2 (BMI and psychological health, 3 %; psychosocial variables, 28 %). Of all predictor variables included in step two, only three of the predictors appeared significant: self-efficacy in the face of psychological barriers ( $\beta = .18, p < .01$ ), affective attitude ( $\beta = .12, p < .05$ ), and identity ( $\beta = .31, p < .001$ ).

The second analysis, in which stages of change in physical activity at time 1 was controlled for, stages of change at time stand out as a strong predictor of time 2 stage of change ( $\beta = .60, p < .001$ ). In step two, BMI and psychological health were included, but they did not appear significant to predict a progression in stages of change from time 1 to time 2. Social support from friends, social support from family, self-efficacy in the face of psychological and practical barriers, evaluative and affective barriers, and identity were included in the third step of the analysis. After controlling for step one and step two, affective attitude ( $\beta = .14, p < .05$ ) and identity ( $\beta = .14, p < .05$ ) were significant as predictors of progression in stage of change. Self-efficacy in the face of psychological barriers were no longer significant ( $\beta = .11, p = .68$ ). After controlling for stages of change at time 1 (accounting for 36 % of the variance in time 2 stage of change), BMI, and psychological health (accounted for an additional 0.3 %), and the psychosocial variables accounted for an additional 3.6 % of variance.

**Table 4. Multiple regression analysis. Prediction value of BMI and psychological health (step 1) and psychosocial variables (step 2) at time 1 for stage of change *status* at time 2.**

Predictor	Step 1		Step 2	
	$\beta^a$	$\beta^b$	$R^2$ (adjusted)	$R^2$ (change)
<b>Step 1:</b>			.03	
BMI	-.10*	-.01		
Psychological health	-.15**	-.04		
<b>Step 2:</b>			.31	.28
Social support, family		.04		
Social support, friends		.08		
Self-efficacy, psychological barriers		.18**		
Self-efficacy, practical barriers		.02		
Attitude, evaluative		-.01		
Attitude, affective		.12*		
Identity		.31***		

Total explained prediction variance. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Table 5. Multiple regression analysis. Prediction value of stage of change (step 1), BMI and psychological health (step 2), and psychosocial variables (step 3) at time 1 for stage of change *progression* at time 2.**

Predictor	Step 1	Step 2	Step 3	$R^2$ (adjusted)	$R^2$ (change)
	$\beta^a$	$\beta^b$	$\beta^c$		
<b>Step 1:</b>				.36	
Stage of change, time 1	.60***	.59***	.42***		
<b>Step 2:</b>				.36	.00
BMI		-.05	-.02		
Psychological health		-.05	-.01		
<b>Step 3:</b>				.40	.04
Social support, family			.00		
Social support, friends			.02		
Self-efficacy, psychological barriers			.11		
Self-efficacy, practical barriers			-.00		
Attitude, evaluative			-.06		
Attitude, affective			.14*		
Identity			.14*		

**Total explained prediction variance. \*p = < .05, \*\*p = < .01, \*\*\*p = < .001**

**Table 6. Correlations between psychosocial variables at time 1 and stages of physical activity change at time 2 (n = 483 – 550). \*p = < .05, \*\*p = < .01**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) <b>SOC</b>	1									
(2) <b>BMI</b>	-.099*	1								
(3) <b>Psych. health</b>	-.151**	.057	1							
(4) <b>Family sup.</b>	.209**	-.046	.056	1						
(5) <b>Friends sup.</b>	.287**	-.019	.036	.543**	1					
(6) <b>Psych. bar</b>	.407**	-.159**	-.188**	.188**	.347**	1				
(7) <b>Practical bar.</b>	.349**	-.098*	-.085	.214**	.349**	.697**	1			
(8) <b>Attitude, evaluative</b>	.296**	-.099*	-.066	.262**	.291**	.361**	.303**	1		
(9) <b>Attitude, affective</b>	.401**	-.115**	-.223**	.229**	.338**	.332**	.380**	.581**	1	
(10) <b>Identity</b>	.495**	-.135**	-.179**	.340**	.413**	.475**	.445**	.392**	.587**	1



## 5.0 DISCUSSION

The purpose of this study was to investigate whether a set of physical and psychosocial variables could offer any prediction abilities for future behavior in a sample consisting of 565 people living in the area of Furuset, Norway, during a period of three years.

The selection of variables were motivated by previous research and anticipations that they could provide valuable insight to what affects people's future behavior.

The anthropological measure of body mass index, people's psychological health status, psychosocial measures of social support from family and friends, psychological and practical barriers to physical activity, evaluative and affective attitude towards physical activity, and physical activity identity were analyzed in this thesis.

Research questions postulated:

- 1. To what extent do psychosocial factors, psychological health, and BMI predict exercise behavior?**
- 2. To what extent do psychosocial factors, psychological health, and BMI predict a progression in the stages of change from time 1 to time 2?**

## **5.1 Research question 1**

The objective with research question 1, was to detect to what extent psychosocial variables, psychological health, or BMI could predict the status of stages of change in physical activity at time 2. Altogether, the psychosocial variables accounted for 28 % of variance when being controlled for BMI and psychological health. This finding displays the potential of psychosocial variables in intervention settings. Especially self-efficacy in the face of psychological barriers, affective attitude towards physical activity, and physical activity identity seem important as they stood out as significant predictors in the current study. The findings suggest that the abovementioned psychosocial variables are important in influencing and maintaining physical activity in intervention practice.

Increased BMI is significantly associated with decreased levels of physical activity (Mora, Lee, Buring, & Ridker, 2006; Morrato, Hill, Wyatt, Ghushchyan, & Sullivan, 2007), and it is likely that people who are suffering from mental distress are less active than their mentally healthy peers (Utschig et al., 2013). Still, psychosocial status appears more important to exercise adherence than BMI and psychological health status combined. BMI and psychological health status could only explain 0.3 % of variance in stages of change status at time 2, after controlling for the psychosocial variables. These findings are valuable in both prevention and treatment of people suffering from overweight and mental distress. Working with people's attitude towards exercise, developing their identity, and finding ways to reduce the perceived psychological barriers could provide considerable potential in this process.

## **5.2 Research question 2**

In order to address whether psychosocial determinants could predict progression in the stages of change model in an unaffected population (research question 2), it was necessary to control for stages of change at time 1 in the regression analysis. To eliminate any potential confounding effects of BMI and psychological health, these factors were controlled for in the regression, but did not appear to play a negative role for progression in physical activity stages of change (0.3 % implicit variance). Since the study participants did not receive any intervention, it was not expected to find a great deal of progression in physical activity stages of change between time 1 and time 2, which also turned out to be the case.

Nevertheless, a small progression was detected, which was largely predicted by past physical activity (controlled for BMI, and psychological health), which accounted for 36 % prediction in stages of change. Psychosocial variables explained an additional 4 % of the forward transition in physical activity stages of change from time 1 to time 2, when controlled for BMI, psychological health, and stages of change at time 1.

Even if this number represents a seemingly modest prediction of progression in stages of change, it is unlikely that the sample population was exposed to factors that could affect the psychosocial variables systematically. It would be unreasonable to argue that psychosocial predictors alone, in the absence of intervention, could be an important predictor of progression in stages of change. Past physical activity behavior overrules all other variables included in the regression analysis, remaining highly significant when being controlled for all other predictor variables ( $\beta = .42, p < .001$ ). This concurs with previous research pointing out that physical activity is largely a habitual behavior. In their meta-analytic synthesis, Ouellette and Wood (1998) argue that past behavior guides future responses through two processes. 1) Well-practiced behaviors in constant contexts recur because the process and control of their performance becomes automatic. 2) The second process, in which the behavior is not fully learned or the person is faced with an unstable or difficult condition, behavior is mainly driven by past behavior, subjective norms, and attitude. In addition, the current study suggests that *identity* should be added, and that the more specific domain of *affective attitude* as exercise behavior predictor could be replacing the general term “attitude”. More research is needed however, to confirm these findings in different contexts.

## **5.3 Predictor analysis**

### **5.3.1 Physical activity identity**

The mean score of the physical activity identity index was 3.4 (sd = 1.7) on the 1 through 5 scale (does not suit – suit well), which provided fruitful conditions for prediction testing. Physical activity identity was a predictor of both status of physical activity behavior at time 2 ( $\beta = .31, p < .001$ ) (research question 1), and of progression in physical activity from time 1 to time 2 ( $\beta = .14, p < .05$ ) (research question 2).

Items in the questionnaire detected people's appraisal of themselves of being a person who is interested in physical activity, who is interested in keeping physically fit, who cares about one's body, and whether physical activity was a part of themselves as a person. These items are all personal in their nature, concerning core values in people's self-concept. Identity thus seem to carry a profound meaning of people's inner agency in a long-term context. As Wilkinson-Ryan & Westen (2000) argued in their paper, identity and self-concept carries a sense of personal continuity over time and across situations. That is, people are behaving consistently with their identity as exercisers, and that a diversion from this would be a deviation of people's core values and ideal self-standards. The findings in this study concur with previous research of several other authors (e.g Anderson, 2004; Strachan et al., 2009; Plotnikoff et al., 2000). However, the findings in this current study are valuable because they reveal physical activity identity's consistency in a *natural context* over a three-year span.

The population of the current study ranged between 30 and 67 years of age at time 1, thus reflecting an adult population. Bandura (1997) argues that origins of a sense of personal agency is something that is shaped during the early stages of life, becoming integrated in the self-concept due to reinforcement of positive outcomes. Despite being regarded as a profound agency of the inner self that is first and foremost shaped early in life, it seems likely that identity can be formed in adult age as well. For instance, long-term goal persuasion might lead to a stronger identification with and self-efficacy for physical activity (Miller, Ogletree, & Welshimer, 2002).

Indeed, Strachan et al. (2009) points out the close resembling aspects of identity confirmation and variables of Bandura's (1986) self-efficacy theory. For instance, according to Stryker & Burke (2000), identity confirmation should enhance or maintain self-efficacy for future identity-relevant behavior. Magnitude of identity is as a strong predictor of future exercise behavior, and people are aware that their actions produce favorable outcomes. It is therefore not surprising to find a strong correlation between physical activity identity and self-efficacy in overcoming psychological barriers in this sample ( $r = .48, p < .01$ ).

### **5.3.2 Self-efficacy in the face of psychological and practical barriers**

In respect to exercise adherence, it appears that people are generally more confident in their abilities to overcome psychological barriers (index mean 4.8,  $sd = 1.7$ ) than practical

barriers (index mean 3.8, sd = 1.3), which also seem to be the case when analyzing the regressions.

When controlling for factors such as BMI and psychological health, self-efficacy in the face of psychological barriers at time 1 stand out as a predictor of future exercise behavior (time 2) ( $\beta = .18, p < .01$ ). On the other hand, when controlling for exercise behavior at time 1, the beta weight was no longer significant ( $.11, p = .68$ ). This means that while efficacy expectations when confronted with psychological barriers at time 1 predict the level of people's future exercise behavior (time 2), it is not predictive of people's *progression* in stage of change from time 1 to time 2.

Regarding psychological barriers, this essentially means that people who believe that they can overcome obstacles of a psychological nature are in fact more likely to meet their projected exercise plans. Participants were asked whether they could perform physical activity in a diversity of unfavorable circumstances. For instance in psychological disadvantageous situations where they felt depressed, tired, had worries, or were cross about something. The mean score of the sample on the psychological barrier variable suggests people are rather confident in their abilities to overcome barriers of such nature. Despite being psychologically challenged by a negative mindset, participants who scored high on this index would still perform the planned physical activity.

Correlation coefficients further reveal that people who overcome psychological barriers to exercise tend to have a high score on affective attitude ( $r = .33, p < .01$ ). Similarly, people who has a high score on psychological barriers identify themselves as exercisers ( $r = .48, p < 0.1$ ). The finding suggests that these people are more persistent in their follow-through of the planned activity, because of their efficacy expectations, positive attitude, identity as exercisers, which ultimately reinforces the characteristics of these individuals' self-confidence. Accordingly, as Bandura (1997) stated in his social cognitive theory, people who have a high sense of efficacy take a future perspective in planning their life, which appears to be true also in this studied sample.

On the contrary, people's confidence in overcoming practical barriers to physical activity seems to offer no prediction in progression of physical activity stages of change at time 2 when controlled for BMI and psychological health ( $\beta = -.00, p > .05$ ). Nor does it seem to comprise any status-prediction on stages of change at time 2, when controlled for BMI and

psychological health ( $\beta = .02, p > .05$ ). The question item inquired whether people would perform their planned physical activity when being exposed by barriers of a practical nature, such as work obligations, bad weather, the time consumption of partners or family, and conflicting demands/interests. The mean score of the item was 3.8 (sd =1.3), denoting that most people in this study had an ambivalent relationship in their belief to overcome practical obstacles to physical activity. A correlation coefficient of .39 ( $p < .01$ ) between practical barriers and affective attitude, suggests that people are well aware of the positive affection that are associated with exercise. Of course, it is natural to imagine that rejecting friends and family might be a greater obstacle than for instance being tired or worried to perform the planned activity, yet it might offer an explanation to what extent people prioritize physical activity.

### **5.3.3 Attitude towards physical activity participation**

Affective attitude concerns items of more emotional character. Findings revealed that affect has an impact on physical activity behavior, and were in fact both status-predictor ( $\beta = .12, p < .05$ ) and progression-predictor ( $\beta = .14, p < .05$ ) of physical activity stages of change. Mean value of the index was 5.2 (sd = 1.4) on the 1 through 7 Likert scale, which manifests people's appraisals of regular exercise to be more easy, interesting, and pleasant than troublesome, boring, and unpleasant. Cognitive appraisals of the value in the activities postulated in the index thus seem to be important for future behavior. Ajzen (1991) postulates in the theory of planned behavior that people learn to favor behavior with a desirable outcome, and that people form negative attitudes against undesirable outcomes. Findings of this study supports this theory. The correlation between affective attitude towards exercise and actual exercise behavior appears to rely on entirely different psychological constructs than for instance evaluative attitude, which exhibited a contrasting finding.

Items of the evaluative variable was measured using Likert scales of bipolar adjectives concerning physical exercise, such as whether physical exercise would be stupid or sensible, harmful or valuable, useless or useful, wrong or right. The mean value of evaluative attitude denotes a relatively high mean score of 6.3 (sd = 1.1), which suggests that people seem to be well aware of the benefits of physical activity. Despite being aware of these benefits, findings reveals that evaluative attitude does not provide predictive abilities for progression ( $\beta = -.06, p > .05$ ) nor status ( $\beta = -.01, p > .05$ ) of stages of change at time 2, when being controlled for

BMI and psychological health. This finding suggests that people's rational appraisals of physical activity is not that important for whether they will exercise or not. Similar findings have been done in the past. For instance, Sallis & Owen (1999) found no association between attitudes (not divided between affective and evaluative) towards exercise or physical activity behavior and actual behavior.

Combined, these are important findings, because it suggests that encouraging people to take on physical activity based on rational arguments of exercising have little or no effect. Instead of promoting physical activity by focusing on how sensible, valuable, and useful physical activity is, the current study suggests that future directives should emphasize on methods that make people realize how easy, pleasant, and interesting physical activity is.

### **5.3.4 Social support and physical activity participation**

Previous research has found positive effects of social support concerning adaption and adherence to physical activity (Boutelle, Jeffery, & French, 2004; Courneya et al., 2000; Sallis & Owen, 1999). The result of this study, however, showed no significant pattern between social support status from family ( $\beta = .04$ ,  $p > .05$ ) and friends ( $\beta = .08$ ,  $p > .05$ ) at time 1, and stages of change status at time 2. Nor did it appear to be any correlation between social support and stages of change in terms of progression in stages of change. Index values reveal a mean score of 2.2 (sd = 0.8) of family support and 2.0 (sd = 0.8) of friends support on the 1 through 5 scale, which corresponds to "seldom" on the index scale. The isolated correlation between social support from family ( $r = .21$ ,  $p < .001$ ) and friends ( $r = .29$ ,  $p < .001$ ), and stages of change are both significant, yet do not seem to provide enough power to predict future exercise status or progression in stages of change. Overall, findings reveals that social support in this sample is low, and not efficient in predicting status and progression of physical activity.

### **5.3.5 BMI and psychological health**

According to longitudinal studies, BMI is a strong predictor of future exercise behavior (e.g., Delahanty, Conroy, & Nathan, 2006; Hjort et al., 2013). In this study, the beta weight of  $-.10$  ( $p < .05$ ) reveals a predicting effect of future exercise behavior based on people's BMI, but only in the first step of the regression model. In step 2, It loses all its

predictive ability ( $\beta = -.01$ ,  $p > .05$ ), suggesting that psychosocial factors are of greater importance to exercise behavior than BMI status.

Correlation coefficients reveals that there is a negative relationship with high BMI and several of the psychosocial variables (table 6). High BMI is associated with perceived barriers to exercise (practical,  $r = -.10$ ,  $p < .01$  psychological,  $r = -.16$ ,  $p < .01$ ), poor attitude towards exercise participation (evaluative,  $r = -.10$ ,  $p < 0.5$  affective,  $r = -.12$ ,  $p < .01$ ), and a lower degree of exercise identity ( $r = -.14$ ,  $p < .01$ ). Yet, the fact that a person is overweight at time 1 does not seem to diminish the potential of the psychosocial factors of status of stages of change at time 2. In other words, being overweight bears little meaning of a person's exercise status in the future. This implies that when consulting people who are overweight, it is crucial to work with these people's mental perspective and remove the focus of bodyweight while putting emphasis on increasing psychosocial qualities such as exercise identity, affective attitude towards exercise, and self-efficacy in the face of psychological barriers.

People with a low score on psychological health, experienced a higher degree of psychological barriers, lower perception of physical activity identity, and reduced affective attitude towards exercise. Nevertheless, a pronounced neutralizing effect of the psychosocial factors was seen in people having a low score on psychological health, which was a significant predictor of stages of change status at time 2 ( $\beta = -.15$ ,  $p < .01$ ). However, the relevance of a low score on psychological health to predict stages of change status on time 2 ceased to exist entirely when being controlled for the psychosocial variables. According to the literature (e.g. Buckworth et al., 2013), people with anxiety and depression experience activities as a burden rather than pleasure. Still, the current study propose that these conditions do not overrule the psychosocial factors in terms of exercise adherence, which is valuable knowledge for treatment in psychiatry. However, it remain uncertain whether people in this study actually suffered from clinical diagnosed levels of psychological health, in which case the predicting effect might have been different.



## 5.4 Strength and limitations

A considerable strength with this study is that it provides the measurable magnitude of psychological factors, BMI, and psychological health on physical activity status and progression in a natural context, thus providing genuine information of influencing factors of people's everyday life. In addition, these data derived from a three-year follow-up design, thereby eliminating methodical weaknesses associated with for instance cross-sectional designs (Marczyk, DeMatteo, & Festinger, 2010). In cases where the data is gathered at a single point in a change process, measurements are treated as though they represent a static, one-dimensional factor, and by doing so, one cannot detect participant's true development of the psychosocial factors.

The current study only addressed people in a certain group. Only adults aging between 31 and 67 at time 1 was assessed, hence only referring to an adult population. The district of Furuset deviates from other district in Oslo in terms of health inequalities and socio-economic status, as reported by Rognerud & Stensvold (1998). These factors may compromise generality to other groups. Furthermore, there was no distinction between gender, ethnicity, or income in the current study. Only 9 % of the population had a non-western background. Population surveys revealed that 26 % (2001) non-westerns inhabits this district (Blom, 2002), suggesting some selection bias in the current sample.

Time 2 data of the self-assessed stage of the change index revealed that 40.7 % belonged in the maintenance stage, which concurs with the findings of Seefeldt, Malina, & Clark (2002), where they found that 60 percent of adults in modern western societies do not exercise on a regular basis. Although it represents a somewhat vague estimate, Norwegian national surveys indicate that the prevalence of the adult population who are sedentary in their leisure time range between 19 and 50 percent (Søgaard et al., 2000). Since these findings resemble the ones of the current study, the reported activity levels could be interpreted as reliable. However, the numbers represented in the aforementioned studies are also based on self-reported measures, thus one cannot rule out the possibility of unreliable physical activity levels, due to the general limitations of self-reported physical activity. There is no way of knowing people's own definition of physical activity, although it is likely that people's perception of physical activity is the same at time 1 and time 2, suggesting an accurate relative increase of physical activity from time 1 to time 2. Furthermore, due to the three years between the surveys, it is unlikely that people remember their responses on the questionnaire

from time 1 to time 2, increasing the actual chance of people being sincere and not affected by their previous responses.

## **6.0 CONCLUSION**

### **6.1 Research question 1**

Results give some support that in a natural, non-interventional environment, psychosocial factors are significant predictors of future physical activity status. More specifically, three psychosocial factors significantly predicted physical activity behavior, thus making them valuable for exercise promotion and maintenance: 1) Affective attitude; people who find physical activity to be easy, pleasant, and interesting, is more likely to be physical active in the future. 2) Physical activity identity; people who identify themselves as exercisers, that cares about their body, is interested in physical activity, and interested in being physical fit, are also more physical active than people with lower perceived physical activity identity. 3) Self-efficacy in the face of psychological barriers; people who believe they can overcome barriers of a psychological nature, such as being tired, stressed, or worried, are likely to be physical active in the future. These results therefore suggest that physical activity promotion should try to strengthen peoples' affective states concerning physical activity, their self-efficacy to overcome psychological barriers and to strengthen their identity as exercisers.

### **6.2 Research question 2**

Progression in physical activity stages of change is mostly determined by past physical activity behavior. Indeed, this finding is in line with previous research giving support to the notion that physical activity behavior to a great extent is habitual. Nevertheless, controlling for the habitual element, affective attitude and physical activity identity were significant predictors of a significant, albeit modest progression explained by the psychosocial variables. These findings support the current knowledge of emphasizing favorable conditions for physical activity in early stages of life.

Finally, the current study demonstrated that BMI and psychosocial health lost their prediction abilities for stage of change status and stage of change progression, when being controlled for the psychosocial factors. This finding reveals the psychosocial factor's promising potential in treatment of these conditions.

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## 8.0 APPENDIXES

### Items as they appear in the questionnaire

#### Stages of change in physical activity (Q2).

Item (category 1-5)	<b>Please read all the alternatives listed below. Draw a cross beside the alternative that best describes your present level of physical activity or your interest in physical activity. Include all physical activity other than activity carried out as part of your job.</b>
	At present I am not physically active, and do not plan to become physically active in the course of the next 6 months
	At present I am not physically active, but I am thinking of becoming more physically active in the course of the next 6 months
	At present I take part in some physical activity, but not regularly
	At present I take regular physical exercise, but only started such activity in the course of the last 6 months
	At present I take regular physical exercise, and have been physically active longer than for the past 6 months

#### Identity (Q2).

Item (scaling 1 – 4)*	<b>To what degree do these statements describe you as a person?</b>
	I regard myself as a person who is interested in physical activity
	I think of myself as a person who is interested in keeping physically fit
	Being physically active is part of being the person I am
	I think of myself as a person who cares about his/her body

\*Scaling variable: Does not suit – suits well.

#### Self-efficacy in the face of barriers (Q2).

Item (scaling 1 – 7)*	<b>I am sure that I can perform the planned physical activity even though:</b>
	I am tired
	I feel depressed
	I have worries
	I am cross about something
	I feel stressed
	Friends are visiting me**
	Others want me to take part in some other activity**
	My family/my partner takes up a lot of my time**
	I cannot find anyone to take exercise with**
	The weather is bad
	I still have a lot of work to do**
	There is an interesting programme on TV

\*Scaling variable: Not at all sure – perhaps – very sure.

\*\*Practical barrier items (marking is not visible in questionnaire).

**Attitude (Q2).**

Item (scaling 1 – 7)	<b>Take a standpoint on the following statement: “In my case, taking regular physical exercise in the course of the next month would be:”</b> <b>Put a cross in the box that fits best with what you think is true.</b>
	Stupid – Sensible Harmful – Valuable Useless – Useful Wrong – Right Troublesome – Easy** Unpleasant – Pleasant** A bad thing – A good thing Boring – Interesting**

\*\*Affective items (marking is not visible in questionnaire).

**Social support (Q2).**

Item (scaling 1 – 6)*	<b>In the course of the last 3 months, my family (members of my household) or my friends/acquaintances/colleagues have:</b>
	Taken part in physical activity with me Encouraged me to continue to be physically active Changed their plans to make it possible for us to take part in physical activity together Suggested that we should do some physical activity together Given me helpful reminders about physical activity (“Are you going to exercise this evening?”) Planned physical activity in connection with excursions Discussed physical activity with me Talked about how much they like to use their body/be physically active Helped me to plan other activities in connection with my planned physical activity Asked me if I have any ideas as to how <i>they</i> can be more physically active Taken over some of my duties to give me more time to be physically active

\*Scaling variable: Never (1), seldom (2), a few times (3), often (4), very often (5), not applicable (6).

Note: **Family** and **friends/acquaintances/colleagues** are two separate indices, but are identical in the questionnaire.

**Psychological health (Hopkins Scaling) (Q1).**

Item (scaling 1 – 4)*	<b>Below is a list of various problems. Have you suffered from any of the following during the last week (including today)?</b>
	Suddenly feel panicky for no reason Suddenly feel frightened or anxious Feel faint or dizzy Feel tense or harassed Easily find fault with yourself Sleeplessness Feel depressed, dejected Feel useless, of little worth Feel that everything is a burden Feeling of hopelessness for the future

\*Scaling variable: Not troubled (1), slightly troubled (2), quite a lot troubled (3), much troubled (4).





