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Physical activity, screen-based activities and their potential determinants

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Introduction



Introduction

This thesis deals with physical activity and screen-based activities of adolescents and the associations of these behaviours with potential determinants (e.g. body image, motives to physical activity, school environment, degree of urbanization, perceived activity-friendly environment). This chapter explores the theoretical background of this research and describes the aim of the study, its theoretical model, its research questions and the structure of the thesis as a whole.

1.1 Active living during adolescence

Active living is an approach to life that values and includes physical activity in everyday living. Active living has been proposed as a core issue in adolescents' lives, based on the notion that good youth development requires more than just being free of risky health-related behaviours (Roth & Brooks-Gunn, 2003), i.e. a series of healthy behaviours is needed that all regard as being active. Lerner coined the phrase 'active living' as one of the important components of the Positive Youth Development theory (Lerner 2005). It was based on the premise that every individual possesses certain strengths which need to be nurtured through appropriate contextual assets. The need for active living during adolescence has substantially risen over the past decade (Zick, 2010). A recent study of Reis et al. (2016) appeals to the need to get people moving and to make the active living of adolescents a more desirable, affordable, and accessible choice. In addition, the new Canadian 24-Hour Movement Guidelines for Children and Youth emphasize the integration of all movement behaviours that occur over a whole day (i.e., light, moderate and vigorous physical activity, sedentary behaviour and sleep) (Latimer-Cheung et al., 2016). These guidelines shift the paradigm away from considering each behaviour in isolation.

1.2 Physical activity in adolescents

Adolescence is a period of extensive psychological change, such as the need to explore, growing independence and the need for peer acceptance and family support. Therefore, explaining physical activity is complex, especially in the target group of adolescents, since many accompanying physical, cognitive and social developmental changes are taking place.

Regular physical activity leads to physical and mental health benefits, which can make an important contribution to improving physical

and psychological quality of life (Penedo, Dahn, 2005). It may also improve academic and cognitive performance (Strong et al., 2005). Low levels of physical activity during adolescence contribute to obesity and poor health outcomes (Penedo, Dahn, 2005; Strong et al., 2005; Hallal et al., 2006; Iannotti et al., 2009; Sallis et al., 2016; Carson et al., 2016). The benefits of an active childhood can carry over into adulthood. Establishment of healthy patterns of physical activity during childhood and adolescence is important, because physical activity moderately follows during adolescence and from adolescence to adulthood (Telama et al., 2009). Further, physical activity plays an important role in establishing, enjoying and maintaining social relationships. Finally, it provides a direct benefit by contributing to physical appearance through increased fitness and strength, as well as weight control (Allison et al., 2005). Generally, findings on physical activity in young people reveal that younger adolescents, boys and adolescents from highly affluent families tend to meet physical activity recommendations, but other groups only to a limited degree (Nader et al., 2008; Kalman et al., 2015a; Inchley et al., 2016; Kopcakova et al., 2017).

Appropriate guidelines for physical activity at the population level, for example, in terms of intensity and duration, have been widely debated in recent years. Based on the existing evidence, the WHO recommends (WHO, 2010; WHO, 2016) firstly that children and young people should participate in at least 60 minutes of moderate- to vigorous-intensity physical activity every day. Secondly, WHO states that amounts of physical activity greater than 60 minutes is likely to provide additional health benefits.

1.3 Screen-based activities in adolescents

Adolescents spend most of their time sitting during the school day. Sitting and being quiet is often seen as a desired behaviour. In leisure time, sitting and consuming screen-based activities (e.g., watching TV, surfing the internet) is also very common (Bucksch et al., 2016), though not a particularly desired behaviour.

Sedentary behaviour is a complex behaviour, and according to Tremblay et al. (2011), it represents “a distinct class of behaviours (e.g. sitting, watching TV) characterised by little physical movement and low energy expenditure”. Similar to physical activity that can be classified by type, context, location, frequency, duration and intensity, being sedentary also has a multi-dimensional nature (Bucksch et al., 2016; Cui et al., 2011). In general, sedentary behaviour can be subdivided into screen-based activities (e.g. watching TV, playing computer games, working with computer) and non-screen-based activities (e.g. motorised transport, social activities, personal care) (Pate et al., 2011). Studies that identify sedentary behaviour as risk behaviour from a public health perspective

highlight the need to examine sedentary behaviours in more detail and to address their health consequences (e.g. Biswas et al. 2015).

Growing evidence suggests that screen-based activities are associated with a range of negative health outcomes (e.g. an important risk factor for physical, psychological and socio-emotional health), independent of physical activity (Carson et al., 2016). These include an increased risk of cardio-metabolic disease, all-cause mortality, and a range of physiological and psychological conditions in adults (de Rezende et al., 2014; Biswas et al., 2015). Generally, findings on screen-based activities in young people reveal that older adolescents and adolescents from lowly affluent families tend to do more excessive screen-based activities (Bucksch et al., 2016; Stierlin et al., 2015; Christian et al., 2015; Kopcakova et al., 2017). Gender patterns for the use of some screen-based activities differ, with girls tending to use computers for social purposes and boys for gaming (Inchley et al., 2016).

Based on the current evidence guidelines regarding screen-based activities refer mostly to reducing these activities and further sedentary activities to no more than two hours in leisure time per day (Trembley et al., 2011). A more recent approach takes into account the interplay and interaction between light and moderate physical activity, sedentary behaviour and sleep. It proposes a 24-movement guideline which integrates all behaviours instead of separating them into different isolated recommendations (Trembley et al., 2011; Chaput & Dutil, 2016).

1.4 Physical activity and screen-based activities in the context of a socio-ecological approach during adolescence

Both physical activity and screen-based activities have an important impact on youth development (Currie et al., 2012; Badura et al., 2015; Inchley et al., 2016). Higher levels of physical activity and lower levels of screen-based activities are of major importance for the development of youth and for their physical, psychological and socio-emotional health. This also underlines the need for a better understanding of the determinants of daily physical activity and screen-based activities among children and adolescents. Better understanding of this might be a prerequisite to develop from healthy adolescents into healthy adults. Figure 1.1 represents the conceptualisation of sedentary behaviour relative to active behaviours in terms of energy expenditure (British Heart Foundation National Centre for Physical Activity and Health, 2012). Energy expenditure is the amount of energy or calories that a person needs to carry out a physical function, such as breathing, circulating blood, digesting food, or physical movement. To prevent weight gain, energy intake or calorie intake must be balanced with energy expenditure. For example, regular physical activity increases energy expenditure, which can help control normal weight.

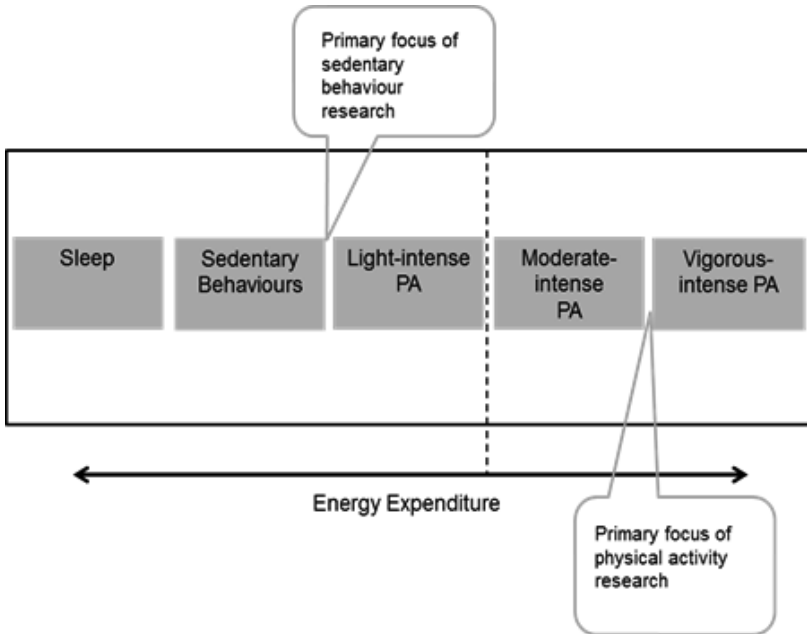


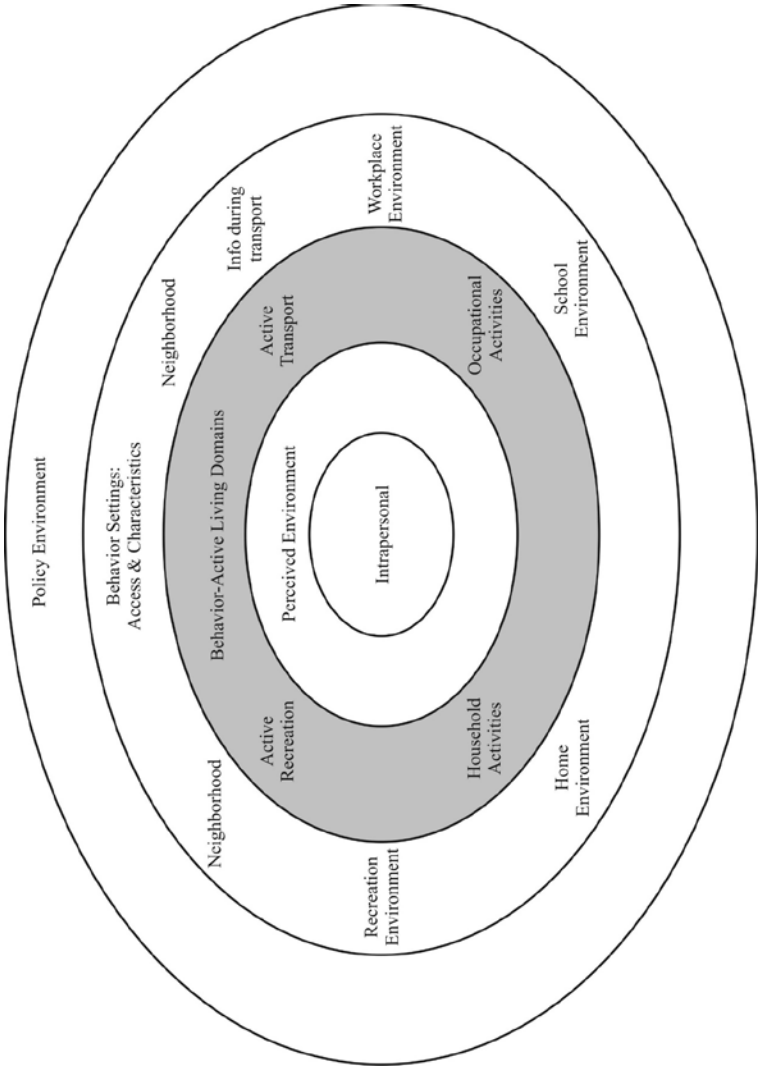
Figure 1.1 Conceptualisation of sedentary behaviours and physical activity (British Heart Foundation National Centre for Physical Activity and Health, 2012)

Next, it might be inferred that more screen-time activities lead to less physical activity; however, screen-time activities and physical activity have been shown to be independent constructs regarding time spent on them, and various studies have highlighted the relative independence of these two behaviours (Mansoubi et al., 2014; Pearson et al., 2014). Young people do not always fall into one group or the other; accordingly it is possible to be highly sedentary and at the same time to meet current physical activity guidelines and vice versa (Pearson et al., 2014). An explanation for this may be that the increase in screen-based activities could, generally, be considered as being at least partially a result of the development of new technologies surrounding adolescents in everyday life.

Both, physical activity and screen-based activities of adolescents could be explained for the purpose of this study in terms of a socio-ecological approach. According to ecological models, higher levels of physical activity and lower levels of screen-based activities are expected when environments and policies support physical activity, when social norms and social support for engagement in physical activity are strong, and when individuals are motivated and educated to be active (Sallis et al., 2006). Currently, ecological models are frequently used to gain insight into the factors that determine physical activity levels and

sedentary behaviour. Both physical activity and screen-based activities of adolescents can be explained in terms of a socio-ecological approach (Sallis et al., 2008), and the research included in this thesis can be fully framed by this model. Therefore, Figure 1.2 represents the ecological model of active living (Sallis et al., 2006) as adolescent's interaction with their physical and socio-cultural surroundings. For the purpose of this thesis determinants of physical activity and screen-based activities will be discussed as the associations of these behaviours with intrapersonal level, perceived environment and environmental setting of behaviour.

Figure 1.2 Ecological model of active living (Sallis et al., 2006- modified)



1.4.1 Determinants of physical activity in adolescents

An overview of potential determinants of physical activity at different levels of influence is given in a review of Bauman et al. (2012). Key determinants include demographic factors (younger age, male), psychological factors (such as perceived competence, self-efficacy), social and cultural factors (such as social support for physical activity from parents and peers) and the physical environment (such as walkability, proximity to recreation facilities) (Bauman et al., 2012).

In general, two approaches have been identified to seek determinants of physical activity behaviour (Biddle & Nigg, 2000). The first approach focuses on a variety of motivational theories, including the Social Cognitive Theory, the Theory of Planned Behaviour, or the Self-Determination Theory (Biddle & Nigg, 2000; McKenna & Ridloch, 2005). These theories assume complex cognitive processes, including self-evaluation, goal setting and planning. The key constructs include self-efficacy, outcome expectations, perceived social norms, behavioural attitudes, perceived behavioural control, perceived competence and autonomy. The second approach is a more descriptive or empirical approach and mostly identifies the correlations between potential determinants of physical activity and physical activity behaviour itself. Since a long list of potential determinants from very different levels of influence has been identified in recent decades, these potential determinants have highlighted the significance of a socio-ecological approach to explain physical activity behaviour in a comprehensive framework (Bauman et al., 2012; Ward et al. 2007). In addition to the already mentioned approach, the socio-ecological approach frames the interplay between the social and physical environment-, and individual characteristics (Sallis et al., 2006; Sallis et al., 2008). In this section the associations of physical activity with the intrapersonal level, perceived environment and environmental setting of behaviour are discussed.

Intrapersonal level

Firstly, the intrapersonal level in the ecological model of active living (Sallis et al., 2006) among adolescents is discussed. One of its constructs is body image. Body image is a multidimensional construct with attitudinal, perceptual and also behavioural components (Verplanken et al., 2008) covering various attributes like muscularity, leanness and body weight. We pay special attention to dissatisfaction with body weight as a component of body image, as it has a particular importance due to its association with subjective well-being (Verplanken et al., 2008; Meland et al., 2007) and weight-control behaviour, which may manifest itself in both unhealthy (e.g., fasting, purging, smoking and extreme diets or training) and healthy (e.g., healthy diet, appropriate physical activity) lifestyles

(Inchley et al., 2016). Body-weight satisfaction may change remarkably during adolescence (especially in puberty) due to rapid and significant somatic changes and may then have an impact on mental well-being and behaviour (Currie et al., 2012; Inchley et al., 2016). Most of the available evidence shows that a more developed pubertal status is associated with a less positive body image, increased body dissatisfaction and increased internalization of thin ideals (Slater & Tiggemann, 2011; Currie et al., 2012).

Dissatisfaction with body weight on average intensifies across adolescence among girls while remaining constant among boys (Currie et al., 2012). Dissatisfaction with body weight seems to be associated with a negative body image (Currie et al., 2014), and gender might modify its effect. The international Health Behaviour in School-Aged Children (HBSC) study has shown that gender-specific patterns on body image exist, consistent with other studies (Currie et al., 2012; Konstanski et al., 2004; Austin et al., 2009), i.e. that girls have a significantly higher prevalence in perceiving their body as being too fat compared with boys. On the other hand, the pathway to boys' body dissatisfaction might go through an internalised commitment to muscularity (Rodgers et al., 2012) and might be related to both underweight and overweight/obesity. According to the findings of Currie et al. (2012), boys and girls in Western and Central Europe are more likely to report being "too fat" than boys and girls in Eastern Europe.

Moreover, motivation has already been shown to be a personal characteristic that may be one of the key factors for understanding why some people are physically active in their leisure time (Aaltonen et al., 2014). Motivation as a central point of the Self-Determination Theory is mostly explored in terms of intrinsic versus extrinsic motivation. Intrinsic motivation is completely self-determined and is reflected in behaviour performed for the pleasure in and stimulation by the activity itself (Ryan, Deci, 2000). More intrinsic, self-determined forms of motivation are associated with optimal functioning and well-being (Ryan, Deci, 2000). Regarding physical activity, adolescents who were intrinsically motivated were more likely to be physically active (Power et al., 2011). The Goal Contents Theory, a theory belonging to the Self-Determination Theory field, does not only distinguish between intrinsic and extrinsic goals and their impact on motivation and wellness. The Goal Contents Theory more specifically outlines extrinsic goals, such as financial success, appearance and popularity/fame, contrasting these with intrinsic goals, such as community, close relationships and personal growth, with the former more likely to be associated with lower wellness and greater ill-being (Ryan, Deci, 2000; Deci, Ryan, 1985). As suggested by several studies, one of the potential pathways leading to an increase in levels of physical activity is through their associations with particular motives for physical

activity (e.g. Nigg, 2003; Kopcakova et al, 2015; Iannotti et al., 2013; Wold et al., 2015). A better understanding of motives for being physically active or inactive could significantly contribute to evidence-based development of national strategies for public health and active living (Kopcakova et al, 2015; Kalman et al., 2015b; Jodkowska et al., 2015) and may increase the effects of interventions.

Perceived environment

Next, we discuss perceived environment as a part of the ecological model among adolescents. Adolescents' perceptions of environments are distinguished from more objective aspects of environments, and intrapersonal level together with perceived environment are likely to be important influences on active living (Sallis et al., 2006). Besides determining the environment objectively, it is also possible to determine the neighbourhood environment subjectively. The subjectively perceived environment of children as well as the perceptions of parents is most frequently used in research investigating the physical environment. An environment perceived as activity-friendly may affect physical activity, but the mechanism is not clear. Recent evidence from an international cross-sectional study among adults suggests that a physical activity-friendly environment may be important for the promotion of physical activity (Sallis et al., 2016). However, studies among adolescents within a European context are scarce (Ding et al., 2011; Ommundsen et al., 2008). To our knowledge, one exception is a study of Bucksch et al. (submitted) among adolescents from four European countries, which found consistent findings on perceived environment and physical activity among boys and girls. It highlights the importance for children of having others at home or nearby to play with and be active.

The environmental setting of behaviour

Last but not least, we discuss in this section the environmental setting of behaviour as part of the ecological model among adolescents. The environmental setting of behaviour is the place where physical activity of adolescents may occur, and it is useful to consider both access to settings and their specific characteristics. To understand the influences on adolescent's activity patterns it might be helpful to first understand the influence of the built environment, such as the level of roads, parks, public transport, housing etc. which can have a positive or negative affect depending on design or location. In this chapter the accessibility of different sports facilities at school, active breaks at school and degree of urbanization need to be discussed. The HBSC study has shown that the physical environmental characteristics of schools (i.e. facilities for physical activity) relate to students' daily physical activity at school (Haug et al., 2008; Haug et al., 2010). Some of the school environmental effects may

in fact be due to the socio-economic position of individuals (Rydin et al., 2012). A review of Ding et al. (2011) found that the most consistent associations were found between objectively measured environmental attributes and self-reported physical activity.

1.4.2 Determinants of screen-based activities in adolescents

It is important to note that the determinants of physical activity and sedentary behaviour differ and might have an opposite meaning for one or the other behaviour (Van der Horst et al., 2007). Increasing evidence suggests that screen-based activities are associated with a range of negative health outcomes, independent of physical activity (de Rezende et al., 2014; Biswas et al., 2015). However, the quality of the studies in this area is limited, and only a few prospective studies exist, since most studies only focus on TV watching. Drawing on a number of different reviews, the following correlates might be promising to focus on in interventions in adolescence (Pate et al., 2011; Salmon et al., 2011; Stierlin et al., 2015): psycho-social, social and environmental (e.g. Brindova et al., 2014; Brindova et al., 2015; Sigmundova et al., 2014a; Kopcakova et al., under review). In addition, most knowledge is on sociodemographic (e.g. sex or age) correlates that cannot be modified (Kopcakova et al., under review; Stierlin et al., 2015).

In addition, regarding screen-based activities an overview of potential determinants at different levels of influence is given in a review of Chastin et al. (2016). Their study also shows a new framework, called systems of sedentary behaviours, which is based on a socio-ecological approach. From a theoretical point of view sedentary behaviour can only be explained by determinants from different levels of influence within a socio-ecological approach (Chastin et al., 2016) and is currently applied to the area of sedentariness in adults (Owen et al., 2010) as well as in children and adolescents (Salmon et al., 2011). In this section we discuss the associations of screen-based activities with the adolescents' perceived environment and the environmental setting of behaviour.

Perceived environment

An environment perceived as activity-friendly may affect screen-based activities in both a positive and a negative way. Most studies to date have focused on demographic and behavioural variables (Stierlin et al. 2015; Chastin et al. 2016). Findings indicate that correlates of the social and physical environment, such as having rules for restricting TV use (Bjelland et al. 2015) or a physical activity-friendly neighbourhood, are associated with reduced screen-time activities (Veitch et al. 2011). Also, a study of Bucksch et al. (submitted) from Central European countries found that if girls and boys have to tell their parents where they are when they go out and play, they are more likely to report lower screen-

time activities. Moreover, it was found that high involvement in screen-based activities, particularly working with a computer, was associated with health complaints among adolescents, and these associations were not moderated by physical activity (Brindova et al., 2015). In addition, the social environment seems to play an important role for adolescent's screen-time activities by providing a social network and social support (Sawka et al. 2013; Macdonald-Wallis et al. 2012; Stierlin et al. 2015). Interestingly, most evidence is derived from individual countries not from Central Europe (Ommundsen et al., 2008) or outside Europe, such as the USA and Australia (Ding et al. 2011; Stierlin et al. 2015).

The environmental setting of behaviour

In this section we will discuss the environmental setting of behaviour, such as the school environment, active breaks and degree of urbanization, as determinants of screen-based activities in adolescents. As adolescents spend a considerable portion of their day at school, school institutional factors may be important determinants of students' health and health behaviour (Spence & Lee, 2003). This may, for instance, be due to the physical environment a school offers and the social environment, with various social connections between students (King et al., 2002). In a recent review, Stierlin et al. (2015) found that for most environmental settings of behaviour and screen-based activities there is no evidence or inconsistent evidence for an association. However, some of the school environmental effects may in fact be due to the socio-economic position of adolescents (Rydin et al., 2012). Adolescents who live in lower socio-economic neighbourhoods are spending more time with screen-based activities (Brodersen et al., 2007).

1.5 Aim of the study and research questions

The general aim of this thesis is to examine the relationships of adolescents' physical activity and screen-based activities and the associations of these behaviours with potential determinants (e.g. body image, motives to physical activity, school environment, degree of urbanization, perceived activity-friendly environment). Additionally, this thesis explores the role of gender, age and socioeconomic differences in these associations.

Figure 1.3 presents the model of the relationships as examined within this thesis.

Five main research questions were formulated based on the previously stated aims.

Research question 1:

Do associations of body image and gender with physical activity exist? (Chapter 3)

Research question 2:

Is there an association between motives for physical activity and the level of physical activity among adolescent boys and girls? (Chapter 4)

Research question 3:

Are the motives for undertaking physical activity items from the HBSC questionnaire reliable among adolescents and does this reliability differ by gender, age group and country? (Chapter 5)

Research question 4:

Are the accessibility of sports facilities at school, active recess and degree of urbanization of the living area supportive for being more physically active and engaging less in screen-based activities among adolescents? (Chapter 6)

Research question 5:

Is a perceived activity-friendly environment associated with adolescent's behaviour in terms of physical activity and screen-based activities? (Chapter 7)

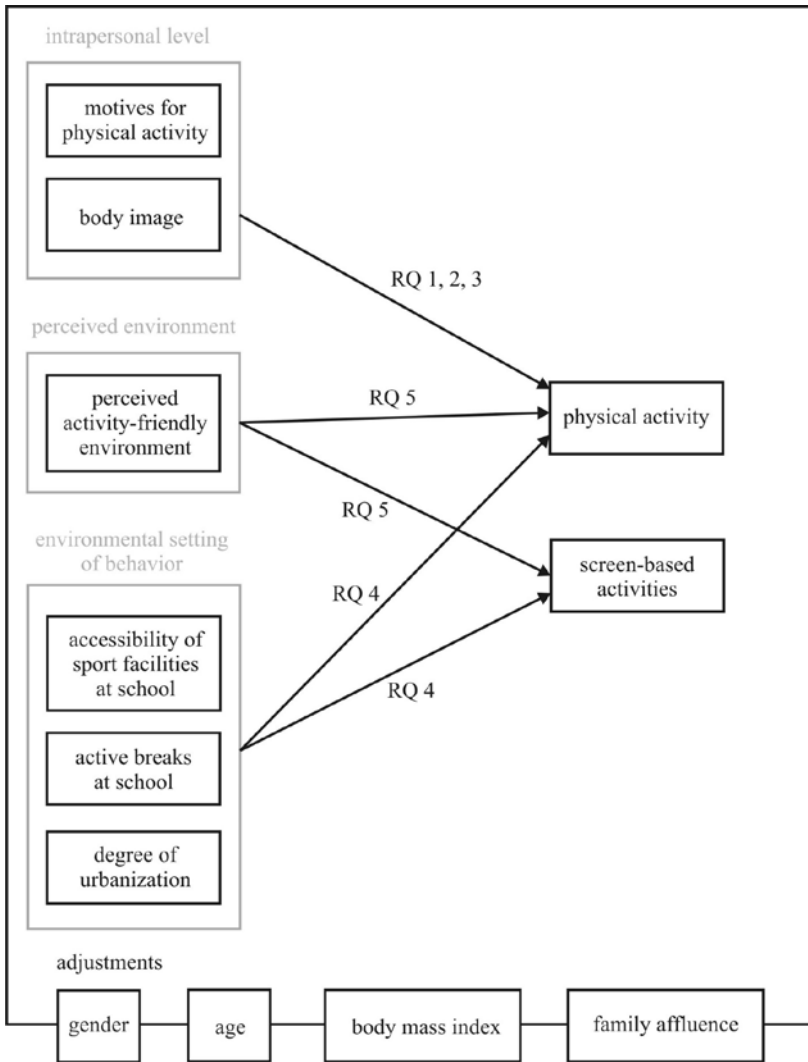


Figure 1.3 Model of the relationships examined in the thesis.

1.6 Outline of the thesis

Chapter 1 provides general information and the scientific background on the key theoretical constructs of this thesis – physical activity, screen-based behaviour – and the associations of these behaviours with their determinants. The aim of the study as well as the research questions are formulated in this chapter.

Chapter 2 provides the description of the five research samples used in this thesis. It also provides information on the design of the study, measures and statistical analyses.

Chapter 3 focuses on the association of body image with physical activity of adolescents, and on whether gender modifies these associations.

Chapter 4 explores the connection between the motives for physical activity and the level of physical activity in adolescence and potential gender-related differences regarding this connection.

Chapter 5 investigates the test-retest reliability of the motives for undertaking physical activity items from the HBSC questionnaire among adolescents, and whether this reliability differs by gender, age group and country.

Chapter 6 assesses whether the accessibility of sports facilities at school, active breaks and degree of urbanization are associated with physical activity and screen-based activities among adolescents and whether these associations are modified by degree of urbanization.

Chapter 7 explores the association of the perception of activity-friendliness of the environment with physical activity and screen-based activities among adolescents.

Chapter 8 summarises and discusses the main findings of this thesis. It also explores the strengths and limitations of the study and the study's implications for practice and policy, as well as further research.