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Physical Activity Level and Socioeconmic Status

A cross-sectional study of Norwegian 6-year-olds. A substudy of the second Physical Activity among Norwegian Children Study (ungKan2).

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SUMMARY

Background: Several large epidemiological studies have described children and youth's physical activity level, but almost none have looked at 6-year-olds. Low socioeconomic status (SES) is associated with a less healthy lifestyle among adults. The research is, however, unclear on how family SES affects the children's activity level.

Purpose: The main purpose with this thesis was to investigate Norwegian 6-year-olds' activity level and to study the associations between SES and physical activity level.

Methods: In this cross-sectional study, 1899 first grade children representative for Norway were randomly recruited. The participation rate was 56.4 %. Physical activity level was objectively assessed by accelerometer. Meeting recommendations for physical activity was defined as ≥60 minutes with ≥2000 counts/min. The mother's highest education level was divided into four groups and used as measure for SES.

Main results: Boys was significantly more physical active than girls. 94 % and 86 % of the 6-year-old respectively boys and girls met the recommendations for physical activity. Girls spent significant more time being sedentary compared to boys. Mother's highest education level was not associated with the children's physical activity level, nor time spent in different activity intensities.

Conclusion: The majority of the Norwegian 6-year-olds met the recommendations for physical activity. The 6-year-olds spent most of their awake-time as sedentary, significantly more girls than boys. There were no found associations between mother's highest education level and the children's activity level.

Key words: children, physical activity, accelerometer, socioeconomic status, mother's highest education, cross-sectional, epidemiology

ACKNOWLEDGEMENTS

ABBREVIATION

ACSM: American collage of sport medicine

BMD: Bone mineral density

BMI: Body mass index

CI: Confidence interval

DLW: Doubly labeled water

ECG: Electrocardiography

EE: Energy expenditure

HR: Heart rate

METs: Metabolic equivalent

MVPA: Moderate-to-vigorous physical activity

NSSS: Norwegian school of sport science

PA: Physical activity

PBM: Peak bone mass

RMR: Resting metabolic rate

SES: Socioeconomic status

VO_2:   Oxygen uptake

CONTENTS

1.0 Introduction

Although some believe that each individual is responsible for their own choices regarding PA, studies have shown that individuals' PA choices are affected and influenced by the environment. A report from The Norwegian Institute of Public Health (NIPH) (Næss, Rognerud & Strand, 2007) showed that the mortality rate was higher among lower socioeconomic status (SES) individuals compared with individuals who had higher SES. Studies show that people with low SES are more likely to smoke daily, eat less vegetables and fruit, and they are less physically active compared to people with higher SES (Næss, Rognerud & Strand, 2007). These are all risk factors for cardiovascular disease, certain types of cancer, and respiratory diseases, which put individuals in lower SES groups at a higher death risk compared with individuals in higher SES groups (Næss, Rognerud & Strand, 2007).

Studies show that children's health also is affected by social inequality. NIPH's report (2007) shows that children in families with lower SES have lower birth weight, higher risk of infant mortality, and poorer nutrition when compared with children from higher SES families. The literature regarding the association between children's PA and family SES is, however, inconsistent. Some studies have found a positive association between SES and activity level in children and adolescents (Fairclough et al., 2011; Stalsberg & Pedersen, 2010; Borraccino et al., 2009), while others have not found an association at all (Riddoch et al., 2007; Hesketh, Crawford & Salmon, 2006; Kelly et al., 2006). To be able to develop effective interventions there needs to be a more comprehensive understanding of which factors are underlying the correlation between SES and PA.

Over the last couple of years, the government has focused on children's PA level as studies have shown that PA levels decline with increasing age (Kolle et al., 2012; Corder et al., 2010; Nader et al., 2008). Daily PA is necessary for children's healthy growth and development (Malina, Bar-Or & Bouchard, 2004). Furthermore, children develop basic PA habits for their adult years during childhood (Telama et al., 2005; Tudor-Locke et al., 2001) and it is therefore important to investigate PA patterns and trends in children in order to develop effective interventions that promote PA in children. Lately there have been several large epidemiological studies describing the PA level of children and youths. Most of the studies involve older children between the age of 9 and 15 (Magnusson et al., 2011; Kolle et al., 2009a; Riddoch et al., 2004). When it comes younger children just starting school (6-year-olds), the research is minimal and the knowledge about their PA level and patterns are small.

The main objective of this study is to objectively assess PA level in Norwegian 6 year-olds and to study the association between SES and PA. The study will encompass two hypotheses (a) boys are more active than girls, and (b) children from families with high SES are more physically active than children from families with low SES.

2.0 Review of literature

2.1 Physical activity – definitions and basic principles

Physical activity (PA) is a complex behavior, defined as "any body movement produced by the skeletal muscles that results in energy expenditure" (Caspersen et al., 1985). PA is a wide term and includes activities like sports, physical education, housework, conditioning, outdoor activities and more. PA consists of intensity (how hard), duration (how long) and frequency (how often). These three dimensions make the total volume of the activity. Metabolic equivalent (METs) is often used to express PA intensity. One MET is defined as the energy cost of sitting quietly and is calculated to a calorie consumption of 1 kcal/kg/hour. Activity of moderate-to-vigorous intensity (MVPA) is usually defined as $3 \geq$ METs, thus at least three times higher calorie consumption for a person compared with sitting quietly. MVPA could for example be brisk walking, housework, dancing or gardening (WHO, 2010).

The different activity types a person engages in (i.e., running, walking, or playing handball), and the context or reason of the PA (i.e., activity performed during leisure time, school hours, transportation and so on) is also an important dimension of PA (Welk, 2002).

2.2 Physical activity and health in children

The health benefits associated with PA are numerous. PA needs to be conducted regularly through life to achieve all the health benefits that come along with an active lifestyle.

Previous research has demonstrated that active children and youth have a lower risk for developing hypercholesterolemia compared to their inactive companions (Carnethon, Gulati & Greenland, 2005). Regular PA reduces blood pressure among children with systemic hypertensive blood pressure (Biddle, Gorely & Stensel, 2004; Strong et al., 2005). PA can also reduce health risks associated with metabolic syndrome (Ritenbaugh et al., 2003; Kang et al., 2002; Gutin et al., 1994).

Bone mineral density (BMD) is an indicator for bone health and is affected by peak bone mass (PBM), which is the greatest amount of bone mass a person can achieve. PBM is usually achieved during the twenties, and can be increased through participation in weight bearing activities among others activities such as jogging, gymnastics and ball sports (Janssen & LeBlanch, 2010). Karlsson (2002) found that the most important skeletal influences happens before children reach puberty, which means that participation in exercise that has a positive influence on bone health should start at an early stage in life when the exercises will have the greatest impact on bone density (i.e., when the children are approximately 7 years old). PA is also positive for the ligaments and cartilage (Meen, 2000).

PA also tends to have a positive effect on the mental health of children and youth (Piek et al., 2010; Meen, 2000). The results of a study indicate that physically active children have improved self-esteem and less symptoms of depression than their less active counterparts (Larun, et al., 2006). However, there is need for better and more methodologically sound studies in this area to before any definite conclusions can be drawn (Janssen & LeBlanch, 2010; Strong et al., 2005).

Several studies have looked at the relationship between PA and overweight

tendencies, but the results have been variable so a definite relationship has not been established (Rauner, Mess & Woll, 2013; Ekblom, 2005; Biddle, Gorely & Stensel, 2004; Tudor-Locke et al., 2004; Ekelund et al., 2002).

2.3 Physical activity recommendations

Studies have shown that there is need for a minimum amount of PA to achieve the health benefits from PA (Janssen & LeBlanc, 2010). Therefore many organizations and agencies have developed recommendations for appropriate amounts of PA for different populations. American College of Sport Medicine (ACSM) introduced the first PA recommendations for children in 1988, and the recommendations were based on recommendations for adults. ACSM lists 8 different opinion statements in their article, one of which asserts that children require 30 minutes of vigorous activity each day. The recommendations have been developed and changed several times since 1988. The Health Education Authority in London, England updated the PA recommendations in 1998 (Biddle, Sallis & Cavil) to at least 60 minutes of moderate activity each day, and included a second recommendation that this activity should occur at least twice a week to strengthen and maintain muscular strength, flexibility and bone health. This recommendation is similar to the US Department of Health and Human Services' (HHS) current recommendation, which is at least 60 minutes of MVPA each day (HHS, 2008).

The Norwegian National Council for Nutrition and PA made a recommendation for PA in the year 2000 targeted at Norwegian children and youth. They recommended that all children and youth should be physically active for at least 60 minutes every day for at least moderate intensity (i.e., equivalent to fast walking, playing or dancing; The

Norwegian Directorate of Health, 2000). The activity should include a variety of exercises including those that increase muscle strength, endurance, flexibility, coordination, reaction and rapidity so the children develop different basic abilities. The overall recommended time to be active could be broken down into shorter activity sections and should include activities of both moderate and vigorous intensities (NNR, 2004). These recommendations are similar to PA recommendations in other countries such as Canada, New Zealand (CSEP, 2011; WHO, 2010; SportNZ, 2007).

2.4 Measurements of physical activity

PA is a complex, multi-dimensional and highly variable behavior, which makes it hard to measure, especially in children. A field study by Bailey et al. (1995) illustrated children's spontaneous PA, where most of the children (95%) did not rest consecutively for more than 4 minutes. The mean duration in light-to-moderate intensity was 6 seconds, and vigorous intensity was even lower, at only 3 seconds. Within vigorous intensity 95 % of the activity lasted under 15 seconds. This spontaneous activity is hard to recall, especially for children (Bailey et al., 1995).

To get accurate results when assessing PA, the measuring tool needs to be both valid and reliable. That means that the measuring tool measures what it claims to measure (valid), and that it is measuring accurately each time (produces similar results under consistent conditions) (reliable). Another important aspect in accurate measurement is feasibility, which includes cost, skills required for using the device(s), the tolerance of the device, and amount of missing data (McNamara, Hudson & Taylor, 2010). It is beneficial that the methods used to measure PA are simple to use, inexpensive, and pose only a

minimal burden for the participants.

There are many different methods for measuring PA and/or total energy
expenditure in children. The big variation in methods for measuring PA makes it obvious
how hard it is to have a simplistic and accurate methods to describe individuals' activity
patterns and to find the energy cost of activities. There are advantages and disadvantages
for all the different methods. The methods for measuring PA are usually divided into two
different categories; subjective and objective (Siard & Pate, 2001).

2.4.1 Subjective methods

Subjective methods for measuring PA include interviews, activity records or logs,
questionnaires and proxy reports from parents or teachers. When studying a large
population, subjective methods tend to be easy and inexpensive to implement (Troiano,
2005). These methods have often been used in epidemiological research designs or
observational studies when use of objective instruments has not been possible.
Questionnaires are the most often subjective method used to estimate PA among children
and youth, as activity records are too challenging for children and youth to complete, and
proxy reports give a vague result as teachers and parents cannot observe all of the activity
a child may engage in. Questionnaires can also give information about the type of activity
the children and youth engage in, and the context. As the results of subjective methods
rely on the validity of participants' reported responses (Malina, Bar-Or & Bouchard,
2004; Sallis, 1991), subjective methods are not the best instruments for measuring PA in
children. At young ages, children's cognitive abilities have not been fully developed,
which makes it harder for them to quantify the duration, frequency or intensity of their
activity. Thus, in general, it is not recommended to use questionnaires when children are

younger than 10-years-old (Shaw, Brady & Davey, 2011; Baranowski et al., 1984).

2.4.2 Objective methods

Objective methods of measuring PA include indirect calorimetry, direct observation, doubly labeled water (DLW), heart rate (HR) monitoring, pedometers, and accelerometers. DLW is considered the 'golden standard' for measuring total energy expenditure. Although doubly labeled water gives exact results of energy expenditure during a period of time, it does not give any information about intensity or duration of the activity (Vanhees et al., 2005; Racette et al., 1994; Speakman, Nair & Goran, 1992; Schoeller et al., 1986). For measuring PA, direct observation is often thought of as the 'golden standard'. All PA at home or at school over a period of time is registered by coding forms, which record the child's PA level. This method is considered to be a valid and reliable for measuring PA in children (Hands, Parker & Larkin, 2006; McKenzie, 1991). Another measuring tool for PA is HR monitoring, which is based on the linear relationship between oxygen consumption and heart rate during MVPA (Rowlands, Eston & Ingledew, 1999). Studies have shown that HR is a valid and reliable method for measuring PA (Trost, 2007; Dugas et al., 2005) and it is possible to collect data over a period of time. However, there other factors in addition to PA that can affect HR, such as age, body size, emotional stress and proportion of muscle mass used. These factors have a larger effect on HR during low physical intensity. (Butte, Ekelund & Westerterp, 2012; Trost, 2007; Dugas et al., 2005).

Pedometers monitor vertical movements (i.e. counts each step a person takes). Many studies have investigated the validity and reliability of pedometers to quantify the distance an individual has walked, the number of steps they have taken, and energy

expenditure. Eston, Rowlands and Ingledew (1998) found a strong correlation (r = .92) between VO_2 and pedometer readings during unregulated play in 9 year-old children. A review from McNarmara, Hudson and Taylor (2010) concluded that a pedometer was a valid and effective tool for determining PA levels in children and adolescents, however other studies have not been able to replicate this finding. Rowlands, Eston and Ingledew (1999) found a correlation of $r = .59$ between pedometer counts and PA level in girls aged 8 to 10 years. A pedometer is designed for measuring walking, and cannot measure duration, intensity, upper body movements or heavy lifting (Rowland, Eston & Ingledew, 1999; Eston, Rowland & Ingledew, 1998).

Recently, the accelerometer has become a popular instrument for measuring PA in children (Basterfield et al., 2011), and several studies that have used it assert that it is a useful instrument for measuring PA in large groups (Kolle, 2009; Riddoch et al., 2004; 2007). Accelerometers measure PA through intensity, duration and frequency of movement, and they react to changes in velocity over time in different axes (Freedson, Pober & Janz, 2005). The plan change of velocity that is measured will vary from accelerometer to accelerometer. There are two different types of accelerometers; uniaxial accelerometers, which measures velocity in one axis and multiple axis accelerometers that measures velocity in two or three axes. John, Tyo and Bassett (2010) looked at four accelerometers during walking and running, and the results did not show any significant differences between uniaxial and multiple axis accelerometers. The study concluded that researchers could choose any of the four accelerometers doing research since the four different accelerometers would provide similar information regarding the PA of the individual using it.

The accelerometer has proven to be a valid and reliable instrument when monitoring PA in children (Corder et al., 2008; Plasqui & Westerterp, 2007; de Vries et al., 2006). Strong correlations between predicted EE (by indirect calorimetry) and measured EE (by accelerometer) for different activities in preschool children have also been found (Jimmy, Seiler & Maeder, 2012). Several studies have produced a large range regarded the recommended minimum days of measurement, which suggests that the number of days may vary by population and age (Nader et al., 2008; Mattocks et al., 2008; Penpraze et al., 2006; Trost et al., 2000). A study by Basterfield et al. (2011) concluded that three days of accelerometer use gave an estimate of habitual PA and sedentary behavior in participants aged 6 to 8 years old. Several studies have used this three-day minimum recommendation (Kawahara et al., 2011; Riddoch et al., 2004, 2007). Seven days is usually regarded as the 'gold standard' for estimating PA and sedentary behavior, but it is hard to achieve a 7-day minimum (Basterfield et al., 2011; Penpraze et al., 2006).

The Actigraph (Manufacturing Technology Inc., Fort Walton Beach, FL) is the most commonly used accelerometer when measuring PA (Basterfield et al., 2011). The monitor removes all movements that are considered to be abnormal movements for humans. The Actigraph also has a timer that makes it possible to time-stamp PA. Studies have found a strong positive correlation ($r = .78 - .86$) between activity registered by the Actigraph, and expected EE and PA (counts/min) from youth during walking and running on a treadmill (Corder et al., 2007; 2005; Trost et al., 1998).

There are some limitations regarding accelerometers, as accelerometers cannot register upper-body movements and activities like running at intensity above 9-10 km/h

may be underestimated (Rowlands, Stone & Eston, 2007). Also, for activities like stair or level walking where the center of mass has to be elevated/decreased the accelerometer cannot register the increased metabolic demands. Accelerometers underestimate activity during biking as it only includes movement of the legs. As the bike seat supports the center of mass, there is no whole-body movement (Brandes, van Hees, Hannöver & Brage, 2012).

A monitor has been developed that combines a HR monitor and an accelerometer; the Actiheart. The Actiheart combines the advantages of both measuring monitors as HR monitors overestimate EE during low intensities, and are therefore best during higher intensities, while the accelerometer underestimates EE during heavy lifting, biking and running during high intensities (Corder et al., 2005). The combined Actiheart monitor is able to measure acceleration, HR, HR variability and ECG magnitude (epoch of 15, 30 and 60 seconds) and is attached to the chest with two ECG electrodes (Corder et al., 2005). The combination of HR and accelerometer has been proven valid for measuring PA energy expenditure (PAEE) during children's exercise on a treadmill walking and running, and this combination had also the lowest level of systematic error (Corder et al., 2005). Eston, Rowlands and Ingledew (1998) compared different PA measurements and looked at their ability to estimate EE. They found that when using HR monitoring with an accelerometer as a second predictor, the ability for HR monitoring to predict VO_2 increased by 21.1 %, which provided the best estimate.

2.5 Levels of physical activity in children

In the existing literature, there is a dearth of studies that measure PA objectively in 6 year-olds. So far studies have looked at PA in older children (9-15 year-olds) (Colley

et el., 2011; Magnusson et al., 2011; Kolle et al., 2009a; Riddoch et al., 2007) or preschool children (Kawahara et al., 2011; Vale et al., 2011). Studies that have included 6 year-olds have included younger or older children as well, such as 6 to 8 year-olds in the study conducted by Basterfield et al. (2011), or 6 to 11 year-olds in the study conducted by Belcher et al. (2010). Table 2.1 gives an overview of existing studies using accelerometer to measure PA level in younger children.

PA is often expressed as time spent in MVPA. A problem with this method is that different studies use different cut-off points for MVPA, which makes it hard to directly compare results between the studies. For instance have some of the studies including time spent in MVPA all used different cut-off points, starting from >1500 counts/min to >3200 counts/min (Basterfield et al., 2011; Colley et al., 2011; Belcher et al., 2010).

However, PA can also be expressed as average of total counts per minute of registered time (counts/min) and is not grouped by intensity. Thus, using mean PA (counts/min) makes it possible to compare some results. By looking at the studies including the youngest subjects Swedish 6 year-olds (Nyberg et al., 2009) are the most active, with mean PA at 835 counts/min for boys and 784 counts/min for girls, while English 6-8 year-old boys and girls (Basterfield et al., 2011) had a mean PA at 745 counts/min and 735 counts/min, respectively. Danish 6-7 year-old boys and girls (Eiberg et al., 2005) had a mean PA at 743 counts/min and 679 counts/min, respectively. The studies confirm previous research by showing that boys are more active than girls. This result has been replicated in children as young as 5 years old, which suggests that sex differences in PA occur early in life (Basterfield et al., 2011; Vale et al., 2011; Belcher et al., 2010; Hinkley et al., 2008; Reilly et al., 2002).

Results from 1116 American children (Belcher et al., 2010) showed that the youngest children (6 to 11 year-olds) spent 88 minutes every day in MVPA ($\geq$ 2020 counts/min). They were the most active group compared to 12 to 15 year-olds and 16 to 19 year-olds (33 MVPA min/day and 26 MVPA min/day, respectively). That PA declines with age is replicated in several other studies (Kolle et al., 2012; Corder et al., 2010; Nader et al., 2008). Studies have shown that the largest decrease in PA appears between ages 12 and 18 (Caspersen et al., 2000; Telama & Yang, 2000; van Mechelen et al., 2000).

Table 2.1 Display of studies that have used accelerometer when measuring young

children's mean PA (counts/min) and the percentage meeting PA recommendations.

Study	Country	Age (yrs)	Sample G - B	Type of accelerometer	PA G - B	PA rec (%) G - B
Eiberg et al., 2005	Denmark	6-7	283 – 309	ActiGraph	679 – 743	NA
Colley et al., 2011	Canada	6-19	799 – 809	Actical	NA	4 – 9
Belcher et al., 2010	USA	6-11 12-15 16-19	1116 1106 884	ActiGraph	658 456 390	NA
Basterfield et al., 2011	England	6-8	135 – 156	ActiGraph	734 – 745	4 – 4
Nyberg et al., 2009	Sweden	6-10 6	653 – 640 139 – 120	Actiwatch	751 – 814 784 – 835	NA

G, girls; B, boys; PA, physical activity; PA rec, physical activity recommendations; NA, not available

2.6 SES and physical activity in children

Correlates of PA can be categorized as demographic and biological (e.g. age, gender, ethnicity, parents education), psychological (e.g. self-efficacy, perceived health), sociocultural (e.g. social support, physician influence, parental PA), and environmental (e.g. access to facilities, season/climate) factors (Uijtdewilligen et al., 2011; Kolle et al., 2009b; Marcus & Sallis, 1997). A review article from 2011 (Uijtdewilligen et al., 2011) studying correlates of PA and sedentary behavior in youth concluded that there is a need for studies with a higher quality of methodology for measuring PA.

SES is an individual's or group's position within a hierarchical social structure and is often based on the individual's or group's education, income and occupation (Galobardes, Lynch & Smith, 2007). When studying relationships between children's PA level and SES, it is important to remember that there are different behaviors associated with SES in different countries and cultures, as well as different classifications/measurements of SES (Møller et al., 2007). Occupation, income, and/or education are the most common measures of SES. Education is usually categorically measured in levels achieved, or total number of years of education. An individual's level of education is considered to be a strong determinant for future employment and income (Galobardes, Lynch & Smith, 2007). Education is also an indicator of knowledge (Næss, Rognerud & Strand, 2007). Some of the advantages for using education as a measure of SES is that it is relatively easy to measure through questionnaires, the response rate is high and it is possible to obtain this information from everybody regardless of age or working conditions (Galobardes, Lynch & Smith, 2007). Income is the most direct measure of material circumstances and can fluctuate the most on short-term basis

(Galobardes, Lynch & Smith, 2007). High income is an indictor for better quality

material resources such as food and shelter and better, easier or faster access to services.

Factors that should be reported when using income as an SES indicator are how many

individuals depend on the reported income, and disposable income reflects what the

family could spend. Studies have shown that income is a sensitive topic and people could

have difficulties disclosing this information. This may be overstated and also may vary in

different countries, by birth cohorts or by gender (Dorling, 1999). Occupation is strongly

related to income and thus any association between occupation-based SES and health

may indicate a direct relationship between material resources and health (Galobardes,

Lynch & Smith, 2007). Occupation is a widely used measure of SES, but may

underestimate SES as unemployed people often are excluded from the data. Other groups

that often are excluded are students, retired people, housewives (work at home) and

people that are unpaid, work informally or have illegal jobs (Galobardes, Lynch & Smith,

2007). Occupation reflects social standing and status, which may relate to health

outcomes due to certain privileges (e.g. it is easier access to better health services,

education)(Galobardes, Lynch & Smith, 2007). However, it's not always possible to

automatically categorize occupations (Næss, Rognerud & Strand, 2007). The association

between children's PA level and SES is unclear. Table 2.2 gives an overview of studies

investigating this association, and the results are various.

    Kelly et al. (2006) did not find any association between SES (geographically

measured) and time spent in MVPA or sedentary time (measured by accelerometer) when

they looked at preschool Scottish children. Riddoch et al. (2007) concluded that it was

unlikely that socioeconomic factors (i.e., mother's education level) could explain the

differences in PA levels between children (11-12 years old). Other studies, also using accelerometer for measuring PA level, have neither found an association between family SES and children's activity level (Tandon et al., 2012; Hesketh, Crawford & Salmon, 2006). According to Tandon et al. (2012) this may be due to children's' activity, which is unorganized and therefore there is less associated financial cost compared to adolescent and adults where SES is more influential (Næss, Rognerud & Strand, 2007).

In contrast, Fairclough et al. (2009) found that children (9-10 year old) from high SES neighborhoods were more likely to participate in sport and had less screen time (i.e., time in front of a television or computer), compared to children from lower SES neighborhoods. These results corresponds with Borraccino et al. (2009), which found that children from higher SES families had significantly higher time in MVPA compared with children from lower SES families. However, Fairclough al. (2009) and Borraccino et al. (2009) used a lifestyle questionnaire for measuring the children's PA level, which is a limitation of these studies.

A study from Germany (Jekauc et al., 2012) that used a sample of children aged between 4 to 17 years, found that SES only affected girls' PA (measured by questionnaire) and that the low SES category had the most active girls. The reason for this is unclear (Jekauc et al., 2012).

Stalsberg and Pedersen (2010) conclude in their review article that there is an association between adolescents' (13-18 year old) PA and SES, although 42 % found an inverse correlation or no correlation at all between SES and PA. Thus, SES might only be partly or periodically essential.

Table 2.2* Display of studies that have investigated the association between children's PA and SES

Study	Study design	Sample / nation	Measures of SES	Measures of PA	Outcome / conclusion
Hesketh, Crawford & Salmon, 2006	Cross-sectional	N= 2458 young group mean age 6, old group mean age 11 Australia	Area based SES (postcode), parents highest education and current employment	6 days with accelerometer (min 4 days)	Inconsistent results. More correctly interventions needed
Kelly et al., 2006	1. Observational 2. "Paired study"	1. N=339, mean age 4.2 2. N=78, mean age 5.6 Scotland	Cairstairs score (a geographically based measure)	1. 6 days with accelerometer 2. 7 days with accelerometer	No associations between SES groups and time spent in MVPA
Riddoch et al. 2007	Cross-sectional	N=5595 (2662 boys, 2933 girls) 11 yrs old England	Mothers highest education	6 days (min 3 days) with MTI Actigraph accelerometers	Unlikely that these socioeconomic conductions could explain the differences in PA levels.
Borraccino et al., 2009	Cross-sectional	N= 160 976 (51.5 % girls, 48.5 % boys) 11-, 13-, and 15 yrs old 32 different countries	FAS	Questionnaire	Significant higher MVPA from high FAS children compared with low FAS children, except from 7 countries.
Fairclough et al., 2009	Cross-sectional	N=6337, age 9-10 England	IMD, derived from each child's home postcode	Lifestyle questionnaire	Children from high SES are more likely to participate in sport compared with children from low SES families.
van Rossem et al., 2012	Cross-sectional	N=4688, age 3 Netherlands	Mothers highest education and child's ethnicity	Questionnaire	Results are inconsistent, thus need for more research in this area
Jekauc et al., 2012	Cross-sectional	N=4529 (2285 boys, 2244 girls), age 4-17 Germany	Parent questionnaire incl. education, profession and total income	Questionnaire	The children's SES only affected the girls' PA and not the boys'
Tandon et al., 2012	Cross-sectional	N= 713 child-parent pairs, children age 6-11 USA	Parents highest education level and household income	7 days with accelerometer	Family SES was not related to children's PA

N, number of participants; FAS, Family Affluence Score; IMD, Indices of Multiple Deprivation; PA, physical activity; SES, socio economic status; MVPA, moderate-to-vigorous physical activity

3.0 Methods and procedures

This study is a part of the second PA among Norwegian Children Study (ungKan2). This is a national, cross-sectional study measuring PA level in a population-based sample of 6-, 9- and 15-year-old Norwegian children and adolescents. The ungKan2 survey is a part of a national monitoring system of PA behavior. The primary purpose of ungKan2 is to obtain objective measurements of PA by accelerometer in the young population.

The current study will only include the research of the PA level and SES among the 6-year-old participants. This method section will only contain information that is necessarily for this Master's thesis.

3.1 Study Design and sampling

The method of sampling that was used in this study is cluster sampling of children in first grade at elementary school. Statistics Norway did the selection and verified that the schools were representative for the country in terms of population density and geography. Schools of children with special needs and schools with less than 10 students in grade one were excluded from the sample. Statistics Norway sent an invitation to the selected schools, and each school that decided to participate in the study contacted the NSSS. All the children studying in first grade attending the particular school were invited to participate. Figure 3.1 presents an overview of the recruitment of schools and participants. Of the invited schools, 59 of them contacted the NSSS and participated in the study, which gave 1899 potential participants. A total of 1071 first grade children

participated in the study, giving a participating rate of 56,4 %.
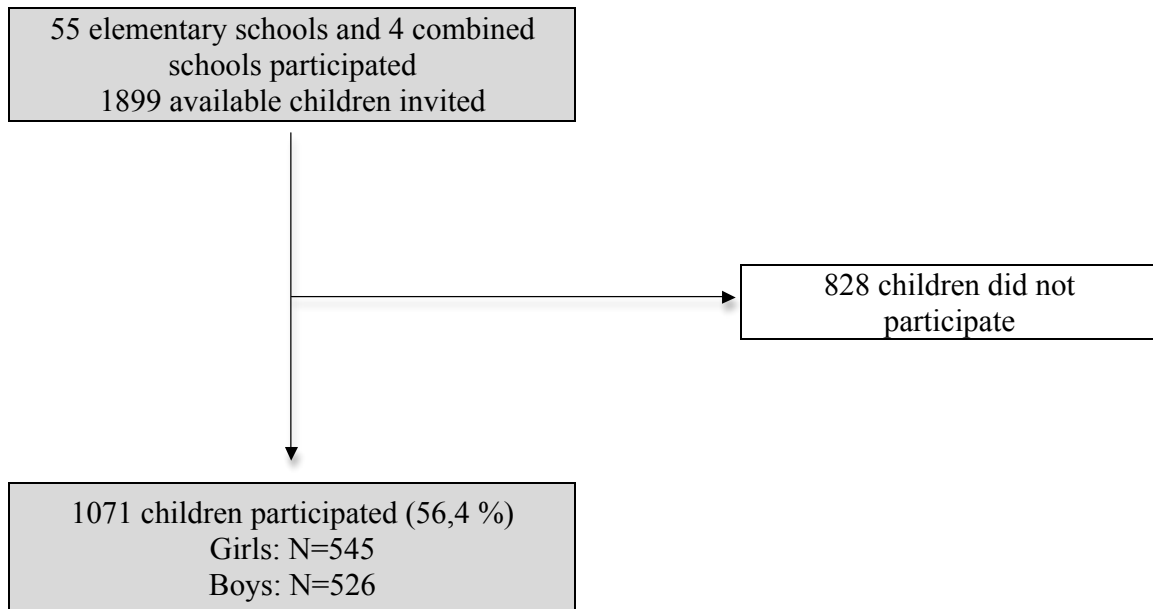
Figure 3.1 Flowchart illustrating the recruitment of schools and participants for the study.

3.2 Sample size

In the sample size calculation, PA (counts/min) was the primary outcome variable. The sample size calculations for differences between groups were based on numbers required per cell to detect a difference of 7% in PA level (counts/min). Calculations were made using a two-tailed test assuming Type I error rate = .05; and statistical power of 80%. Calculations indicated that the study would require 516 participants of each sex, which gave a total of 1032 6-year-olds. Because cluster sampling was used, a design effect of 1.1 was incorporated, giving a final target sample size of 500 subjects per age and gender group.

3.3 Measures

3.3.1 Anthroponomy

The children had on light clothing and no shoes during the PA measurements. For measuring weight, a digital Seca 770 scale (SECA GmbH, Hamburg, Germany) was used and weight was measured to the nearest 0.1 kg. Height was measured to the nearest 0.1 cm when the child was standing upright against the wall by using wall mounted tapes. BMI was calculated by dividing weight (kg) with height squared (m^2).

3.3.2 Physical activity assessment

PA was measured by ActiGraph GT1M and ActiGraph GT3X+ (ActiGraph, LLC, Pensacola, Florida, USA) accelerometers. GT3X+ measures movement in three axes, while GT1M only measures movement in the vertical axis. To make it possible to compare the different accelerometers, the vertical axis in GT3X+ was isolated, and this measurement was used in the analyses.

3.3.3 Socioeconomic status (SES)

The classification of SES was based on the mother's highest education, which was collected from the parental questionnaire. Previous studies only using one of the parents' highest education level have also chosen the mother's highest education, not the fathers' (van Rossem et al., 2012; Riddoch et al., 2007). The answers were divided from six into four groups due to low numbers of subjects in the lowest education groups. The four groups are: "Elementary school", "High school", "University < 4 yrs", and "University > 4 yrs".

3.4 Procedure

After an agreement was established with the particular school, each school had one contact person that was responsible for providing information to teachers and students, and they also collected the written approval from students and their parents. Two trained researchers from NSSS visited the school and preformed anthroponomy measurements, handed out the accelerometers and the questionnaires. The accelerometer's functions and usage was explained to the students and were fitted to each child with an elastic band around their waist with the monitor placed on their right hand side. They were told to wear the monitor for all waking hours for seven days, except during aquatic activities. The children were asked to fill out the questionnaire together with their parent(s) or legal guardian and bring it back to class on the eighth day together with the accelerometer.

3.5 Physical activity data reduction and analysis

The accelerometer was initialized and downloaded by the software program ActiLife (ActiGraph, Pensacola, Florida, USA), and a custom-made software was used to analyze the data (Propero, University of Southern Denmark, Denmark).

To prevent abnormally high activity in the children during the first hours after receiving the accelerometer, the accelerometer was set to start recording at 06.00 the day after the monitors were handed out. Night activity between 24.00 and 06.00 was excluded. Blocks of 20 minutes or more without any registered activity (0 counting) were considered as the child has taken off the monitor, and was removed from each child's recording. Epoch duration was set to 10-second intervals. Inclusion criteria for data analyses were minimum 2 days with at least 8 hours daily recording.

Mean PA level was expressed as counts per minute (counts/min), and included all the acceleration the monitor had been exposed for, divided by the number of minutes the accelerometer had been activated for. The number of counts per minute reflected how active a child was. A child with a high number of counts per minute had a high mean PA level, whereas a child with a low number of counts per minute had a low mean PA level.

Sedentary behavior was defined as all activity below <100 counts/min, medium-to-vigorous PA (MVPA) was >2000 counts/min, and vigorous PA was defined as >5999 counts/min. These cut-off points have been used in several other studies (Kolle et al., 2009; Andersen et al., 2006). Previous studies have demonstrated that 2000 counts/min equates with walking at around 4 km/h (3 METs) (Brage et al., 2003; Puyau et al., 2002) Since total PA (min/day) could affect time spent in different intensities, all analyses including intensities were adjusted by total PA (min/day). To estimate how many children that met the daily recommendations for PA, the number of minute above 2000 counts/min during the measuring period were summed up, and then divided by numbers of valid days with activity measures.

3.6 Statistics

Demographic characteristics were represented as mean values with standard deviation (SD). One-Way ANOVA was used to compare mean counts/min and numbers of days with valid accelerometer wear. *T*-tests were used to study differences in PA level between sexes. To compare PA level across SES groups and PA level across percentile groups, an ANOVA with a Bonferroni correction for multiple comparisons was used. Chi-square analysis was used to assess the percentage of children meeting the criteria for recommended PA level. Statistical analysis was completed with the IBM Statistical

Package for Social Sciences (IBM SPSS Statistics) version 18.0. Level of significance was reached if $p < 0.05$.

3.7 Ethics

The study was reviewed by the Regional Committee for Medical Research Ethics and reported to the Norwegian Social Science Data Services. A booklet was developed to inform the child's legal guardian about the purpose and importance of the study, what was being measured, the child's and their rights during the study. The booklet made it clear that the child and/or legal guardian could choose to withdraw from the study without any explanations. The booklet also included a written approval that the child's legal guardian had to sign and give to the teacher (who further delivered them to the schools contact person) to be able to participate in the study.

When the results were registered, all the children's identities were protected by replacing names with an identity number, and all the data were treated as confidential.

4.0 Results

This chapter presents the main results of this study. The results are first presented by sex, and then the associations between PA and mother's highest education level are presented.

4.1 Characteristics of the subjects

Table 4.1 presents the subjects' age, height, weight and BMI by sex. Boys were significantly taller than the girls ($p = .001$), but there was no sex difference in any of the other variables.

Table 4.1 Describes the subjects' mean (SD) age, height, weight and BMI by sex. (N=1071)

	Boys	Girls
N	526	545
Age (yrs)	6.6 (0.4)	6.6 (0.4)
Height (cm)	122.0 (5.9)*	120.8 (5.5)
Weight (kg)	23.9 (3.7)	23.8 (4.5)
BMI (kg/m^2)	15.9 (1.6)	16.2 (2.1)

* *p*=0.001 significant difference between boys and girls
N, Number of participants; BMI, Body mass index

Table 4.2 presents the subjects' age, height and weight divided by sex and four education groups. There were no significant differences between any of the characteristic variables and mother's education level in neither boys nor girls.

Table 4.2 Describes the subjects' mean (SD) age, height and weight by sex and four education levels. (N=871)

	Boys (N=418)			
	Elementary school	High school	University < 4 yrs	University > 4 yrs
N	26	125	114	153
Age (yrs)	6.5 (0.3)	6.7 (0.5)	6.6 (0.4)	6.6 (0.4)
Height (cm)	121.0 (5.9)	122.2 (5.9)	121.9 (5.9)	122.1 (5.4)
Weight (kg)	24.1 (4.2)	24.2 (4.2)	23.4 (3.1)	23.7 (3.1)
BMI (kg/m^2)	16.4 (1.8)	16.1 (1.7)	15.7 (1.3)	15.8 (1.3)
	Girls (N=453)			
	Elementary school	High school	University < 4 yrs	University > 4 yrs
N	22	148	112	171
Age (yrs)	6.5 (0.3)	6.6 (0.4)	6.6 (0.4)	6.6 (0.4)
Height (cm)	118 .8 (6.1)	121.2 (5.3)	121.1 (5.2)	121.0 (5.5)
Weight (kg)	22.6 (4.5)	23.9 (4.3)	24.0 (4.1)	23.6 (5.1)
BMI (kg/m^2)	15.9 (2.1)	16.2 (2.1)	16.3 (1.9)	16.0 (2.2)

N, Number of participants; BMI, Body mass index

Table 4.3 Shows mother's highest education level by sex, total number and percent (N=889).

Mother's education level	Boys	Girls	N (%)
Elementary school	26	24	50 (5.6)
High school	129	153	282 (31.7)
University <4 years	119	114	233 (26.2)
University >4 years	153	171	324 (36.4)
Total	427	462	889 (100)

N, Number of participants

4.2 Physical activity

Boys and girls had an average (SD) of 6.0 (1.4) and 5.8 (1.5) days of physical assessment with valid accelerometer wear, respectively. Boys had significantly 7.4 more minutes per day with valid accelerometer wear compared with girls (95% CI: 0.08, 14.8, $p = 0.047$).

Table 4.4 shows mean counts/min for participants with different number of days with valid accelerometer wear. Participants with only one day of valid accelerometer wear had significant lower mean counts/min compared to participants with at least two days or more of monitoring ($p<0.001$).

Table 4.4 Mean (SD) counts/min for participants with different numbers of days with valid accelerometer wear (N=1013)

Days	N	Counts/min
1	17	385 (368)*
2	32	807 (277)
3	41	727 (246)
4	67	767 (253)
5	103	805 (222)
6	234	766 (189)
7	519	773 (206)

*$p<0.001$ significant difference for mean counts/min for participants with one day accelerometer wear compared to participants with two or more days with accelerometer wear
N, Number of participants

4.2.1 Physical activity level

Figure 4.1 presents mean PA level (counts/min) by sex. Boys and girls had a mean (SD) PA level of 809 (228) counts/min and 725 (206) counts/min, respectively. The difference in mean PA level between boys and girls was 84 counts/min (95% CI: 57.1, 110.5, $p < 0.001$).
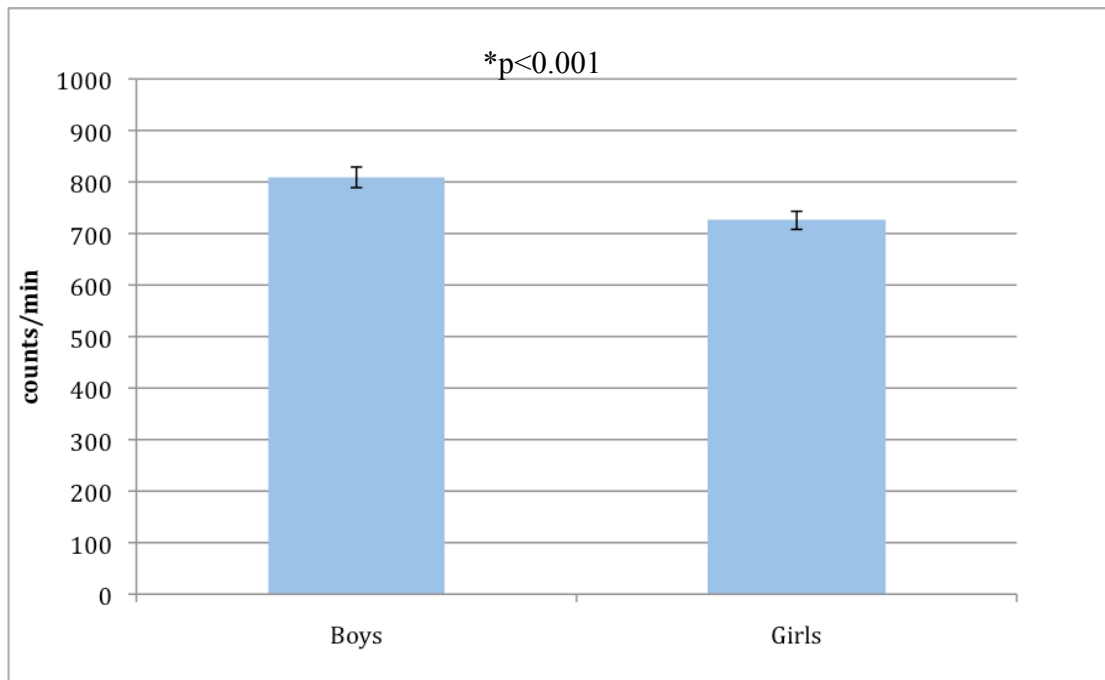
Figure 4.1 Subjects' mean (95% CI) PA level (counts/min) by sex (N=1015). Error bars representing upper and lower 95 % CI.

Figure 4.2 presents mean PA (counts/min) when the sample is divided into five equal parts relative to how physical active they are. Of the sample is 0-20 % the least active group, while 81-100 % is the most active. The most active boys and girls are 2.2 and 2.1 times more active compared to the least active boys and girls, respectively. Boys are significant more active than girls in all five percentile groups (p<0.05).
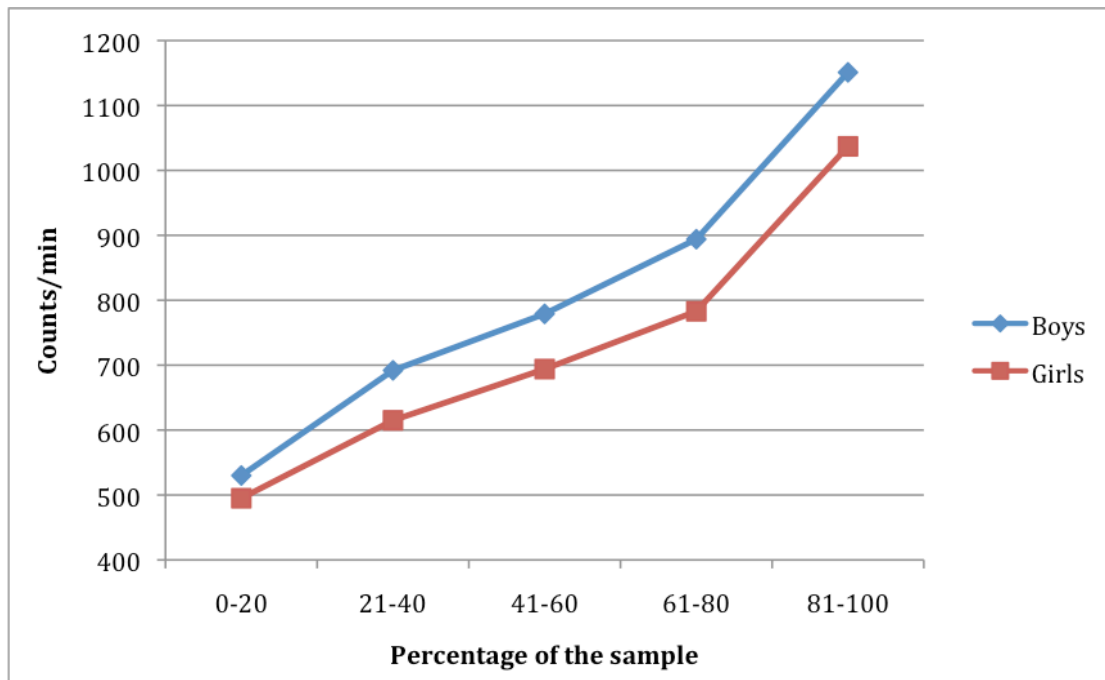
Figure 4.2 Percentiles of mean PA (counts/min) divided by sex. 0-20 represents 20 % of the least active participants, while 81-100 represents 20 % of the most active participants.

Table 4.5 presents time spent in different intensities of PA. Boys spent on average 17 (95% CI: 14.6, 19.9, $p<0.001$) minutes more per day in activities of moderate intensities than girls. Girls, on the other hand, had 18 (95% CI: 12.5, 24.1) more sedentary minutes compared to boys ($p<0.001$). There was no significant difference between boys and girls when looking at activities of low and vigorous intensities.

Table 4.5 Mean (SE) time (min/day) used on sedentary, low, moderate and vigorous PA per day by sex (N=1015)

	Boys (N= 496)	Girls (N= 519)	Mean difference (95 % CI)	*P* value
Sedentary time (min/day) (<100 counts/min)	376 (2.1)	394 (2.1)	18 (12.5, 24.1)	<0.001
Low PA (min/day) (100-1999 counts/min)	250 (1.5)	248 (1.5)	2 (-1.7, 6.6)	0.247
Moderate PA (min/day) (2000-5999 counts/min)	90 (0.9)	73 (0.9)	16 (13.7, 19.0)	<0.001
Vigorous PA (min/day) (>5999 counts/min)	9 (0.3)	10 (0.3)	0.4 (-1.3, 0.4)	0.323

*Analyses are adjusted for schools and wear time
PA, Physical activity; N, Number of participants

4.2.2 Recommendations

A total of 94 % of the boys and 86 % of the girls met the recommended levels of at least 60 minutes of MVPA daily. Significantly more boys than girls met the recommendation *(p* <0001).

4.3 Physical Activity and Socioeconomic Status

4.3.2 Physical activity level

Table 4.6 presents mean PA (counts/min) divided by sex and mother's highest education. There was no association between mean PA and mother's education level in neither boys nor girls.

Table 4.6 Mean (SD) PA (counts/min) divided by sex and four education levels. (N=871).

	Elementary school	High school	University < 4 yrs	University > 4 yrs
Boys **Mean PA (counts/min)**	823 (195)	828 (230)	810 (237)	825 (205)
Girls **Mean PA (counts/min)**	792 (215)	749 (206)	699 (198)	731 (199)

Figure 4.3 presents mean PA (counts/min) divided by mother's highest education. There was no association between mean PA and mother's education level.
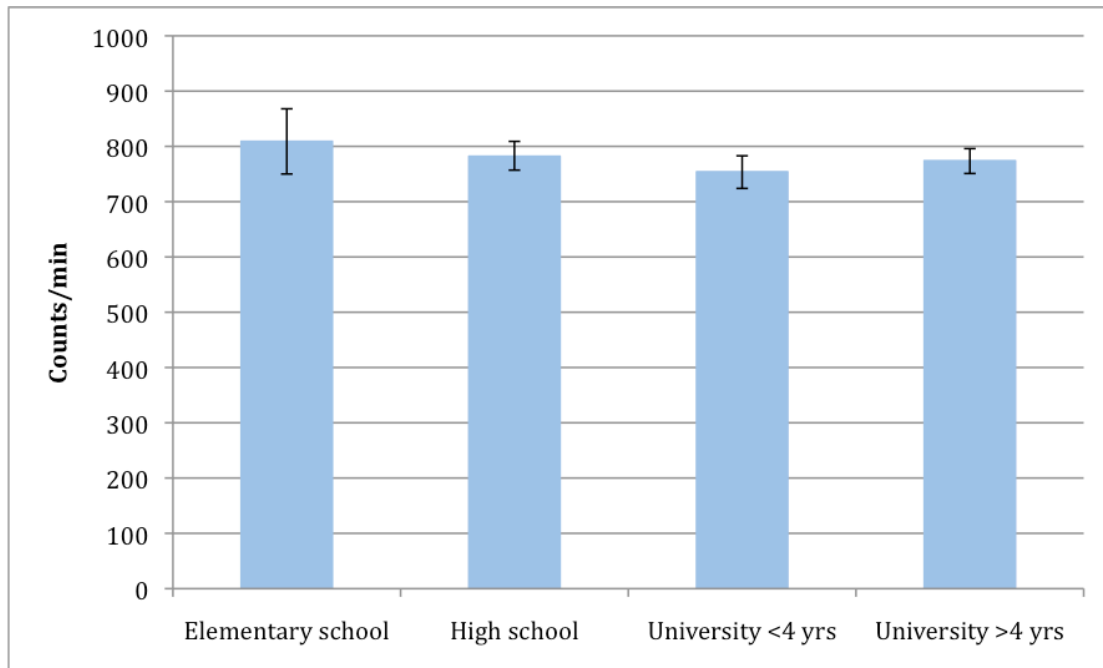

Figure 4.3 Mean PA (counts/min) divided by four education levels (N=871). Error bars representing upper and lower 95 % CI.

Table 4.7 contains minutes spent in different intensities of PA per day accounted for sex and mother's highest education. There are no significant associations between activities in different intensities and mother's education level in neither boys nor girls.

Table 4.7 Mean (SE) time spend in sedentary, low, moderate and vigorous PA per day by sex and four education groups (N=857)

	Boys			
	Elementary school	**High school**	**University < 4 yrs**	**University > 4 yrs**
Sedentary PA (min/day) (<100 counts/min)	379 (8.3)	374 (3.8)	379 (3.9)	377 (3.5)
Low PA (min/day) (100-1999 counts/min)	252 (5.7)	255 (2.6)	254 (2.7)	253 (2.4)
Moderate PA (min/day) (2000-5999 counts/min)	92 (4.3)	94 (2.0)	89 (2.1)	92 (1.8)
Vigorous PA (min/day) (>5999 counts/min)	11 (1.4)	10 (0.7)	9 (0.7)	9 (0.6)
	Girls			
	Elementary school	**High school**	**University < 4 yrs**	**University > 4 yrs**
Sedentary PA (min/day) (<100 counts/min)	389 (8.5)	387 (3.3)	400 (3.8)	394 (3.1)
Low PA (min/day) (100-1999 counts/min)	247 (6.2)	252 (2.4)	245 (2.8)	246 (2.3)
Moderate PA (min/day) (2000-5999 counts/min)	75 (3.5)	75 (1.4)	70 (1.6)	75 (1.3)
Vigorous PA (min/day) (>5999 counts/min)	12 (1.5)	10 (0.6)	9 (0.6)	10 (0.5)

*Analyses are adjusted for schools and wear time
PA, Physical activity

4.3.3 Recommendations

Figure 4.4 shows the percentage (95 % CI) of boys and girls meeting the PA recommendations related to mother's education level. There are no significant differences in boys or girls meeting the PA recommendations in the different education categories.
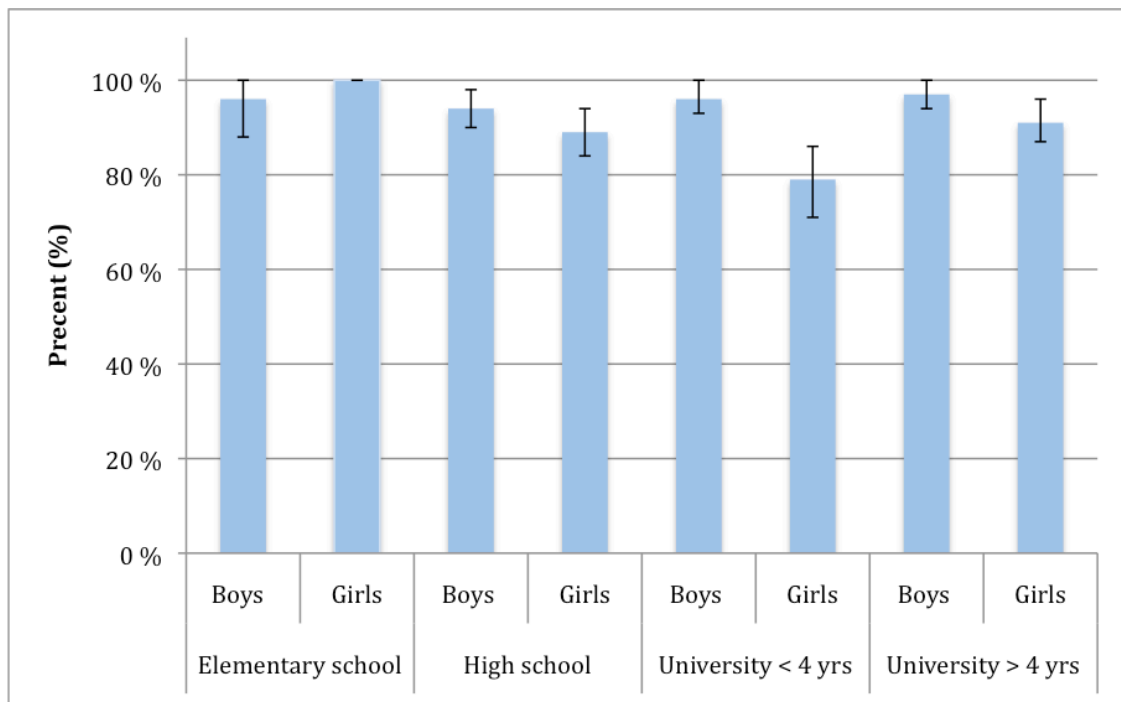

Figure 4.4 Percentage (95 % CI) of boys and girls meeting the PA recommendations of minimum 60 min MVPA each day (N=413). Error bars representing upper and lower 95 % CI.

5.0 Discussion

5.1 Summary of the results

The main objective of this study was to objectively assess PA level in Norwegian 6 year-olds and to study the association between SES and PA.

The results showed that most of the subject met the recommendations of at least 60 minutes of moderate PA each day. Boys were more active then girls, and girls spent more time being sedentary than boys. This means that sex differences in PA is evident even in this age group.

There was no association between mother's highest education and any of the PA measures in neither boys nor girls.

5.2 Subjects and selection

This study included a large selection of 6-year-old children that were representative of children in Norway. The sample selection was made by Statistics Norway, which included schools representative of Norway in terms of population density and geography. There are no exact standards for participation rates but in general a participation rate between 60 % and 75 % is adequate (Halvorsen, 2008). The participation rate in this study was 56.4 %. Other similar studies regarded to age had participation rates between 48.7 % and 84 % (Basterfield et al., 2011; Nyberg, 2009; Eiberg, 2005). However, all of these studies were conducted in and around one city. This might make the follow-up and challenges regarded the use of accelerometer tighter and

better. The present study covers most of Norway and includes many cities and different areas, which makes this work harder. Colley et al. (2011) and Belcher et al. (2010) included a large national sample if children similar to the present study and they had a participation rate at 40.8 % and 65 %, respectively. However, both studies have calculated the participation rate form the whole sample and therefore includes participants from age 6 to 19.

Demographic information from Statistics Norway (2011) shows that 14.4 % of Norwegian women (age 35-39 years) had elementary school as their highest education level, and only 12.3 % had more than four year of university education. The mothers of the participants in this sample did not reflect these findings, as only 5.6 % of the mothers had elementary school as their highest education level, and 36.4 % had more than four years of university education. That the study sample does not reflect the distribution of education level among women in Norway is a limitation and there is a reason to believe that this has influenced the results. A sample more similar to the education could affect the results since there would be more participants from the lower education group that could have a different PA level then what shown in this present study. Also, 17% of the participants did not complete the parental questionnaire. The mothers who did not answer the questionnaire could have been from lower educated groups, which mean that the number of mothers in this education group might be underestimated. There is no information on the missing/not-completed questionnaires. Looking at mothers with high school as their highest education level, the results are comparable to the numbers from Statistics Norway (2011).

5.3 Study design

This is a cross-sectional study, which means that sampling is done at a single point in time. This kind of study can be used to measure mean PA and to uncover relationships between different variables in a big population. This might for example be useful when trying to conduct a national survey of a population's PA and/or patterns for PA and health for a specific time. A limitation with this study design is that it is impossible to a make a causal inference about the results.

5.4 Methods of measurement for physical activity and SES

The objective assessment of PA in a large population based sample of 6–year-olds is a major strength for this study. Accelerometers have shown to be both valid and reliable when measuring young children's PA (Jimmy, Seiler & Maeder, 2012; Tanaka et al., 2007). Also, for quantifying the amount and intensity of PA are accelerometers considered as optimal (Reilly et al., 2008).

There are, however, some limitations regarding the use of accelerometer. The monitor underestimates when running at intensities above 9-10 km/h (Rowlands, Stone & Eston, 2007). In the present study did the children spend an average of 10 minutes in vigorous intensity each day. This is a relatively small amount, which would probably only have a minor impact on the result. Also, the accelerometer cannot register the increased metabolic demand during level walking or activities like biking where there is no whole-body movement. Thus, activities like biking and level walking might be underestimated in the study result.

Two different types of accelerometers were used (Actigraph GT1M and GT3X+) in the present study which could influence the results. However, research has shown that there is no significant differences between uniaxial and multiple axis accelerometers (John, Tyo & Bassett, 2010). Therefore, the use of two accelerometer types probably did not have a significant impact on the results.

Epoch periods was set at 10 seconds. Studies have shown that children's high intensity activity is short and spontaneous (Bailey et al., 1995), thus it is important that the epoch periods are short enough to include the children's spontaneous activity. Several older studies have used one minute epoch periods, which might have underestimated activities of higher intensities (Kolle et al., 2009c; Riddoch et al., 2004; Klasson-Heggebø & Anderssen, 2003). This was due to the fact that older accelerometers did not have as good of a memory capacity as the newer models which forced the studies to increase the epoch duration to be able to measure activity over a longer period. With a one minute epoch duration would activity including shorter periods of high intensity be underestimated because the activity and rest would be summarized into one minute. This means that children have to be active for a longer period of time for the activity to be registered. However, a 10 second epoch period would better register this difference in intensity, and therefore give a more correct picture of the participants' activity patterns. As the accelerometer has evolved, a 10 second epoch durations have become more normal.

The period for measuring PA was set at 7 days, but all participants with a minimum of 2 days with at least 8 hours daily of recording were included in the data analyses. This is a lower time period than several other studies (Kawahara et al., 2011;

Riddoch et al., 2004, 2007) that suggest using a three-day minimum of activity recordings (Basterfield et al., 2011). A two-day PA record is thought to provide a rough estimate of PA, but data analyses showed that there was no significant difference between participants having a two-day record of PA compared with participants having 3-7 days of activity recordings. Thus, the lower minimum recordings of PA registration should not affect the study results.

Blocks of 20 minutes or more without any registered activity (0 counting) was excluded from each person's recording. In these blocks it is assumed that the accelerometer was not worn. There could be several reasons for this as for example the participants forgot to put the monitor on or they took it off to go swimming. It is not known for sure whether the participants have been inactive or not during these blocks. Thus, if some of these blocks have been inactive time the study results could be overestimated. On the other hand, if the participants have been active without wearing the monitor, the results could be underestimated. The accelerometers were set to start

recording at 06.00 the day after distribution to prevent reactivity. Also, night activity between 24.00 and 06.00 was excluded. This was to prevent underestimation of the participants' total PA in case they forgot to take the monitor off during the night. However, the nighttime data exclusion could lead to underestimation of PA if the participants were still awake and active after 24.00. Since the participants are 6-year-olds this is fairly unlikely.

In this study, level of PA was assessed by counts per minute (counts/min). According to Freedson, Pober & Janz (2005) this value does not speak for itself and should therefore be related to a reference to provide more sense. There is no integrated

program for estimating counts/min into EE in Actigraph, therefore it is necessary to set values for counts/min for the different activity intensities.

Not only does classification differences make it hard to compare between study results, different methods are used for measuring PA across studies. Even studies using the same PA measurement method have different protocols in terms of reducing and analyzing the dataset. For example, across studies using the accelerometer, studies have used different benchmark guidelines, and different presentation techniques for PA level (such as minutes per hour compared with minutes per day, or percentage versus average).

In the present study, mother's highest education level was used as an indicator for the participants' SES. It is hard to tell if education is the best representation of SES. The benefits of using education as a measure of SES is that it is a stable feature over time, easy to measure through questionnaires, high response rate, and it is possible to obtain from everybody (Galobardes, Lynch & Smith, 2007). Education is also a strong determinant for future employment and income (Galobardes, Lynch & Smith, 2007). On the other hand, information from Statistic Norway (2011) shows that there is an increase of people taking higher education in Norway, which leads to an increased homogeneity in education level. This will reduce the breadth of education as a measure for SES. Also, it is hard to compare the different studies investigating the association between SES and PA when they are using different classifications/measurements of SES. Finally, different cultures and countries could have other behaviors associated with SES (Møller et al., 2007).

5.5 Physical activity

5.5.1 Physical activity level

Results from the present study show that boys are significantly more active than girls, which confirms previous research investigating children's and youth's PA level (Vale et al., 2011; Kolle et al., 2009; Nyberg et al., 2009; Eiberg et al., 2005). Compared with other studies looking at counts per minute, Norwegian 6 year-olds are among the most active children (Basterfield et al., 2011; Belcher et al., 2010; Nyberg et al., 2009; Eiberg et al., 2005). Eiberg et al. (2005) have the study most comparable with the present study considering age (mean age were 6.8 years for boys and 6.9 years for girls) and type of accelerometer. Their study showed that mean PA level for boys were 743 counts/min and for girls 679 counts/min. Compared with this study had the boys and girls in Eiberg et al. (2005) 66 and 46 less counts/min, respectively. Also, this difference in counts/min is the largest difference when comparing the results from studies looking at young children (Basterfield et al., 2011; Belcher et al., 2010; Nyberg et al., 2009; Eiberg et al., 2005), which means that the findings are quite similar.

The low participation rate in this study could be contributed to the higher activity level. The children with low activity level may have chosen not to participate or because of various causes not used the accelerometer enough to be included in the study. There is no information about the activity level of the participants who chose not to participate.

5.5.2 Intensities

Children spent most of their time being sedentary and girls spend significantly more time than boys being sedentary. These findings have also been reported in previous

studies (Basterfield et al., 2011; Colley et al., 2011; Belcher et al., 2010). The present study shows that Norwegian boys and girls were sedentary for 52 % and 54 % of their walking hours, respectively. This is similar to the 55 % Colley et al. (2011) found among Canadian boys and girls. However, Colley et al. (2011) used a lower cut-off point for sedentary behavior than the present study (<100 counts/min vs. <1100 counts/min). Also, the results from the Canadian study included older participants, age 6 to 10 years (Colley et al., 2011). On the other hand, Basterfield et al. (2011) found that English boys and girls were sedentary for 76.6 % and 78 % of their waking hours, respectively. Similar, the American study by Belcher et al. (2010) shows that 6- to 11-year-olds spent 71.6 % of their walking hours in sedentary time. Compared to these previous studies spent Norwegian children much less of the walking hours as sedentary.

Results from the present study shows that boys and girls spent 9 min/day and 10 min/day, respectively. This corresponds with other studies concluding that boys and girls spend very little time engaging in vigorous activity (Colley et al., Belcher et al., 2010). The Canadian children in Colley et al. (2011) study only spent 2 min/day in vigorous activity. The results from Canada are low compared to both, Belcher et al. (2010) and the present study with 13.3 min/day and 9/10 min/day in vigorous activity, respectively. The low results on vigorous time in Colley et al. (2011) study could be due to the higher cut-off point for vigorous time than the two other studies (>6500 counts/min vs. >5999 counts/min).

5.5.3 Recommendations

This study shows that 94 % of the boys and 84 % of the girls reached the recommended levels of PA each day. The proportion of children meeting the

recommendations are considerably higher than what was observed in the study by

Basterfield et al., 2011, who reported that only 4 % of the children met the PA

recommendations. One of the reasons for the low proportion is the MVPA cut-off point,

which was >3200 counts/min. Comparing mean PA (counts/min) between Basterfield et

al. (2011) and the present study, the difference is small with only 64 counts/min less for

the English boys and 9 counts/min more for the English girls. The English children have

a mean age of 7.4 and are therefore one year older than the participants of this study, but

the difference in PA cannot be entirely attributed to this. Also, the participants are only

from one urban district in North East England and are therefore not representative of all

of England. It could be that their sample was simply less physically active than rest of the

country.

There are no recommendations for which cut-off points for moderate to vigorous

PA are preferred when measuring activity levels in children and youth. We defined

MVPA as all activity above 2000 counts/min which is equal to 3 METs, which previous

studies have demonstrated (Brage et al., 2003; Puyau et al., 2002). However, the value

for resting metabolic rate (RMR) is higher for children than the assumed RMR value for

adults. The assumed RMR value for adults is 3.5 ml•kg^{-1} min^{-1}. As 1 MET is equal to

the EE of RMR some studies have suggested that 3 METs represents a lower relative

activity in children compared to adults (Riddoch et al., 2007; Pate et al., 2006). Thus,

some studies used 4 METs as a value for MVPA (Basterfield et al., 2011; Colley et al.,

2011; Magnusson et al., 2011; Riddoch et al., 2007), resulting in a higher cut-off point for

reaching the intensity threshold. For example, the threshold for MVPA in Basterfield et

al. (2011) was set as >3200 counts/min. The threshold for MVPA (>2000 counts/min) in

this study might be in the lower end of moderate intensity, but according to the other studies is this cut-off point approximately mid-way between the different threshold for intensity for children and youth (Basterfield et al., 2011; Riddoch et al., 2004; 2007; Kolle et al., 2009a).

5.6 Physical activity and socioeconomic status

5.6.1 Physical activity level

We found no association between mother's highest education and PA in neither boys nor girls. This is in accordance with other studies using mother's highest education as an indicator of SES, who reported no or inconsistent associations between SES and children's activity level (van Rossem et al., 2012; Riddoch et al., 2007). Also, other studies using accelerometers to measure PA level did not find an association between children's activity level and SES (Tandon et al., 2012; Hesketh, Crawford & Salmon, 2006). It seems that even though adults from lower SES have a less healthy lifestyle, is it not given that children from lower SES families automatically will be affected by their parent's lifestyle.

On the other hand, there are studies generating opposing results. Both Borraccino et al. (2009) and Fairclough et al. (2009) found that children from higher SES families were more active compared to children from low SES families. According to Fairlough et al. (2009) could this difference be attributed to parenting, as parents with higher SES may have more knowledge about the health benefits that PA provides and thus encourage and support their kids more to engage in PA compared with parents with lower SES.

Furthermore, many physical activities require financial outlay such as equipment, membership fees or transport, which may be harder to afford for families with low SES. Jekauc et al. (2012) found the opposite association, that the low SES category had the most active girls, and that it only affected the girls. Their hypothesis was that children from families with high SES in Germany often attend better universities and therefore had more homework and spent more time at school, hence less spare time and less time for being physical active. Jekauc et al. (2012) are unclear why only the girls were affected. All threes studies used questionnaires for measuring PA, which is a limitation since children's ability to recall the duration, frequency and intensity of their activity are reduced. Additionally, the studies are from different countries and cultures, which might have different behaviors associated with SES and also the variation of measures (e.g. postcode, current employment, household income or different scores including several measures of SES) used for SES might affect the results differently.

There could be many reasons why we could not find any association between children's PA and SES. It is possible that the participants are so young that very few of them have started to take part of the organized sport. Thus, the children's activity is less dependent on equipment, the parents' ability to drive forth and back from practice and matches and so on. Children's activities are very spontaneous and unorganized. The latter is associated with lower financial cost and might explain the lack of association between SES and PA (Næss, Rognerud & Strand, 2007). Other factors related to SES aside from mother's highest education level could have an effect on the results such as ethnicity, occupation, income, culture and so on (Uijtdewilligen et al., 2011; Kolle et al., 2009b).

5.7 Future research

This present study has objectively investigated the PA level among 6-year-old Norwegians, which at this point have never been studied before. There is a lack of information regarding this young group of children and their activity level. Thus, this study might give new knowledge to the literature.

Regarding methods for determining activity intensities there are many cut-off pints available. All of them are depending on type of activity, data reduction and so on. The different decisions are affecting the results which is important to consider when comparing to other studies. In this context, there is a need for international consensus to standardize methods and cut-off points for PA intensities.

The results form the present study shows that the main focus should be at the many hours children spend as sedentary, and girls seems to have a bigger problem with this inactive time. Future research should continue on investigating associations between children's PA level and different activity patterns to be able to develop interventions to improve children's activity level and to prevent sedentary time.

6.0 Conclusion

This study shows that almost all the Norwegian 6-year-olds met the recommendations for PA. The Norwegian 6-year-olds had a mean PA level (counts/min) at 809 counts/min for boys and 725 counts/min for girls. Also at this age was the sex difference present. Most of the children's awake-time is spent as sedentary, significantly more among girls than boys.

SES did not seem to affect the children's PA level as there was not found any association between boys' or girls' activity level and mother's highest education level.

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TABLE OVERVIEW

FIGURE OVERVIEW

APPENDIX OVERVIEW

APPENDIX 1:

Informed Consent

Forespørsel om deltakelse i "ungKAN2"
– en kartleggingsundersøkelse av fysisk aktivitet blant barn og unge i Norge

Kjære elev og foreldre/foresatte

På oppdrag fra Helsedirektoratet skal Norges idrettshøgskole i 2011 for andre gang gjennomføre en kartlegging av fysisk aktivitetsvaner, kost og ulike faktorer som har sammenheng med aktivitetsnivå blant barn og unge i Norge. Et landsrepresentativt utvalg av 3400 barn og unge i 1.-, 4.- og 10.-trinn skal delta i undersøkelsen.

Hvorfor "ungKAN2"?

I 2005-06 ble den første landsomfattende undersøkelsen av fysisk aktivitet blant barn og unge i Norge gjennomført. Resultatene fra denne studien har vært sentrale i arbeidet med å målrette og evaluere innsatsen for å øke graden av fysisk aktivitet i befolkningen. Barn og unge er en prioritert målgruppe i det helsefremmende arbeidet, og foreliggende undersøkelse vil gi oss ny verdifull informasjon om barn og unges aktivitetsvaner, samt kunnskap om hvordan disse har utviklet seg de siste årene. Resultatene fra denne undersøkelsen vil bli oppsummert i en rapport fra Helsedirektoratet. Deres barns skole har sagt ja til deltakelse i denne undersøkelsen, og alle undersøkelser skjer i full forståelse med skolens ledelse. Deres barn deltok i undersøkelsen i 2005-06, og vi ønsker med dette å invitere dere til å delta i denne oppfølgingsstudien.

Hva innebærer deltakelse for deg og ditt barn?

1. Aktivitetsregistrering

Vi ønsker å kartlegge barn og unges aktivitetsnivå. Denne registreringen gjøres objektivt ved hjelp av en aktivitetsmåler som barnet skal bæres i et belte rundt livet i sju påfølgende dager. Aktivitetsmåleren er på størrelse med en fyrstikkeske, og blir levert ut på skolen. Registrreringen vil ikke på noen måte påvirke barnets hverdag.

2. Spørreskjema

Elevene skal besvare et spørreskjema vedrørende kost- og aktivitetsvaner. Foresatte har rett til å se spørreskjemaet som skal besvares, og et kort spørreskjema vil også bli gitt foreldre/foresatte vedrørende deres fritids- og mosjonsvaner.

3. Fysisk undersøkelse

Det vil bli gjennomført måling av høyde og vekt. Dette vil foregå på skolen, den dagen barnet får utdelt aktivitetsmåler og spørreskjema. Erfarne prosjektmedarbeidere fra Norges idrettshøgskole vil foreta målingene.

Generell informasjon

Det er frivillig å delta i undersøkelsen. Du kan når som helst trekke deg og kreve personopplysningene som er gitt anonymisert uten å måtte begrunne dette nærmere. Opplysninger som samles om deg vil bli behandlet konfidensielt, og alle medarbeidere i prosjektet har taushetsplikt. Det er ønskelig å innhente opplysninger om foreldrenes/foresatts utdanning, inntekt og etniske bakgrunn. Deltakelse i prosjektet innebærer at vi vil koble de nevnte data med registerdata fra Statistisk sentralbyrå.

Innsamlede opplysninger oppbevares slik at navn er erstattet med en kode som viser til en atskilt navneliste. Det er kun prosjektleder som har adgang til koblingslisten. Det vil ikke være mulig å identifisere deg eller ditt barn i resultatene av undersøkelsen når disse publiseres. Prosjektet er ment som et ledd av et nasjonalt monitoreringssystem av aktivitetsnivået til barn og unge i Norge. Etter prosjektslutt, forventet omkring utgangen av 2012, blir data lagret i et dataregister hvor personopplysningene er avidentifisert. Dette dataregisteret vil bli lagret ved Norges idrettshøgskole og i Helsedirektoratet. Hvis vi får mulighet til å gjøre en ny undersøkelse om noen år vil du selvfølgelig få forespørsel om dette og kunne ta stilling til hvorvidt du ønsker å delta igjen.

Prosjektet er tilrådd av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste A/S.

Ansvarlig for gjennomføringen av studien er Norges idrettshøgskole, Seksjon for Idrettsmedisinske fag, Oslo. Prosjektledere er postdoktor Elin Kolle og professor Sigmund Anderssen. Dersom dere ønsker ytterligere informasjon er dere velkomne til å kontakte prosjektkoordinator Johanne Støren Stokke på telefon xxxxxx eller e-post johanne. storen.stokke@nih.no. Undersøkelsen er finansiert av Helsedirektoratet.

Bli med i trekningen av to flotte sykler!
Alle 10.-klassinger som deltar i undersøkelsen er med i trekningen av to flotte sykler til en verdi av kr 5000.

Vennligst klipp av og returner samtykkeskrivet nedenfor i svarkonvolutten til klasseforstander.

Med vennlig hilsen

Elin Kolle   **Sigmund Anderssen**
postdoktor   *professor*
Norges idrettshøgskole   Norges idrettshøgskole

SAMTYKKESKJEMA

❑ Ja, jeg bekrefter herved å ha mottatt informasjon om prosjektet. Jeg/vi ønsker å delta og lar min/vår datter/sønn delta i studien.

Vennligst utfyll opplysningene nedenfor: (Skriv tydelig med blokkbokstaver)

Barnets fornavn: ....

Barnets etternavn: ....

Barnets personnummer (11 siffer): ....

Jeg er informert om at deltagelsen er frivillig og at mitt barn kan avstå fra å svare på enkelte spørsmål, eller trekke seg fra deltagelse uten å oppgi grunn. Jeg er også bekjent med at foresatte har rett til å trekke seg/trekke opplysninger om seg selv fra prosjektet.

....
Foreldre/verges underskrift   Elevens underskrift

Leveres klasseforstander i vedlagte konvolutt så snart som mulig.

3

ung Kan 2

Helsedirektoratet

NIH

APPENDIX 2:

Approval letter from the Norwegian Social Science Data Service

NSD

Elin Kolle
Seksjon for idrettsmedisinske fag
Norges idrettshøgskole
Postboks 4014 Ullevål Stadion
0806 OSLO

Vår dato: 27.01.2011   Vår ref: 25870 / 3 / JSL   Deres dato: Deres ref:

TILRÅDING AV BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 25.12.2010. Meldingen gjelder prosjektet:

25870	*Nasjonalt overvåkingssystem fysisk aktivitet. Kartlegging av fysisk aktivitet og determinanter for fysisk aktivitet blant barn og unge i Norge - ungKAN2*
Behandlingsansvarlig	*Norges idrettshøgskole, ved institusjonens øverste leder*
Daglig ansvarlig	*Elin Kolle*

Personvernombudet har vurdert prosjektet, og finner at behandlingen av personopplysninger vil være regulert av § 7-27 i personopplysningsforskriften. Personvernombudet tilrår at prosjektet gjennomføres.
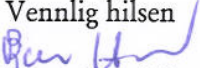
Personvernombudets tilråding forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, eventuelle kommentarer samt personopplysningsloven/-helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/forsk_stud/skjema.html. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, http://www.nsd.uib.no/personvern/prosjektoversikt.jsp.

Personvernombudet vil ved prosjektets avslutning, 31.12.2012, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Bjørn Henrichsen   Juni Skjold Lexau

Kontaktperson:Juni Skjold Lexau tlf: 55 58 36 01
Vedlegg: Prosjektvurdering

Personvernombudet for forskning

Prosjektvurdering - Kommentar

Formål:
Prosjektet har som formål å kartlegge fysiske aktivitetsvaner og determinanter for fysisk aktivitet blant norske 6-åringer, 9-åringer og 15-åringer.

Utvalg:
Utvalget består av ca 3400 barn - et representativt utvalg av den norske befolknings 6-åringer (1. trinn), 9-åringer (4. trinn) og 15-åringer (10. trinn). Utvalget trekkes på skolenivå av SSB. Utvalget består videre av barnas foreldre og kroppslærere. Elevenes foreldre informeres skriftlig om prosjektet (jf. informasjonsskriv mottatt 20.01.2011) og samtykker skriftlig til barnets deltakelse. Elevene vil informeres skriftlig om prosjektet, og samtykker til deltakelse ved å fylle ut og levere spørreskjemaet. Kroppslærer informeres muntlig om prosjektet (jf. e-post mottatt 26.01.2011). Vi forutsetter at kroppslærer i tillegg får informasjon om navn og kontaktopplysninger til daglig ansvarlig (Elin Kolle) og behandlingsansvarlig institusjon NIH).

Metode og datainnsamling:
Det behandles sensitive personidentifiserende opplysninger om elevenes og foreldrenes helseforhold (jf. pol § 2 nr 8 bokstav c).

Opplysningene samles inn gjennom spørreskjema fra barn og foreldre, intervju med kroppslærer, aktivitetsmåler (akselerometer) fra barna, og måling av barnas høyde og vekt. Datamaterialet vil bli koblet til opplysninger fra SSB om foreldrenes utdanning, inntekt og landbakgrunn. Videre vil det fysiske skolemiljøet kartlegges og observeres.

Det registreres direkte personidentifiserende opplysninger om barna og foreldrene gjennom navn og fødselsnummer. Det registreres indirekte personidentifiserende opplysninger gjennom bakgrunnsopplysninger om foreldrene. Direkte personidentifiserende opplysninger lagres separat fra det øvrige datamaterialet, men kan kobles mot det øvrige datamaterialet ved hjelp av en referansekode som kun prosjektleder har tilgang til.

Det registreres indirekte personidentifiserende opplysninger om kroppslærer, gjennom bakgrunnsopplysninger som stilling, arbeidssted og utdanning.

Prosjektslutt og anonymisering:
Prosjektslutt er satt til 31.12.2012. Opplysninger om kroppslærer vil da bli anonymisert. Det øvrige datamaterialet oppbevares videre etter prosjektslutt i avidentifisert form, i påvente av en mulig oppfølgingsundersøkelse om 3-10 år. Utvalget vil da bli kontaktet igjen. Det avidentifiserte datamaterialet lagres hos Helsedirektoratet og Norges idrettshøgskole, mens koblingsnøkkel til de direkte personidentifiserende opplysningene lagres hos NSD.

Alle innsamlede opplysninger vil bli anonymisert i 2025, ved at direkte personidentifiserende opplysninger slettes, mens indirekte personidentifiserende opplysninger slettes eller grovkategoriseres på en slik måte at de ikke kan tilbakeføres til enkeltpersoner.

Norsk samfunnsvitenskapelig datatjeneste AS
NORWEGIAN SOCIAL SCIENCE DATA SERVICES

Harald Hårfagres gate 29
N-5007 Bergen
Norway
Tel: +47-55 58 21 17
Fax: +47-55 58 96 50
nsd@nsd.uib.no
www.nsd.uib.no
Org.nr. 985 321 884

Elin Kolle
Seksjon for idrettsmedisinske fag
Norges idrettshøgskole
Postboks 4014 Ullevål Stadion
0806 OSLO

Vår dato: 17.03.2011	Vår ref: 25870 JSL/RF	Deres dato:	Deres ref:

ENDRINGSMELDING

Vi viser til endringsmelding mottatt 01.03.2011 for prosjekt:

25870   *Nasjonalt overvåkingssystem fysisk aktivitet. Kartlegging av fysisk aktivitet og determinanter for fysisk aktivitet blant barn og unge i Norge - ungKAN2*

Vi har registrert følgende endringer i prosjektet:

1. Vi har registrert at det vil bli inkludert spørsmål om høyde og vekt i spørreskjemaet til barna.
2. Vi har registrert at det vil bli inkludert spørsmål om utdannelse og fødeland i spørreskjemaet til foreldrene, i stedet for at disse opplysningene skal samles inn gjennom SSB.
3. Vi har registrert at foreldre vil motta informasjon om at de ikke kan fylle ut spørreskjema på vegne av den andre forelderen uten at det foreligger samtykke fra sistnevnte til dette. Denne informasjonen vil bli formidlet via lærer.

Vi forutsetter at prosjektet for øvrig er uendret, og viser i den anledning til våre tidligere vurderinger.

Ta gjerne kontakt dersom noe er uklart.

Vennlig hilsen

Bjørn Henrichsen

Juni Skjold Lexau

Kontaktperson: Juni Skjold Lexau tlf: 55 58 36 01

Avdelingskontorer / *District Offices:*
OSLO: NSD. Universitetet i Oslo, Postboks 1055 Blindern, 0316 Oslo. Tel: +47-22 85 52 11. nsd@uio.no
TRONDHEIM: NSD. Norges teknisk-naturvitenskapelige universitet, 7491 Trondheim. Tel: +47-73 59 19 07. kyrre.svarva@svt.ntnu.no
TROMSØ: NSD. HSL, Universitetet i Tromsø, 9037 Tromsø. Tel: +47-77 64 43 36. martin-arne.andersen@uit.no

APPENDIX 3:

Parental Questionnaire

SPØRRESKJEMA TIL FORELDRE/FORESATTE

"ungKan2" – en kartleggingsundersøkelse av fysisk aktivitet blant barn og unge i Norge

Denne undersøkelsen gjennomføres av Norges idrettshøgskole på oppdrag fra Helsedirektoratet. Målet med undersøkelsen er å kartlegge fysisk aktivitetsnivå, holdninger til fysisk aktivitet og faktorer som assosieres med fysisk aktivitet blant barn og unge.

Informasjonen i dette spørreskjemaet behandles konfidensielt og er tilgjengelig kun for de som gjennomfører denne undersøkelsen. Navneliste vil oppbevares separat fra det øvrige datamaterialet. Skjemaet skal leses ved hjelp av en datamaskin. Bruk derfor sort eller blå penn ved utfylling.

Ved avkrysning: Sett kryss innenfor rammen av boksen ved det svaret som passer best.

Om du krysser av i feil boks, retter du ved å fylle boksen slik.

Der du skal svare på spørsmål med tall, pass på at du skriver tydelige tall innenfor rammen av boksen. Det skal kun skrives ett tall i hver rute.

| | 7 | 9 | ,5 | Riktig |

Det er frivillig å delta, og du kan når som helst trekke deg fra undersøkelsen. Hvis du trekker deg, vil alle opplysninger bli anonymisert. Vi ber om at dere svarer på spørsmålene så nøyaktig som mulig. Hvis det er spørsmål dere ikke ønsker å svare på kan de hoppes over. Sett bare et kryss for hvert spørsmål.

Del A kan fylles ut av en av foreldrene/foresatte.

Del B er rettet mot barnets mor/kvinnelige foresatte og **Del C** til barnets far/mannlige foresatte.

Hvis kun en av foreldrene/foresatte har mulighet for å svare på spørsmålene så ber vi at det gjøres så utførlig som mulig for begge parter.

Ved eventuelle spørsmål kan prosjektkoordinator Johanne Støren Stokke kontaktes på telefonnummer: 975 87 897 eller på e-post: johanne.storen.stokke@nih.no

Vær oppmerksom på at spørreskjemaet har spørsmål på begge sider av arkene

Vennligst send skjemaet i den vedlagte konvolutten med ditt barn til kontaktlærer så snart du er ferdig.

PÅ FORHÅND TAKK FOR HJELPEN! ☺

DEL A
Denne del kan fylles ut av hvilken som helst av foreldrene/foresatte.

1. **Hva var fødselsvekten til deres barn?**

☐☐☐☐ gram

2. **Har deres barn en lang sykdomsperiode, kronisk sykdom/medisinsk problem eller funksjonshemming?**

☐ Ja , lang sykdomsperiode
☐ Ja, kronisk sykdom/medisinsk problem
☐ Ja, funksjonshemming
☐ Nei

Hvis svaret er JA på ett eller flere av punktene over, vennligst gi en kortfattet beskrivelse under:

_____

_____

_____

_____

_____

DEL B
Denne del inneholder spørsmål til <u>barnets mor</u> (eller kvinnelige foresatte)

1. **Er du alene forelder i husstanden med barnet?**
   ☐ Ja
   ☐ Nei

2. **Hva er ditt fødselsår?** 19 ☐☐

3. **Hvor høy er du?** (rund av til nærmeste 0,5 cm) ☐☐☐ **,** ☐ **cm**

4. **Hvor mye veier du?** (rund av til nærmeste 0,5 kg) ☐☐☐ **,** ☐ **kg**

5. **I hvilket land er du født? (skriv tydelig med blokkbokstaver)**

   _____

6. **Hvilken sivilstatus har du?** (sett ett kryss)

   ☐ Gift/samboer   ☐ Fraskilt
   ☐ Ugift/alene   ☐ Separert
   ☐ Enke   ☐ Skilt fra barnets far og omgift

7. **Driver du regelmessig med mosjon eller sport?** (2 eller flere ganger per uke)
   ☐ Ja
   ☐ Nei

8. **Hvor ofte er du fysisk aktiv med sykling, rask gange eller annen aktivitet cirka ½ -time per gang i løpet av en normal uke?**
   ☐ Hver dag
   ☐ 5-6 dager per uke
   ☐ 3-4 dager per uke
   ☐ 1-2 dager per uke
   ☐ Veldig sjelden

9. **Hvilken utdanning er den høyeste du har fullført?** <u>(sett ett kryss)</u>
   ☐ Mindre enn 7 år grunnskole
   ☐ Grunnskole 7-10 år, framhaldsskole eller folkehøgskole
   ☐ Realskole, middelskole, yrkesskole, 1-2 årig videregående skole
   ☐ Artium, økonomisk gymnas, allmennfaglig retning i videregående skole
   ☐ Høgskole/universitet, mindre enn 4 år
   ☐ Høgskole/imiversitet, 4 år eller mer

TAKK FOR AT DU HAR BESVART SPØRRESKJEMAET!

DEL C
Denne del inneholder spørsmål til _barnets far_ (eller mannlige foresatte).

10. Er du alene forelder i husstanden med barnet?
☐ Ja
☐ Nei

11. Hva er ditt fødselsår? 19 ☐ ☐

12. Hvor høy er du? (rund av til nærmeste 0,5 cm) ☐ ☐ ☐ **,** ☐ **cm**

13. Hvor mye veier du? (rund av til nærmeste 0,5 kg) ☐ ☐ ☐ **,** ☐ **kg**

14. I hvilket land er du født? (skriv tydelig med blokkbokstaver)

_____

15. Hvilken sivilstatus har du? (sett ett kryss)

☐ Gift/samboer   ☐ Fraskilt
☐ Ugift/alene   ☐ Separert
☐ Enke   ☐ Skilt fra barnets far og omgift

16. Driver du regelmessig med mosjon eller sport? (2 eller flere ganger per uke)
☐ Ja
☐ Nei

17. Hvor ofte er du fysisk aktiv med sykling, rask gange eller annen aktivitet cirka ½ -time per gang i løpet av en normal uke?
☐ Hver dag
☐ 5-6 dager per uke
☐ 3-4 dager per uke
☐ 1-2 dager per uke
☐ Veldig sjelden

18. Hvilken utdanning er den høyeste du har fullført? (sett ett kryss)
☐ Mindre enn 7 år grunnskole
☐ Grunnskole 7-10 år, framhaldsskole eller folkehøgskole
☐ Realskole, middelskole, yrkesskole, 1-2 årig videregående skole
☐ Artium, økonomisk gymnas, allmennfaglig retning i videregående skole
☐ Høgskole/universitet, mindre enn 4 år
☐ Høgskole/imiversitet, 4 år eller mer

TAKK FOR AT DU HAR BESVART SPØRRESKJEMAET!