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The association of self-reported health indices and psychosocial factors to stages of change in physical activity

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ABSTRACT

Background: Low levels of physical activity are a major risk factor for lifestyle diseases and mortality from all causes. Despite the well-known health benefits gained from physical activity, population levels of participation are insufficient low. Improved knowledge about the psychosocial factors might be helpful in understanding why some are active and others not. ***Purpose:*** The purpose of this thesis is to 1) examine the association of self-reported health indices and psychosocial factors to stages of change in physical activity. 2) To examine the moderating effects of gender, age groups and educational background in the association of self-reported health indices and psychosocial factors to stages of change in physical activity . ***Method:*** This is a cross-sectional study based on data from the "Romsås in Motion" project. Altogether, 2336 men and women aged 31-67 years completed two self-administered questionnaires that assessed different socio-demographic variables, indices of health, BMI, stages of change in physical activity, and selected theoretically informed psychosocial variables supposed to influence stage of change in physical activity. The statistical tests comprised descriptive statistics and multiple regression analyses. ***Results:*** Analyses revealed that the psychosocial variables explained 42% of the variance in the stages of change score, whereas the variables comprising health indices while controlling for BMI and socio-demographic variables (age, gender and education) only accounted for 8%. Social support from family and friends for being physically active, identification as being a physically active person and self-efficacy in face of psychological barriers represented strong psychosocial influences to stages of change. Further, self-efficacy in face of practical barriers and social support accounted for more variance among men than for women, and older adults seemed to rely less on social support, and higher educated participants were more confident that they could overcome practical barriers and were less dependent on support from family. ***Conclusion:*** The findings suggest that intervention aiming to activate sedentary adults and to help active adults remain at their activity level may be more successful if they foster support from family and friends and increase their confidence in overcoming psychological barriers. While the results regarding social support seems to vary a bit between socio-demographic subgroups, the finding concerning self-efficacy for psychological barriers seems to apply across subgroups. Results for the psychosocial influences also seem to apply, irrespective of variations in self-reports of psychological health and general self-perceptions of health as well as BMI score.

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1.0 INTRODUCTION

There is well-supported evidence that regular physical activity contributes to the primary and secondary prevention of several chronic diseases (e.g. cardiovascular disease, diabetes, cancer, hypertension, osteoporosis and obesity) and is associated with a reduced risk of premature death (Warburton, Nicol & Bredin, 2006). Physical inactivity has in fact been established as the major factor contributing to the obesity epidemic (Blanchard et al., 2005). There is also good evidence that exercise provides psychological benefits like mental well-being as well as being effective as a treatment for clinical depression and anxiety (Fox, 1999). Further, there seems to be a linear relationship between physical activity level and health status, indicating that a further increase in physical activity level will provide additional improvement in health status (Warburton, Nicol, & Bredin, 2006).

Despite the well-known health benefits gained from physical activity, population levels of participation are insufficient low. In fact, only one out of five Norwegian adults meet the physical activity recommendation of 30 minutes of moderate physical activity daily (The Norwegian Inspectorate of Health; Helsedirektoratet, 2011). Moreover, little is known about the social and contextual correlates (e.g. social influence, environment, psychosocial factors and social network) influencing the adoption and maintenance of physical activity (Fleury & Lee, 2006).

Physical activity is a complex behaviour that has demonstrated to be influenced by many factors, and several theories suggest possible psychosocial predictors to mediate the adaptation of physical activity behaviour (Prochaska & DiClemente, 1983; Bandura, 1977; Ajzen & Madden 1986). Testing the psychosocial mediators in an intervention aiming to move participants in the stages of change may provide important information about how different intervention components work (Bauman, Sallis, Dzewaltowski & Owen, 2002). This information may further improve physical activity change methods, strategies and theories useful when planning to activate a population or an individual (Blue & Black, 2005). Previous research and literature demonstrates that the most promising psychosocial predictors in adopting a physical activity behaviour includes self-efficacy in face of physical activity (Sallis & Owen, 1999), social support from significant others (Treiber et al., 1991), attitude toward physical activity (Courneya, 1995) and physical activity identity (Rivis & Sheeran, 2003). Further, analyses in subgroups (e.g. age, gender) are also suggested to be essential, as they may function as moderators when participating in a specific intervention on physical activity behaviour or psychosocial variable (Blue & Black, 2005). That being said, it is believed that

an improved understanding of these different variables could be helpful to overcome the challenges we are faced with: influencing sedentary people to become physically active, and influencing active people to maintain their activity level (Bauman, Sallis, Dzewaltowski & Owen, 2012).

This thesis is based on data from the ”Romsås in motion” project (Jenum et al., 2003; Lorentzen et al., 2007). The ”Romsås in motion” was implemented as a three year long community-based physical activity intervention project in 2000. The main purpose of the project was to increase physical activity level among the adult population to reduce the risk of lifestyle related diseases. As a part of the project, different theoretically informed psychosocial influences were selected as targets of mediators of physical activity change in the intervention program. The current study is based on time 1 data collected from this part of the project (Lorentzen, Ommundsen & Holme, 2007). The current study add to previous examinations on psychosocial correlates of stages of change in physical activity by examining the relative influence of various self-reported indices of health, BMI and psychosocial correlates to stages of change in physical activity. Moreover, the current study examines subgroup variations (moderating effects) with respect to the role of these influences, by taking also into consideration potential age, gender and educational background differences.

1.1 Research question

On the basis of the mentioned material, this thesis will examine health indices, BMI and psychosocial variables in relation to physical activity, and further investigate subgroup differences of gender, age and education level. The study raises two main research questions:

1) Is there an association of self-reported health indices, BMI and psychosocial factors to stages of change in physical activity (PASOC)?

2) Are there moderating effects of gender, age and educational background in the association of self-reported health indices, BMI and psychosocial factors to PASOC?

1.2 Thesis structure

The thesis is divided into seven chapters. The next chapter will start off with providing a theoretical framework, and reporting on previous studies explaining potential factors

correlating with or mediating changes in physical activity behaviour. In chapter three the method used by the research group in "Romsås in Motion" project will be represented. Chapter four and five will give a presentation of the results followed by a discussion the findings. The two last chapters (six and seven) will provide some concluding comments and suggestions for further research.

2.0 THEORETICAL BACKGROUND

2.1 Levels and determinants of physical activity

The American Heart Association reported that 49% of the adults in 2011 were not physically active at the recommended level. World Health Organization also reported that 31% of adults were insufficiently physically active globally in 2008. There are several reasons why this remains a pressuring problem. Today's technology and economics tend to discourage activity. Technology seems to discourage physical activity by reducing the energy needed for activities of daily living, and economics by paying more for sedentary than active work (Haskell et al., 2007). Sallis & Owen (1999) also suggest that the technology has reduced the necessity for being physically active, and made it possible for people in developed countries to live a sedentary life. It is therefore essential to investigate the determinants that can influence physical activity behaviour in a positive direction. Physical activity is a complex and dynamic process that can be explained by several psychosocial, cognitive, and emotional factors (Sherwood & Jeffery, 2000). Moreover, individuals go through different phases in life where physical activity behaviour is determined by diverse factors (Sherwood & Jeffery, 2000). Knowledge about the determinants of physical activity is therefore needed to achieve a better understanding of the behaviour, and to develop an effective activity promotion intervention (Sallis, Simons-Morton, Stone & Corbin, 1992).

In addition to the individual factors, the economic, political, social, and physical environment can be helpful in explaining why some people are active and others inactive (McNeill, Kreuter & Subramanian, 2006). Bauman, Sallis, Dzewaltowski & Owen (2012) found that sex, age and socioeconomic stature are the categories that correlates the most to physical activity. Furthermore, The Norwegian Inspectorate of Health (Helsedirektoratet) (2011) reports that people with higher education and higher income represent the majority of those who are physically active in Norway. Pratt, Macera & Blantion (1999) and Bauman et al., (2012) conducted studies on the American population and found differences in ethnicity

(white were more active than African Americans and Hispanics), gender (participation was higher for boys), age (younger tend to be more active than older), and income (persons with higher family income and more education reported being more physical active). This are the same findings that were reported from the American College of Sport Medicine and American Heart Association (Haskill et al., 2007).

The knowledge about the differences in ethnicity, age, gender, and income show the importance of increasing physical activity level in specific groups and areas. Proposed mechanisms where income inequality may influence physical activity behaviour includes, for example, underinvestment in social service (e.g. sidewalk maintenance and availability of physical activity facilitates) and psychological factors such as social comparison (McNeil, Kreuter & Subramanian, 2006). Furthermore, low-threshold offers would be important for the elderly that may not be able to drive a car, have the financial resources or who may be frightened of the thought of exercise due to their physical ability. Knowledge about the difference between subgroups also shows the importance in understanding the predictors and mediators in changing behaviour for each group. We know that some subgroups are less active than others, but we need to know the underlying reasons as to why this is the case, and how to act based on this knowledge to increase their physical activity level.

2.2 Physical activity and indices of health

2.2.1 Physical activity and psychological health

Existing evidence supports the belief that physical activity is associated with psychological health (Netz & Wu, 2005). Physical activity has been suggested to offer benefits for both psychiatric and non-clinical populations for many years (Taylor, Sallis & Needle, 1985). Moreover, physical activity has been discussed to play an important role when it comes to coping with mild to moderate mental health diseases, especially depression and anxiety (Paluska & Schwenk, 2000). Depression is considered to be an affective disorder (mood disorder) that is increasing in the population (Kjellman, Martinsen, Taube & Andersson, 2008). Physical activity can be explained as a modification in behaviour. Depression is often characterized by passivity, withdrawl, and isolation, and a modification in behaviour is therefore believed to affect feelings and thoughts and thus contribute to the reduction of depression. Furthermore, physical activity has shown to promote positive feelings and thoughts as well as increase faith in dealing with one's own problems, improve

capacity of self-control, and provide greater confidence (Beck in Kjellman, Martinsen, Taube & Andersson, 2008). Moreover, there is also a general belief that physical activity and exercise have positive effects on anxiety (Ströhle, 2009), although the documentation is limited (Martinsen & Taube, 2008). Anxiety is a broad range of feelings that are followed by physiological symptoms such as breathing difficulties, increased heartbeat, sweating, dizziness, and tremor. Feelings of anxiety may occur under different circumstances, for example in open areas, social settings or from sudden panic attacks. There are several hypotheses as to why physical activity may contribute with a reduction in anxiety; persons who exercise may normalize the heart frequency faster after a physical load, furthermore, increased temperature when exercising may give a calming effect. Moreover, the distraction hypothesis has also been discussed: exercising may distract thoughts away from anxiety and worries. The symptoms that arise from anxiety and physical activity are also quite similar as they both occur from an activation in the sympathetic nervous system. By participating in physical activity, a person with anxiety may get used to these bodily reactions and learn to interpret them in a different way (Martinsen & Taube, 2008). Indeed, Stephens study (1988) revealed that level of physical activity were positively associated with lower levels of anxiety and depression, a positive mood, and a general well-being. Furthermore, Teychenne, Ball & Salmon (2008) found in their review that both duration and intensity of physical activity were associated with reduced likelihood of depression. These results indicate the possibility that impaired mental health prevents people from being and becoming physically active.

2.2.2 Physical activity and self-reported health

As mentioned above, physical activity has a documented effect on a number of health outcomes, like cardiovascular diseases, diabetes, and mental health. Moreover, previous research has also documented an association between physical activity and self-reported health (Abu-Omar, Rutten & Robin, 2004; Södergren, Sundquist, Johansson & Sundquist, 2008), and lately attention has focused on the impact of physical activity on modification of self-reported health in the adult population (Kaleta, Makowiec-Dabrowska, Dziankowska-Zaborszczyk & Jegier, 2006). Although Self-reported health often is considered to be subjective it could be an important predictor of morbidity and mortality in the population (Bailis, Segall & Chipperfield, 2003). In addition, self-reported health as a variable could be useful when conducting a cross-cultural comparison (McGee, Liao, Cao & Cooper, 1999).

2.2.3 Physical activity and BMI

BMI (body mass index) is an approximation of body fat based on a person´s weight and height. BMI refers to whether a person is under- or overweight, and the higher a person's BMI, the higher the percentage of fat on their body (Mora, Lee, Buring & Ridker, 2006). There exist well-supported evidence that increased BMI is significantly associated with a decreased physical activity level (Cherkas et al., 2008; Mora, Lee, Buring & Ridker, 2006; Morrato, Hill, Wyatt, Ghushchyan & Sullivan 2007). Deforche, Bourdeaudhuij & Tanghe (2005) also demonstrate in their study that overweight and obese participants show lower sport participation and have a less positive attitude toward physical activity. Furthermore, Blanchard et al., (2005) found in his study that the socio ecological correlates of physical activity were moderated by BMI at different levels of the social-ecological models. BMI is moreover associated with several life threatening diseases, like cardiovascular diseases and diabetes. Increasing physical activity and changing diet are further documented to reduce both body weight and the risk of these diseases. Changing lifestyle for those with high BMI is therefore effective and important in preventing diseases (Mokdad et al., 2001). It should be taken into account that BMI is a superficial measure, as it does not for example take bone structure, muscle mass, fat distribution or age and gender into consideration. (Burkhauser & Cawley, 2008). An athletic person with a high amount of muscles may therefore have a BMI of an overweight person (Rothman, 2008). However, BMI is an acceptable measure of adiposity and is commonly used in population based surveys (Booth, Hunter, Gore, Bauman & Owen, 2000).

2.3 Motivation

A term that is essential when it comes to changing behaviour is motivation. A better understanding of the term motivation may therefore be helpful when trying to explain why some people are active and others are not. Motivation is in short, how behaviour is activated and maintained (Bandura, 1977), and concerns a system of self-regulatory mechanisms (Bandura, 1997). Motivation can be visualized as an umbrella over different psychosocial factors that affect the choices you make, the effort you put into the choices you have made and the maintenance of this decision. For example, motivation will affect whether you chose to live a physically active life or not, furthermore influence the effort you put into being

physical active, and affect the maintenance of this behaviour. These variables are also different ways to measure motivation (Skaalvik & Skaalvik, 2004).

Motivation can be divided into at least two forms: internal and external motivation. Internal motivation is based on psychological factors that are combined of different components. These are components such as genuine interest for the specific subject or the specific behaviour, a person's own values as well as social values. Furthermore, self-confidence in own ability to perform the behaviour (Bandura, 1997; Rosenberg, 1979), and attribution with respect to physical activity (Weiner, 1988) interact to influence motivation. For example, if you have a general low confidence, the probability of attribute your physical activity to factors inside your own personal control, your physical activity will most likely increase or be persistent. External motivation, on the other hand, is motivation that is gained from an external source outside yourself. External motivation is about achieving a reward or a benefit from other people, but also sometimes to avoid something unpleasant. A reward can be a concrete thing like a price or social recognition. For example, one would participate in physical activity due to social pressure or a physical reward rather than of genuine interest (Weiner, 1988) are examples of motivating forces that are likely to lead to a lower quality of motivation. Internal (intrinsic) and external (extrinsic) motivation concerning physical activity behaviour is in a way contradictory, but on the other hand they may act as complementary motivational factors. This may be particularly so among those in the early stages of physical activity change. Individuals often tend to behave according to both values and interests, but also act in line with external motivation such as social support or pressure (Deci & Ryan, 2002).A person may start exercising due to interest and knowledge about the advantages with physical activity, but however relies on external rewards to maintain this behaviour over time. While a person may start exercising due to an external reward, such rewards may internalize into a more internal regulation of motivation as the person develops interest and knowledge about physical activity (Deci & Ryan, 2002; Skaalvik & Skaalvik, 2004).

To explain how motivation can be influenced from different internal and external sources, in line with the framework driving this part of the "Romsås in Motion" project, in the following I will present a psychosocial theoretical framework based on the theory of planned behaviour and social cognitive theory. Aside these theories, I briefly also will mention ecological aspects of one's environment, as these more distal factors clearly also are important for peoples' possibilities, opportunities and thus motivation to be physical activity. In fact, the social cognitive theory in itself can be seen as also embracing ecological aspects,

as it includes social aspects in one's ecology or life environment with potential consequences for physical activity.

2.4 Psychosocial theories

Psychosocial and ecological theories both intend to explain changes in human behaviour. Social psychologists have developed psychological theories in an attempt to explain the more proximal predictors that may influence our behaviour, and further prevent the onset of chronic diseases (Tarrant, Hagger & Farrow 2012). These models have three main aims: (1) to identify the psychological construct related to a healthy behaviour. (2) understand the mediation and moderation effects on the behaviour. (3) apply the knowledge to develop interventions that promote an increased health-related behaviour (Tarrant, Hagger & Farrow, 2012).

Ecology is the interrelations between organisms and their environment (Hornby, 2000). Moreover, ecological models emphasize structural physical and social environment as important distal determinants of physical activity, for example, economic conditions, societal norms, and urbanisation is expected to influence physical activity (Bauman et al., 2012). Bauman et al., (2012) also posits that new research identifies variation in genetics and biology as important determinants for physical activity behaviour. Moreover, research based on psychosocial theories of human behaviour explains how cognition and social factors contribute to human health (Bandura 1997).

There are several theoretical models that discuss the psychosocial factors that might contribute to a physically active behaviour. Stages of change model (Prochaska & DiClemente, 1983), Social cognitive theory (Bandura, 1989) and Theory of planned behaviour (Ajzen & Madden, 1986) are three that will be described more closely in the upcomming sections.

2.4.1 Stages of change

"The stages of change" model was originally developed by James Prochaska & Carlo DiClemente (1983) in studies pertaining to how smokers were able to quit smoking. They explain the stages individuals go through in their efforts to change behaviour and have recently been applied to investigate in physical activity behaviour. This model could be

important as it allows us to understand when and how the changes in attitude, intention and behaviour occur (Prochaska, Diclemente & Nocross, 1992). Prochaska and DiClemente (1983) identify five main stages in the process of changing behaviour:
(1) *Precontemplation* is the stage in which there is no intention to start physical activity in the nearest future. People of this stage have not recognized their problems although significant others are often aware of the problems that exist.
(2) *Contemplation* is the stage where they are aware of their problem and are thinking about overcoming it. Nevertheless, they have not made a commitment to take action.
(3) *Preparation* is the stage where individuals have made a commitment to make change, and are participating in some kind of physical activity, however, not on a regular basis.
(4) *Action* is the stage where individuals believe they have the ability to make change, and modify their behaviour to overcome the problems. Individuals of this stage are regularly physically active, but have only been so for a period from one day to six months.
(5) *Maintenance* is the last stage in which people work to prevent relapse. People of this stage are regularly physically active from six months to an indeterminate period.

The first stages (pre-contemplation, contemplation and preparation) in this theory explain the intention to change behaviour while the later stages (action and maintenance) explain the changes in the new behaviour. This theory also describes how behaviour change is a cyclical process where people can relapse to previous stages at any time before moving forward again (Marcus et al., 1992). Moreover, what motivates people during a behaviour change may vary depending on the stages the person is at. A person may for example rely on an external reward to start exercising, but however continues due to interest and knowledge about the advantages of physical activity. It is therefore important to have different strategies for a person's stage to be able to move them forward. Strategies that will not only affect whether a person chooses this behaviour, but also importantly affect the maintenance of this behaviour, are essential (Skaalvik & Skaalvik, 2004).

Although stages of change theory describes the cognitive processes that may influence the movement in stages, including factors from other psychosocial theories is essential as it may explain potential influences on the stage transition. To demonstrate, there are consistent findings that several factors that are included in the social cognitive theory that correlate with or mediate transitions in stages of change in physical activity (Lorentzen, Ommundsen & Holme, 2007; Lorentzen et al., 2007; Bandura, 1997).

2.4.2 Social cognitive theory

Social cognitive theory seeks to understand both why and how individuals change health behaviour and suggest multiple influences on behaviour (Bandura, 1997). The theory focuses on a reciprocal determinism in the interaction between people and their environment, and posits that human behaviour is a result of the interplay of personal, behavioural and environmental influences (McAlister, Perry & Parcel, 2008). However, this does not mean that different sources of influence are of equal strength or occur simultaneously. Some may be stronger than others, and appear later in the process of changing behaviour (Bandura, 1989).

Within social cognitive theory, self-efficacy is suggested to be the most important mediator of behaviour (Bandura, 1997). Self-efficacy can be explained as the confidence a person has about his/her ability to perform a particular behaviour (Bandura, 1977), and is a personal factor that has repeatedly been associated with physical activity behaviour (Sallis & Owen, 1999). Self- efficacy expectations in physical activity behaviour is, according Bandura (1997), essential as it influence peoples physical activity preferences, affects the effort a person uses in this behaviour, and finally the extend to which a person can overcome barriers. Numerous studies also show that the performance of different behaviour is determined by self-efficacy beliefs (Bandura, 1997). For example, low self-efficacy may form negative attribution toward a behaviour and further lead to lower degree of motivation.

Additional to self-efficacy, the social cognitive theory recognizes how environment shapes a person's behaviour and also how people are able to alter and construct the environment to suit their behaviour (McAlister, Perry & Parcel, 2008). For example, people tend to select activities and associates from their acquired preferences and competencies. Through action, people create as well as select environments (Bandura, 1977). Studies show that with intervention that emphasizes self-efficacy, people are more likely to use their personal resources to adopt and maintain a healthy behaviour (Bandura 1997). Furthermore, according to Lorentzen and co-workers (Lorentzen et al., 2007), research has repeatedly shown that self-efficacy distinguishes people at different stages in the stage of change model. For example, individuals in the first stages may not have developed high enough confidence in their ability to change behaviour. Whereas individuals in the action- or maintenance stage may have higher confidence in that they can overcome barriers to keep up with regular physical activity.

Bandura states that self-efficacy can be developed from different sources of both social and psychological character. The four sources he discusses are: verbal persuasion, vicarious learning, mastery experience and physiological feedback. *1) Verbal persuasion* can be gained by telling the person that he or she can do it. This encouragement can develop the confidence that is needed to take the first step towards a behaviour change (Bandura, 1997). 2) *Vicarious learning* is a method that can increase self-efficacy through social comparison where similar others offer the best basis for comparison. If a person observes a similar peer manage a task, he or she might believe that they can do it. This method has, however, a weaker effect than actual performance because if a person fails the performance, it could have the opposite effect and decrease the degree of self-efficacy (Schunk & Meece, 2006). 3) *Mastery experience* seems to have the strongest influence on self-efficacy beliefs as it shows a persons actual behaviour. It is therefore important to develop strategies that enable persons to experience mastery by setting achievable and realistic goals (Schunk & Meece, 2006) By focusing on past experiences people can create expectations that an action or behaviour will bring valued benefits. In that way people can change future benefits/consequences into current motivation and self-efficacy (Bandura 1977). The statement: ”past behaviour is the best predictor of future behaviour” is well discussed and well supported by empirical evidence, and according to Ajzen (2002) past behaviour contributes independently to the intention, over and above the three aspects of attitude, social norms and perceived behavioural control.

4) Improved physical and emotional state makes it possible for participants to be relaxed and prepared before attempting a new behaviour, and also to build positive emotions where for example ”fear” is being recognized as ”excitement” (Bandura, 1997). When persons experience fewer symptoms that can signal lack of skills (e.g. heart rate, anxiety) they may feel more self-efficacious (Schunk & Meesce, 2006). Moreover, people often read their physiological state in stressful situations as a sign of vulnerability to dysfunction. By developing more experience with physical activity and the symptoms that follow, individuals may develop thoughts about their ineptitude and stress reaction and further rouse themselves to eliminate levels of stress that produce the dysfunction they fear (Bandura, 1997). For example, if a person remembers previous experience with anxiety and nervousness, it might affect the way this person reacts the next time these feelings appear. In this way physiological state is part of developing a mastery experience.

Another socially defined construct that has been included in social cognitive theory is social support (Bandura, 1997) and this has been defined as resources provided by other persons (Cohen & Syme, 1985). Social support is perhaps the most well-established social correlate of physical activity, and the concept and its relationship to health, has been a focus in psychosocial epidemiology for many years (Uchino, 2005). Social support for physical activity comes from many different sources and takes different forms as emotional (e.g. caring about a person), instrumental (e.g. baby-sitting, transport), and informational (e.g. giving constructive advices) (Ball, Jeffery, Abbott, McNaughton & Crawford, 2010). Furthermore, Robert Weiss' (1974) theory of social provision states that individuals seek specific types of social support in their relationships with others. He argues with six basic provisions**:** attachment (affection, security, emotional closeness), reliable alliance (others are counted on for assistance, not necessarily an emotional one), enhancement of worth (confirmation of one's competence or value), social integration (sense of belongingness and sharing experience) guidance (advice), and finally opportunity of nurturance (taking care of another). Weiss further hypothesized that different provisions are obtained in different relationships (Hamilton & White, 2008). Albert Bandura (1997) states that people who are adopting physical activity behaviour need supportive feedback when meeting barriers in the early phase. Barriers in the early phase may be experienced to a greater degree, and supportive feedback may increase a person's self-efficacy that is essential when overcoming barriers. Also participation from significant others as, family, friends, co-workers etc., is believed to be essential when it comes to adapting and adhering in physical activity (Lorentzen, Ommundsen & Holme, 2007). This is also being supported by a review done by Kahn et al., 2002, that found strong evidence that social support intervention increases physical activity level by exercising with others, and that exercise with another person can increase both duration and frequency.

In line with social cognitive theory, theory of planned behaviour is a motivational model that discusses potential psychosocial predictors to mediate changes in physical activity behaviour, and furthermore emphasises that an intention or a goal is the strongest predictor of behaviour (Sniehotta, 2009).

2.4.3 Theory of planned behaviour

Theory of planned behaviour is an extension of Ajzen & Fishbein's theory of reasoned action that aims to explain intentional behaviour (Ajzen, 1991). This theory suggests that the determinant of a behaviour is one's intention to engage in a particular behaviour (Hamilton & White, 2008), and further demonstrate that intention reflects the degree of effort that individuals expect to invest in physical activity participation (Hagger & Chatzisarantis, 2008). Theory of planned behaviour permits more accurate prediction of intention than the theory of reasoned action, and postulates that the intention is determined by three sets of individual constructs: attitude, subjective norm and perceived behaviour control (Ajzen & Madden, 1986). Attitude represents the overall evaluation of physical activity, subjective norms represent the influence a person receive from significant others in the execution of physical activity, whereas perceived behaviour control represent to what extent a person is in control to exert the target behaviour (Hagger & Chatziranatis, 2008). With these three constructs, theory of planned behaviour captures the motivational factors that influence behaviour. As mentioned above, motivation can be gained from both genuine interest for the specific behaviour, a person's social values, and self-confidence in own ability to perform the behaviour. The variables are indications of how hard people are willing to try and how much effort they are putting into the attempt to perform the behaviour. Thus, the stronger the intention is to change behaviour, the more likely to succeed (Ajzen, 1991).
Further in this section the three constructs will be described more closely:
1) Attitude towards a healthy behaviour is the degree to which the performance is negatively or positively valued and has a dominant role in forming intentions (Hagger & Chatzisarantis, 2008). When we are talking about attitude towards behaviour, the belief links the behaviour to a certain outcome (Ajzen, 1991). We therefore learn to favour behaviours that have a desirable outcome and form negative attitudes towards behaviours we associate undesirable outcome (Ajzen, 1991). As mentioned above under Bandera's social cognitive theory, self-efficacy expectations in physical activity behaviour are essential as it influences people's physical activity preferences and affects the effort a person use in this behaviour.
Furthermore, attitude in social science research are often viewed multidimensional with three different aspects: Affective/emotional, instrumental/cognitive, and functional/behavioural (Hagger & Chatzisarantis, 2008). Within the theory of planned behaviour, researcher has examined the importance of affective/emotional and instrumental/cognitive components of attitude. Affective attitude involves a person's feelings or emotions regarding participating in

certain behaviours. E.g. physical activity is ”pleasant” versus ”unpleasant” for me. Cognitive attitude on the other hand reflects the instrumentality or a person’s knowledge about the behaviour. E.g. physical activity is useless/useful for me (Hagger & Chatzisarantis, 2008). Corneya (1995) found that people hold a more positive attitude as they increase in stages of change.

2) Social norms is the second predictor in this theory, and can be explained as the pressure from significant others to engage or not engage in a behaviour (Ajzen, 1991). The predictor social norms has been recognized lately and been included in a number of theories, among others social cognitive theory (Ball, Jeffery, Abbott, McNaughton & Crawford, 2010). Social norms can be divided into two terms. Injunctive norms, the perceived pressure from significant others to engage in physical activity (one can be influenced by what others say), and descriptive norms, to what degree does significant others participate in physical activity (one can be influenced by what others do) (Ball, Jeffery, Abbott, McNaughton & Crawford, 2010). However, previous research that has taken advantage of the theory of planned behaviour within physical activity behaviour has shown that subjective norms is a concept being a weaker predictor of physical activity than attitude and perceived behavioural control (Hagger & Chatzisarantis, 2008).

3) Perceived behavioural control is the last variable that Ajzen and Madden discuss, and play an important part in this theory (Ajzen, 1991). According to Ajzen and Madden (1986) perceived behavioural control indicates to which extent people perceive their behaviour to be under their own control. Perceived behavioural control can be comprised and gained from a combination of controllability and self-efficacy (Ajzen, 2006). Controllability is explained to what extent the performance is up to the actor (Ajzen, 1991), whereas self-efficacy refers to a person’s own capacity and ability to engage in the behaviour (Bandura, 1997). Controllability and self-efficacy are two very similar terms, but differs as self-efficacy is a broader term. Controllability concerns beliefs about past experiences and external barriers, whereas self-efficacy does not distinguish different constraints (Biddle, 1999). When it comes to physical activity behaviour, research suggests that perceived behavioural control is particularly relevant for physical activity behaviour (Lorentzen et al, 2007). For example, experience of control over troublesome situations can function as efficacy strengthens, increase people’s thoughts about their own capability and further lead to the adaptation of physical activity behaviour (Bandura 1997). Moreover, those with a higher perceived behavioural control are likely to try harder to adopt a healthy behaviour compared to those with low levels of perceived behavioural control (Amireaul, Godin, Vohl & Pérusse,

2008) Ajzen also posits that perceived behavioural control together with behavioural intention can directly predict change in behaviour (Ajzen, 1991).

Overall, there is strong evidence for the theory of planned behaviour in predicting exercise intention and behaviour (Hamilton & White, 2008). The importance of attitude, subjective norm and perceived behavioural control when it comes to intention of behaviour, is expected to vary across behaviours and situations (Ajzen, 1991). As mentioned earlier, social norms are shown be the weakest predictor, and Ajzen (1991) suggests that the repeatedly poor association between social norms and intention supports that attitude and perception of control are more likely to predict behavioural intention rather than pressure from others.

However, there are still unexplained variances that propose additional variables to the theory. Ajzen (1991), himself is open to include additional variables as long as they are theoretically justified and show significance (Hamilton & White, 2008). Hamilton and White (2008) aimes to extend the theory of planned behaviour by adding self-identity and social support in their research about the role of self and social influences in predicting adolescent physical activity. Some researchers have argued that the term subjective norm is inadequate, and that the narrow focus on social pressure does not capture the impact of social influence. The effect of social support has therefore been suggested to give a better explanation of the social influences determining behavioural intention (Hamilton & White, 2008). Studies have reported an association between social support and behavioural intention. In fact, studies indicate that social support has a stronger influence than subjective norms in predicting physical activity behaviour (Courneya, Plonikoff, Hotz & Birkett, 2000). As social support within physical activity has been described above, the next section will explain self-identity as the second construct with which Hamilton and White (2008) extended the theory of planned behaviour.

The self-identity concept has long played a critical role in psychology by providing a link between the individual and the larger social structure (Callero, 1985). Self-identity can be explained as a person's identification of her-/himself that typically engages in certain behaviours (Hagger & Chatzisarantis, 2008). Identifying one-self as a physically active person might increase the possibility of actually being physically active and to maintain this behaviour, and furthermore increase ones identity related to physical activity. For example, if a person identify her/himself as a "sporty" person that likes to participate in exercise activities, the role is likely to influence the person`s intention to participating in physical activity later in life (Lorentzen, Ommundsen & Holme, 2007). Individuals often attempt to behave in accordance with their self-identity to validate their status (Callero, 1985). Role-

identities can therefore give meaning and values to one's past behaviour and predicts the future behaviour, and most probably stimulate behaviour that is consistent with the identity (Anderson & Cychosz, 1995). Rivis and Sheeran (2003) found that people participate in more exercise when they are identified as a person who exercises. Furthermore, Miller and co-workers found that vigorous activity was associated with physical activity identity and physical activity self-efficacy. They also suggest that encouragement in the beginning of exercise behaviour is essential to set a long-term goal. This encouragement may lead to stronger identification with self-efficacy (Miller, Ogletree & Welshimer, 2002). Thus, when an individual is being strongly identified as a person who performs in physical activity, this behaviour will become important for the person's self-concept and the person's role in a social context, and further influence his/her motivation to perform in physical activity (Hamilton & White, 2008). Self-identity factors may therefore be essential when predicting intention and physical activity.

As mentioned above, self-efficacy is being developed from four difference sources; verbal persuasion, vicarious learning, mastery feeling and improved physical and emotional state. According to Bandura (1997, 1977) these sources are a part of forming one's identity. For example within physical activity, if a person gets a lot of credit from significant others when exercising, it will most likely encourage the person to identify himself/herself as a sporty person (Verbal persuasion). If a person is growing up in a sporty environment or in an environment that makes it easy to participate in physical activity, a person will most likely identify himself/herself thereby, as a person that enjoys physical activity (Vicarious experience). If a person has experienced concrete mastery feelings with exercise, it might influence a person to believe that he/she is a person that masters physical activity behaviour (Mastery experience). Lastly, if a person gets in a situation where anxiety occurs, it may influence how the person perceives himself/herself, and influence the person's expectations towards himself/herself (Improved physical and emotional state). Bandura further states that both verbal persuasion and vicarious learning are sources that can be developed when growing up.

As already mentioned social psychologists have developed psychological theories that intend to explain the predictors that influence our physical activity behaviour. However, Amerault, Godin, Vohl & Pérusse (2008) hold that there exist a variety of control factors residing within the person (abilities) and within remaining parts of the individual's environment (resources and external conditions) that also are hypothesized to contribute to

adoption of physical activity. Hence, the adoption of physical activity depends on a multiply of factors. In other words, the performance of physical activity is not fully under complete volitional control. This should be kept in mind, so as not to expect that all the variance in stages of physical activity would be expected to be accounted for by the sets of factors examined. In the following, a focus will be set on factors less amenable to change, but which seem important to understand potential differences in the variance in stages of physical activity will be accounted for by the set of health indices and psychosocial factors examined.

2.5 Moderators of physical activity – sub-groups analyses

A mediator or moderator can be explained as a third variable that changes/influences the association between the independent variable and the dependent variable (Baron & Kenny, 1986). Both terms function as a third factor, however, it is important to distinguish a mediator from a moderator. A mediator is a variable that specifies how the association between the independent variable and the outcome variable occurs, whereas a moderator is a variable that affects the strength and/or direction of the association between the independent variable and the outcome variable (Bennett, 2000).

So far we have provided evidence that there are several psychosocial and environmental factors that function as correlates of physical activity behaviour, or as mediators and predictors in changing behaviour. However, the gap between intention and behaviour could also be attributed to differences in various background factors (Amireault et al., 2008). Godin, Shepard & Colantonio (1986) suggest that the differences in the intention-behavioural relationship between those who are active and inactive are not influenced by differences in the psychosocial factors (as attitude, subjective norm and perceived behavioural control) but by possibly moderating factors. Baron and Kenny (1986) posit that inconsistence in the association between the independent variable and the dependent variable may indicate a third variable that affects the direction and strength of the relationship. It is therefore helpful to investigate the possible moderators in the relationship by means of conducting sub-group analyses on selected background factors.

Gender

As mentioned earlier, physical activity level between genders differ. Men/boys are repeatedly reported as being more physically active than women/girls (Pratt, Macera & Blantion 2008; Bauman et al., 2012; Haskill et al., 2007). Wu, Pender and Noureddinge (2003) conducted a

study in Taiwan examining gender differences in factors related to physical activity, including 832 adolescents. Girls reported lower physical activity self-efficacy, less perceived benefits and more perceived barriers to being active than boys. However, the girls reported significantly more perceived social support, and social norms from their parents, but less support from their peers.

Age

In a meta-analysis including 72 studies, Hagger, Chatzisarantis and Biddle (2002) found that age was a moderator in the theory of planned behaviour relationship. Older samples (25 years of age or older) had a significantly stronger relationship between intention and behaviour than the younger sample (under 25 years of age). This suggests that the older population is more likely to translate their intention to participate in physical activity into real action. Hagger, Chatzisarantis & Biddle (2002) suggest two possible explanations for the moderating effect on the intention-behavioural relationship. First, the younger population may have unstable intentions or are inexperienced with the targeted behaviour, second the younger population has most likely not encountered the decision making process as often as the older population and therefore form intentions that are less inconsistent with the behaviour.

Education background

Kantomaa, Tammelin, Näyhä & Taanila's (2007) in a study from Finland shows that parents with higher education were associated with their children (adolescents) having a higher physical activity level. The Norwegian Inspectorate of Health in Norway reported in 2011 that 25 % of those with a higher education (university degree) meet the recommendations of physical activity compared to 16 % among those with lower education (completed high school). Another factor that is related to education level is income. When comparing different countries and income we can see a difference in the type of activity that dominates the total physical activity level. In low-income and middle-income countries it seems that household, transportation and occupation are the most common types of physical activity, whereas in high-income countries physical activity during leisure-time seems to contribute the most to the total amount of physical activity (Macnive, Bauman & Abouzeid, 2012). In addition to the difference in type of activity between low and high-income population, total amount of physical activity have also been reported to be consistently associated with annual income and educational level (Trost, Owen, Bauman, Salliz & Brown, 2002). Further, a study done by Amireault, Godin, Vohl & Pérusse (2008) shows that

perceived behavioural control was higher for individuals with a higher income compared to those with a lower income. It is reasonable to believe that those with higher financial resources (and therefore access to equipment) face fewer barriers to leisure-time activity than those with lower income. Further it is suggested that those with a higher level of education have greater knowledge concerning physical activity and health (Amierault et al., 2008). The findings from these researcher's highlights the importance of also examining sub-group differences in the role of psychosocial factors as correlates of stages of change in physical activity. Indeed, in designing intervention that is suitable for specific sub-group, such potential differences in the relative role of psychosocial correlates of stages in physical activity would seem important to take into consideration.

3.0 MATERIALS AND METHODS

3.1. Quantitative Research

As mentioned in Chapter 1, the data from this thesis is based on the "Romsås in Motion" project. This is a quantitative research approach that is based on self-administered questionnaires. Quantitative studies comprise research that uses numerical analysis. It is often collected in the form of a questionnaire or survey and typically involves the development of questions and scales that are used to measure feelings, satisfaction and other important factors on a numerical level (Thomas, Nelson & Silverman, 2011).

3.2 Overall project

The data in this thesis are drawn from the "Romsås in motion" project. The project was designed as a non-randomized controlled community-based intervention. Romsås, which is a low-income and multi-ethnic suburban district of Oslo, was served as the intervention group, while Furuset with similar socio-economic and similar ethnicity was selected as the control group. It was conducted a pre- and post- intervention assessment in both Romsås and Furuset in 2000 and 2003. In the period between, a physical activity promoting intervention was implemented in Romsås.

The background for the ”Romsås in motion” project was the major differences in health observed between eastern and western districts in Oslo. Residents of eastern districts were reported to have a higher rate in developing lifestyle-related diseases and had a higher prevalence of mortality than the western residents. It is also reported that the population in the eastern districts are less physical activity than the western district. The Romsås in motion” project was implemented as a 3-year-long-theory-based intervention program (2000-2003) aimed at increasing physical activity level in the adult population to reduce the risk of cardiovascular diseases and type 2-diabetes in the eastern district of Oslo. To reduce the risk of lifestyle related diseases, they aimed at moving people forward in the stages of change in physical activity.

Based on previous research different possible theoretically informed psychosocial mediators were selected as targets of mediators of change in the intervention program (Jenum et al., 2003; Lorentzen et al, 2007). These mediators included self-efficacy, social support from friends, and social support from family, attitude, and physical activity identity. Based on strategies and methods from theoretical models and additional literature, various strategies and efforts were “set in motion” to influence the possible psychosocial mediators. The intervention components were grouped into four main strategies: Communication strategies, physical activity programs, environmental strategies and participatory strategies. The data in this thesis are drawn from the baseline assessments in ”Romsås in Motion”, and the further method description will only address the methodology used in this master thesis.

3.3 Data assessment

3.3.1 Data collection procedure

At the time 1 data collection in 2000, the Norwegian Institute of Public Health were in charge of collecting the data (likewise at time 2; 2003). Questionnaire data 1 was concerned with socio-demographic information, indices of health, physical health status (physiological and biological parameters) and health behaviour, while questionnaire 2 included self-reports on physical activity participation and psychosocial mediators of change in physical activity. This thesis is based on selected data from both of the questionnaires.

The targeted participants included all residents between 31-67 years in year 2000 except those who attended other health-screening projects by the Norwegian Institute of

Public Health at that time. Another group with same size and similar socio-demographic factors formed the target participants in the control group.

All the addresses and personal identity numbers for the target population were obtained from the Norwegian Registry of Vital Statistics. Two weeks before the baseline assessment, the target individuals were invited to take part in this study with a personal letter. The letter included questionnaire 1 to be completed in advance, and suggested appointment time for the physical examination. The letter also informed that the participation was voluntary, anonymous and free of cost, and that those who completed the examination would have a chance to win 10000 NOK. Furthermore, the letter informed about the main outline of the project.

Both in Romsås and Furuset the survey locations were set up to be on a central location. At the survey location the participants were provided with their written informed consent to having their data used for research purpose. After signing the informed consent, questionnaire 2 was handed out, followed by a standardized physical examination. Questionnaire 1 took about 20-30 minutes to complete. Questionnaire 2 took about 30-45 minutes to complete, and the physical examination took about 15 minutes. The ones who did not attend the survey were sent two reminders.

3.3.2 Measurement

The variables that are used in this thesis include socio-demographic, health indices, anthropometric variables (BMI), stages of change in physical activity, and psychosocial variables.

Stages of change in Physical Activity

A single-question algorithm adapted by Marcus and Simkin (1993) were used to measure the stages of change in physical activity. Physical activity was defined as ”all physical activity except work-related activity”, and no particular specifications of physical activity regularity, intensity, frequency and duration were given. Participants were asked to classify themselves into one of the categories that represent the different stages of change. 1) ”I am currently not physically active and do not intend to engage in physical activity in the next 6 months” (precontemplation), 2) ”I am currently not physically active, but I am thinking about getting physically active in the next 6 months” (contemplation), 3) ”I currently do some physical

activity, but not regularly" (preparation), 4) "I am currently regularly physical active, but I have only begun doing so within the last 6 months" (action), and 5) "I am currently regularly physical active and have done so for more than 6 months".

Psychosocial variables

Self-efficacy for physical activity was assessed with a twelve-item measure (Fuchs & Schwarzer, 1994). Participants were asked to place themes elves on a seven-point scale with "not at all confident" and "extremely confident" on opposite ends, to what extend they were confident in their ability to perform planned physical activity in the face of barriers. Five-items represented the psychological barriers, e.g. "I am sure I can perform the planned physical activity even though I am tired", and seven-items represented the practical barriers, e.g. "I am sure I can perform the planned physical activity even though the weather is bad". Also in this measurement physical activity was defined as "all physical activity, expect work-related physical activity".

Social support for physical activity was measured using an eleven-item scale (Sallis et al., 1987). The same eleven-item scale was used when measuring social support from family, and social support from friends (including acquaintances and co-workers). Participants separately rated how often over the last three months, their family and friends had been supportive of their being physically active, e.g. "In the course of the last 3 months, my family (members of my household) or my friends have encouraged me to continue to be physically active". Responses to each question was based on a five-point scale ranging from 1 (never) to 5 (very often), a sixth item were added so that participants could also answer "do not apply to me", this was treated as missing data.

Attitude towards physical activity was measured using a seven-point scale rating their evaluation of eight attitude statements regarding being regularly physical active the next months. (Ajzen & Madden, 1986). Of the eight attitude statements five items represented the cognitive/evaluative attitude including: "Being regularly physically active the next month will to me be: stupid-wise, harmful-valuable, useless-useful, wrong-right, and troublesome-easy", whereas the next three items represented the affective/emotional attitude including: "Being regularly physically active the next month will to me be: unpleasant-pleasant, bad-good, boring, interesting". 1 represented the most negative attitude, and 7 represented the most positive attitude.

Physical activity identity was determined by using a four items scale by Sparks and Guthrie

(1998) and Charng with colleagues (1988) including health-related behaviours. The items that were used in the questionnaire were modified to fit physical activity behaviour. Participants were asked to rate on a scale from 1 (suits badly) to 5 (suits well) to what degree four different statements described them concerning physical activity, e.g. "Being physically active is a part of being the person I am."

The reliability and validity estimates of these variables have been reported previously (see Jenum et al., 2003; Lorentzen et al., 2007; Lorentzen, Ommundsen & Holme, 2007).

Socio-demographic variables

Data on gender and age were available from Statistics of Norway. Age was further divided into four groups (youngest = 30-39, second youngest = 40-49, second oldest = 50-59, oldest = 60-69). Years of education were self-reported, and further divided in three groups (low education = elementary school – middle school, middle education = high school, high education = university/college).

Anthropometric variable

BMI was measured as a part of the physical examination and calculated from the participants' weight in kilograms and height in meters squared (kg/m^2) with an electronic height and weight scale (DS 102, Artic Heading, Norway).

Self-reported health

Self-reported health was measured with the same method as in the HUBRO study (health examination in Oslo, 2001). Participants were asked to self-report their own health by placing themselves in one of the four categories: Bad – not that good – good – very good. (*National* Institute of Health; Folkehelseinstituttet, 2001)

Psychological health

The Hopkins Symptom Check List (HSCL) is a widely used, self-administered instrument designed to measure psychological distress in population surveys. (Søgaard, Bjelland, Tell & Røysamb, 2003). The HSCL-10 consists of 10 items on a 4-point scale ranging from "not at all" to "extremely". Participants were asked to read each one of the symptoms or problems listed below and decide how much the symptoms bothered or distressed them during the last week, including the actual day. Participants were asked to classify themselves in one of the four categories: Not at all - A little - Quite a bit – Extremely on the following symptoms:

Suddenly scared for no reason,
Feeling fearful
Faintness, dizziness, or weakness
Feeling tense or keyed up
Blaming yourself for things
Difficulties falling asleep or staying asleep
Feeling blue
Feeling of worthlessness
Feeling everything takes an effort
Feeling hopeless about the future

The average HSCL-10 score was calculated by dividing the total score by the number of items. Missing values were replaced with the sample mean value for each item. Records with three or more missing items were excluded (Søgaard, Bjellland, Tell & Røysamb, 2003). All items included in questionnaire 2 underwent translation and back-translation procedure, and were also pilot-tested on a small sample before it was taken for consideration. Participants had to complete 75 % or greater on the respective items to be a part of the analysis.

3.4 Study Participants

Participants in the ”Romsås in motion” study were collected from individuals who completed a health survey conducted in 2000 as part of a 3-year physical activity-promoting intervention project. 6140 (intervention = 2955, control = 3185) individuals between 31 and 67 years were invited to the baseline health study. 2950 (48%) filled in at least questionnaire 1. Of these 2336 (38%) also filled in questionnaire 2 providing stages of change data and made the sample for the analyses conducted in this thesis. Those who attended the baseline health survey had a slightly higher socio-economic status than the non-attendees (Jenum et al., 2003; Lorentzen et al., 2007).

Baseline analyses showed that the socio-economic status was a bit higher among those who provided baseline data compared to those who did not attended the survey. Non-western participants who completed questionnaire 1 (22%) were similar to the proportion of non-

western participants who were invited (23.7%). However, non-western participants were significantly lower among those who completed questionnaire 2 (16.3%).
When comparing the two districts, the difference between the attendees and the non-attendees did not show any systematic pattern.

3.5 Statistical analyses

All analyses were performed with the Statistical Package for the Social Science (SPSS).To describe the anthropometric variables, health indices, stages of change variable and psychosocial variables descriptive and frequency analyses were used. Pearson's correlation coefficients were calculated for the relationship between the stages of behavioural change and psychosocial variables, as well as the socio-demographic background variables. The psychosocial variables were chosen as influences of stages of change in physical activity together with the health indices. The psychosocial variables were chosen as previous research reveals that these variables are determinants of physical activity behaviour (Courneya, Plotnikoff, Hotz & Birkett, 2000).

Main analyses

For the main analyses four regression models were set up. In the first analysis BMI, self-assessment of health, age, gender, education and psychological health indices were entered in a first block. In the second block the seven psychosocial variables cognitive attitude, emotional attitude, self-efficacy in face of practical barriers, self-efficacy in face of psychological barriers, social support from friends, social support from family, physical activity identity were included. The first block thus allowed for an examination of the genuine effects of the health indices (self-assessed health, psychological health) while controlling for socio-demographic factors (gender, age, education) and BMI, whereas the second block allowed for an examination of the genuine influence of the set of psychosocial factors on stages of change in physical activity while controlling for all factors in the first block. Both total variance accounted for by the different sets of variables in each respective block, and genuine contributions of each of the variables (as shown by their respective beta weights) in each respective block are reported.

The second set of analyses was included to test for sub-group differences (moderating effects) of gender, age group and education background, respectively, in the relationship between health indices and psychosocial variables on stages of change in physical activity while controlling for BMI.

4.0 RESULTS

4.1 Descriptive statistics.

The majority of the sample was female (56.6%). The mean age of the sample was 48 (ranging from 30 to 69), the mean length of education was 12.1 years, and the mean BMI was 26.8. The mean physical activity level was 3.1 (ranging from 1 to 5).

Table 1. Mean score and standard deviation of psychosocial characteristics of participants.

Psychosocial variables	*mean (sd)*
Social support, family	2.1 (0.8)
Social support, friends	2.0 (0.8)
Self-efficacy, psychological barriers	4.5 (1.7)
Self-efficacy, practical barriers	3.7 (1.4)
Attitude, evaluative	6.2 (1.2)
Attitude, affective	5.2 (1.4)
Identity	3.3 (1.2)

Note: Social support (family and friends) and identity range from 1 to 5. Self-efficacy (psychological and practical barriers), attitude (evaluative and affective), and identity range from 1 to 7. Higher score indicate a greater psychological readiness for physical activity.

Table 1 provides descriptive data on the psychosocial variables of all participants, and show that mean score on self-efficacy in the face of psychological barriers, attitude concerning both evaluative and affective aspect and identity were relatively high whereas social support from friends and family and self-efficacy in the face of practical barriers were less high.

In terms of psychological health, BMI and self-reported health across gender the results revealed that mean score on the selected variables did not differ that greatly. Both female and males scored relative low on both self-reported health (women = 2.7, men = 2.8) and psychological health (women = 1.4, men = 1.3). The female participants scored higher on self-efficacy in face of psychological barriers (women = 4.5, men = 3.9), and slightly higher on social support from family (women = 2.1, men = 1.9) and friends (women = 2.0, men 1.7). Furthermore, BMI, self-efficacy in face of practical barriers, attitude and identity score were more or less the same for both genders.

Looking at the difference between age groups self-efficacy in face of psychological barriers this was the only variable that revealed an age group difference (youngest = 4.6, next youngest = 4.5, next oldest = 4.3, oldest = 3.9). The remaining variables showed no age-group specific differences in mean values.

Analysing the low, middle and high education levels, the difference between the mean scores was more apparent. When it comes to self-reported health the higher education groups revealed a higher score than the group of those with lowest education level (low = 2.5, middle = 2.8, high = 3.0). Psychological health seem to show the opposite trend (low education group = 1.4, middle education group = 1.3, high education group = 1.2). BMI scores were not significantly different across education groups.

Most of the psychosocial variable scores seem to be higher for those with a higher education level. Social support from family (low = 2.0, middle = 2.0, high = 2.2) and from friends (low = 1.8, middle = 2.0, high = 2.0). Furthermore, mean score on self-efficacy in face of psychological barriers revealed a difference across education groups with (low = 3.6, middle = 4.5, high = 5.0). Self-efficacy in face of practical barriers revealed on the other hand a less obvious difference (low = 3.3, middle = 3.7, high = 3.9). Lastly, both evaluative and affective attitude, and identity score were not shown to be different across education levels.

4.2 Regression analyses.

Included in the first step of the analyses (table 2; total sample) were psychological health, self-assessment of health, BMI, education, gender and age. Age was the only variable that did not show any significant association to stages of change in physical activity. However, when entering the psychosocial factors in step 2, psychological health, self-assessment of health, BMI, gender, education and age were no longer significantly associated to stages of change in physical activity. Of the seven psychosocial variables that were included in step 2, four were strongly significant: social support from friends, social support from family, self-efficacy in the face of psychological barriers and identity. Further, psychosocial variables accounted for 45% of the variance of stages of behaviour change in physical activity, whereas the set of variables in step 1(psychological health, self-assessment of health, BMI, education, gender and age) only accounted for 8% of the variance.

Sub-group differences (moderating effects)

When comparing the data set between men (table 3) and women (table 4) both education and self-assessment of health were shown to be significant correlates to stages of behaviour change in physical activity, whereas BMI are only significant for women (beta = -.13, $p < .001$ (a negative correlates indicates lower BMI)). When it comes to the psychosocial

variables, both identity and self-efficacy in face of psychological barriers show significance for both gender. In terms of practical barriers, for the males there was a strong significant influence of self-efficacy in face of practical barriers (beta = .04, $p < .001$) whereas among the females no significant association for practical barrier self-efficacy could be observed. Further, it seems that social support both from family and friends is more important for men than for women. All together the psychosocial variables accounts for 48% of the variance for men, and 42% for women, whereas small gender differences were observed with respect to the first set of variables (men 8%, women 7%).

The four different age groups have a lot of similarities when it comes to the potential correlates to stages of change in physical activity. In all age groups, however, the significance of the social-demographic and the health indices variables lost their significance as predictors when entering the psychosocial variables in step 2. Further, in all four age groups self-efficacy in face of psychological barriers and identity were found to be strong correlates (beta coefficients between .22 and 43, $p<.001$). However, comparing the four age groups also revealed some differences. The youngest age group seems to be dependent on social support from family (beta = .10, $p < .05$) and friends (beta = .11, $p < .05$). The next youngest group also seems to depend on social support from friends (beta = .11, $p < .05$) but not from family, whereas in the two oldest age groups no evidence of a role of social support from friends and family to stages of change in physical activity were found.

Inspection of the potential correlates to stages of change in physical activity between education levels shows that those with “lower” education level have a higher stage of change score when receiving greater support from family (table 9). In contrast, the participants with “higher” education level were shown to have a higher stage of change level when receiving greater support from friends (table 11). In the group with “middle” education both social support from family (beta = .08, $p < .05$) and social support from friends (beta = .09, $p < 0.01$) were shown to associate significantly with stages of change (table 10). The different education level groups seem to be characterized by a pattern in which a strong significant relationship between self-efficacy in face of psychological barriers and identity (table 9, table 10, table 11) were found for all education levels. In addition, in the “high” education level group an association between physical activity score and self-efficacy in face of practical barriers was revealed (beta = .13, $p < .05$).

The psychosocial factors explained 45 % of the total variance in both the “middle” education group and the “high” education group, whereas 37 % of the total variance is being explained by the psychosocial factors in the “low” education group. The first set of variables accounted for 4% (low education group), 3% (middle education group), and 7% (high education group) in physical activity stage of change.

4.3 Tables

Table 2: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity (n = 2054-2258)

		Block 1	Block 2		
Predictor		**β^a**	**β^b**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*			.08	
	Psychological health	- .06*	- .02		
	Self-reported health	.15***	.04		
	BMI	- .09***	-.02		
	Gender	.07**	.03		
	Education	.13***	.02		
	Age	.01	.04		
Step 2:	*Psychosocial variables*			.45	.38
	Social support, family		.08***		
	Social support, friends		.08***		
	Self-efficacy, psychological barriers		.24***		
	Self-efficacy, practical barriers		.04		
	Attitude, evaluative		.01		
	Attitude, affective		.04		
	Identity		.36***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

Table 3: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity within men.

		Block 1	**Block 2**		
Predictor		**β[a]**	**β[b]**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*				
	Psychological health	-.06	-.02	.08	
	Self-reported health	.22***	.06*		
	BMI	-.05	-.03		
	Education	.11**	.00		
	Age	.02	.06*		
Step 2:	*Psychosocial variables*			.48	.39
	Social support, family		.11*		
	Social support, friends		.10**		
	Self-efficacy, psychological barriers		.25**		
	Self-efficacy, practical barriers		.04***		
	Attitude, evaluative		-.02		
	Attitude, affective		.02		
	Identity		.38***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

Table 4: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity within women.

		Block 1	**Block 2**		
Predictor		**β^a**	**β^b**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*			.07	
	Psychological health	-.06	-.03		
	Self-reported health	.08*	.02		
	BMI	-.13***	.01		
	Education	.16***	.04		
	Age	-.13	.01		
Step 2:	*Psychosocial variables*			.42	.35
	Social support, family		.05		
	Social support, friends		.06		
	Self-efficacy, psychological barriers		.25***		
	Self-efficacy, practical barriers		.03		
	Attitude, evaluative		.05		
	Attitude, affective		.05		
	Identity		.33***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

Table 5: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity within age group 30-39.

		Block 1	**Block 2**		
Predictor		**β^a**	**β^b**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*			.07	
	Psychological health	-.02	.01		
	Self-reported health	.24***	.08		
	BMI	-.04	.04		
	Education	.05	-.01		
	Gender	.06	0.4		
Step 2:	*Psychosocial variables*			.40	.33
	Social support, family		.10*		
	Social support, friends		.11*		
	Self-efficacy, psychological barriers		.22***		
	Self-efficacy, practical barriers		.04		
	Attitude, evaluative		.03		
	Attitude, affective		.05		
	Identity		.31***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

Table 6: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity within age group 40-49

		Block 1	**Block 2**		
Predictor		**β^a**	**β^b**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*			.04	
	Psychological health	-.08	-.06		
	Self-reported health	.10	.04		
	BMI	-.07	.01		
	Education	.15**	.01		
	Gender	.10*	.06		
Step 2:	*Psychosocial variables*			.43	0.39
	Social support, family		.06		
	Social support, friends		.11*		
	Self-efficacy, psychological barriers		.22***		
	Self-efficacy, practical barriers		.03		
	Attitude, evaluative		.04		
	Attitude, affective		.08		
	Identity		.31***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

Table 7: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity within age group 50-59

		Block 1	**Block 2**		
Predictor		**β[a]**	**β[b]**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*			.05	
	Psychological health	-.09	-.03		
	Self-reported health	.12*	.01		
	BMI	-.10*	-.02		
	Education	.18***	.05		
	Gender	.09	.01		
Step 2:	*Psychosocial variables*			.46	.41
	Social support, family		.08		
	Social support, friends		.02		
	Self-efficacy, psychological barriers		.25***		
	Self-efficacy, practical barriers		.06		
	Attitude, evaluative		.01		
	Attitude, affective		.02		
	Identity		.43***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

Table 8: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity within age group 60-69

		Block 1	**Block 2**		
Predictor		**β[a]**	**β[b]**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*			.06	
	Psychological health	-.03	.03		
	Self-reported health	.18*	.04		
	BMI	-.20*	-.11		
	Education	.15	.03		
	Gender	-.03	-.03		
Step 2:	*Psychosocial variables*			.44	.38
	Social support, family		.10		
	Social support, friends		.07		
	Self-efficacy, psychological barriers		.38***		
	Self-efficacy, practical barriers		-.06		
	Attitude, evaluative		-.08		
	Attitude, affective		.04		
	Identity		.35***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

Table 9: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity within participants with "low" education.

		Block 1	Block 2		
Predictor		**β^a**	**β^b**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*			.04	
	Psychological health	-.15*	-.06		
	Self-reported health	.13	.03		
	BMI	-.04	.01		
	Gender	.06	.01		
	Age	-.03	.03		
Step 2:	*Psychosocial variables*			.37	.33
	Social support, family		.02**		
	Social support, friends		-.06		
	Self-efficacy, psychological barriers		.34***		
	Self-efficacy, practical barriers		-.08		
	Attitude, evaluative		-.07		
	Attitude, affective		.15		
	Identity		.29***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

Table 10: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity within participants with "middle" education.

		Block 1	**Block 2**		
Predictor		**β^a**	**β^b**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*			.03	
	Psychological health	-.01	.02		
	Self-reported health	.15***	.03		
	BMI	-.84*	-.00		
	Gender	.07	.03		
	Age	.00	.00		
Step 2:	*Psychosocial variables*			.45	.42
	Social support, family		.08*		
	Social support, friends		.09**		
	Self-efficacy, psychological barriers		.26***		
	Self-efficacy, practical barriers		.03		
	Attitude, evaluative		.01		
	Attitude, affective		.06		
	Identity		.36***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

Table 11: Summary of regressions analysis examining potential background and psychosocial correlates to stages of change in physical activity within participants with ”high” education.

		Block 1	**Block 2**		
Predictor		**β^a**	**β^b**	**R^2 (adjusted)**	**R^2 change (adjusted)**
Step 1:	*Background variables*			.07	
	Psychological health	-.06	-.06		
	Self-reported health	.18***	.06		
	BMI	-.15**	-.01		
	Gender	.08	.04		
	Age	.07	.12**		
Step 2:	*Psychosocial variables*			.45	.38
	Social support, family		.04		
	Social support, friends		.12**		
	Self-efficacy, psychological barriers		.17***		
	Self-efficacy, practical barriers		.13*		
	Attitude, evaluative		.09		
	Attitude, affective		-.07		
	Identity		.41***		

Beta[a] Standardized regression coefficients without *psychosocial factors* entered into the regression.
Beta[b] Standardized regression coefficients with *psychosocial factors* entered into the regression.
*p < .05 **p < .01. ***p < .001.

5.0 DISCUSSION

The aim in this thesis was to 1) examine the association of self-reported health indices and psychosocial factors to stages of change in physical activity (PASOC). 2) To examine the sub-group specific (moderating) effects of gender, age-groups and educational background, respectively, in the association of self-reported health indices and psychosocial factors to PASOC.

To answer the first research question the selected background variables and selected health indices, BMI and psychosocial variables are being discussed in relation to reported stages of physical activity behavior change and also how they influence each other in relation to physical activity.

The selected variables includes:
1) Self-reported health; 2) BMI; 3) Socio-demographic background variables: Gender; Age; and Education Level. 4) The selected psychosocial variables including: Social support from family and friends; Self efficacy in face of psychological barriers and practical barriers; Attitude, both evaluative and affective; Physical activity identity

The second research question discusses sub-group (moderating) differences of gender, age -groups and education level on the relationship of health indices and psychosocial variables to stages of change in physical activity while controlling for BMI.

5.1 The association of self-reported health indices and psychosocial factors to stages of change in physical activity (PASOC)

5.1.1 The relationship of Step 1 variables to physical activity level

The three variables of the variable set in step 1that show the strongest correlation toward physical activity score are: 1) Self-reported health 2) BMI 3) education level. Regression analyses showed significant positive relationship between the selected variables and stages of change (table 2). Overall, it should be kept in mind that the cross-sectional design of this study does not allow causal conclusions to be drawn. However, in general, the significant beta coefficients between self-reported health, BMI and education toward physical activity (table 2) are in line with previous research and literature (Rütten et al., 2000; Cherkas

et al., 2008; Trost, Owen, Bauman, Sallis & Brown, 2002).

Self-reported health

Individuals who reported their own health as good were found to report a higher stage of change in physical activity (table 2). These results appear to be consistent with Rütten et al's., (2000) study that found people's (18 years and older from 7 different countries) self- reported health to be significantly associated with both perceived opportunities and physical activity itself. Perceived opportunities include among others availability and accessibility of physical activity and also barriers in the relevant environment (Prins, Oenema, Horst & Brug, 2009). It is reasonable to predict that those who claim to be healthy also are those who take part in physical activity. For example, persons who do not participate in physical activity are less likely to describe themselves as healthy (Abu-Omar, Rutten & Robin, 2004).

BMI

BMI (body max index) is an approximation of body fat based on a person's weight and height, and refers to whether a person is under- or overweight. The higher a person's BMI, the higher the percentage of fat in their body, furthermore, the higher percentage of fat in the body, the less probability for a person to be physical active (Mora, Lee, Buring & Ridker, 2006). The analyses in this thesis revealed that participants with lower BMI appear to be more physically active as indicated by reporting a higher stage of change (table 2). These findings are in line with several studies showing that increased BMI is significantly associated with a decreased physical activity level (Cherkas et al., 2008; Mora, Lee, Buring & Ridker, 2006; Morrato, Hill, Wyatt, Ghushchyan & Sullivan, 2007). It is however unsure whether it is the high BMI that causes a person not to participate in physical activity or if it is a physical inactive lifestyle that results in high BMI. Furthermore, there may be other factors that come into play in relation to BMI and physical activity. For example, Blanchard and co-workers (2005) found in his study that the social ecological correlates of physical activity were moderated by BMI at different levels of the social-ecological models. As mentioned in the theoretical framework section, according to socio ecological models the environment both the physical and the social are important determinants of physical activity (Bauman et al., 2012) People with high BMI might perceive more obstacles in the environment compared with those with lower BMI.

Education level

The regression analyses further reveals that participants with higher education report a higher stage of change (table 2). This is also a finding that is in line with previous studies (Trost, Owen, Bauman, Sallis & Brown, 2002; Shaw & Spokane, 2008; Thornórarinsson, Harðarson, Sigvaldason & Sigfússon, 2002). Shaw and Spokane (2008) suggest that highly educated adults have the financial resources to participate in more physical activities with greater access to resources that facilitate this behaviour. Furthermore, they are better equipped to maintain this behaviour despite the age-related changes in abilities. For example, as older adults they may be better equipped to participate in organized exercise. Lastly, they suggest that people with higher level of education have an increased knowledge about the advantages of taking part in physical activity.

Taken together, these are the variables from the first variable set (socio-demographic variables, BMI and health indices) that show the strongest significant correlation to stages of change by James Prochaska & Carlo DiClemente (1986). Participants reporting to have a better health, lower BMI and higher education are more likely to place themselves in stages where they are regularly physical active. Somewhat surprising, psychological health indices, as indicated by the Hopkins symptoms checklist variables, were only modestly, (and only in the total sample) negatively related to stages of change. In fact, this is an encouraging finding, and reveals that people with high reports of these kinds of symptoms of psychological ill-health are no more strongly prevented from reporting a higher stage of change than those with a less strongly reporting of symptoms.

However, when entering the psychosocial variables in step two, all the variables in step 1 did lose their significance (table 2). This indicates that the psychosocial variables account for more of the explained variance in stages of physical activity behavioural change, and overrides the importance of the set of variables comprising of the health indices, BMI and the socio-demographic factors. The variables in the first set consist of more stable, fixed ones, whereas those in the psychosocial set are more amenable to change. From that perspective the results are encouraging in that it might be possible to change peoples' stage of change by means of intervention efforts. Indeed, there is evidence of this in the Romsås in Motion project (Lorentzen et al, 2007).

Nevertheless, the results from step 1 indicate that there are connections between the self-reported health and stages of change. Participants that self-report their health as being

good also report to be in a higher stage of change. This may not be due to participants reporting their own health as good, but persons who are confident in their own health might also be confident that they can overcome barriers towards a physical active behaviour and further also have a higher physical activity identity. One of the items in the questionnaire that were included to measure a persons identity was: to what degree does the statement ” I am a person who takes care of my body” describe you as a person. People who report that they take care of their body, is most likely a person who is healthy, and further self-reports their health to be good.

Furthermore, it seems that people with low BMI is higher in the stages of change with physical activity (table 2). This may not solely be due to the body weight, but the low BMI could help people develop a positive physical activity identity. For example, it may be easier for a person to identify himself/herself if the person is lean and fit compared to overweight. Moreover, the low BMI could affect a person’s attitude towards physical activity. Deforche, Bourdeaudhuij & Tanghe (2005) demonstrated in their study that overweight and obese participants show lower sport participation and had a less positive attitude toward physical activity. It is reasonable to believe that leaner participants report that physical activity is more enjoyable and easy to perform compared to overweight and obese participants, and thus have a more positive attitude. Again, however, the cross-sectional design does not allow causal conclusions to be drawn, so it is unsure whether it is the negative attitude towards physical activity that results in higher BMI, or if high BMI facilitates a negative attitude towards activity.

Moreover, self-efficacy may also operate with BMI to influence stages of change. Gallagher, Jakicic, Napolitano & Marcus (2006) found that higher levels of physical activity self-efficacy were related to the weight loss. These results indicate that those with higher BMI have a lower degree of physical activity self-efficacy, which is a predictor that is essential when adopting a health promoting behavior (Bandura, 1997).

Education is one of the variables in step 1 that has the strongest relation to stages of change, but which loses significance in step two (table 2). Shaw & Spokane (2008) have suggested that those with higher education are more likely to have a stronger sense of self-efficacy in face of physical activity and also have healthier influence from social networks. Two of the predictors that were included in step two when the psychosocial predictors where entered in the analyses, were self-efficacy in overcoming barriers, and social support from

friends/acquaintances/co-workers. This may be a reason why the psychosocial predictors account for more of the variance and why the relationship between education and stages of change lose significance as correlate in step 2. For example, persons with a higher education background are more likely to have a wider social network and experience a higher degree of social support. Social support of such a kind rather than the level of education itself may then be a reason why a highly educated person is higher in physical activity stages of change.

Moreover, table 2 reveals that psychological health has a weaker but significant negative association with stages of change when the remaining factors in step 1 are accounted for. While this variable as previously stated loses significance in step two, it may well be that a person who is better off in terms of psychological health are more likely to find their physical health important and also experience a higher degree of perceived support from family and friends compared with those who report poorer psychological health.

As the psychosocial variables seem to account for 45 % of the total variance, whereas the step 1 variables only account for 8 %, I have chosen to further focus on the potential psychosocial factors in this chapter.

5.1.2 Psychosocial factors in relation to physical activity

Social support

Social support has been defined as resources provided by other persons (Cohen & Syme, 1985) and has been identified in social cognitive theory of Bandura (1977) to be an important factor when it comes to adopting physical activity behaviour. Furthermore, social support is included as one of a number of important factors people are affected by when considering their own opportunities for being active (Bandura, 1977). Table 2 reveals a strong significant relationship between social support and stages of change. These results are being supported by previous studies demonstrating that support from family and friends are correlated to physical activity level (Kahn et al., 2012; Courneya, Plonikoff, Hotz & Birkett, 2002).

When comparing theory of planned behaviour and the social cognitive theory of Bandura they both emphasize social impact, be it a certain social pressure or a source of information about how you are as a person (Ajzen, 1991; Bandura, 1997). Bandera's theory focuses on social support, whereas Ajzen's theory focuses on social norms. Social norms can be explained as the pressure from significant others to engage or not engage in a behaviour

(Ajzen, 1991). Speaking of social norms, one can be influenced by what others say and by what others do (Bali et al., 2010). The items in the questionnaires included among others, to what degree do family/friends: ”participate in physical activity with me”, ”talked about how much they like to use their body”, and asked if ”I am going to exercise today”. These are items that can be perceived as indicating a sort of social pressure. Therefore, the results from this study may also support the theory of planned behaviour from Ajzen (1991), as well as Banduras social cognitive theory.

Attitude

Attitudes toward physical activity concern the outcome of engaging in a behavior and whether performing the behavior is negatively or positively valued (Hagger & Chatzisarantis, 2008). The previous study distinguishes between affective attitude (a person’s feelings towards physical activity) and evaluative attitude (a person’s opinion about physical activity). However, neither of the attitude measurements showed any significant relationship with stages of change. When looking at table 1, we observed a high average score for both attitude measurements toward physical activity behaviour. Moreover, when entering attitude toward being physically active (table 2) neither affective nor evaluative components of attitude was a significant contributor to stages of change. One reason may be that the attitude items are too generally described. According to Rosenberg (1979), people tend to answer what they think or know is correct and how they like to think of themselves rather than how they act in reality. The items in the questionnaire that measured the cognitive attitude were: ”Me being physically active the next months will be: stupid – wise, wrong – right, useless – useful, hurtful – valuable. Common knowledge is that physical activity is good for your health, so the participants might have answered what they know about physical activity rather than actually having this attitude and make action. In everyday life we are rarely told that physical activity is wrong or useless. Further, the items in the questionnaire concerning emotional attitude were more personal like: ”Me being physical active the next months will be: troublesome – easy, uncomfortable – comfortable, bad – good and boring – interesting. When the participants were answering these items they might have answered what they thought seemed ideal. Rosenberg (1979) also has a theory about self-perception; how people look at themselves and how they actually are in reality might not always be in accordance. They may also answer what they think others will answer, and without knowing it, they are answering out of social norms and social desirability. In fact, these results are the same findings as previous research that shows no association between attitude to physical activity and actual behaviour (Sallis &

Owen, 1999). According to Ajzen's theory of planned behaviour (1991), we learn to favour behaviour we associate with a desirable outcome, and we learn to form negative attitudes with behaviour that ais associated with an undesirable outcome. However, this does not seem to be consistent with the results from this study.

Identity

Physical activity identity can be explained as a person's identification of her-/himself that typically engages in certain behaviour (Hagger & Chatzisarantis, 2008). Table 2 reveals further that physical activity identity was the strongest predictor to stages of change. Unlike the items that measured attitude above, these items were more directed to actual behaviour, for example the participants were asked to what degree do the state: " being physically active is a part of who I am" describes you as a person. Answering that this state suits you well when not participating in physical activity will be more obviously incorrect. The results in this study are in line with previous research showing that people exercise more when being identified as a person who exercises (Rivis & Sheeran 2003; Miller, Ogletree & Welshimer, 2002), and also supports Callero (1985), who states that people often attempt to behave in accordance with their self-identity to validate their status. As Lorenzten and co-workers (Lorentzen, Ommundsen & Holme, 2007) suggested in their paper, identifying oneself as a "sporty" person might increase the possibility of actually being physically active and maintaining this behaviour, and further the role is likely to influence the person's intention to participating in physical activity in later stages. When a person are being identified as healthy and sporty" from significant others, it might function as a kind of pressure to maintain this positive "label" (Bandura, 1997).

Self-efficacy

Self-efficacy is the confidence a person has about his/her ability to perform a particular behaviour (Bandura, 1977). This study distinguishes between self-efficacy in face of psychological barriers and self-efficacy in face of practical barriers. Table 2 reveals that these two variables differ when it comes to the relationship towards physical activity score. Self-efficacy in the face of psychological barriers was found to correlate significantly and positively with stages of change in physical activity. Psychological barriers considered in this measure includes: being tired, feeling stressed and having no one to exercise with. According to Bandura (1997), earlier intervention studies that emphasize self-efficacy reveal that people with high self-efficacy are more likely to use their personal resources to adopt and maintain a healthy behaviour. This indicates that participants with higher confidence use their personal

resource to overcoming barriers. However, self-efficacy in one's ability to perform planned physical activity faced with practical barriers was not a genuine significant correlate to stages of change. Practical barriers considered in this measure included among others: visit from friends, work, family and being busy with other activities. It can be suggested that people might use practical barriers, as lack of time just as an excuse for not exercising. It might feel better to blame the time rather than saying that "I do not feel like exercising today". Earlier research shows that lack of time is the most common excuse individuals uses for not taking part of exercise (Brownson, Baker, Housmann, Brennan & Bacak, 2001). Moreover, self-efficacy in face of psychological barriers can also be influenced by one's self-perception like mentioned earlier. Individuals might answer what they think of themselves or what they think is ideal (Rosenberg, 1979). For example, it seems more ideal to say that I am confident that I can perform planned physical activity even though I feel tired, or stressed. Practical barriers on the other hand, are factors that you cannot help, so therefore it might be easier to report less confidence in overcoming those barriers. Another suggestion is that psychological decisions are directly connected to intrinsic motivation (Skaalvik & Skaalvik, 2004), and it is the intrinsic motivation that is our core driving force for how we choose to behave. As mentioned earlier intinsic motivation is based on psychological factors like genuine interest and a person's own value. If a person has a great amount of intrinsic motivation, it might be that one does not let himself/herself get hindered by a practical barrier as bad weather, or not having enough time. These are, however, just speculations as earlier research have not divided self-efficacy in terms of psychological barriers and practical barriers before.

As revealed we can observe that there exists an association between some of the psychosocial variables and stages of change in physical activity. The next part is to discuss the moderating effects of gender, age-groups and educational background.

5.2 The moderating effects of gender, age-group and educational background in the association of self-reported health indices and psychosocial factors to PASOC

5.2.1 Gender differences

Gender-based differences in health have been continuously documented (Bauman et al., 2012; Haskill et al., 2007) Gender-based differences further result in the differences in lifestyle-related morbidity and mortality. However, less is known about the role of gender in

psychosocial determinants of lifestyle change, and is still an underresearched area (Neil, Absetz, Ghisletta, Renner & Uutela, 2010). The results from this study reveal some interesting gender differences.

Table 3 and table 4 suggest that the main difference between male and females is their perceived support from family and friends. The results demonstrate that social support from both family (beta weight = .11, p<001) and friends (beta weight = .10, p<.001) are more important for men. There is support in the literature that men have experienced a history of physical competition both one-on-one and in coalitions (Deaner et al., 2012). One suggestion could therefore be that men are more competitive and therefore more motivated when exercising with others. According to Kahn et al., 2002 study, when exercising with others intensity and duration seems to increase which might be due to the feeling of competition. Furthermore, Kilphatrick, Hebert & Bartholomew (2005) found in their study that men reported more motivation than women for challenges, competition and social recognition. Females, on the other hand, may not be motivated by competition and social company at the same level, and they might therefore be less dependent on support from others to participate in physical activity. Kilphatrick, Hebert & Bartholomew (2005) also found that women, compared to men, reported significantly more motivation for exercise than for sport participation. Being fit and healthy may be factors that motivate women rather than competition and social recognition which may be reflected in the stronger case for social support for men.

Another finding when looking at gender differences (table 3, table 4), is self-efficacy in face of practical barriers. Practical barriers are, as mentioned, factors like time, work and weather. This type of self-efficacy is strongly significant for males whereas it does not correlate significantly for women. When placing self-efficacy in a larger context, self-perception and gender roles could be taken into account (Bandura, 1977; Rosenberg, 1979). Males may see themselves as the tougher and stronger gender, or try to live up to such a role, and it may therefore seem weak having to give in for practical reasons.

5.2.2 Age differences

There is already evidence that physical activity level is negatively associated with increasing age (Norman, Bellocco, Vaida & Wolk, 2002), so the interesting part in this thesis is to look at how the importance of psychosocial factors for stages of change in physical

activity changes with age within the adult population. Self-efficacy in face of psychological barriers and physical activity identity were both shown to be strong genuine correlates for all four age groups. Social support, on the other hand, seems to differ. From table 5, table 6 and table 7 younger participants seem to rely more on social support from family and friends. The youngest group aged 30 to 39 years, may spend more time with family and friends on an everyday basis. This fact could lead the younger participants to be more dependent on their social network and thus be in need for more of significant others' support to pursue the behaviour. The results from this analysis appear to be consistent with Treiber and co-workers (Treiber et al., 1999) who found a positive relationship between social support (from family and friends) for exercise and physical activity among younger adults (mean age 35 years).

The older age group, on the other hand, may have less of a social network, or family that they interact with on an everyday basis. Hence, the social pressure may be less of a driving force of behaviour. Moreover, a person's need to look fit and slim might decrease with age, they may exercise solely for their body function rather than from pressure from the outside. On the other hand, older adults might be more embarrassed about heir own shape, and therefore prefer to exercise in their own self-set pace with focus on own physical and mental well-being as driving forces.

Taken together, the difference in the psychological predictors does not seem to differ that greatly between the four age groups. One possibility is that the different age groups need to be split into a greater interval to be able to reveal differences in importance as factors moderating the importance of the psychosocial factors as predictors of stages of physical activity change. Participants in their 30s and participants in their 40s may be too similar in how they think and act (as well as participants in their 50s and 60s might be) .

5.2.3 Education level differences

A significant positive correlation between social support and stages of change in physical activity has been shown repeatedly in research. However, when dividing the participants into different education sub-groups, levels social support seems to vary (table 8, table 9). Participants with a lower education seem to be more dependent on support from family. One interpretation is that people with lower education level are closer to family on a regular basis and more dedicated to collectivistic values, while those in the higher education group are more characterised by individualistic values, more self-centred, independent and in

less need of social support from family. Social support from friends, on the other hand, seems to be more essential. Friends in the questionnaire also include co-workers and acquaintances. Hence, one possibility is that people with higher education have a greater social network with study friends and co-workers. This interpretation is further supported and makes sense as for the group with middle education level, social support from both friends and family are positively and genuinely related to stages of change.

Moreover, when looking at the difference between education levels, self-efficacy in face of practical barriers related significantly and positively with stages of change for the group with high education. One assumption is that they are used to more structure on an everyday basis, and it might therefore be easier for them to plan a day that includes physical activity and further have more confidence that they can re-schedule their day should a practical obstacle occurs. People with a higher level of education might also be better equipped to participate in physical activity and also to maintain this behaviour despite the age-related changes in abilities (Shaw & Spokane, 2001). Being better equipped can result in a higher confidence that they can overcome practical barriers in face of physical activity. For example, having access to a car makes it easier to overcome some of the typical barriers as time and distance. Another assumption is that people with higher education also have a more ”all around” knowledge and are more aware of the advantages of participating in physical activity. This knowledge might facilitate efforts to adopt and maintain this physical activity behaviour. On the other hand, participants in the ”higher education” group might be more determined to answer what seems to be ”correct”, and it may be more difficult to give a poorer answer. The self-representation is a possible source of bias in the survey. Another example is that those with higher education have higher ideals to live by, and can therefore over-report their physical activity behaviour. The fact that they do not answer with complete honesty may affect the reliability of the survey. Being an ideal and healthy human being may not be that important for those with lower education or for people in certain social environments.

5.3 Strengths and Limitations

5.3.1 Study design

Survey with a cross-sectional design is perhaps the most frequently conducted type of study to investigate the relationship of physical activity to various influencing factors. Such a study design is used to examine relationships between variables at one point in time.

Furthermore, the cross-sectional survey is a good method for mapping and generalization of health status (Thomas, Nelson & Silverman, 2011). The advantages of this method are that it often is quick and inexpensive, and many variables can be tested in the same study. On the other hand, cross-sectional study is the weakest design as it provides no evidence of causality (Grimes & Shulz, 2002). Findings from cross-sectional studies must be further examined in studies with prospective and in particular experimental study designs to be able to tease out their influence on physical activity behavior and change in such behavior in a causal sense (Thomas, Nelson & Silverman, 2011).

5.3.2 Selection bias and generalization

Selection bias occurs when the participants who attend the research study differ in meaningful ways from those who choose not to participate in the study. Selection bias may result in under-representation of some groups (Grimes & Shulz, 2002). This study is based on data from ”Romsås in Motion”, which is three-year long quasi-experimental intervention aiming at increasing the physical activity level in the population. Participants, who entered the study voluntarily may be more interested in physical activity, compared to those who did not enter the study. Furthermore, findings from the baseline measurement have revealed that the socio-economic status was higher among those who provided baseline data compared with those who did not participate in the study, and also the proportion of non-western participants who completed questionnaire 2 was lower compared to all invited (Jenum et al,. 2003). Therefore, the results observed in this thesis may not necessarily generalize to those with lower socio-economic status.

A factor that may have influenced the response rates of questionnaire 2, which measured the psychosocial variables used in this thesis, is the fact that it is voluntary. Participants who chose to bring the paper home may have forgotten it or felt less obliged to complete it. Also the length of the questionnaire may have influenced the response rate. Questionnaire 2 took approximately 30-45 minutes to complete, and may have reduced the participants’ motivation to fill it in. People are more likely to complete a short questionnaire than to a long and complex one (Thomas, Nelson & Silverman, 2011). Another issue with a long and complex questionnaire is that respondents may answer superficially as it takes a long time to complete.

External validity refers to the generalization of the results of a study (Thomas, Nelson & Silverman, 2011). The results from "Romsås in Motion", where a population have purposely been selected due to their high mortality rates, low socio-economic status, high proportion of non-western immigrants, poor health status and high inactivity may not generalize to other populations. Results from this study may not for example apply to wealthier and healthier communities.

5.3.3 Evaluation of questionnaire data

Questionnaire are the most common descriptive research, and the most practical method for assessing data in large groups due to the reasonable cost. However, questionnaires are self-reported, and with that the research validity and reliability may be limited. Validity is the degree to which a test or instrument measures what it purports to measure, whereas reliability refers to the extent to which a measure is repeatable (Thomas, Nelson & Silverman, 2011).

Factors that may limit the validity and reliability of this study are recall bias, over-reporting, and definition of physical activity as measured by the stage of change algorithm. Recall-bias is a systematic error that represents a major threat to the internal validity of studies using self-reported data (Hassan, 2006). This bias arises when participants intentionally or unintentionally recall past events differently (Hassan, 2006). Because questionnaires, like many evaluation methods, occur after an event or behavior, participants may forget important information. In this study, participants were asked to report stages change in the format of past physical activity behavior. It may be difficult to remember all the amount of past physical activity behavior, specially time spent in low-intensity activities compared to organized sport or physical activity with high intensity. Participants in this study may therefore have under-reported their physical activity level and placed themselves in a lower stage than is the case. That being said, over-reporting is a common problem with questionnaires. It invites people to answer incorrectly, answer very vaguely and/or answer based on social desirability motivation. Participants in this study may have over-reported their physical activity level, as it sounds more ideal. As previously mentioned, Rosenberg's theory about self-perception may help to explain that the way people like to describe themselves may not be in accordance with the reality. This may result in people ranking themselves in higher stage of physical activity behavior change.

The last factor that must be taken into consideration is the fact that physical activity is a wide and complex term (Caspersen, Powell & Christenson, 1985). Assessment of the level of physical activity level should therefore include intensity, frequency and duration when defining the behavior. The questionnaire used in this study only provided a brief definition without mentioning intensity, frequency or duration. Participants may therefore have considered physical activity as a high intensity exercise, and under-reported their physical activity level. On the other hand, over-reporting could also occur if participant consider physical activity as every movement they make.

5.3.4 Strengths and limitations of present study

A considerable strength of the present piece of research is that it is based on a study with a strong and validated data set developed by experienced researchers. However, the fact that I was in the position to base my study on an already collected data material, might also be a disadvantage. There is a possibility that the validity is reduced as I may have interpreted the questions another way than the ones who developed them. Thus, getting access to second hand data may yield invalid results.

Moreover, this study captures the "in-depth" variables that in one way are an advantage as they may provide better answers psychologically and socially. On the other hand, this could also be a disadvantage in a scientific view as the variables are interconnected and reciprocal. It is difficult to draw practical conclusions only by statistical information. An additional personal interview could be an advantage, as it may provide more detailed and supplementary information from the participants and their life situation.

6.0 CONCLUSION

6.1 The association of self-reported health indices and psychosocial factors to stages of change in physical activity

Except for age, regression analyses for the total sample showed significant positive relationships between all the variables under study in step 1 and stages of change. Whereas indices of psychological ill-health (negative) (Hopkins checklist symptoms) and gender (men positive) both were found to be genuine associates to changes of change, self-reported health,

BMI and education level were the stronger associates in step 1. The finding that indices of psychological ill-health is clearly of less negative importance to stages of change than is the positive role of the psychosocial factors, is a new finding in this research area, and should be considered encouraging. Moreover, when entering the psychosocial variables in step two, all significant variables in step 1 lost their significance as genuine correlates of self-reported stages of change in physical activity. The significant increase in variance accounted for by the psychosocial variables in step 2 reveals that these variables are relatively more important as influences in stages of physical activity behavioural change than are socio-demographic factors and indices of peoples' health condition. The psychosocial variables showing the strongest association to stages of change in the regression models in step 2 were social support from family and friends, self-efficacy in face of psychological barriers and identity. These results are in line with previous research (Courneya et al., 2000; Bandura, 1997; Rivis & Sheeran 2003). Attitudes and self-efficacy in face of practical barriers however showed no significant relationship. The latter may be explained by Rosenberg's self-perception theory; how people look at themselves and how they actually are in reality might not always be in accordance.

6.2 The moderating effects of gender, age-groups and educational background in the association of self-reported health indices and psychosocial factors to PASOC.

An important finding from this study is the decisive role of self-efficacy in terms of being able to face psychological barriers for peoples' stage of change in all subgroups. Hence, there is little evidence of a moderating role of age, gender and educational background for this psychosocial influence on stages of change, even when indices of health and BMI are controlled for. This would seem important in that it implies that intervention efforts to increaee self-efficacy to overcome such barriers may prove equally effective across various demographic subgroups of individuals, irrespective of BMI scores and indices of health.

The study also demonstrates that men rely more on support from family and friends than women. This could be because men are more competitive and therefore more motivated when exercising with others. Furthermore, results suggest that men are more confident in overcoming practical barriers to being physical active. When it comes to the psychosocial predictors between different age groups the variance did not differ that greatly. Social support was the factor that stood out the most. Younger adults seem to rely more on support from

family and friends compared to those in the older group. These results suggest that younger adults may be more closely tied in with their social network and are more connected to family and friends on everyday basis. Moreover, this study indicates that higher educated participants rely more on support from friends, whereas those less well educated rely more on support from family. Furthermore, people with higher education are more confident when it comes to overcoming physical barriers, which may be an indicator that they are used to better structure their time on an everyday basis.

The consistent findings across this study suggest that physical activity in face of psychological barriers and physical activity identity are strongly connected with stages of change for all the different sub groups. The fact that this holds when socio-demographic variables, BMI and indices of health are accounted for, provide new evidence on the pertinent role of psychosocial influences of stages of physical activity change. When looking at social support for the total sample, a higher social support scorer is significantly and genuinely related to higher stages of change. Nevertheless, subgroup differences in the importance of social support do exist. Further, self-efficacy faced with practical barriers and attitude seems to be less relevant for movement in the stages of change in physical activity.

Taken together, the findings emanating from the regression analyses that have been identified in this study may be useful when planning future interventions targeting to help activate sedentary adults, and to help active adults to maintain their physical activity level.

7.0 IMPLICATIONS

The above findings suggest that interventions aiming to activate sedentary adults and to help active adults remain at their activity level may be more successful if they foster support from family and friends, develop their physical activity identity, and increase their confidence in overcoming psychological barriers. To increase social support, interventions should encourage people to involve family and friends when participating in exercise. This could be anything from asking family or friends to give them a ride to the gym, or asking them to be their jogging partner. Just talking about physical activity with significant others may be helpful to develop social support. This kind of intervention may be most successful for males, younger adults as well as among people of various education levels. Intervention strategies aiming to develop physical activity identity should include encouraging people to participate in physical activity with family and friends, and exercise in public. For example,

group activities, outdoor jogging, and team sport. Further, wearing exercise clothes and buying exercise equipment may be helpful in building physical activity identity. These are interventions that could increase physical activity level for all people independent of gender, age, educational level as well as state of psychological health and general self-perception of health. Further, interventions aiming to develop self-efficacy in face of psychological barriers should encourage people to focus on past accomplishment and also refers to similar other who has accomplished planned physical activity despite different psychological barriers like tiredness, and stress. Moreover, strategies for developing a physical activity level and self-efficacy in face of psychological barriers should be included in interventions for both gender, at all adult age groups, and independent of education levels and symptoms of ill-health. Furthermore, building training facilities that are accessible and attractive, and implementing motivational information to both sexes, and all age groups may be helpful when fostering these psychosocial variables. Lastly, further research in this area, with the aim to constantly improve the stimulus for all groups of people, should be a priority for future research.

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