UNIVERSITY OF AGDER

Moderators of self-reported screen time and breaks in screen time among 10-12 years old European children

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This master's thesis is carried out as a part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

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ABSTRACT

Introduction: To date it is unknown whether there are moderating variables for the associations between children's self-reported screen time and breaks in screen time and objectively measured sedentary time and breaks in sedentary time. The aim of the present study was to examine whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were moderated by gender, ethnicity, children's moderate-to vigorous physical activity (MVPA), parents' educational level, parents' screen time and breaks in screen time and parents physical activity (PA).

Methods: Screen time and breaks in screen time were assessed with questionnaires in a sample of 445 children (10-12 years) in Belgium, Greece, Hungary and Norway. Parents' screen time, breaks in screen time, parents' PA and demographics were also assessed with questionnaires. Accelerometers measured sedentary time per day and breaks in sedentary time per day and MVPA (children only). Bivariate and multivariate linear regression analyses were applied to assess the associations between the independent variables and the dependent variables. Interaction terms were added in the final model to examine whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were moderated by the significant independent variables.

Results: No statistical significant interactions were found between the significant independent variables. Country specific significant associations were found between self-reported screen time and gender, parents' screen time, parents' educational level and accelerometer assessed sedentary time. Country specific associations were found between self-reported breaks during one hour of screen time and parents' educational level and ethnicity.

Conclusion: The associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks were not moderated by gender, ethnicity, MVPA, parents' educational level, parents' self-reported screen time and breaks in screen time and parents' PA.

Keywords: children, sedentary behavior, screen time, breaks, questionnaire, accelerometer, measurement.

SAMMENDRAG

Introduksjon: Per dags dato er det uvisst om det finnes variabler som modererer sammenhengen mellom selvrapportert skjermtid og pauser i skjermtid og objektivt målt sittetid og pauser i sittetid blant barn. Hensikten med denne studien var derfor å undersøke om denne sammenhengen modereres av kjønn, etnisitet, fysisk aktivitet av moderat-høy intensitet, foreldres utdanningsnivå, foreldres skjermtid og pauser i skjermtid, samt foreldres fysiske aktivitet.

Metode: Spørreskjema ble benyttet til å undersøke skjermtid og pauser i skjermtid i et utvalg bestående av 445 barn (10-12 år) i Belgia, Hellas, Ungarn og Norge. Foreldres skjermtid, pauser i skjermtid, fysisk aktivitet og demografisk informasjon ble også undersøkt med spørreskjema. Barnas totale sittetid/dag, pauser i sittetid/dag og fysisk aktivitet av moderat-høy intensitet ble målt med akselerometer. Bivariat og multivariat lineær regresjon ble benyttet for å undersøke sammenhengen mellom de uavhengige og avhengige variablene. I den endelige modellen ble interaksjonsledd lagt inn for å undersøke om signifikante uavhengige variabler modererte sammenhengen mellom selvrapportert skjermtid og pauser i skjermtid og akselerometermålt sittetid og pauser i sittetid.

Resultat: Det ble ikke funnet noen statistisk signifikante interaksjoner mellom noen av de signifikante uavhengige variablene. I enkelte land ble signifikante sammenhenger funnet mellom selvrapportert skjermtid og kjønn, foreldres skjermtid, foreldres utdanningsnivå og akselerometermålt sittetid. I enkelte land ble også signifikante sammenhenger funnet mellom selvrapporterte pauser i skjermtid og foreldres utdanningsnivå og etnisitet.

Konklusjon: Sammenhengen mellom selvrapportert skjermtid og pauser i skjermtid og akselerometermålt sittetid og pauser ble ikke moderert av kjønn, etnisitet, fysisk aktivitet av moderat-høy intensitet, foreldres utdanningsnivå, foreldres skjermtid og pauser i skjermtid og foreldres fysiske aktivitet.

Nøkkelord: barn, sittetid, skjermtid, pauser, spørreskjema, akselerometer, målemetoder

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PART ONE:

Theoretical background, methods and discussion of methods

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1.0 Introduction

On a population level children spend a large proportion of their waking time being sedentary, which is worrying as there is evidence suggesting that high levels of sedentary time are associated with increased cardio metabolic risk in children (1). In addition to the total volume of sedentary time, the manner in which sedentary time is accumulated is also important. Evidence is suggesting that frequent breaks in sedentary time are beneficially associated with indicators of health risks (2).

Despite increased knowledge on the negative health impacts of high volumes of time spent sedentary, there is still no clear consensus regarding the most valid and reliable measurement of sedentary time (3,4). Valid and reliable instruments for assessing sedentary time are essential when investigating the health impacts of sedentary time, for understanding any dose–response relationship between sedentary time and health outcomes, to identify predictors and correlates of sedentary time, and to evaluate the effect of interventions aimed at reducing sedentary time (5,6).

A large proportion of the former research on sedentary time has relied on self–reports of specific behaviors, in which television viewing is the most common assessed behavior (3). In several studies, consistent associations between self-reported time spent watching television and detrimental health outcomes have been found (1, 7-9). Despite the frequent use of self-reports, the validity and reliability of the measures is rarely provided, meaning that results from studies in which the validity of the self-reports is unknown must be interpreted with caution (6, 10).

Disagreements in physical activity assessed by self-report and accelerometers have been found in subgroups of gender, age, weight status, educational level and ethnicity (11, 12). On average, self-reported physical activity was overestimated compared to accelerometers, both among adolescents and adults (11, 12). However, the degree of overestimation may vary among subgroups. For example, greater disagreements were found among adolescent girls than adolescent boys, i.e. girls were more likely to overestimate their level of physical activity (11). Thus, it seems like individual and grouping variables may affect the accuracy of self-reported physical activity.

When assessing sedentary behavior in children, associations between self–reported sedentary time (mainly screen time) and accelerometer assessed sedentary time have been found (13). However, to date we do not know whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time may be moderated by any of the same variables that have been found to moderate self-reported physical activity. No studies have yet examined whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time are moderated by gender, ethnicity (defined from both parents born in home country or not), children's moderate-to vigorous physical activity (MVPA), parents' educational level, parents' self-reported screen time and breaks in screen time and parents' self-reported physical activity (PA).

1.1 Aims of the study

The objectives of the present study were:

1.To examine whether the associations between self-reported screen time and accelerometer assessed sedentary time, are moderated by gender, ethnicity, MVPA, parents' educational level, parents' screen time and parents' PA.

2.To examine whether the associations between self-reported breaks in screen time and accelerometer assessed breaks in sedentary time, are moderated by gender, ethnicity, MVPA, parents' educational level, parents' self-reported breaks during screen time and parents' PA.

2.0 Theoretical framework

2.1 Conceptual clarification

The term "sedentary" is often used as a synonym for "lack of MVPA, which is incorrect as being sedentary and performing too little MVPA are distinct concepts with independent relationships towards health indicators (14). Too much time spent sedentary is related to negative health outcomes that are independent of whether the recommended guidelines for physical activity are met, and therefore it is important to provide a frame of reference to distinguish the concept "sedentary" from "too little physical activity" (15).

Sedentary behaviors may be referred to as: "activities that do not increase energy expenditure substantially above the resting level and includes activities such as sleeping, sitting, lying down, watching television and other forms of screen-based entertainment" (16, p 174). Explained in the means of energy expenditure, sedentary behavior includes activities that involve energy expenditure at the level of 1.0–1.5 metabolic equivalent units (MET) (16). MET is commonly used to express the energy cost of physical activity, and is based on the relationship between resting metabolic rate (RMR) and energy expenditure during physical activity. One MET equals the energy cost during rest, often defined in terms of oxygen uptake as 3.5 ml/kg/min (16). Interruptions in sedentary time for at least one minute may be considered as a break (2). The activities performed during interruptions in sedentary time are likely to be different between individuals, and may include activities as light in intensity as standing up from a sitting position or walking a few steps (2).

On the other hand, physical activity is referred to as: "any bodily movement produced by the skeletal muscles that results in energy expenditure that are substantially above the resting level" (17). Moderate intensity physical activity involves energy expenditure at the level of 3.0–5.9 MET's, whereas vigorous intensity physical activity is characterized by energy expenditure ≥ 6 MET's (18). There is now broad consensus that MVPA has beneficial effects on several health outcomes, and prescriptive guidelines on how regular engagement in physical activity can promote and maintain health, as well as reduce the risk of chronic disease and premature mortality have been developed (15, 19). To obtain desired health and behavioral outcomes of physical activity, it is recommended that school-aged children participate in ≥ 60 minutes of MVPA on a daily basis, performing activities that are enjoyable and developmentally appropriate (20).

As evidence are suggesting that the negative health effects of being sedentary may be attenuated by including breaks in prolonged periods of sedentary behavior, recommendations towards reducing time spent sedentary have recently been published as well (21). Regardless of exercise habits, it is recommended to reduce the total time spent sedentary and break up prolonged periods of sedentary behavior by including short bouts of physical activity and standing (21).

2.2 Sedentary behavior among children and youth

The availability of sedentary forms of entertainment has increased in the recent decades, as well as the reliance on physically active transport has been reduced (22). These changes have influenced the activity behavior of both children and adults, leading to increased time spent sedentary and a decline in physical activity (22). Children spend a great deal of time in screen based-sedentary behaviors, as well as they engage in other sedentary behaviors too, i.e. reading and talking on the phone (22, 23).

In general, boys spend more time engaged in screen-based behaviors compared to girls (23). In their study, Klitsie et al (23) also reported that boys had higher volumes of total time spent sedentary compared to girls. However, this is contrary to findings from other studies reporting that in total, girls accumulate more time spent sedentary compared to boys (24, 25). Children from low socioeconomic (SES) backgrounds are found to spend more time engaged in screen time behaviors compared to children from high SES backgrounds, whereas overall sedentary time is found to be equal among children from low and high SES backgrounds (26).

Steele et al (27) reported that 10 years old boys and girls in the United Kingdom spent 7.5 and 7.7 h/day respectively being sedentary, and similar trends have been reported in children from other European countries as well (24, 28). In a sample of 10–12 years old Belgian children, accelerometer-derived sedentary time revealed that approximately 60 % of their waking time was spent sedentary (24). Furthermore, in the U.S., 6–11 years old boys and girls spent 6.0 and 6.1 h/day respectively being sedentary, whereas older boys and girls aged 12-15 years spent 7.4/h and 7.7 h/day respectively being sedentary (25).

In addition to the high volumes of time spent sedentary, the levels of physical activity among children are in general low (29). Many children do not meet the current physical activity

guidelines suggesting that children should engage in at least 60 minutes of MVPA on a daily basis (20, 29). It is also recognized that even children who meet the recommended guidelines spend the majority of their leisure time being sedentary (29). However, in a representative sample of 9- and 15 year old Norwegian children and adolescents, four out of five 9 year old children met the guidelines for physical activity, but only half of the adolescents did (30). These findings indicate a negative association between age and physical activity. Thus, as age increases, the level of physical activity seems to decrease (30). For time spent sedentary the association is positive, meaning that time spent sedentary seems to increase as age increases (31).

2.3 Sedentary behavior and health

In the last decades, the prevalence of overweight and obesity in children has increased (32). Low levels of physical activity have been associated with obesity and therefore, increased physical activity has been considered as an important target in means of preventing and managing overweight and obesity in children (33, 34). In the recent years however, time spent sedentary has also been highlighted as a contributor to the development of overweight and obesity in children, leading to increased attention towards sedentary time in means of managing and preventing overweight (33).

Sedentary time has been associated with detrimental health outcomes, and high volumes of time spent sedentary is now considered as a risk factor for some chronic diseases in adults (35). The associations between sedentary time and detrimental health outcomes have been found to be independent of time spent in MVPA, thus it seems like they cannot fully be compensated for by being more physically active (35). For example, Matthews et al (36) found that even individuals who participated in ≥7 hours of MVPA per week, but who also watched ≥7 hours of television per day, still had a 50 % greater risk of death from all causes. Thus, high levels of MVPA did not fully protect for mortality risk. However, it seems like individuals who according to the guidelines for physical activity are not sufficiently engaged in MVPA, have greater benefits of reducing time spent sedentary compared to those who are engaged in at least 30 minutes of MVPA on a daily basis (36). Matthews et al (36) found that individuals who never or rarely engaged in MVPA and who reported ≥7 hours of television viewing per day, were almost twice as likely to suffer from premature mortality compared to individuals who never or rarely engaged in MVPA and who reported ≤2 hours of television viewing per day.

Further, there is some evidence suggesting that in addition to the total volume of sedentary time, the manner in which sedentary time is accumulated is important as well (2). Frequent breaks in prolonged periods of sedentary behavior leads to increased total energy expenditure, which may provide beneficial metabolic effects that are independent of the total time spent sedentary and MVPA (2).

The associations of time spent sedentary and detrimental health outcomes are inconsistent in children (28). Some positive associations between sedentary time and health indicators in children have been found, but in these studies the researchers did not control for MVPA, which is a limitation as MVPA is an independent predictor of health risks (28, 37-38). However, in their study, Vaisto et al (1) examined the independent and combined associations of sedentary time and physical activity with cardiometabolic risk in children. The cardiometabolic risk score decreased with increasing physical activity, whereas the risk score increased with higher levels of electronic media time and lower levels of physical activity. The lowest risk score was among children with high levels of physical activity and low levels of electronic media time. Further, screen time behaviors, in particular television viewing, have been associated with obesity in children (39). Overweight and obesity in children are a major public health problem as they are found to track from childhood to adulthood, as well as being associated with several negative health outcomes (40, 41). In addition, television viewing is related to other important health indicators in youth, i.e. unfavorable body composition, decreased fitness, self–esteem, pro-social behavior and academic achievement (41).

Although more high–quality studies with a longitudinal design are needed to confirm the relationships between sedentary time and health indicators in children, reducing and breaking up sedentary time in children seems to be an important aim for public health strategies (1, 24, 28).

2.4 Measures of sedentary time

Sedentary behaviors are a relatively new field of research, and there is a need to expand the evidence base to better understand the health impacts of time spent sedentary and to develop effective interventions aimed at reducing sedentary time (42, 43). For this reason, valid and reliable measures of sedentary time are important (3). Although several measures are being used, there is no consensus on which method is the most appropriate for measuring sedentary time (4).

The previous focus on physical activity in means of preventing and managing overweight and obesity has lead to several studies exploring methodological issues regarding the assessment of physical activity in children and adolescents, while methodological issues regarding the assessment of sedentary time have received less attention (6). One issue related to the measurement of sedentary time is the fact that in many previous studies, the researchers probably did not measure sedentary time directly (16). Instead, sedentary has been defined as the absence of MVPA. Thus, study participants who were classified as sedentary were actually those who did not meet the criteria for MVPA (16).

It is difficult to assess sedentary time accurately as time spent sedentary is not limited to one single behavior, but instead consist of a variety of behaviors occurring at different times of the day and in multiple locations (3, 4). To provide comprehensive measures of sedentary time, the method of measurement should provide insight in which behavior is undertaken, as well as the context of which it occurs, the duration and total volume of sedentary time (4).

In a substantial amount of the previous studies on sedentary behavior in both children and adults, self-reported television viewing has been used as a proxy measure of sedentary time (6). Although children spend a great deal of time engaged in screen time behaviors, measures of single behaviors may fail to capture the complexity and diversity of children's behavioral patterns (6, 44). In their study, Biddle et al (44) examined whether television viewing represented a wider pattern of sedentary behaviors in teenagers. High levels of television time were associated with less time spent in other sedentary behaviors, as well as television time occupied only 32-56 % of overall sedentary time (44). These findings suggest that television viewing is an important and prevalent sedentary behavior, but does not appear to be a good marker of overall sedentary time in teenagers (44).

2.4.1 Subjective measurements

Self – reports

As screen time behaviors are prevalent among children and adolescents, self-reported screen time is commonly used to assess sedentary time (45). Measures of specific behaviors in specific domains may be less prone to recall errors than measures of overall sedentary time. However, single item questionnaires do not seem to reflect overall sedentary time, and therefore questionnaires should be designed to assess more than just one single behavior (46).

Some of the reasons for the widespread usage of self-reports in large population studies are the low costs and the easy administration, as well as the relatively low participant burden (3-6). Further, self-reports have the ability to capture all dimensions of sedentary time, including specific behaviors, frequency, duration, domain and the context of which sedentary behaviors occurs (47). These features are important as this information can be used to inform intervention design (3).

However, self–reports are known to be prone to several measurement errors as a result of recall error, misrepresentations and social desirability (4). Self-reports are cognitive demanding, and findings from previous studies on physical activity are suggesting that the usage of self-reports should be avoided in children younger than 10 years old (48). Time spent sedentary may be even more difficult to remember than activities of higher intensity, as well as children and adolescents may have more difficulty recalling and processing intermittent complex information about past sedentary behavior compared to adults (49, 50). In this context, it is worth mentioning that some of the limitations associated with questionnaires can be overcome by using diaries. When using diaries, the participant prospectively records the main activity undertaken during a specified time interval, and therefore has the potential to provide a more detailed assessment of time spent sedentary than single-item questionnaires (3, 4). Further, measurements errors due to recall problems may be reduced as the assessment is done as the behavior occurs or very close to when it occurs (4). However, this method may lead to reactivity in the participants, as well as it carries a high degree of both researcher and participant burden (3, 4).

Another key limitation of self-reports used to measure sedentary time, is that they consistently demonstrate poor validity (4). In their review of the reliability and validity of self-reports assessing sedentary time, Lubans et al (6) reported that in thirteen studies assessing the reliability of self-reports, seven demonstrated acceptable test-retest reliability. However, the findings on validity were less consistent (6). For example, sedentary time was heavily underestimated when compared to accelerometers in adults, whereas in another study a questionnaire completed by adolescents demonstrated acceptable validity when compared with accelerometers (51, 52).

Breaks in sedentary time are challenging to measure due to recall errors and misconceptions in terms of the definition of a break (53). Clark et al (53) were the first to examine the validity

of a questionnaire of breaks in sitting using accelerometers as the criterion measure. The self-reported breaks were significantly but not highly correlated with the accelerometer-derived breaks in sedentary time (r_s=0.23 – 0.43). Despite positive results from this study, more research is needed (53).

Thus, although the widespread use of self–reports, there are few studies that examine the associations between questionnaires and an objective measurement (6). Comparison between a questionnaire and a reference measure is difficult, as there is no existing accepted "gold standard" measure of sedentary behavior (3). The lack of an "gold standard" hampers the possibility to validate the self – reports used, and many studies rely on correlating new finding with those from an existing measure (6). This is a possible pitfall in establishing validity as two measures of unknown validity are compared to another, possibly resulting in correlated error (3). Although not accepted as "gold standards", accelerometers or direct observation are often used as criterion measures in studies assessing the validity of questionnaires (6).

2.4.2 Objective measures

To overcome some of the limitations associated with self–reports, objective measures can be used (3). As objective measures are not affected by individual variations in cognitive development, recall issues and social desirability, they can provide measures containing less measurement error (4). Unfortunately, objective methods of measurement are more practical demanding and the financial cost may limit the ability to use objective measures in large population studies (4).

2.4.2.1. Accelerometers

The development of accelerometry as an objective measure of physical activity and sedentary time has opened up new possibilities for studying the health effects of all intensity levels of activity, and accelerometers are frequently used to assess both sedentary time and physical activity (6, 16). An accelerometer is a small and lightweight device that is generally worn on the hip and that measures body movement, more precisely acceleration in one or more planes. The acceleration of the body is a direct measure of body movement and can be used to estimate the amount and intensity of physical activity (54). Further, the acceleration of the body is directly related to the muscle force that is being used, which in turn can be related to energy expenditure (55, 56). Most accelerometers contain a piezoelectric transducer and a

microprocessor that produces an electric signal that is proportional to the forces that are applied during movement (57, 58). Data from the accelerometer is formed by the electric signals that are converted into accelerometer counts per unit of time (59).

The accelerometer counts are a product of the total amount of acceleration during a unit of time. A high number of counts per unit of time indicate high intensity or high levels of physical activity, whereas a low number of counts indicate the opposite (60). The time period over which accelerometer counts are summed and stored is called an "epoch" (59). When examining sedentary time and physical activity in adults, data from the accelerometer is usually expressed as 60 - second epochs. In children, the activity pattern is highly intermittent, and a 15 – second epoch is more appropriate when examining sedentary time and physical activity in children (60).

Accelerometers have several advantages, including that they are easy to use and cause low participant burden. Further, accelerometers can store large amounts of data for prolonged periods of time, as well as they are able to record the total volume of sedentary time and physical activity, the intensity of the activity performed and the patterns of activity (57-59). In addition, one can also set a specific start- and stop time, making it possible to assess physical activity and sedentary time within a given timeframe (61).

Many researchers have used the Actigraph in their studies of sedentary time (62). One important limitation of the older versions of the Actigraph accelerometers (and other older devices) is that they do not detect body posture, i.e. they are not able to distinguish between sitting and standing (3). This in turn means that these accelerometers may fail to capture short activity breaks from sitting and that activities performed standing may be classified as sitting (3). However, newer models of the Actigraph (GT3X, GT3X+) contain an inclinometer that may increase the sensitivity to detect changes in body posture (62). Another limitation is that they are not able to detect activities performed by the upper body due to their attachment at the hip, which may lead to underestimation of activity (58). Further, the devices may also provide insufficient measures of activities causing low acceleration in the hip joint, i.e. cycling (58).

Despite the frequent use of accelerometers to measure physical activity and sedentary time in children, less effort has been made to standardize methods of data collection, processing and interpretation (63). Accelerometer output provides almost dimensionless activity counts, but these counts themselves have no biological meaning (64, 65). In order to make sense, the activity counts have to be converted into biological constructs such as sedentary, light, moderate or vigorous intensity physical activity (65). Counts from the accelerometers are interpreted by using cut-points (intensity thresholds) that are established in empirical studies of the relationship between activity counts and energy expenditure for each type of accelerometer (65). Further, these cut-points are applied to determine whether the wearer was engaged in activities that were sedentary or of light, moderate or vigorous intensity (64).

Both field based and laboratory based validation studies of the Actigraph have been performed, concluding that the Actigraph can provide satisfactorily measures of physical activity (66, 67). In relation to the assessment of sedentary time, research examining the validity of the Actigraph is limited (62). However, in their review of the validity and reliability of sedentary behavior measures used with children and adolescents, Lubans et al (6) reported that in the five studies assessing the Actigraph, the accelerometers provided greater than 80 % sensitivity and specificity for children in all ages. Four studies examined cut-points for the Actigraph, in which three of them reported excellent validity (6).

Reilly et al (68) developed an accelerometer cut-off for sedentary time in 3-4 years old children. Optimal sensitivity and specificity were found at an accelerometer output cut-off of <1100 counts per minute using direct observation as the criterion measurement. Treuth et al (54) developed cut-points for intensity thresholds in adolescents. In their study, 74 girls aged 13-14 years wore the Actigraph accelerometer while performing activities ranging from sedentary to vigorous intensity physical activity. Oxygen consumption, as a measure of energy expenditure, was used as the reference measure. For sedentary time, optimal specificity and sensitivity was found at an accelerometer output cut-off of <100 counts per minute (54). In their calibration study of the Actigraph and Actical accelerometers, Evenson et al (64) determined threshold counts to classify activity intensity in children 5-8 years of age using oxygen consumption as the reference measure. For sedentary time, sensitivity (95 %) and specificity (93 %) for the Actigraph accelerometer was found at an output cut–off of < 25 counts per 15 second, i.e. <100 counts per minute (64).

As demonstrated in the findings from the studies above, there is variation between the cut-points developed in different studies, as well as in practice between researchers in the use of cut-points (65). Further, comparison of the different cut-points developed is also challenging due to differences in study populations, criterion measures used and study protocols (64). The great variation between the multiple sets of cut-points is a practical issue that must be considered as differences in the amount of measured sedentary time and physical activity may arise from the use of different cut-points, meaning that the levels of sedentary time and physical activity may depend on the cut-point applied to the data (65).

In order to get an understanding of which cut-points are the most appropriate for assessing activity intensity in youth, Trost et al (69) evaluated the classification accuracy of five independently developed Actigraph cut-points using indirect calorimetry as a criterion measure. For four of the five sets of cut–points examined, their cut-point for sedentary of <100 counts per minute exhibited good or excellent classification accuracy. However, the classification accuracy for light, moderate and vigorous physical activity varied between cut-points (69). Of the five sets of cut-points examined, only the cut-points of Evenson et al (64) provided acceptable classification accuracy across all intensity levels, as well as they performed well among children of all ages. Therefore, based on their findings, Trost et al (69) recommended usage of the Evenson's (64) cut-points to estimate sedentary time and time spent in light, moderate and vigorous intensity physical activity in children and adolescents.

2.4.2.2 Posture monitors – the activPAL

The development of inclinometer-based devices, such as the ActivPAL, has enabled researches to directly identify periods of sitting or lying, standing and stepping (70). The ActivPAL is a small and lightweight device worn under clothing, attached directly to the skin on the anterior aspect of the thigh (71). Due to this unique positioning, the inbuilt inclinometer is able to distinguish between sitting/lying and standing. The device is also able to provide information on cadence, number of steps taken, sit to stand and stand to sit transformations and estimates of energy expenditure (71). The device uses proprietary algorithms (Intelligent Activity Classification) to classify time as sedentary (sitting/lying), standing and stepping (72).

Kozey-Keadle et al (73) examined the validity of the ActivPAL in assessing sedentary time and reductions in sitting time. Inactive office workers were observed for two periods of 6

hours while wearing the ActivPAL and the Actigraph accelerometer. The correlation between the ActivPAL and direct observation (r^2 =0.94) was higher than the correlation between the Actigraph and direct observation (r^2 =0.39), as well as only the ActivPAL was able to detect reductions in sitting time. These findings are suggesting that the activPAL is a valid tool for the assessment of sedentary time in adults (73). In another study examining the validity of the activPAL in children, the subjects wore the device while performing usual activities in nursery school (70). The subjects were filmed (criterion measure) for one hour, and the activPAL demonstrated 87 % sensitivity, 97 % specificity and 96 % predictive value for time spent sitting or lying. These findings are suggesting that ActivPAL may also provide valid measures of sitting time in children (70).

As the ActivPAL is able to distinguish between sitting and standing, researchers interested in examining the pattern of time spent sedentary should consider using the ActivPAL. The ability of monitors to distinguish between sitting and standing is an important feature, as standing leads to higher energy expenditure compared to sitting or lying (74). The differences in energy expenditure when standing versus sitting are small, but the accumulation of these differences may impact long-term energy balance (75).

2.4.2.3 Observation methods

Observation methods involve a trained observer recording participants' activity while watching the participant (76). The participants' are observed either directly or indirectly by filming the participant during an extended period of time, and the observer records the different behaviors in time intervals, i.e. every minute (4, 76). To ensure systematic recording of the observations, the observer may use a simple list to record the child's posture, the activity being performed and domain of which it occurs (4).

The use of observation methods has several advantages and may be a useful alternative to other methods (76). When using video records, the view of multiple trained individuals can improve objectivity and aspects of behavior can be viewed several times (4). Furthermore, observation methods can obtain detailed information about the behavior being performed, including type of behavior, context, duration and the frequency (4). Another benefit of observation methods is that they do not require participants' to recall activity behavior, leading to less bias than for self–report measures (4). However, such methods can be expensive as they are time consuming for the observer to collect and analyze the data, as well

as it takes time to train observers to become experienced (76). Furthermore, the participants may be affected by the presence of an observer, leading to altered behavior (4). In addition, direct observation may not be feasible to assess leisure time sedentary behavior and is most appropriate when assessing sedentary time in specific domains, i.e. work place or schools (4)

The combination of both self-reports and an objective measure seem to be the most appropriate in capturing a wide range of sedentary behaviors (5). Self-reports provide contextual and behavior specific information, whereas an objective measure can provide precise measures of the total volume and duration of sedentary time (3). Prior to widespread use of self-reports in large-scale studies, objective measures should be used as a reference measure in a representative sample to determine the validity of the self-report to be used (5).

2.5 Moderators of self-reported behavior

Self-reports are based on the subject's own perceptions, making them prone to measurement errors, i.e. recall errors, misinterpretations and social desirable answers (4). Social desirability is a tendency for respondents to intentionally provide incorrect answers due to pressures to respond in a social acceptable manner (77). As physical activity is established as a health enhancing behavior, social desirability may lead to overestimation of self-reported physical activity (77). Being sedentary however, is considered as a health risk in adults. In the context of social desirability one might assume that self-reported sedentary time may be underestimated (77). No studies have yet focused on whether individual and grouping variables may lead to over-or underestimation of self-reported sedentary time, and therefore a great proportion of the theoretical basis for the present study is obtained from previous studies on physical activity.

Self-reported physical activity may vary between subgroups of age, gender, weight status, educational level and ethnicity (11, 12, 78). These differences have been confirmed with accelerometers as well, but there is considerable disagreement between self-reported and accelerometer assessed physical activity in the magnitude of these differences (11, 79). On average, self-reported physical activity is overestimated compared to objective measures, as well as the differences among subgroups are more pronounced when using accelerometers (11, 12). Thus, it seems like physical activity may be reported with lower accuracy among subgroups, i.e. individual and grouping variables may lead to over– or under reporting of physical activity.

Findings from studies examining differences in the validity of self-reported physical activity by body mass index (BMI), are suggesting that overweight adults tend to report physical activity with lower accuracy than leaner persons (49, 80-81). In their study, Buchowiski et al (49) found that self-reported energy expenditure was overestimated as body fatness increased. Thus, the degree of overestimation was greater in overweight subjects (49). BMI has been associated with social desirability, meaning that the overestimation of physical activity among overweight subjects may have been a result of social desirable answers (49, 82). Further, overestimation of physical activity may also have been a result of lower levels of physical fitness among overweight subjects compared to normal weight subjects. Thus, overweight subjects may more easily have rated an activity as strenuous due to low levels of cardiorespiratory fitness (49, 83).

Girls are less engaged in physical activity than boys, both when physical activity is measured with self-reports and objective measures (11, 84). Discrepancies between self-reported and objectively measured physical activity are prevalent in both genders, i.e. subjects tend to overestimate their level of physical activity compared to accelerometers (85). However, the degree of overestimation seems to be greater in girls than in boys. In their systematic review, Adamo et al (85) reported that in comparison to accelerometers, self-report measures overestimated physical activity by 114 % in boys and in 584 % in girls. Similar results were found in the study of Slootmaker et al (11), in which adolescent girls reported greater amounts of moderate physical activity compared to boys. However, accelerometer assessed physical activity showed the opposite.

Further, gender differences in physical activity is lower for self-reported than for objective measured physical activity (12, 86). The lower gender differences for self-reported versus objective measured physical activity may be due to several factors, i.e.; girls are more likely to respond in a social desirable manner and thereby overestimate their level of physical activity, accelerometers may be less sensitive towards activities that girls are more likely to engage in, accelerometers and self-reports may assess different aspects of physical activity or that boys are more likely to alter their amount of physical activity by wearing the accelerometers (12).

Social influences have been associated with leisure-time physical activity, in which subjects from low SES backgrounds reported less leisure-time physical activity compared to those from higher SES backgrounds (87). In the study of Slootmaker et al (11), lower educated adolescents also reported less physical activity than highly educated adolescents. However, when comparing self-reports and accelerometer measures, the lower educated adolescent actually had higher levels of physical activity compared to highly educated adolescents. Thus, highly educated adolescents, in particular girls, over reported their level of physical activity (11).

Differences in physical activity and time spent sedentary (primarily screen time), have also been found between ethnic groups (78). In general, minority adolescents had lower levels of physical activity and higher levels of screen time (78, 88). These differences between ethnic groups are probably a result of a complex interaction between socioeconomic, environmental and cultural factors (78). Further, the differences may also be explained in terms of differences in the reporting of these behaviors, as cultural and social influences and expectations may lead to over- or under reporting of physical activity and sedentary behaviors (78).

Given that sedentary behaviors and physical activity are not consistently associated and have their own determinants, it is uncertain whether any of the variables that have been found to exert an influence on self-reported physical activity may also lead to an over – or underestimation of sedentary time (14, 89). However, although the evidence is sparse, there is some evidence suggesting that weight status may also affect self-reported sedentary time, with overweight adults underreporting minutes of sedentary activities compared to normal weight adults (90).

Socioeconomic conditions and ethnicity are found to exert an influence on sedentary behaviors (89, 91). Self-reported sedentary time (primarily television viewing) has been associated with gender, age, race/ethnicity, socioeconomic status and parental education. Thus, although not established as moderators of self-reported sedentary time, it seems likely that social influences may have a moderating effect on the relationships of sedentary behavior with other factors (92).

However, differences in self-reported television viewing may not translate directly to differences in objectively measured overall sedentary time (25). Thus, those subgroups reporting the highest levels of television time are not necessarily those who spend most time being sedentary during the whole day, as well as both children and adults are found to spend twice as much time sedentary when using accelerometer-measures compared to self-reports (25, 93). Discrepancies between self-reported television viewing and accelerometer-derived sedentary time may reflect that measures of television time is not indicative of overall sedentary time, as well as the discrepancies may be a result of measurement errors in self-reporting of sedentary time (93). For example, Jago et al (29) created groups of children's physical activity and sedentary behavior based on self-report measures, in which resulted in groups of children with very different levels of self-reported sedentary time and physical activity. However, when comparing objectively measured data with self–reports in the same sample, the groups appeared to be almost identical (94).

3.0 Methods and subjects

3.1 Study design

The present study is based on the EuropeaN Energy balance Research to prevent excessive weight Gain among Youth (ENERGY) intervention. The ENERGY–project was a cross–European school-based and family involved intervention program aimed at preventing overweight among children. The school-based intervention program with parental involvement was aimed at reducing and breaking up sedentary time among 10-12 years old schoolchildren (95). The intervention program was tested in five European countries (Germany, Greece, Hungary, Norway and Belgium) in the autumn of 2011 in a randomized controlled trial with a pre- and post-test design. The controls did not implement the intervention, but continued with the regular school curriculum (96). The study is registered in International Standard Randomized Controlled Trial Number Register (registration number: ISRCTN34563078).

Study outcomes were assessed prior to and after the intervention. Children with parental consent and one of their parents responded to a questionnaire on sedentary behavior and related factors, i.e. screen time, breaks in sitting during screen time and physical activity. In addition, a subsample of approximately 20 % wore an accelerometer to objectively record total sedentary time and breaks in sedentary time (96). Detailed description of the study design and procedures has been reported elsewhere (96).

In the present study, baseline data only will be included in the analyses.

3.2 Subjects

In order to achieve a sample size of 2500 children, at least 10 schools in each of the five countries had to be included (96). The initial contact with the schools was a phone call and a formal letter to the headmaster of the sampled school, followed by a personal phone call (96). A convenient sample of schools was chosen, i.e. schools close to the University or in other convenient areas. Further, the schools were then paired according to size or type of school in order to get similar intervention and control groups. One school in each pair was randomly drawn to the intervention group by the project coordinator (96).

The targeted study population was 10-12 years old schoolchildren, which included all pupils from 5^{th} and 6^{th} grade (the majority of pupils born in 1999 and 2000) and one of their parents.

All pupils within the included classes were invited to participate (96) (appendix 1). Parents received a letter explaining the purpose of the survey and were asked for consent for the child to participate in the study (97) (appendix 2). The project adhered to the Helsinki Declaration and the conventions of the Council of Europe on human rights and biomedicine. Prior to initiating the project, ethical clearance was obtained from the relevant ethical committees and ministries in all participating countries (97)(appendix 3).

In total 62 schools participated in the study, 31 intervention schools and 31 control schools. In total, there were 5117 eligible pupils in these schools, of which 3394 pupils were given parental consent. The final sample consisted of 3325 children (Intervention n= 1662, controls n= 1663) with approved pre–test questionnaire data, while 470 children had approved accelerometer data. 3038 parents completed the pre–test questionnaire. Across all five countries, 469 children had both valid accelerometer data and questionnaire data. However, Germany (n=24) was excluded from the present study due to very few participants. After the exclusion of Germany, 445 children with both valid accelerometer data and questionnaire data remained. Of the 445 remaining children, data on age were missing for six children. Of the 439 children with data on age, 13 children were born in 1998, whereas 232, 142 and 47 children were born in 1999, 2000 and 2001 respectively.

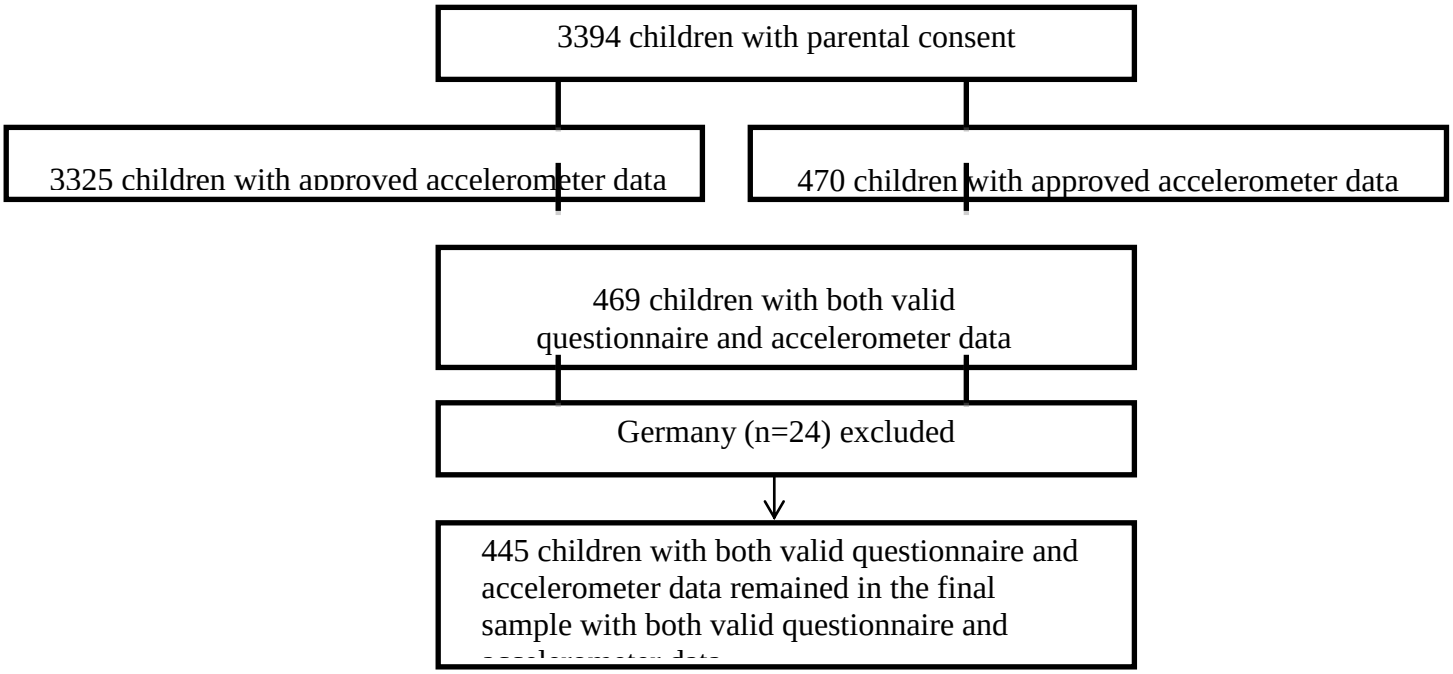

Figure 1: Flowchart illustrating inclusion and exclusion of participants in the present study.

3.3 Measures

3.3.1 Self–reported screen time (children and parents):

The participants completed a pen and paper questionnaire on sedentary behaviors and various related factors (appendix 4). The measurement instruments had to be standardized for all participating countries, and the questionnaire was developed in English, and further translated into the language of each participating country. The questionnaires were then back translated in order to detect any differences between the two. The questionnaires were completed during one school lesson (45 minutes) in the presence of the research assistant or project worker. In addition, the pupils brought home a questionnaire for one of their parents (appendix 5).

The main outcome measures were TV/DVD watching and computer/games console usage reported by children and parents. The amount of time spent watching TV/DVD and using a computer/games console was reported as hours a day, and the duration were ascertained by ten categories (appendix 4,5). Screen time was assessed separately for weekdays and weekends. Self–reported screen time was obtained from the following questions:

- *Roughly how many hours a day do you usually spend watching TV/DVD in your leisure time?*
- *Roughly how many hours a day do you usually use a computer/games console for leisure activities?*

Total TV time (minutes/day) was calculated by transforming the categories into continuous values. The categories on duration of TV time reported as hours/day were given values as minutes/day for both weekdays and weekends. To obtain mean TV time for both weekdays and weekends, TV time for weekdays and weekends were added and divided on seven (TV time weekdays x 5) + (TV time weekends x 2)/7. Similar procedures were followed when calculating total computer/games console time. Total screen time was computed by adding up TV/DVD and computer/games console time. In the final analysis, parents' screen time was dichotomized into "less than two hours screen time/day" and "more than two hours screen time/day".

3.3.2 Self–reported breaks in screen time (children and parents): Breaks in sitting during one hour of watching TV/DVD and one hour of computer/games console usage were reported as breaks per hour. Six categories were given (appendix 4, 5). The participants responded to the following questions:

- *During one hour of watching TV/DVD, how often do you usually stand up, stretch or walk around a bit?*
- *During one hour of using a computer/games console for leisure activities, how often do you usually stand up, stretch or walk around a bit?*

Total number of breaks was calculated by transforming the categories into continuous values by giving the categories of breaks numeric values. To obtain the total number of breaks during screen time, breaks per hour of TV/DVD – time and per hour of computer/games consoles usage were added and divided on two (breaks per hour of TV/DVD + breaks per hour of computer/games console)/2.

3.3.3 Parents' physical activity:

To obtain information on parents' physical activity, the parents responded on the following question: *"Over a typical or usual week, on how many days are you physically active for a total of at least 30 minutes per day?"* Eight categories were given (appendix 5).
In the final analysis, the eight categories were dichotomized into "less than five days a week" and "five days or more a week".

3.3.4 Accelerometer assessed sedentary time, breaks in sedentary time and MVPA:

Time spent sedentary, breaks in sedentary time and MVPA were objectively assessed using accelerometers. The devices used as the criterion measure were four models (GT1M, GT3X, GT3X + and ActiTrainer) of the Actigraph accelerometer (LLC, Fort Walton Beach, Florida, USA). All accelerometers were worn on the right hip, secured by an elastic waist belt (98). Data were collected as average number of counts in a 15–second epoch measurement interval, and analyzed using the Actilifte software (98, 99). Children were asked to wear the accelerometer for seven consecutive days. They were instructed to wear the device for all waking hours, except during bathing and other aquatic activities. Non-wearing time was calculated as periods of more than 60 minutes of consecutive zero counts (96). In the present study, pupils were included if they had at least one weekday with minimum 8 hours-wearing time.

Sedentary time was calculated by using the cut–points from Treuth et al (54, 98). Time spent at an activity level of ≤100 counts per minute (cpm) equaled sedentary time. Total sedentary time per day was calculated by dividing total sedentary time across valid days on the total

number of valid days. Breaks in sitting time were defined as total number of breaks (periods of >100 cpm) during the total time spent in sedentary bouts (96). In the present study, the number of breaks per day was calculated by dividing the total number of breaks across valid days on the total number of valid days. Time spent in MVPA was also calculated using the cut-points from Treuth et al (54, 98). The range of 3000 – 5199 cpm equaled moderate intensity PA, whereas vigorous intensity PA was defined as ≥ 5200 cpm. Moderate intensity PA and vigorous intensity PA were combined into MVPA. MVPA per day was calculated by dividing total MVPA on the total number of valid days. In the final analysis, MVPA/day was dichotomized into "less than 30 min MVPA/day" and "more than 30 min MVPA/day".

3.3.5 Demographics:

Gender and birth year were assessed with single questions (appendix 4, 5).
Parents' educational level was assessed in the parental questionnaire, and was assessed by asking: "What is the highest level of education you have completed?" Four categories were given; elementary school, secondary school, college/university bachelor's degree and college/university master's degree. In the analysis, "no higher education" corresponded to elementary and secondary school, whereas "higher education" corresponded to college/university education. Information on ethnicity was obtained from the parental questionnaire as well, and was assessed by asking: "Were both biological parents of your child born in home country?" Three categories were given; "yes", "no, one parent only" and "no, none of the parents". In the analysis, "one parent only" and "none of the parents" corresponded to "no" (appendix 5).

3.4 Statistical analyses

Demographic data are presented as mean values with standard deviation unless otherwise stated and results as mean or regression coefficients with 95 % confidence intervals (CI). Scatterplot's were made to confirm the homogeneity of the data. Normal probability plots were made to ensure that the residuals were normally distributed. To examine whether the countries were significantly different in regard of the dependent and independent variables Chi Square and ANOVA tests were applied.

Bivariate and multivariate linear regression analyses were applied to assess whether the independent variables were related to the dependent variables (self-reported screen time and self-reported breaks during screen time). For self-reported screen time, the following independent variables were included: total sedentary time per day, gender, ethnicity, MVPA,

parents' PA, parents' educational level and parents' screen time. For self-reported breaks in screen time, the following independent variables were included: total number of breaks per day, gender, ethnicity, MVPA, parents' PA, parents' educational level and parents' self-reported breaks during screen time. All analyses were stratified by country (Belgium, Greece, Norway and Hungary).

First, all significant independent variables were included in the intermediate analysis. Further, of those independent variables that were not significant, the least significant variable was removed from the model before the analysis was performed again. This procedure was repeated until only significant independent variables remained (backward approach). Finally, we added an interaction term to the final model to examine whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were moderated by the significant independent variables. All statistical analyses were performed in Statistical Package for Social Sciences (SPSS) Statistics 19 (SPSS, Inc. Chicago IL). P-values ≤ 0.05 were considered as statistically significant.

4.0 Discussion of methods

The purpose of the present study was to examine whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were moderated by gender, ethnicity, MVPA, parents' self-reported screen time and breaks in screen time, parents' PA and parents' educational level. The study assessed whether any of the independent variables were associated with self-reported screen time and breaks and whether they moderated the associations between self-reports and accelerometers. The choice of topic was done on the basis of the need for greater insight into how to best measure sedentary time and breaks in sedentary time.

4.1 Study sample and generalizability

The sample consisted of 469 children with both valid questionnaire data and accelerometer data. The sample was homogenous in regard of age as well as the distribution of boys and girls were almost equal. The multinational sample of children of the same age from different regions across Europe must be considered as one of strengths of the study as this is an advantage in terms of being able to generalize the findings from the present study to a larger population of children across European countries. The fact that different variables were associated with self-reported screen time across countries may indicate that the questions were interpreted differently across these countries, and that different social and cultural influences must be considered when designing this type of study. Thus, the identification of different variables being associated with self-reported screen time across countries must be considered to be strength of the study.

However, the use of convenience samples of schools is a limitation as this may reduce the ability to generalize the results to a larger population. Further, Germany (n=24) was excluded from the present study due to too few participants with valid questionnaire- and accelerometer data, leading to 445 children included in the analyses. A convenience sample of 445 children may be a limitation in terms of identifying moderating variables among 10-12 year old European children.

4.2 Selection of moderator variables

As no previous studies have examined whether moderators of self-reported sedentary time exist, the selection of potential moderating variables in the present study was based on

findings from previous studies on physical activity, as well as variables associated with sedentary behaviors. However, as sedentary behavior and physical activity are distinct behaviors with their own determinants, quite different variables may appear as moderating for the associations of self-reported sedentary time and objectively measured sedentary time. Thus, the selection of variables in the present study was done with uncertainty, which may be considered as a weakness of the study.

4.3 Methods of measurement

The measurement of time spent sedentary and breaks in sedentary time are complex, and to date there are few quality controlled and standardized methods that are suitable for large epidemiological studies (3, 4). The majority of the previous epidemiological studies of sedentary behavior have used self-reports as their main source of data (4). Data from self-reports are based on the subject's own perception of behavior, and it is challenging to convert self-reported data into quantifiable measures in quantitative studies. This itself may be a source of misclassification (100).

In the ENERGY study, both questionnaires and accelerometers were used in the assessment of sedentary time. Using objective measures in combination with a questionnaire is beneficial as both precise measures of total sedentary time and contextual information are provided, increasing the likelihood for capturing many dimensions of sedentary behavior (3, 5). Thus, this must be considered as one of the strengths of the study. However, the questionnaire mainly assessed screen time, i.e. children's sedentary time was operationalized as screen time. The questions regarding screen time demonstrated acceptable test-retest reliability, indicating good stability in means of assessing screen time (96). The choice of screen time as a marker of sedentary time was made on the basis of previous research identifying screen time behaviors as an important target in means of obesity prevention in children (97). Further, questions about specific individual behaviors, such as time spent engaged in screen time behaviors, may be less prone to recall errors than questions about overall sedentary behavior (46). Thus, it is more likely that children are able to provide accurate recall of time spent engaged in specific behaviors during the day compared to overall sedentary time, and therefore using single-item questionnaires may be an advantage.

Although recall errors may be reduced by using self-reports of specific behaviors, other important sedentary behaviors are excluded, i.e. single-item questionnaires does not represent

overall sedentary time (6, 44). Compared to self-reports of physical activity, it is even more complicated to measure overall time spent sedentary accurately with self-reports as sedentary behaviors occur several times per day, both in shorter and longer periods (3, 4). These types of behaviors are in a larger degree performed unconsciously compared to planned and structured physical activity with higher intensity, and therefore specific questions regarding overall time spent sedentary may be prone to recall errors (46). Therefore, to obtain more accurate measures of overall sedentary time as well as minimize recall errors, it may have been beneficial to use diaries or activity logs (3, 4). With these instruments, the respondent records activity when it occurs or close to when it occurs, which may provide more accurate estimates of the total time spent sedentary. Unfortunately, a high degree of participant burden excludes the use of diaries or activity logs in large epidemiological studies.

Further, the questionnaire used in the ENERGY study was not compared to an objective measure prior to the study, meaning that the validity is unknown. There is neither an accepted "gold standard" for sedentary time, as well as self-reports of specific behaviors and objective measures may not measure the same constructs of sedentary time, i.e. television viewing versus overall sedentary time (3). In the ENERGY study, screen time was reported as hours a day whereas accelerometers provided measures of the total time spent sedentary as minutes per day. To be able to assess the associations between the two instruments, categorical self-reported data had to be converted into continuous data. Converting categorical data into continuous data is not optimal, and this may have affected the reliability of the data. However, the main objective in the present study was to assess whether the associations of self-reported screen time and breaks in screen time with accelerometer assessed sedentary time and breaks in sedentary time were moderated by any other variable, not the associations between self-reports and accelerometers per se. In this sense, the conversion of data has probably not compromised the results in the present study.

In terms of assessing breaks in sedentary time, few studies have assessed breaks in sedentary time using self-reports, and therefore no validated instruments for assessing breaks in sedentary time were available for the ENERGY study (96). Due to this, the questions on breaks in sedentary time were developed for the study and showed low test-retest reliability (96). The questionnaires assessed the number of breaks during one hour of screen time and one normal school lesson, whereas the accelerometers provided measures of the total number of breaks in sedentary time per day. Thus, the questionnaires did not assess breaks occurring

at any other time of the day, which is most likely the explanation for the poor association with accelerometer assessed breaks in sedentary time in the present study.

Clark et al (53) were the first to examine the validity of an interview administered questionnaire on breaks in time spent sitting, and found a significant modest correlation (r=0.26) between self-reported breaks during work time sitting and accelerometer assessed breaks. In this study, self-reported breaks in work time sitting were compared to accelerometer assessed breaks in sitting during work time hours. Thus, it is conceivable that the associations of self-reported breaks with accelerometer assessed breaks would have been greater if self-reported breaks during screen time were compared to accelerometer assessed breaks after school only, at not throughout the whole day. However, the positive results from the study of Clark et al (53) are domain specific, and it may be easier to recall breaks from a limited time period during the day than for the whole day. Thus, it is conceivable that self-report assessment of the total number of breaks throughout the day may be very difficult to recall as short breaks in sedentary time are normally performed quite unconsciously.

Using older versions of accelerometers may also be a limitation when assessing breaks in sedentary time as they are not able to distinguish between sitting and standing, which may have lead to misclassifications of breaks in sedentary time (3). In terms of the assessment of breaks in sedentary time, newer devices containing inclinometers would have been favorable as they are able to provide accurate measures of breaks in sedentary time (70-73). Although improved objective measures are now available, it may be difficult to develop questions that correspond to the objective devices' definition of a break. For example, the definition of a break in the questionnaire may not correspond to the objective measure of a break, meaning that the objective measure may record breaks that are not reported in the questionnaire (53).

To achieve the largest sample size as possible, all children with at least one day of valid accelerometer data were included. However, one day with objective measures may not be sufficient to represent habitual patterns of activity in children and adolescent, and the suggested duration of the measurement is four to nine days (97). Thus, one day of objective measures may be considered as a weakness in the present study as this may have compromised the results. However, it is conceivable that a minimum of four days of accelerometer data would have been of greater importance if the main objectives of the study were to assess the total time spent sedentary or to evaluate the effects of the study.

As stated in the literature, self-report measures differs consistently from objective measures and one must be careful in drawing conclusions from results based solely on self-reports (94). In future research, the development of valid and reliable self-report measures of overall sedentary time as well as breaks in sedentary time should be prioritized. Composite self-report measures of time spent sedentary (summaries of responses from multiple domains) have shown better correlations with accelerometer assessed sedentary time, and may be beneficial compared to single-item questionnaires (46). Further, researchers interested in examining the patterns time spent sedentary, may benefit from using the ActivPAL or newer versions of accelerometers containing inclinometers (70- 73).

5.0 References

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PART TWO:

Paper

"Moderators of self-reported screen time and breaks in screen time among 10-12 years old European children"

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Moderators of self-reported screen time and breaks in screen time among 10-12 years old European children

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ABSTRACT

Background: To examine whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were moderated by gender, ethnicity, children's moderate-to vigorous physical activity (MVPA), parents' educational level, parents' self-reported screen time and breaks in screen time and parents physical activity (PA).

Methods: Screen time (hours/day) and breaks in screen time were assessed using a questionnaire in a sample of 445 boys and girls, 10-12 years of age in Belgium, Greece, Hungary and Norway. Parents' screen time and breaks, parents' PA and demographics were also assessed with questionnaire. In children, accelerometers measured sedentary time per day (min/day ≤100 counts/min), the daily number of breaks in sedentary time (at least one minute >100 counts/min) and MVPA per day (min/day ≥ 3000 counts/min). Bivariate and multivariate linear regression analyses were applied to assess whether the independent variables were related to the dependent variables. An interaction term was added in the final model to examine whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were moderated by the significant independent variables.

Results: No statistically significant interactions were found between the significant independent variables. Country specific significant associations were found between self-reported screen time and gender, parents' screen time and educational level and accelerometer assessed sedentary time. Country specific significant associations between self-reported breaks in screen time and parents' educational level and ethnicity were found.

Conclusions: The associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks were not moderated by gender, ethnicity, MVPA, parents' educational level, parents' self-reported screen time and breaks in screen time and parents' PA.

Key words: children, sedentary behavior, screen time, breaks, questionnaire, accelerometer, measurement.

Moderators of self-reported screen time and breaks in screen time among 10-12 years old European children

Introduction

On a population level children spend a large proportion of their waking time being sedentary, which is worrying as there is evidence suggesting that high levels of sedentary time are associated with increased cardio metabolic risk in children (1). Furthermore, evidence is also suggesting that the manner in which sedentary time is accumulated may also be important, in which frequent breaks in prolonged sedentary time are beneficially associated with indicators of health risks in adults (2).

Even though the knowledge on the negative health impacts of high volumes of time spent sedentary has increased, there is still no clear consensus regarding the most valid and reliable measurements of sedentary time (3,4). A large proportion of the former research on sedentary behavior has relied on self–reports of specific behaviors, in which television viewing is the most common assessed behavior (3). Although self-reports are the most common method used to assess time spent watching television, the validity and reliability of the measures used is rarely provided (5).

Disagreements in physical activity assessed by self-report and objective measures have been found in subgroups of gender, age, weight status, educational level and ethnicity (6-10). On average, self-reported physical activity was overestimated compared to objective measures, both among adolescents and adults (6-9). However, the degree of overestimation may vary among subgroups. For example, greater disagreements have been found among adolescent girls than adolescent boys, i.e. girls may be more likely to overestimate their level of physical activity (6, 10). Thus, it seems like individual and grouping variables may affect the accuracy of self-reported physical activity.

When assessing sedentary time in children, associations between self–reported sedentary time (mainly screen time) and accelerometer assessed sedentary time have been found (11). Furthermore, differences in self-reported television viewing have been found among subgroups of age, gender, ethnicity and work status (12). However, it is not yet known whether the associations between self–reported screen time and breaks in screen time and

accelerometer assessed sedentary time and breaks in sedentary time may be moderated by any of the variables that have been found to moderate self–reported physical activity. No studies have yet examined whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time are moderated by gender, ethnicity (defined from both parents born in home country or not), children's moderate- to vigorous intensity physical activity (MVPA), parents' educational level, parents' self-reported screen time and breaks in screen time and parents' self-reported physical activity (PA).

The objectives of the present study were:
1) To examine whether the associations between self-reported screen time and accelerometer assessed sedentary time, are moderated by gender, ethnicity, MVPA, parents' educational level, parents' screen time and parents' PA.
2) To examine whether the associations between self-reported breaks in screen time and accelerometer assessed breaks in sedentary time are moderated by gender, ethnicity, MVPA, parents' educational level, parents' self-reported breaks during screen time and parents' PA.

Methods

The present study is based on data from the EuropeaN Energy balance Research to prevent excessive weight Gain among Youth (ENERGY) intervention study. An important aim of the ENERGY-project was to reduce and break up sedentary time among 10-12 years old schoolchildren (13). The school-based intervention program with parental involvement was tested in five European countries (Germany, Greece, Hungary, Norway and Belgium) in the autumn of 2011 in a randomized controlled trial with a pre– and post–test design (13). In the present study, baseline data only will be included in the analysis. The study is registered in International Standard Randomized Controlled Trial Number Register (registration number: ISRCTN34563078).

The project adhered to the Helsinki Declaration and the conventions of the Council of Europe on human rights and biomedicine. Ethical clearance was obtained from the relevant ethical committees and ministries in all participating countries (14).
Children with parental consent and one of their parents responded to a questionnaire on sedentary behavior and related factors, i.e. screen-time, breaks in sitting during screen-time and physical activity. In addition, a subsample of approximately 20 % wore an accelerometer

to objectively record total sedentary time and breaks in sedentary time (14). Detailed description of the study design and procedures has been reported elsewhere (14).

Subjects

The targeted study population was 10-12 year old schoolchildren, which included all pupils from 5th and 6th grade (the majority of pupils born in 1999 and 2000) and one of their parents. In total 62 schools participated in the study: 31 intervention schools and 31 control schools. In total, there were 5117 eligible pupils in these schools, of which 3394 pupils were given parental consent. The final sample consisted of 3325 children (intervention n = 1662, controls n= 1663) with approved pre–test questionnaire data, while 470 children had approved accelerometer data. 3038 parents completed the pre–test questionnaire (14). Across all five countries, 469 children had both valid accelerometer data and questionnaire data. However, Germany (n=24) was excluded from the present study due to very few participants. After the exclusion of Germany, 445 children with both valid accelerometer data and questionnaire data remained. Of the 445 remaining children, data on age were missing for six children. Of the 439 children with data on age, 13 children were born in 1998, whereas 232, 142 and 47 children were born in 1999, 2000 and 2001 respectively.

Measures

Self–reported screen time (children and parents): Children's and parents' screen time was obtained from the following questions: "*Roughly how many hours a day do you usually spend watching TV/DVD in your leisure time?"* and "*Roughly how many hours a day do you usually use a computer/games console for leisure activities?"* The amount of time spent watching TV/DVD and using a computer/games console was reported as hours a day, and the duration were ascertained by ten categories ranging from "none" to "four hours or more per day". Screen time was assessed separately for weekdays and weekends.

Screen time was analyzed as continuous data. To obtain mean TV time for both weekdays and weekends, TV time for weekdays and weekends were added and divided on seven ((TV time weekdays x 5) + (TV time weekends x 2))/7. Similar procedures were followed when calculating total computer/games console time. Total screen time was computed by adding up total TV/DVD and total computer/games console time. In the final analysis, parents' screen time was dichotomized into "less than two hours screen time per day" or "more than two hours screen time per day".

Self–reported breaks in screen time (children and parents): The number of breaks in sitting were obtained by the following questions: "*During one hour of watching TV/DVD, how often do you usually stand up, stretch or walk around a bit?"* and *"During one hour of using a computer/games console for leisure activities, how often do you usually stand up, stretch or walk around a bit?"* Six categories were given ranging from "never" to "four times or more".

Breaks in screen time were analyzed as continuous data. Total number of breaks during one hour of screen time was calculated by adding breaks per hour of TV/DVD-viewing and breaks per hour of computer/games consoles usage, and further divided on two (breaks per hour of TV/DVD + breaks per hour of computer/games console)/2.

Parents' physical activity: The participants responded on the following question: *"Over a typical or usual week, on how many days are you physically active for a total of at least 30 minutes per day?"* Eight categories were given, ranging from "none" to "every day". In the final analysis, the eight categories were dichotomized into "less than five days a week" and "five days or more a week".

Accelerometer assessed sedentary time, breaks in sedentary time and MVPA:
The devices used as the criterion measure were four models (GT1M, GT3X, GT3X + and ActiTrainer) of the Actigraph accelerometer (LLC, Fort Walton Beach, Florida, USA). All accelerometers were worn on the right hip, secured by an elastic waist belt (15). Accelerometer-data was collected in 15-second epochs and analyzed using the Actilife software (16). Children were asked to wear the accelerometer for seven consecutive days. Non-wearing time was calculated as periods of more than 60 minutes of consecutive zero counts (14). Pupils were included in the present study if they had at least one weekday with minimum 8 hours-wearing time.

Sedentary time was calculated using the cut–points from Treuth et al (15, 17). Time spent at an activity level ≤100 counts per minute (cpm) equaled sedentary time. Total sedentary time per day was calculated by dividing total sedentary time across valid days on the number of valid days. Breaks in sitting time were defined as total number of breaks (periods >100 cpm) during the total time spent in sedentary bouts (14). In the present study, number of breaks per day was calculated by dividing the total number of breaks across valid days on the total number of valid days. Time spent in MVPA was also calculated using the cut-points from

Treuth et al (15, 17). The range 3000–5199 cpm equaled moderate intensity PA, whereas vigorous intensity physical activity was defined as ≥ 5200 cpm. Moderate intensity PA and vigorous intensity PA were combined into MVPA. MVPA per day was calculated by dividing total MVPA on the total number of valid days. In the final analysis, MVPA/day was dichotomized into "less than 30 min MVPA/day" and "more than 30 min MVPA/day.

Demographics:

Gender and birth year were assessed with single questions.
Parents' educational level was assessed in the parental questionnaire, and was assessed by asking: "*What is the highest level of education you have completed?"* Four categories were given; elementary school, secondary school, college/university bachelor's degree and college/university master's degree. In the analysis, "no higher education" corresponded to elementary and secondary school, whereas "higher education" corresponded to college/university education. Information on ethnicity was also obtained from the parental questionnaire, and was assessed by asking: *"Were both biological parents of your child born in home country?"* Three categories were given; "yes", "no, one parent only" and "no, none of the parents". In the analysis, "one parent only" and "none of the parents" corresponded to "no".

Statistical analyses

Demographic data are presented as mean values with standard deviation unless otherwise stated and results as mean or regression coefficients with 95 % confidence intervals (CI). Scatterplot's were made to confirm the homogeneity of the data. Normal probability plots were made to ensure that the residuals were normally distributed. To examine whether the countries were significantly different in regard of the dependent and independent variables, Chi Square and ANOVA tests were applied.

Bivariate and multivariate linear regression analyses were applied to assess whether the independent variables were related to the dependent variables (self-reported screen time and self-reported breaks in screen time). For self-reported screen time, the following independent variables were included: total sedentary time per day, gender, ethnicity, MVPA, parents' PA, parents' educational level and parents' screen time. For self-reported breaks in screen time, the following independent variables were included: total number of breaks per day, gender, ethnicity, MVPA, parents' PA, parents' educational level and parents' self-reported breaks

during screen time. All analyses were stratified by country (Belgium, Greece, Norway and Hungary).

First, all significant independent variables were included in the intermediate analysis. Further, of those independent variables that were not significant, the least significant variable was removed from the model before the analysis was performed again. This procedure was repeated until only significant independent variables remained (backward approach). Finally, we added an interaction term to the final model to examine whether the associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were moderated by the significant independent variables. All statistical analyses were performed in Statistical Package for Social Sciences (SPSS) Statistics 19 (SPSS, Inc. Chicago IL). P-values ≤0.05 were considered as statistically significant.

Results

Characteristics of the participants are presented in table 1. No significant differences between the four countries were found for total sedentary time per day, parents' screen time, accelerometer assessed breaks and parents PA. However, significant differences between countries were found for MVPA (p=<0.001), children's screen time (p=<0.001), children's self-reported breaks (p=0.004), parents' self-reported breaks (p=0.003), parents' educational level (p=<0.001), ethnicity (p=<0.001) and gender (p=0.017).

Accelerometer assessed sedentary time was significantly associated with self-reported screen time in Belgian children (β=0.54 [95% CI: 0.22, 0.86]) (table 2). No significant associations were found between accelerometer assessed sedentary time and self-reported screen time for Greek, Hungarian and Norwegian children. In Hungarian (β=53.53 [14.75, 92.30]), Greek (β=47.35 [5.67, 89.02]) and Norwegian (β= 106.63 [72.58, 140.69]) children, boys reported significantly more screen time compared to girls (table 2). However, this association between self-reported screen time and gender was not found in Belgian children. Parents' self-reported screen time (>2h/day) was significantly associated with children's self-reported screen time in Belgian (β=58.70 [20.07, 97.33]) and Greek (β=45.43 [2.28, 88.78]) children, but not in Norwegian and Hungarian children (table 2). Parents' educational level was significantly associated with children's screen time in Belgian children. Belgian children with low educated parents reported significantly more screen time compared to children with highly educated parents (β=62.97 [25.68, 100.25]). However, this association was not found in

Greek, Hungarian and Norwegian children (table 2). For MVPA, ethnicity and parents' physical activity no significant associations were found (table 2).

In Belgian children, parents' educational level and total sedentary time remained significant in the final model. However, no statistically significant interactions were found between parents' educational level and total sedentary time in the Belgian sample.

Self-reported breaks in screen time were significantly associated with parents' educational level (β=0.59 [0.14, 1.05]) and ethnicity (β=0.58 [0.09, 1.08]) in Greek children (table 3). However, these associations were not found in Belgian, Hungarian and Norwegian children. No significant associations were found between self-reported breaks in screen time and accelerometer assessed breaks per day, gender, MVPA, parents' breaks in screen time and parents' PA (table 3).

Discussion

To our knowledge, this is the first study to examine whether the associations between children's self-reported screen time and breaks in screen time and accelerometer-derived sedentary time and breaks are moderated by gender, ethnicity, MVPA, parents' educational level, parents' screen time and breaks during screen time and parents' PA.

The associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were not moderated by any of the variables examined in the present study. However, country specific significant associations were found between self-reported screen time and gender, parents' screen time, parents' educational level and accelerometer assessed sedentary time. Further, country specific associations were found between self-reported breaks during one hour of screen time and parents' educational level and ethnicity.

As there are no previous studies examining moderators of self-reported screen time, there are no previous findings that directly can be compared to the present results.

However, in previously published studies on physical activity, the discrepancies between self-reported and objectively assessed physical activity have been found to be larger among girls than among boys (6,9-10). In the present study, gender did not have such a moderating effect

on the associations between self-reported screen time and accelerometer assessed sedentary time. Further, the associations between self-reported physical activity and accelerometer assessed physical activity have also been found to be moderated by respondents' educational level, in which highly educated adolescents overestimated their physical activity levels compared to accelerometers (6). In the present study however, educational level (parents') did not moderate the associations of self-reports with accelerometers. Further, no ethnic differences were found in the associations between self-reported and accelerometer assessed sedentary time in the present study. This is contrary to findings from the study of Sallis et al (10) suggesting that the discrepancies between self-reported and objectively measured physical activity varied among ethnic groups.

In this context it is important to emphasize that sedentary behaviors and physical activity are distinct behaviors that are not consistently associated, as well as they have their own unique determinants (12, 18). Therefore, it is conceivable that quite different variables may appear as moderating for the associations of self-reported sedentary time with objectively measured sedentary time.

Interestingly, the stratified analyses revealed that variables associated with self-reported screen time were country specific. This illustrates that using similar self-reports across countries may be a challenge (19). For example, different languages were spoken in all four countries. Although the questionnaires were translated into the language of each participating country, different interpretations of the questions may have affected the responses (20). Further, different cultural and social influences across countries may be one of the reasons for the differences in the associated variables, as well as socioeconomic conditions may be different across the four countries (12, 19).

For example, parents' educational level was significantly different between countries in the present study ($p=<0.001$), which may explain why significant associations between parents' educational level and children's screen time were country specific only. In Belgium there were significantly more highly educated parents than less educated parents ($p=0.024$), whereas in Hungary there were significantly more parents with low education than with higher education ($p=<0.001$). In Norway and Greece there were no significant differences in parents' educational level. As parents educational level was only significantly associated with children's screen time among Belgian children, this may indicate that socioeconomic

conditions may exert a stronger influence on children's screen-time in Belgium compared to the other countries.

One possible explanation for the results of the present study may simply be that none of the variables examined moderate the associations between self-reported screen time and breaks in screen time, and accelerometer assessed sedentary time and breaks in sedentary time. Thus, no real interactions were prevalent in the data set. Further, a possible explanation of why interaction terms are present for physical activity and apparently not for sedentary time may be due to physical activity being more prone to social desirable answers. As physical activity is considered as a health enhancing behavior, it is conceivable that respondents are more likely to overestimate their level of physical activity (21).

In addition, self-reports are based on the respondents' own perceptions, which means that physical activity may be overestimated by individuals with low levels of cardiorespiratory fitness (7, 22). Thus, individuals with low levels of cardiorespiratory fitness may be more likely to report an activity as strenuous compared to individuals with higher levels of cardiorespiratory fitness, and therefore leading to disagreements between self-reported and objective measured physical activity. However, cardiorespiratory fitness is probably less likely to have an impact on self-reported time spent sedentary.

The associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were in general poor. The poor associations between the two instruments are most likely a result of the two instruments measuring different constructs of sedentary time. The questionnaires assessed time spent engaged in screen time behaviors, whereas the accelerometers provided measures of the total time spent sedentary per day. Breaks in screen time were reported as breaks per hour screen time, whereas accelerometer assessed breaks were expressed as the total number of breaks per day. Thus, a large proportion of the breaks recorded by the accelerometers probably occurred at any other time of the day than during screen time.

It is challenging to assess sedentary time and breaks in sedentary time accurately by self-reports as time spent sedentary is not limited to one single behavior, but instead consist of a variety of behaviors occurring at different times of the day and in multiple locations (3,4). Using single item questionnaires, for example screen time, is beneficial in means of reducing

recall errors associated with questionnaires assessing overall sedentary time (23). However, single item questionnaires excludes other important sedentary behaviors, i.e. they do not represent overall sedentary time (24, 25).

Further, there is no accepted "gold standard" criterion measure of sedentary time, which hampers the possibility to provide the validity of self-reports (3, 4). Although not accepted as a "gold standard", accelerometers are commonly as the criterion measure in the assessment of sedentary behavior (3). However, older versions of the accelerometers are unable to distinguish between sitting and standing, leading to a misclassification of sedentary time and breaks in sedentary time (3). In this sense, newer accelerometers models or the ActivPAL should be considered, as they are able to provide accurate measures of time spent sedentary, including breaks in sedentary time (26, 27). Further, to obtain more accurate measures and minimize recall errors associated with self-reported overall sedentary time as well as breaks in sedentary time, it may be beneficial to use diaries or activity logs (3, 4).

The primary strength of the present study is the multinational sample of children of the same age from different regions across Europe. A multinational sample is an advantage in terms of being able to generalize the findings from the present study to a larger population of children across European countries. Further, the identification of different variables being associated with self-reported screen time is also one of the strengths of the study, as this information may be important to consider in means of designing these types of studies.

The use of both questionnaires and accelerometers are favorable in means of providing precise measures of total sedentary time and contextual information (3, 28). Basically, using both subjective and objective measures is beneficial in means of capturing many dimensions of sedentary behavior. However, in the present study, the questionnaires and the objective measures did not provide measures of the same constructs. Thus, this may have compromised the results. When the questionnaire was designed, no validated measures of breaking up sedentary time were available. Therefore, the questions on breaks in sedentary time were developed for the ENERGY intervention study (14). In addition, these questions demonstrated low test-retest reliability, which may have compromised the results of the present study (14).

The use of convenience samples of schools is a limitation as this may reduce the ability to generalize the results. Further, Germany (n=24) was excluded from the present study due to too few participants, leading to 445 children in the analyses. A convenience sample of 445 children may be a limitation in terms of identifying moderating variables among 10-12 year old European children. Due to significant country differences in regard of MVPA, children's and parents' self-reported screen time and breaks, parents' educational level, ethnicity and gender, stratified analyses were performed. However, using stratified analyses reduces statistical power, which may have compromised the results of the study.

To achieve the largest sample size as possible, children with at least one day of valid accelerometer assessment were included in the present study. One day with objective measures may not be sufficient to represent habitual patterns of activity in children and adolescents, and the suggested duration of the measurement is four to nine days (29). Thus, one day of objective measures may be considered as a weakness in the present study as this may have compromised the results.

Conclusions

The associations between self-reported screen time and breaks in screen time and accelerometer assessed sedentary time and breaks in sedentary time were not moderated by gender, ethnicity, MVPA, parents' educational level, parents' screen time and breaks in screen time and parents' PA. However, interactions may still be present and our inability to reveal them may be due to lack of suitable tools.

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Table 1: Descriptive characteristics of the sample (mean ± standard deviation). Demographics are presented as frequencies (n).

	Belgium n=97*		Greece n=88*		Hungary n=133*		Norway n=127*	
	62 % girls	**38 % boys**	**56 % girls**	**44 % boys**	**43 % girls**	**57% boys**	**47 % girls**	**53 % boys**
Screen time[a]	153.9(88.8)	172.7(101.8)	168.1(80.4)	215.5(112.7)	194.5(89.3)	248.0(125.8)	131.7(79.5)	238.4(104.1)
Accelerometer sedentary time[a]	513.9(52.5)	492.6(67.3)	511.0(77.0)	517.6(77.1)	511.5(65.3)	498.6(84.1)	524.3(87.4)	524.8(95.9)
Accelerometer MVPA[b]	29.2(12.5)	38.5(14.2)	20.2(9.8)	28.3(14.3)	28.7(15.2)	38.0(18.2)	34.3(15.3)	41.3(23.0)
Breaks in one hour screen time[c]	1.7(1.2)	1.7(1.4)	2.3(1.0)	2.5(0.9)	2.1(1.8)	1.7(1.2)	1.9(1.3)	1.8(1.2)
Accelerometer breaks per day[c]	22.5(4.7)	20.9(5.8)	21.8(6.4)	21.3(5.9)	21.5(4.9)	21.0(6.0)	22.4(6.2)	24.1(7.0)
Parents screen time (min/day)	136.5(81.8)		146.4(92.0)		158.6(87.8)		143.5(77.4)	
Parents breaks in one hour screen time	1.2(1.1)		1.9(1.4)		1.7(1.2)		1.2(0.9)	
Parents self-reported PA								
- <30 min. 5 days/week (n)	61		54		75		76	
- ≥30 min. 5 days/week (n)	29		28		57		37	
Parents' educational level								
- Elementary/secondary school (n)	33		40		101		50	
- College or University (n)	54		41		29		63	

Ethnicity				
- Both parents born in home country (n)	71	56	120	92
- One or both parents not born in home country (n)	11	26	7	20

a: children's screen time and sedentary time (min/day)
b: children's MVPA: Moderate – to vigorous intensity physical activity (min/day)
c: children's number of breaks
*Belgium n= 89–97, Greece n= 81-88, Hungary n=129-133, Norway n=111–127

Table 2: Bivariate and multivariate regression analyses (95 % CI) for the relation between the independent variables and the dependent variable (self-reported screen time)

	Bivariate analysis			Final multivariate analysis		
	β -coefficients	**Confidence intervals**	**P-values**	**β-Coefficients**	**Confidence intervals**	**P-values**
Belgium						
Low educational level (parents)	65.63	26.14, 105.13	*0.001*	62.97	25.68, 100.25	*0.001*
Parents screen time >2h/day	58.70	20.07, 97.33	*0.003*			
Total sedentary time (min)	0.55	0.24, 0.86	*0.001*	0.54	0.22, 0.86	*0.001*
MVPA <30min/day	-0.30	-39.70, 39.09	0.988			
Boys	18.84	21.73, 59.42	0.359			
Both parents not born in home country	9.59	-51.01, 70.26	0.754			
Parents PA <5 days/week	13.48	-30.03, 56.98	0.539			
Greece						
Low educational level (parents)	12.56	-31.71, 56.84	0.574			
Parents screen time >2h/day	45.43	2.28, 88.78	*0.039*	45.43	2.28, 88.78	*0.039*
Total sedentary time (min)	0.60	-0.22, 0.04	0.672			
MVPA <30 min/day	8.59	-39.29, 56.47	0.722			
Boys	47.35	5.67, 89.02	*0.026*			
Both parents not born in home country	-12.50	-59.61, 34.61	0.599			
Parents PA <5 days/week	-15.97	-62.57, 30.63	0.497			

Hungary						
Low educational level (parents)	28.30	-19.41, 76.02	0.243			
Parents screen time >2h/day	30.03	-11.33, 71.40	0.153			
Total sedentary time (min)	0.05	-0.21, 0.31	0.719			
MVPA <30min/day	5.93	-33.56, 45.46	0.767			
Boys	53.53	14.75, 92.30	*0.007*	53.53	14.75, 92.30	*0.007*
Both parents not born in home country	-7.25	-95.10, 81.50	0.872			
Parents PA <5 days/week	-26.72	-66.27, 12.83	0.184			
Norway						
Low educational level (parents)	14.97	-26.39, 56.33	0.475			
Parents screen time >2h/day	10.34	-31.96, 52.64	0.692			
Total sedentary time	0.17	-0.05, 0.38	0.135			
MVPA <30min/day	14.13	-25.56, 53.81	0.482			
Boys	106.63	72.58, 140.69	*<0.001*	106.63	72.58, 140.69	*<0.001*
Both parents not born in home country	10.96	42.10, 64.02	0.683			
Parents PA <5 days/week	-8.70	-52.17, 34.76	0.692			

Table 3: Bivariate analyses (95 % CI) for the relation between the independent variables and the dependent variable (self-reported breaks in screen time)

	Bivariate analyses	
	β-coefficients	**P-values**
Belgium		
Educational level (parents)	-0.15 (-0.83, 0.53)	0.661
Parents breaks per hour screen time	0.22 (-0.22, 0.66)	0.324
Total number of breaks per day	0.11 (-0.05, 0.07)	0.730
MVPA <30min/day	-0.08 (-0.72, 0.58)	0.819
Gender	-0.03 (-0.68, 0.61)	0.922
Both parents not born in home country	-0.92 (-1.99, 0.14)	0.087
Parents PA <5 days/week	0.45 (-0.03, 1.12)	0.188
Greece		
Educational level (parents)	0.59 (0.14, 1.05)	**0.011**
Parents breaks per hour screen time	0.16 (-0.06, 0.37)	0.159
Total number of breaks per day	-0.03 (-0.04, 0.04)	0.861
MVPA <30 min/day	0.32 (-0.20, 0.84)	0.219
Gender	0.20 (0.26, 0.66)	0.391
Both parents not born in home country	0.58 (0.09, 1.08)	**0.022**
Parents PA <5 days/week	-0.12 (-0.64, 0.40)	0.652
Hungary		
Educational level (parents)	-0.24 (-0.78, 0.31)	0.396
Parents breaks per hour screen time	0.21 (-0.03, 0.46)	0.082
Total number of breaks per day	0.03 (-0.01, 0.07)	0.179

MVPA <30min/day	-0.19 (-0.64, 0.26)	0.405
Gender	-0.36 (-0.81, 0.08)	0.110
Both parents not born in home country	0.42 (-0.60, 1.44)	0.414
Parents PA <5 days/week	0.17 (-0.29, 0.62)	0.469
Norway		
Educational level (parents)	-0.21 (-0.75, 0.33)	0.440
Parents breaks per hour screen time	0.10 (-0.25, 0.45)	0.571
Total breaks per day	-0.01 (-0.05, 0.03)	0.590
MVPA <30min/day	-0.22 (-0.74, 0.30)	0.407
Gender	-0.09 (-0.61, 0.43)	0.731
Both parents not born in home country	-0.30 (-0.99, 0.40)	0.401
Parents PA <5 days/week	-0.07 (-0.66, 0.52)	0.823

PART THREE:

Appendix

CONTENTS

Appendix 1

Til deg som går i 6. eller 7. klasse!

Vi håper du kan være med å hjelpe oss med et viktig forskningsprosjekt.

Prosjektet heter ENERGY, og foregår i 5 europeiske land: Belgia, Hellas, Norge, Tyskland og Ungarn. Vi trenger hjelp av elever som er 10-12 år, og en av deres foreldre/foresatte, for at prosjektet skal bli bra.

Litt mer om prosjektet:
I Europa er det mange barn og ungdom som er overvektige. Det er også mange som sitter mye stille og ser mye på TV. Vi vil gjerne finne ut mer om hvorfor det er sånn, og hvordan vi kan hjelpe barn og unge til å ha en god helse og en sunn kropp.

Hva trenger vi hjelp til?

- Vi håper du kan fylle ut et spørreskjema på skolen om kosthold og aktivitet to ganger til høsten. Dette tar ca en skoletime hver gang, og da er en person fra prosjektet der hvis du lurer på noe.
- Du tar med hjem et spørreskjema til en av dine foreldre/foresatte disse to gangene.
- Noen vil også bli trukket ut til å gå med et apparat som festes på hoften og som måler hvor fysisk aktive de er.

Hvis du vil være med er det viktig at en av dine foreldre/foresatte signerer den vedlagte samtykkeerklæringen, og at du tar den med tilbake til skolen.

Alle svarene dine er hemmelige og det er ingen du kjenner som får vite hva du har svart. Det er helt frivillig å delta i spørreundersøkelsen og målingen av fysisk aktivitet (om du blir trukket ut til dette). Du kan trekke deg fra undersøkelsen når som helst. Læreren din skal ikke lage noen oversikt over hvem i klassen som deltar, det skal vi gjøre. Det vil ikke påvirke ditt forhold til skolen dersom du velger å ikke delta i undersøkelsen.

Hvis du lurer på noe mer, så kan du spørre en av oss i prosjektet når vi kommer til skolen din!

Hilsen oss i ENERGY-prosjektet

v/ Frøydis N Vik på Universitet i Agder
Tlf. 38141855

Appendix 2

Forespørsel om deltakelse i forskningsprosjektet *"ENERGY"*

Klassen hvor barnet ditt er elev deltar i høst i forskningsprosjektet ENERGY. ENERGY er finansiert av EUs forskningsprogram, og gjennomføres i 5 land: Norge, Belgia, Hellas, Ungarn og Tyskland.

Bakgrunn og hensikt

Dette er en forespørsel til foreldre/foresatte om å la ditt barn delta i en forskningsstudie for å bedre forståelsen av hvordan inaktivitet hos 10-12 åringer kan reduseres, noe som igjen vil være viktig for å fremme sunn vektutvikling og god helse. Barn og unge bruker mye tid på å sitte stille, bl.a. når de bedriver skjermaktivitet (TV/PC). Målet med studien er å redusere og bryte opp sitte-tid (inkludert skjermaktivitet) i skolen og hjemme.

Selve studien

Studien er en intervensjonsstudie blant 10 skoler i hvert av de 5 deltagende landene. Dette betyr at en rekke aktiviteter vil settes i gang på noen av skolene for å se hvilke tiltak som har effekt. For at en slik intervensjon skal ha vitenskapelig tyngde, så vil fem skoler tilfeldig bli trukket ut til å være intervensjonsskoler, mens fem skoler vil være kontrollskoler (hvor ingen prosjektaktiviteter skal foregå). Begge kategoriene er like viktige og avgjørende for kvaliteten på resultatene. Kontrollskolene vil få utdelt alt materiell som blir benyttet i intervensjonen etter at prosjektperioden er fullført.

Hva innebærer studien?

I løpet av høsten 2011 vil følgende skje:

- Ditt barn blir spurt om å svare på to spørreskjema på skolen om inaktivitet. Ett i august/september og ett i november/desember. Spørreskjemaet tar en skoletime å besvare. Spørreskjemaet inneholder spørsmål om inaktivitet, fysisk aktivitet og kosthold, samt spørsmål om årsaksfaktorer til inaktivitet (som kunnskap, holdninger, regler hjemme) og sosiodemografiske bakgrunnsvariabler som alder, kjønn, hvem de bor sammen med og hvilket språk de snakker hjemme.
- Noen få tilfeldig valgte barn blir bedt om å bruke et akselerometer i 6 dager etter besvart spørreskjema (begge ganger). Dette er et lite apparat som festes i belte/bukselinning som måler aktivitetsnivået hos barnet.
- Når ditt barn fyller ut spørreskjemaene på skolen vil det også få med spørreskjema hjem som en av foreldrene/foresatte blir spurt om å fylle ut. Spørsmålene vil omhandle barnas inaktivitet og egen inaktivitet, fysisk aktivitet og kost, og vil ligne elevenes spørreskjema. I tillegg vil spørreskjemaet inneholde spørsmål om sivil status, utdanningsnivå, yrke og barnets etnisitet. Skjemaene returneres med barnet til kontaktlærer på skolen i lukket konvolutt.

Mulige fordeler og ulemper

Studien vil ikke føre til ulemper for deg eller ditt barn, utover punktene som er skissert over. Fordelen med studien er at den vil gi økt kunnskap om inaktivitet blant barn og unge som igjen er med på å utvikle effektive tiltak for å forebygge inaktivitet og overvekt i Norge og Europa.

Hva skjer med informasjonen om deg og ditt barn

All informasjon angående barn og foreldre/foresatte vil utelukkende bli brukt til forskning i henhold til gjeldende nasjonal lovgivning. Opplysningene som innhentes i denne studien er konfidensielle og ingen uvedkommende vil få tilgang til dem. Studien er basert på avidentifiserte opplysninger. Med dette menes opplysninger der navn og andre personlige kjennetegn er fjernet. Kun deltagere i forskningsteamet har

adgang til navnelister. Disse oppbevares innelåst og separat fra datafilen, og vil ikke bli brukt på noen måte i resultatene fra undersøkelsen eller frigitt på noen annen måte. Det vil ikke være mulig å identifisere verken foreldre/foresatte eller barn i resultatene av studien når disse publiseres. Datamaterialet vil bli anonymisert ved prosjektets slutt (30.06.2012), dvs. at navnelistene blir makulert (slettet), og ingen kan kople navn til datamateriale.

Frivillig deltakelse

Det understrekes at det er frivillig å delta i studien. Du kan når som helst, og uten å oppgi noen grunn, trekke ditt samtykke tilbake. I så fall vil alle innsamlete data bli slettet. Dette vil ikke få konsekvenser for barn eller foreldre/foresatte. Dersom du ønsker å la ditt barn delta, undertegner du samtykkeerklæringen på siste side og returnerer den i konvolutten til kontaktlærer, via barnet. Har du spørsmål til studien, kan du kontakte:

Frøydis N. Vik, Universitet i Agder
Telefon: 38141855
E-post: froydis.n.vik@uia.no

Prosjektet er godkjent av Regional komité for medisinsk forskningsetikk.

De barna som ikke deltar i utfyllingen av spørreskjema på skolen, vil få et alternativt opplegg på skolen de 2 timene hvor spørreskjemaene fylles ut.

Samtykke til deltakelse i studien (returneres med eleven til kontaktlærer)

Jeg bekreftet å ha mottatt informasjon om studien. Hvis jeg ønsker tilleggsinformasjon, så vet jeg hvem jeg skal kontakte.

Jeg samtykker til at mitt barn deltar i studien som beskrevet i informasjonsbrevet ved å besvare 2 spørreskjema, og eventuelt bruke et akselerometer hvis mitt barn trekkes ut til det, og at det kan sendes med barnet hjem to spørreskjema til foreldre/foresatte.

Jeg har blitt informert om at mitt barns deltagelse og foreldre/foresattes deltagelse er frivillig. Jeg kan når som helst trekke meg selv og/eller mitt barn fra studien uten å oppgi noen grunn. Hvis jeg og mitt barn ikke velger å delta, eller trekker oss fra studien, så vil det ikke medføre noen form for ulemper.

Barnets navn (store bokstaver), navn på skole, klasse (f.eks. 6A)

_____

Forelders/foresattes navn (store bokstaver)

_____

Sted og dato

_____

Underskrift til forelder/foresatt

_____

Navn på forskere: Professor Elling Bere og PhD-student Frøydis N. Vik

Appendix 3

REK
REGIONALE KOMITEER FOR MEDISINSK OG HELSEFAGLIG FORSKNINGSETIKK

Region:	Saksbehandler:	Telefon:	Vår dato:	Vår referanse:
REK sør-øst	Tone Gangnæs	22 84 55 20	05.07.2011	2011/919b
			Deres dato:	Deres referanse:
			15.06.2011	

Professor
Elling Bere
Universitetet
i Agder
Serviceboks
422
4604 Kristiansand

2011/919b ENERGY WP9 intervensjonsstudie

Vi viser til mottatt skjema for tilbakemelding på REKs utsettende vedtak av 9. juni 2011, vedlagt informasjons- og samtykkeerklæring til foresatte, samt informasjonsskriv til barna.

Prosjektleder:	Elling Bere
Forskningsansvarlig:	Universitetet i Agder ved øverste ledelse

REK har i vedtak 9. juli 2011 anmodet om at det skal brukes aktivt samtykke i studien. Et aktivt samtykke er i samsvar med lovens hovedregel om et gyldig samtykke, jf helseforskningsloven § 13. Forskningsprosjektet har imøtekommet REKs merknader og oversendt informasjon- og samtykkeerklæring, som prosjektet også skisserte som alternativ to i opprinnelig prosjektsøknad.

REK finner at det foreliggende informasjonsskriv og samtykkeerklæring til foresatte er tilfredsstillende utformet, samt informasjonsskrivet til barna. Vi vil presisere at det er viktig at barna informeres og spørres om deltakelse i studien.

Vedtak
Komiteen godkjenner at prosjektet gjennomføres i samsvar med det som fremgår av søknaden og tilbakemelding. Videre at prosjektet gjennomføres i samsvar med de bestemmelse som følger av helseforskningsloven med forskrift.

Godkjenningen gjelder til 30.06.2012.

Dersom det skal gjøres endringer i prosjektet i forhold til de opplysninger som er gitt i søknaden, må prosjektleder sende endringsmelding til REK.

Forskningsprosjektets data skal oppbevares forsvarlig, se personopplysningsforskriften kapittel 2, og Helsedirektoratets veileder for «Personvern og informasjonssikkerhet i forskningsprosjekter innenfor helse- og omsorgssektoren». Graden av personidentifikasjon for helseopplysninger skal ikke

være større enn nødvendig for å nå formålene. Personidentifiserbare data skal slettes straks det ikke lenger er behov for dem. Deretter skal opplysningene anonymiseres eller slettes.

Prosjektet skal sende sluttmelding på eget skjema, se helseforskningsloven § 12, senest et halvt år etter prosjektslutt.

Komiteens vedtak kan påklages til Den nasjonale forskningsetiske komité for medisin og helsefag, jfr. helseforskningsloven § 10, 3 ledd og forvaltningsloven § 28. En eventuell klage sendes til REK sør-øst B. Klagefristen er tre uker fra mottak av dette brevet, jfr. forvaltningsloven § 29.

Vi ber om at alle henvendelser sendes inn via vår saksportal:
http://helseforskning.etikkom.no eller på e-post til post@helseforskning.etikkom.no.

Vennligst oppgi vårt referansenummer i korrespondansen.

Med vennlig hilsen

Stein Opjordsmoen Ilner (sign.)
professor dr. med
Komiteleder

Appendix 4

UNIVERSITETET I AGDER

CHILD QUESTIONNAIRE

We would like to ask you to answer this questionnaire which includes questions about screen time. The questionnaire also includes some questions about physical activity and some questions about you. It will take roughly 1 school lesson to complete. No one, except the researchers, will get to know about your answers. So you don't have to worry that your teacher, parents or classmates will see your answers. There are no 'right' or 'wrong' answers. Just fill in what is true for you or your situation.

Your participation in the study is voluntary. So if you don't want to fill in the questionnaire you can tell us.

Thank you in advance for your help!

How to complete the questionnaire?

- Complete the questionnaire using a blue or black pen.
- Place a clear ■ in the answer box.
- Mark only one box per question for most questions.
- In a few questions multiple answers can be given (this is indicated in the questions).

Questions about watching TV/DVD

By 'watching TV/DVD' we mean all TV programmes and films watched on a TV or on a computer.

8. Roughly how many hours a day do you <u>usually</u> spend watching TV/DVD in your leisure time?
(Please mark one box for weekdays and one box for weekend days)

(a) <u>Weekdays</u>

□ None at all
□ Less than 30 minutes per day
□ 30 minutes per day
□ 1 hour per day
□ 1 hour 30 minutes per day
□ 2 hours per day
□ 2 hours 30 minutes per day
□ 3 hours per day

□ 3 hours 30 minutes per day
□ 4 or more hours per day

(b) Weekend days

□ None at all
□ Less than 30 minutes per day
□ 30 minutes per day
□ 1 hour per day
□ 1 hour 30 minutes per day
□ 2 hours per day
□ 2 hours 30 minutes per day
□ 3 hours per day
□ 3 hours 30 minutes per day
□ 4 or more hours per day

Questions about using a computer/games console for leisure activities

*By 'leisure activities' we mean using a computer in your free time and **NOT** at school or for homework.*

By 'using a computer/games console' we mean:
*- **Playing games** on a computer, games console (e.g. Playstation, Xbox, Nintendo (Wii, GameCube, DS)) or mobile phone*
*- **Using the internet** for leisure activities such as chatting, e-mailing, surfing, Facebook*

28. Roughly how many hours a day do you usually use a computer/games console for leisure activities? (Please mark one box for weekdays and one box for weekend days)

(a) Weekdays

□ None at all
□ Less than 30 minutes per day
□ 30 minutes per day
□ 1 hour per day
□ 1 hour 30 minutes per day
□ 2 hours per day
□ 2 hours 30 minutes per day
□ 3 hours per day
□ 3 hours 30 minutes per day
□ 4 or more hours per day

(b) Weekend days

□ None at all
□ Less than 30 minutes per day
□ 30 minutes per day
□ 1 hour per day
□ 1 hour 30 minutes per day

Questions about breaking up the time you spend sitting

By 'breaking up the time you spend sitting' we mean standing up, stretching or walking around a little while doing an activity where you are normally sitting.

***Include** only breaks that you do because you want to break up the time you spend sitting – i.e. **do not include** breaks such as going to the toilet or to get something to eat.*

52. During one hour of watching TV/DVD, how often do you usually stand up, stretch or walk around a bit?

□ Never
□ Once
□ Twice
□ Three times
□ Four times or more
□ I usually do not watch TV/DVD for a full hour

53. During one hour of using a computer/games console for leisure activities, how often do you usually stand up, stretch or walk around a bit?

□ Never
□ Once
□ Twice
□ Three times
□ Four times or more
□ I usually do not use a computer/games console for a full hour

Appendix 5

UNIVERSITETET I AGDER

ENERGY

PARENT QUESTIONNAIRE

Your child's school is taking part in a scientific study 'UP4FUN' as part of the ENERGY project focusing on sedentary activities (e.g. screen time). The study includes 50 schools and about
2500 children from different countries across Europe. In this regard, information from the children's parents/guardians is also important. Therefore, we would like to ask you to answer this questionnaire. It takes usually less than 30 minutes. The results of this study will be used for scientific and public health purposes only. No one, except for the researchers, will see your answers. Don't write your name on the questionnaire. When you have answered the questionnaire, put it in the envelope and give it back to your child in order to return it back to the school. There are no 'right' or 'wrong' answers. We prefer if the questionnaire can be filled in on Tuesday – Saturday, so that 'yesterday' is a week day.

Later this autumn a second questionnaire will be sent home with your child. It is important that the same parent/guardian answers both of these two questionnaires, and we hope that you will be willing to do so. Your participation in the study is voluntary.

Thank you in advance for your help!

How to complete the questionnaire?
- Please complete the questionnaire using a blue or black pen.
- Place a clear ☒ in the answer box.
- Mark only one box per question (in a few questions multiple answers can be given).
- In a few questions you are asked to fill in numbers.
- When referring to 'your child' we mean the child that brought home this questionnaire.

Questions about <u>you</u> watching TV/DVD

By 'watching TV/DVD' we mean all TV programmes and films watched on a TV or on a computer.

6. Roughly how many hours a day do you <u>usually</u> watch TV/DVD in your leisure time? (Please mark one box for weekdays and one box for weekend days)

a) <u>Weekdays</u>

□ None at all

□ Less than 30 minutes per day

□ 30 minutes per day

□ 1 hour per day
□ 1 hour 30 minutes per day
□ 2 hours per day
□ 2 hours 30 minutes per day
□ 3 hours per day
□ 3 hours 30 minutes per day
□ 4 or more hours per day

(b) Weekenddays

□ None at all
□ Less than 30 minutes per day
□ 30 minutes per day
□ 1 hour per day
□ 1 hour 30 minutes per day
□ 2 hours per day
□ 2 hours 30 minutes per day
□ 3 hours per day
□ 3 hours 30 minutes per day
□ 4 or more hours per day

Questions about you using a computer/games console for leisure activities

By 'leisure activities' we mean using a computer in your own (or your child's) free time and NOT for work related activities (or at school or for homework for your child).

By 'using a computer/games console' we mean:
- Using the internet (computer, iPad, mobile phone) for leisure activities such as social networking (e.g. Facebook), chatting, e-mailing, surfing
- Playing games on a computer,
games console (e.g. Playstation, Xbox, Nintendo (Wii, GameCube, DS)), or on a mobile phone

21. Roughly how many hours a day do you usually use a computer/games console for leisure activities? (Please mark one box for weekdays and one box for weekend days)

(a) Weekdays

□ None at all
□ Less than 30 minutes per day
□ 30 minutes per day
□ 1 hour per day
□ 1 hour 30 minutes per day

□ 2 hours per day
□ 2 hours 30 minutes per day
□ 3 hours per day
□ 3 hours 30 minutes per day
□ 4 or more hours per day

(b) Weekenddays

□ None at all
□ Less than 30 minutes per day
□ 30 minutes per day
□ 1 hour per day
□ 1 hour 30 minutes per day
□ 2 hours per day
□ 2 hours 30 minutes per day
□ 3 hours per day
□ 3 hours 30 minutes per day
□ 4 or more hours per day

Questions about your physical activity

By 'physical activity' we mean any activity that increases your heart rate and causes you to be out of breath for part of the time.

Some examples of physical activity are brisk walking, biking, running, dancing, swimming, basketball, football and surfing.

Add up all the time you spend in physical activity each day.

37. Over a typicalorusualweek, on how many days are you physically active for a total of at least 30minutes per day?
□ None
□ One day
□ Two days
□ Three days
□ Four days
□ Five days
□ Six days
□ Every day

Questions about breaking up the time you spend sitting

By 'breaking up the time you spend sitting' we mean standing up, stretching or walking around a little while doing an activity where you are normally sitting.

Include only breaks that you do because you want to break up the time you spend sitting – i.e. do not include breaks such as going to the toilet or to get something to eat.

51. During onehour of watching TV/DVD, how often do you do you usually stand up, stretch or walk around a bit?

- □ Never
- □ Once
- □ Twice
- □ Three times
- □ Four times or more
- □ I usually do not watch TV/DVD for a full hour

52. During onehour of using a computer/games console for leisure activities, how often do you usually stand up, stretch or walk around a bit?

- □ Never
- □ Once
- □ Twice
- □ Three times
- □ Four times or more
- □ I usually do not use a computer/games console for a full hour

Some final questions about you

74. Were both biological parents of your child born in [home country]?

- □ Yes
- □ No, only one parent
- □ No, none of the parents

77. What is the highest level of education you have completed?

- □ Elementary school (country specific)
- □ Secondary school (country specific)
- □ College/University (bachelor's degree or equivalent (country specific)
- □ College/University (master's degree or eqvivalent)(country specific)