Children's physical activity levels

Examining the association between parental and child physical activity levels

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Kristiansand, May 2024
Sincerely,
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Abstract

The complexity of determinates affecting children's physical activity levels remains largely unknown. However, previous research indicates a weak but positive association between parents´ and children's physical activity level. Thereby, this study aimed to answer the following research question: “What is the relationship between parents and their children’s physical activity?”

This study is part of a pilot in the larger international research project called DE- PASS. A total of 25 children and 19 parents were included in this study. We assessed parent-child physical activity levels, using the hip worn accelerometers ActiGraph wGT3X-BT Activity Monitor, which captures and records high resolution raw acceleration data. Height and weight were measured objectively, and a questionnaire was used to assess descriptive data.

The results revealed a significant difference between children and parent´s physical activity level, with children being more physically active, and less sedentary. We also found that boys engage in significantly more moderate-to- vigorous physical activity than girls (95 CI: -37.56, -1.06). There were no significant associations between parent-child PAB. However, we found an association between gender and children’s Moderate-to- vigorous physical activity (95 CI: 0.89, 50.66), as well as gender and children’s steps per day (95 CI: 119.00, 6380.96).

Although there was no significant association between parents' physical activity levels and their children´s physical activity levels, other determining factors concerning parent-child relations would be interesting to further explore.

Sammendrag

Kompleksiteten bak faktorer som påvirker barns fysiske aktivitetsnivå er i liten grad forsket på. Imidlertid indikerer tidligere forskning en svak, men positiv sammenheng mellom foreldres og barns fysiske aktivitetsnivå. Derfor har denne studien som mål å svare på følgende forskningsspørsmål: "Hvordan er sammenhengen mellom foreldre og barns fysiske aktivitet?"

Denne studien er en del av et større internasjonalt pilotstudie med navn DE-PASS. Totalt 25 barn og 19 foreldre ble inkludert i denne studien. Vi vurderte foreldre-barns fysiske aktivitetsnivå ved hjelp av hoftebårne akselerometre ActiGraph wGT3X-BT Activity Monitor, som fanger opp og registrerer data om høyoppløselig akselerasjon. Høyde og vekt ble målt objektivt, og et spørreskjema ble brukt for å vurdere deskriptiv data.

Resultatene avslørte en betydelig forskjell mellom barns og foreldres fysiske aktivitetsnivå, der barn er mer fysisk aktive og mindre stillesittende enn foreldre. Vi fant også at gutter deltar betydelig mer i moderat til høy intensitets fysisk aktivitet enn jenter (95 CI: -37,56, -1,06). Det var ingen signifikante sammenhenger mellom foreldre-barns fysiske aktivitetsvaner. Imidlertid fant vi en sammenheng mellom kjønn og barns moderat til høy intensitets fysisk aktivitet (95 CI: 0,89, 50,66), samt kjønn og barns skritt per dag (95 CI: 119,00, 6380,96).

Selv om det ikke var noen signifikant sammenheng mellom foreldrenes fysiske aktivitetsnivå og deres barns fysiske aktivitetsnivå, ville andre bestemmende faktorer knyttet til foreldre-barn-forhold være interessant å forske nærmere på.

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1.0 Introduction

Physical activity (PA) prevents the risk of the most crucial non- communicable diseases (NCDs) (King et al., 2019). Among these are heart diseases, cancer and diabetes. Furthermore, increased PA can contribute to a better life quality, sleep patterns and positively impact mental health (King et al., 2019). Worldwide, there is a concerning decrease in PA (Guthold et al., 2018). The consequences of increased physical inactivity (PinA) affect 1.4 billion people worldwide (Guthold et al., 2018). The World Health Organization (WHO, 2019) categorizes PinA as the fourth leading risk for mortality globally. PinA is related to 16 percent of the world's NCDs, and nine percent of the world's mortality rate. By increasing PA worldwide, life expectancy will increase as a positive consequence (Lee et al., 2012). There is a concerning amount of individuals not meeting the recommendations for PA, emphasizing the need for public health interventions increasing PA levels worldwide (Lee et al., 2012).

Malina's (1996) research on the tracking of PA and fitness across the lifespan highlights the importance of promoting an active lifestyle among children globally, emphasizing the potential long-term benefits of interventions aimed at increasing childhood PA levels. As children grow older their moderate- to- vigorous physical activity (MVPA) declines (Farooq, et al., 2020). This affects both genders, but more so among girls. From age three to eighteen research (Farooq, et al., 2020) have found a yearly decrease in children´s MVPA, with 5.3 percent among girls and 3.4 percent amongst boys worldwide. Only one third of both children and adults globally meet the recommendations for PA set by the World Health Organization. This is problematic related to preventing public health problems (Farooq, et al., 2020). Significant disparities in PA levels among nations reflect the importance of political regulations (Steene-Johannessen et al., 2019). Interestingly, while underdeveloped nations are experiencing an increase in PA, wealthier nations are experiencing declines in PA. In Norway the PA level has been reduced over the last decade, with older kids being less PA, especially girls (Steene-Johannessen et al., 2019). Overall, a decrease of the world´s PA is a concerning trend going against the World Health Organizations goal of increasing global PA by 10 % by 2030 (Guthold et al., 2018).

The complexity of why children are physically active is related to several determinants categorized as: personal, interpersonal, organization, community and public policy (Hu et al., 2021). Interpersonal determinants show a positive association between children (age 6-12) and their parents PA, revealing an even stronger correlation between same sex parent-child relationships. This is likely due to a role model effect within father-son and mother- daughter dynamics. Matos et al. (2021) reveal that parents who meet the recommendations for PA are more likely to instill these habits in their children, particularly MVPA (Matos et al., 2021). Regardless of the child´s age, several studies show a weak, but clear positive relationship between parents and their children's PA level (Petersen, et al., 2020). Furthermore, positive PA habits established in childhood are likely to create a beneficial foundation for PA later in adult life (Petersen, et al., 2020; Malina, 1996).

Further research is needed to gain a better understanding around what determinants affects individual´s PA level (Bauman et al., 2012) amongst European citizens (Condello et al., 2016). However, despite sedentary behavior and decreased PA being acknowledged as significant threats to public health (De Craemer et al., 2018), existing studies concerning determinants associated with youth PA are often lacking, providing limited evidence (Carlin et al., 2017, Brug et al., 2017), or are inaccessible for cross- European research (De Craemer et al., 2018). The identified gap in understanding what determinants contribute to children´s engagement in PA underscores the importance of further research. By exploring the relationship between parental and child PA levels and motivations leading to a more active lifestyle, this study seeks to provide valuable insight into promoting healthier PA habits among children (De Craemer et al., 2018).

1.1 Aim of the study

Based on the above mentioned there currently is a clear lack of knowledge concerning the association between children´s and parent´s PA habits. This study aims to address the existing gap by investigating and comparing parent-child PA level and further determinants influencing children´s engagement in PA. We strive to provide valuable insight for developing effective strategies to enhance children´s overall PA levels, thus contributing to a better understanding of the role of parental influence in shaping children´s PA habits. The findings could inform public

health interventions aimed at promoting PA among children by targeting relevant determinants identified through this research. The central research question guiding this study is: “What is the relationship between parents and their children´s physical activity?”

2.0 Theory

Caspersen et al. (1985) defines physical activity (PA) as: “any bodily movement produced by skeletal muscles that results in energy expenditure”. PA is a fundamental contributor to public health, reducing the risk of chronic diseases and increasing overall well-being. Because of the numerous positive impacts PA have on public health, it's essential to promote and support opportunities for individuals of all ages and abilities to engage in PA (Keadle et al., 2021).

PA has a positive long-term effect on preventing obesity, Alzheimer's disease, dementia, type 2 diabetes mellitus (T2DM), osteoarthritis, depression and coronary heart disease (Reiner et al., 2013; Geidl et al., 2020; Cleven et al., 2020). Non- communicable diseases (NCDs), such as the above-mentioned are medical conditions or health issues not caused by infectious agents and cannot be transmitted. These diseases typically have a long duration and develop over time, often progressing slowly (WHO, 2014). Physical inactivity (PinA), defined as “an activity level insufficient to meet current recommendations” (Lee et al., 2012), are among the major contributors to the development of NCDs (WHO, 2014). However, effective prevention strategies include lifestyle modifications, such as increased PA and reduced sedentary behavior (WHO, 2014). A German study (Geidl et al., 2020) found that a weekly engagement in MVPA of 150 minutes, combined with muscle- resisting training twice a week will optimize the prevention of developing NCDs on an individual level. By encouraging PA, public health programs and guidelines aim to reduce the burden of NCDs on society and improve overall health outcomes (Dempsey et al., 2020). Without evidence-based intervention, the personal, societal, and economic toll caused by NCDs will continue to increase (WHO, 2014). UNICEF defines a child as: “any person under the age of 18”, while an adolescent is defined as a human being between the age of 10 and 19 (WHO). A daily habit of 60 minutes of MVPA for children aged 5-17 also seems to be an effective way of reducing the risk of developing NCDs (WHO, 2014). Steene-Johannessen et al. (2020) underscores that the recommended daily 60 minutes of MVPA will reduce the risk of adiposity among children between 5-17 years. Although MVPA is a significant contributor to public health, Steene-Johannessen et al. (2020) stresses that light- intensity PA is more sustainable for longer durations and is more accessible to most individuals.

Reiner et al. (2013) did a review of a large-scale epidemiological longitudinal studies concerning the association between PA and NCD´s. The results revealed that PA has a positive impact on reducing the risk of age-related diseases, but further long-term research is needed to fully understand this impact (Reiner et al., 2013). Studies (Warburton et al. 2017) have revealed that significant health benefits can be attained with PA volumes significantly lower than international recommendations. Warburton et al. (2017) found a dose-response relationship between PA and health, typically following a curvilinear pattern where the greatest relative benefits occur at lower activity levels. Janssen et al. (2010) did a review on observational studies concerning school- children PA benefits, where they found several health benefits related to engagement in PA. Similarly to Warburton et al. (2017), Janssen et al. (2010) revealed a dose-response relationship clearly stating that increased engagement in PA has a positive impact on schoolchildren´s overall health. As illustrated in Figure 1, even low intensity PA can notably benefit high-risk individuals, such as people struggling with obesity or high blood pressure (Janssen et al., 2017). Optimal health benefits are achieved through MVPA, particularly those that challenge the cardiovascular and respiratory systems, with high-impact weight-bearing exercises being crucial for bone health (Janssen et al., 2017).

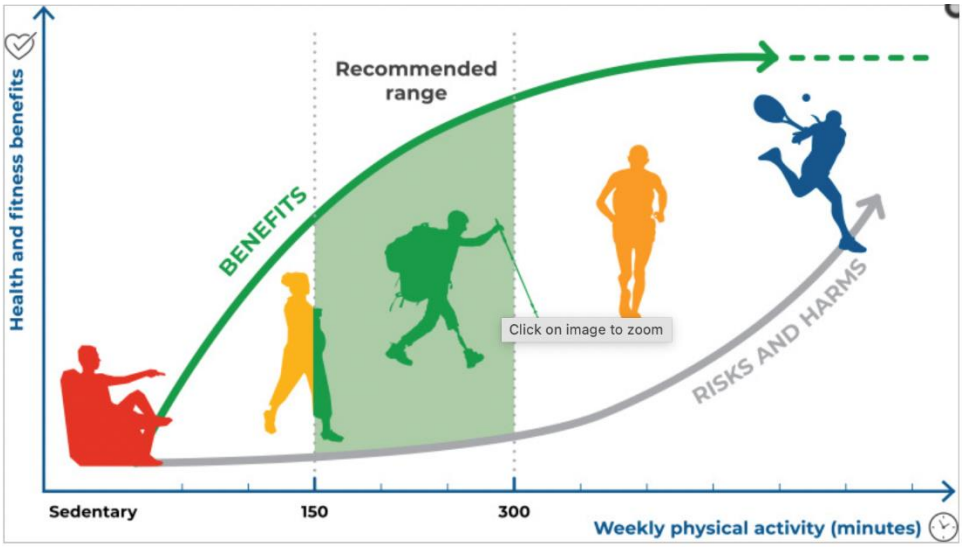


Figure 1: Dose response curve (WHO, 2020)

PinA is linked to increased visceral and abdominal fat, as well as being one of the biggest determinants for developing type 2 diabetes (González, 2017). However, the most conspicuous consequence of PinA is the heightened risk of obesity. Obesity becomes a predicament from a young age, as overweight children tend to transition into overweight adults in later life (Perez-Rodriguez, 2012). Obesity among children and adolescents can culminate in various cardiovascular diseases and type 2 diabetes (Perez-Rodriguez, 2012). A global public health concern is drawn due to the growing prevalence of childhood hypertension. Elevated body mass index (BMI) among children seems to be a key determinant (Song et al., 2019). However, the common belief that PA influences body fat levels is challenged by studies (Bauman et al., 2012) suggesting high body fat levels may contribute to decreased levels of PA. Baseline adiposity may have a stronger predictive value for future activity levels than baseline activity does for future adiposity (Bauman et al., 2012). Furthermore, emphasis should be placed on promoting key determinants of healthy lifestyle behaviors rather than solely focusing on health outcomes. Encouraging enjoyment of PA and addressing multiple lifestyle behaviors can serve as an effective approach when working towards promoting healthy living, both physically and mentally (Warburton et al. 2017). Children, from age 10-19, is a crucial age group related to the world´s public health (Patton et al., 2016). Investing in their health will not only influence their own adult life, but also the future generation's upbringing. Social gradient and gender differences are the core of health inequalities in adolescents. Early investment in adolescent's health through organized and increased participation in health beneficial activities, is an approach that will improve the societies health in the long run (Patton et al., 2016; WHO, 2017).

Physical literacy in childhood refers to developing fundamental movement skills, confidence, and motivation to engage in PA throughout life (Caldwell et al., 2020). It involves mastering basic movements like running, jumping, throwing, and catching, as well as understanding concepts like balance, coordination, and spatial awareness (Caldwell et al., 2020). Caldwell et al. (2020) found that children´s enhanced physical literacy leads to a positive body composition, blood pressure and overall life quality.

Mental health

Regular engagement in PA can positively impact mental health, by reducing symptoms of depression and anxiety, as well as contributing to improved sleep quality and overall mental wellness (Mahindru et al., 2023). PA releases endorphins, contributes to healthy brain development, and reduces depression, stress and total psychological distress (Rodriguez-Ayllon et al., 2019). Emphasis on maintaining good mental health in developed countries is crucial due to it being one of the main causes of disability (Paluska et al., 2000). A recent national American study (Zablotsky et al., 2023) measured the prevalence of mental health treatments among children aged 5-17 years, revealing a growing use of prescription medication, being especially prevalent among the older children and boys. Potrebny et al. (2017) highlights that adolescents´ mental health rates have been stabilizing in northern Europe over the past decade. However, self-reported psychosomatic health complaints have been increasing over the last four decades (Potrebny, et al., 2017). Rodriguez-Ayllon et al., (2019) highlights that PA contributes to an overall increased satisfaction with life among adolescence and children. Furthermore, investment in childhood mental health, through encouraged engagement in PA (Paluska et al., 2000) will impact the development of positive mental health when reaching adult life (Castelpietra et al., 2022, Petersen, et al., 2020).

Paluska et al. (2000) empasizes the long-term mental health benefits of engagement in PA. However, most studies drawing this conclusion are mainly centered around adolescents, emphasizing the need for further investigation into the relationship between PA and mental health among children (Paluska et al., 2000). The cognitive benefits of PA in children are not evidentially clear. However, several growth factors that are a part of a healthy brain development are related to increased PA among children (Singh et al., 2019). This calls for a bigger focus towards initiatives concerning children´s mental health (Singh et al., 2019). Andermo et al. (2020) highlights the schools´ positive influence on children´s mental health, through a rise in school related PA reinforcement. Increased PA education also seem to benefit children´s mathematical performance (Singh et al., 2019), as well as reducing attention deficit hyperactivity disorder symptoms (Seiffer et el., 2022).

PinA

A healthy lifestyle should consist of both PA and reduced sedentary time. Despite this being general knowledge, from a public health perspective PinA it is considered a global pandemic (Pratt, 2020), with one in five over the age of 15 being inadequately PA worldwide (González, 2017). It´s crucial to recognize that PA and sedentary behaviors are not mutually exclusive; individuals can be both active and sedentary, highlighting the complexity of defining these terms accurately (Thivel et al., 2018). Confusion surrounding the distinction between sedentariness and PinA underscores the need for clear definitions and improved understanding in public health discourse (Thivel et al., 2018). Sedentary behavior is defined as time spent with low levels of metabolic energy expenditure (González, 2017), and identified as a significant risk factor for mortality, independent of PA levels. These risks are suggested to increase by 2 % for every seated hour, rising to 8% per seated hour when reaching 8 hours of daily seated time (Thivel et al., 2018). Despite the growing knowledge of the health benefits from PA, a high level of PinA remains within society (Pratt, 2020). Societal trends favoring minimal physical effort makes the issue worse, as individuals tend to avoid unnecessary exertion despite the well-documented health risks of PinA (Thivel et al., 2018). Moreover, society´s reliance on technology and sedentary behaviors contradicts the growing emphasis on a healthy lifestyle. This paradox is evident in the simultaneous promotion of PA alongside pharmacologic treatments for chronic diseases, emphasizing the essential role of an active lifestyle (Thivel et al., 2018).

By including data from 93% of the world´s population Ding et al. (2016) addresses the global economic impact of PinA. A conclusion was drawn upon a concerning economic burden worldwide, caused by the population struggling to meet the recommendations for PA (Ding et al., 2016). Additionally, the lifetime diseases associated with PinA vary across borders, with low-and middle-income countries bearing a disproportionate share of the disease burden. While the study (Ding et al. 2016) has limitations, including focusing on major NCDs and using self-reported PA data, it provides valuable insights for global policy and practice in promoting PA. As PinA continues to pose significant challenges globally, collaborative efforts are crucial to address this pandemic and its economic implications effectively (Ding et al. 2016). Obesity often arises as a consequence of PinA worldwide, which can lead to decreased cardiorespiratory fitness (CRF) and increase the risk of developing cardiovascular diseases (CVD) (Elagizi et al., 2020).

The relationship between PinA, decreased CRF, and obesity is particularly concerning given that obesity and sedentary behavior are leading preventable causes of CVD and mortality (Elagizi et al., 2020).

Lee et al. (2012) found that PinA is a significant contributor to NCDs, accounting for 6-10% of major conditions like coronary heart diseases, type 2 diabetes, breast, and colon cancers, as well as 9% of premature mortality globally. Eliminating PinA could increase the world´s life expectancy by 0.68 years, making it comparable to established risk factors like smoking and obesity. While current findings emphasize the importance of PA, there is a need for further research, as the benefits extend beyond statistical averages and are even more substantial for individuals transitioning from an inactivate to an active lifestyle (Lee et al., 2012).

Non-Communicable Diseases

The global burden of chronic diseases is closely linked to PinA (González, 2017, Santos et al., 2023). PinA seems to increase the risk of developing the most common NCDs, such as coronary heart disease, type 2 diabetes, osteoarthritis, stroke and clinical depression (Geidl et al., 2020; Cleven et al., 2020). If current trends in PinA persist, the global health-care cost of NCDs attributable to PinA will reach 520 billion dollars by 2030 (Santos et al., 2023). WHO (2014) emphasizes the social and economic threat of an increase in PinA cases and identifies diabetes, cancer, CVD and chronic respiratory disease as the four major diseases responsible for 82% of NCD´s deaths.

Globally T2DM has become a concerning public health problem. Risk factors for developing T2DM include a sedentary lifestyle, obesity and being overweight. With a 5-7 percent reduction in body weight among adults the risk of developing T2DM can be reduced by 29-58 percent (DeFronzo et al., 2015). Furthermore, obesity and overweight, both closely linked to PinA, are significantly associated with developing type 2 diabetes, regardless of gender, age, ethnicity or BMI (González, 2017). An alarming rise in type 2 diabetes among adolescents and young adults is setting the stage for a future public health crisis (Lascar et al., 2018). This concerning trend not only elevates the risk of chronic complications but is also closely linked to sedentary lifestyle, obesity and a decrease in life quality (Lascar et al., 2018).

Globally, high levels of PinA (Katzmarzyk et al., 2022), excess body fat, higher BMI and sedentary behavior is significantly associated with an increased risk of several cancer types (Friedenreich et al., 2021), such as colon and breast cancer (Katzmarzyk et al., 2022). By 2030 cancer is predicted to account for 1 percent of the worldwide NCD cases. Simultaneously 15 percent of the health care costs will be caused by PinA linked to cancer alone (Santos et al., 2023). Approximately 30–40 percent of cancer cases can be prevented by lifestyle and environmental changes. By making research available, public health organizations and primary healthcare providers can raise awareness and promote the risks of PinA to reduce the overall burden of cancer (Friedenreich et al., 2021).

Ramakrishnan et al. (2021) found that high levels of PinA significantly increases the risk of developing CVD, referring to a linear inverse dose-response correlation showing PA helps maintain healthy blood pressure, cholesterol levels, and overall cardiovascular function (Ramakrishnan et al., 2021). Simultaneously, the lack of PA increases the risk of developing hypertension, atherosclerosis, and other cardiovascular conditions (Ramakrishnan et al., 2021). Mavrovouniotis (2012) underscores that PinA may precipitate multiple chronic persistent and degenerative health conditions, such as heart disease, high blood pressure, and elevated cholesterol levels. Mavrovouniotis (2012) also highlights that many of these diseases may have their origins in childhood. Preventable NCDs are crucial to attack when improving the population´s public health and can be prevented through engagement in PA (Santos et al., 2023). Type 2 diabetes is responsible for 2 percent of these preventable diseases, while simultaneously bearing 9 percent of the health care costs (Santos et al., 2023). Furthermore, dementia is predicted to account for 22 percent of the preventable NCDs health care cost by 2030, being only 3 percent of the cases (Santos et al., 2023). Lack of weight-bearing PA, such as walking, running and resistance training, can lead to osteoporosis. A life consisting of high PinA can lead to higher risk fractures and following consequences (Pinheiro et al., 2020). The global consequences of individuals struggling to meet the recommendations for PA, is concerning related to the increase of chronic diseases, such as NCDs (González, 2017, Santos et al., 2023).

Mavrovouniotis (2012) posits that there exist several significant consequences associated with sedentary behaviors and PinA among children. Prioritizing PA is essential for effectively managing obesity-related health risks and improving outcomes in obese populations (Elagizi et al., 2020). PinA can lead to diminished physical fitness, muscle weakness, and reduced muscle mass in young individuals (Mavrovouniotis, 2012). These consequences limit children´s capacity to engage in physical activities and adversely impact their quality of life. Additionally, these outcomes may engender social repercussions among the youth. This can manifest as low self-esteem and difficulties in forming social relationships, given that PA and play are pivotal for social development. These determinants can lead to a development of mental health issues among children and adolescents, including anxiety and depression (Mavrovouniotis, 2012).

2.1 Levels of physical activity

WHO (2022) recommends that adults between the age of 18-64 should engage in at least 150-300 minutes of moderate-intensity PA per week, as well as include muscle-strengthening activates at moderate or greater intensity two or more days a week. WHO (2022) recommends that children in 4th and 5th grade should engage in moderate PA for at least one hour daily, with vigorous activities to strengthen muscles and bones at least three days a week. WHO (2022) also stresses the importance of reducing sedentary time, particularly screen time. The Norwegian Directorate of Health (Helsedirektoratet, 2022) echoes these recommendations, emphasizing that Norwegian children should engage in PA at least one hour daily, with three days dedicated to cardiovascular training. The Norwegian authorities also recommend young people to engage in minimum one hour of MVPA daily to maintain a healthy lifestyle. Even though clear guidelines are provided, many individuals fail to meet these (Norges idrettshøyskole, 2019).

Marques et al. (2015) found that 61.47% of European adults reported that they engage in MVPA according to the guidelines (Marques et al., 2015). The Kan3 study (Hansen et al., 2023) investigated trends and patterns of PA among adults and elderly in Norway from 2020 to 2022. Only three out of four meet the minimum PA recommendations, and only 30% meet recommendations for sedentary time. Key findings reveal a social gradient and gender inequalities in favor of men (Hansen et al., 2023). According to WHO (2022) only 19% of children worldwide are sufficiently physically active. In Europe 29% of children are sufficiently

physically active, with southern regions engaging in less PA and more sedentary time. Although European children (29%) (Steene-Johannesen et al., 2020) are more sufficiently physically active than the average worldwide (19%) (WHO, 2022), these are still concerning numbers (Steene-Johannesen et al., 2020). Furthermore, there has been a decline in Norwegian children's PA level over the last decade, and a concerning declining trend in not following WHO´s recommendations (Norges idrettshøyskole, 2019).

Physical activity status

As mentioned above, only 29% of children in Europe seem to be sufficiently physically active, with southern regions engaging in less PA and more sedentary time. Moreover, the onset of declining PA and increasing sedentary time seem to occur around 6 to 7 years of age (Steene-Johannessen et al., 2020). UngKan is a Norwegian national monitoring system that measures PA, sedentary time and physical fitness among children and adolescents (Norges idrettshøyskole, 2019). To this day three UngKan studies (2005, 2011 and 2018) have been completed, mapping 6-, 9- and 15-year olds´ physical- and sedentary habits. The ungKan 3 report offers a comprehensive analysis of the activity patterns observed among children and adolescents in Norway (Steene-Johannessen et al., 2019). This study encompassed a sizable cohort, consisting of 3169 children who whore an accelerometer throughout a minimum of 4.7 days, logging an average above 12 hours per day. Thereby 1237 9-year-olds, consisting of 619 girls and 618 boys, where 64% of the girls and 81% of the boys satisfied the physical activity guidelines. A total of 841 6-year-olds, consisting of 428 girls and 413 boys had a much higher percentage of children that satisfied the guidelines by 87% of the girls and 94% of the boys, respectively. The 15-year-olds had the lowest percentage of active children with only 40% of the girls and 51% of the boys satisfying the guidelines, with a total of 531 girls and 540 boys wearing accelerometers (Steene-Johannessen et al., 2019).

When comparing the three ungKan studies, it seems that nine-year olds are less active nowadays, than they were ten years ago. This is a concerning trend knowing that inactive children have a higher risk of developing NCDs later in their adult life. While WHO´s previous goal was to

reduce the number that doesn´t meet the recommendations by 10 percent, the ungKan studies clearly show that only half of the fifteen-year-olds do so. It seems that children become less active the older they get. Simultaneously, six-year-olds stay at somewhat the same activity level year after year (Norges idrettshøyskole, 2019). The ungKan 3 study (Steene-Johannessen et al., 2019) was carried out from December 2017 to November 2018. The selection was picked from the same schools the ungKan1 and ungKan2 studies were. The conclusion drawn from ungKan3 (Steene-Johannessen et al., 2019) reveal that the work towards improving adolescents´ activity level is not satisfying WHO's (2022) goal of reducing PinA (Steene-Johannessen et al., 2019). A majority of children´s life is spent sitting down or attending other sedentary activities. As much as half of the participating adolescents did not meet WHO´s (2022) age group specific recommendations for PA. Furthermore, Steene-Johannessen et al. (2019) revealed a concerning trend of a falling PA level among nine-year-olds. All over, the PA level decreases with children´s age. None of the age groups' PA level are completely satisfying WHO´s (2022) recommendations. While the PA level is reduced during the years between conducting ungKan1 and unKan3 (Norges idrettshøyskole, 2019), it seems children and adolescents measure smaller waists in 2018 than in 2005. This does not include 9-year old boys. However, overweight has been reduced in all three age groups (Steene-Johannessen et al., 2019).

Gender differences and PA patterns

Across borders a distinct gender difference shows women engaging in less PA than men (Guthold et al., 2018). In Europe boys have higher activity levels and less sedentary behavior across all age groups (Steene- Johannessen et al., 2020). This is also reflected in Norwegian assessment, where the older the kids grow, the bigger the difference is between the different genders (Steene-Johannessen et al., 2019). Children seem to be more active during weekdays than during weekends, (Brooke et al., 2014; Norges idrettshøyskole, 2019; Steene-Johannessen et al., 2019) while very active children and adults seem to have a more consistent PA pattern (Fairclough et al., 2015). An American study found that although both children and adults were more active during weekdays, children seem to vary more than adults, while men and adults with lower education vary more than women and adults with higher income (To et al., 2022).

Dahlgren et al., (2021) investigated PA and sedentary behavior among 188 children aged 7–12 years in Sweden, using a wrist-worn accelerometer over a period of 7 days. Time spent in light PA, moderate PA, vigorous PA, MVPA, and sedentary behavior was calculated using ActiLife software. The results indicated that the post-school period exhibited the highest accumulation of sedentary behavior compared to pre-school and school time. Furthermore, boys spent 225.4 min/day in sedentary behavior, whereas girls spent 222.2 min/day (Dahlgren et al., 2021). During school hours, boys engaged in significantly more MVPA than girls, both during school days and weekends. Overall, boys participated in more MVPA than girls on weekdays. Moreover, the afternoon-evening period during weekends represented the highest accumulation of sedentary behavior, with boys being significantly more sedentary than girls. The conclusion suggests that children are highly sedentary and spend little time engaging in MVPA, more so among girls (Dahlgren et al., 2021).

Growing public health challenge

WHO´s (2018) global action plan on PA aims to reduce sedentary time by addressing the growing public health challenge concerning PinA behavior. The mission is to raise community and individual PA and improve overall health. This involves raising awareness, policy development, creating supportive environments and promoting behavioral change (WHO, 2018). WHO´s (2018) target is to reduce the inactivity in society with 15% by 2030, with a baseline of 2016. Countries adopting WHO´s (2018) guidelines will experience significant cost savings within their national health systems, as well as the positive public health improvement. WHO´s (2018) guidelines cover PA and sedentary behavior for all ages and abilities. They emphasize the importance of regular aerobic and muscle strengthening activities, while reducing sedentary behavior. The benefits extend beyond health, impacting social, economic and environmental factors with aims to achieve a more physically active future worldwide (Bull et al., 2020). The global PinA epidemic remains due to nations' lack of ability to respond to the pressing issue of individuals struggling to meet the recommendations for PA (Sallis et al., 2016). While there has been advancement in PA surveillance, there is little evidence of a positive trend in global PA levels (Sallis et al., 2016). Knowing that PA habits established in childhood, are likely to follow individuals into adulthood (Petersen, et al., 2020; Malina, 1996), this alarming state calls for

investigation of determinants deciding children´s PA habits (Hallal et al., 2012). This knowledge will improve the quality of implementation within measures aimed to rise children´s PA level (Connor & Norman, 2017).

Implementing public health interventions that provide information concerning the benefits of light-intensity activity among children could have a significant health impact. Furthermore, substituting sedentary behavior with light- intensity physical activities can lead to substantial health benefits (DiPietro et al., 2020). Only 10 minutes of moderate PA each day can reduce 9- and 15-year-olds inactivity by 15-20% (Steene-Johannessen et al., 2019). Despite the recognized benefits of PA, research into its potential to foster social capital within communities remains limited and warrants further investigation (DiPietro et al., 2020). Brug, et al. (2017) concludes that the determinants followed by participating in sports and PAs, are important to maintain a healthy lifestyle. This was seen in light of the depths and quality of the determinants (Brug, et al., 2017). Determinants that have the largest influence on a population's physical health habits are biological, psychological, socioeconomic, environmental and behavioral (Brug, et al., 2017). It´s still challenging to conclude to what extent these determinants affect the population's physical health. Translating the conclusion in these kinds of studies are hard for the decision makers, because of the heterogenic determinants (Brug, et al., 2017).

2.2 Determinants of children´s physical activity levels

Collecting information concerning the determinants causing individuals to develop an active or inactive lifestyle is fundamental when working towards establishing a more PA population (Connor & Norman, 2017). This knowledge can be used by decision makers when implementing PA related interventions, guidelines and infrastructure in society (Connor & Norman, 2017). It's challenging to extract meaningful analyses from European research addressing determinants for engagement in PA (Lakerveld et al., 2017). The main challenge seems to be article´s lack of in-depth information regarding the relevant determinants, while simultaneously not responding with the FAIR principles (De Creaemer, et al., 2018). The FAIR principles involve ensuring that the research is findable, accessible, interoperable and reusable (Wilkinson et al., 2016). Thus, most scientifical articles concerning PA are not easily replicable or accessible, requiring human resources to utilize the data (De Creaemer, et al., 2018).

The complexity of individuals PA behaviors can be explained by multiple determining factors, such as personal and environmental conditions. Each of these factors interacts and intertwines in unique ways, shaping individuals´ choices, attitudes, and behaviors towards PA (Condello et al., 2016). Thus, why some people are more physical active than others is a significant question to include when addressing the population´s PA level (Bauman et al., 2012). Bronfenbrenner (1979) studied the environment surrounding children and found that habits and personality traits are affected by different layers of social interactions. He defines human development as a complex interplay between individuals and their environment across time, emphasizing the dynamic interaction between various systems. This is how the *bioecological system theory* came to life. The theory is based on a hierarchical organization of the different systems. The child is the center surrounded by the microsystem, mesosystem, exosystem, macrosystem and chronosystem as illustrated in figure 2. The order defines to what degree each system influences the child (Bronfenbrenner, 1979).

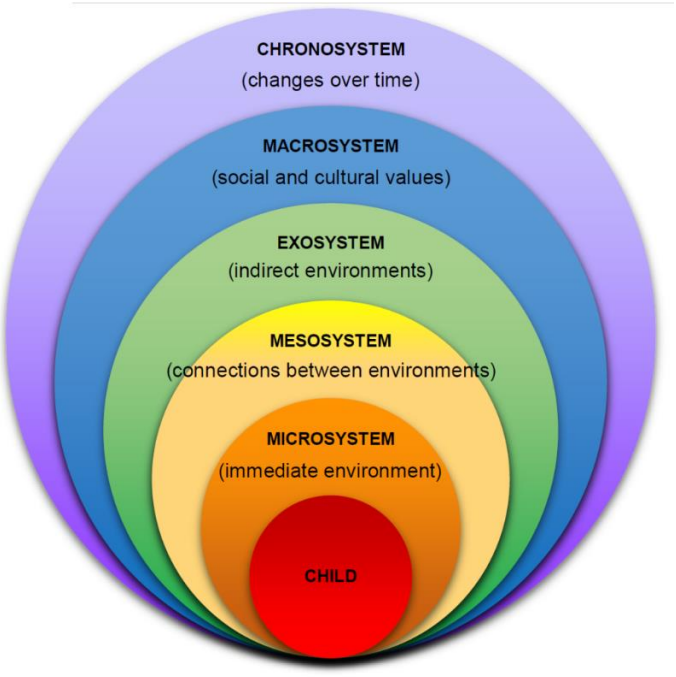


Figure 2. Ecological systems theory by Bronfenbrenner (Budzyna & Buckley, 2023, p. 45).

The bioecological system theory helps researchers and practitioners understand the complexity of the human development and provides insights into how different factors at multiple levels of

the ecological model can influence an individual´s growth, behavior, and well-being (Paquette & Ryan, 2001). It has been widely used in fields such as psychology, education and social work to guide research and interventions aimed at promoting positive development and addressing challenges in individual´s lives (Paquette & Ryan, 2001).¨

The system closest to the individual is the microsystem, which includes immediate family, friends, school, classmates/peers, neighborhood and other close relationships (Bronfenbrenner 1979). This is the child´s direct environment and where most daily social interactions occur, making it strongly associated with the child´s habits and behavioral development (Bronfenbrenner 1979). Continuously, the mesosystem represents the next level and involves interconnections and relationships between different elements of the microsystem. For instance, how a child's experience at home might affect their experience at school, and vice versa. These connections can have significant impact on an individual´s development (Bronfenbrenner, 1979). Elements that indirectly affect the child are situated in the exosystem. Events and developments in this system can have big consequences for children´s development, even though it isn´t in immediate interaction. An example could be how a parent´s workplace affects the parent and therefore indirectly influences the family dynamic (Bronfenbrenner, 1979). Continuously, the macrosystem represents the cultural norms, customs, values and laws in the environment surrounding the child. This system can be defined as the broader context in all the factors listed above (Bronfenbrenner, 1979). The outermost system is the chronosystem, recognizing how the dimensions of time influence human development (Bronfenbrenner 1979). This includes historical events, transitions and changes that occur because of time. It can also include events in one’s personal life, for example the loss of loved ones, displacement and exposure to violence, as well as parents’ divorce. These events will influence the child´s immediate environment, relationships and opportunities for development (Paquette & Ryan, 2001).

Immediate determinants

Hu et al., (2021) highlights self-consept as the biggest determinant for children´s engagement in PA. Furthermore, determinants including societal influences, genetics, obesity, and evolutionary biology are all affecting individual´s health at different levels and contribute to regulate children´s engagement in PA (Bauman et al., 2012). Among these are individual determinants, such as birth weight, gender and age (Aleksovska et al., 2019), as well as appetite and other inheriting biological factors (Bauman et al., 2012). Hu et al., (2021) pinpoints gender as the main intrapersonal factor and addresses the need for gender specific measures of PA levels. Adding to this, Aleksovska et al. (2019) revealed that young males with normal birth weight exhibit higher levels of PA. Oehme et al. (2020) addresses puberty and highlights a trend towards earlier puberty onset in girls over the past three decades, potentially influenced by factors such as obesity and exposure to endocrine-disrupting chemicals. The Growth Study in Bergen 2 conducted in Norway found evidence suggesting earlier puberty onset compared to previous years, with girls on average showing breast development at 10.4 years and boys on average reaching puberty around 11.7 years (Oehme et al., 2020). Early puberty in girls has been linked to increased mortality and elevated risks of conditions like breast cancer and CVD. Factors affecting puberty timing include genetics, nutrition, psychosocial stress, perinatal factors, body composition, and environmental exposures. Understanding these influences is crucial for public health planning and interventions (Oehme et al., 2020).

Furthermore, determinants for early life PA consists of a long list of environmental, familial, physiological, biological, social, policy related, global components and psychosocial factors (Petersen, et al., 2020). Carlin et al. (2017) conducted a literature search covering 67 physical environmental characteristics potentially linked to PA habits. The results revealed that numerous determinants are positively associated with high levels of PA among children, such as backyard space, available outdoor toys, PA programs and equipment availability in schools. Furthermore, safe neighborhoods with sidewalks and bike lanes were also positively associated with PA in children and adolescents (Carlin et al., 2017). Children engaging in daily PA is positively associated with participation in organized sports (Mooses, 2020), which also positively affects children´s bone health, and mental health by reducing both depression and anxiety (Bjørnarå, 2021). Conversely, high dropout levels in competitive club-based sports doesn´t makes this a

reliable factor securing children´s participation in PA (Westerbeek, 2021). Zecevic et al. (2010) found young children being highly influenced by their parent´s PA level. Supportive parents influenced their children to become 6.3 times more likely to engage in high levels of PA (Zecevic et al., 2010). Krutsevich et al. (2021) found that although most of children´s socialization in the micro and macro environment significantly can influence their decision to engage in organized sports. Supportive parents who encourage and facilitate their children's participation by providing transportation, financial support, and emotional encouragement create an environment conducive to sports involvement (Krutsevich et al., 2021). Also, parents active in sports or whon value PA are more likely to instill similar enthusiasm in their children (Krutsevich et al., 2021).

There has been a noticeable shift in adult´s and adolescent´s PA patterns in high-income countries, characterized by a decline in occupational PA and a rise of leisure-time PA. Individuals PA now largely depend on their free time, seemingly resulting in only one in five adolescents and two in three adults meeting public health guidelines for PA (Hallal et al., 2012). Simultaneously, O'Donoghue et al. (2018) refers to a positive association between socioeconomic (SES) and PA habits among adults. Individuals with higher SES tend to engage in more leisure time PA, despite being less engaged in occupational PA demanding work (O'Donoghue, 2018). Controversially, Petersen, et al., (2020) points out that several studies struggle to conclude that children´s PA level is influenced by their parent´s SES. Parents self-reporting their children´s PA may play a crucial role in this, but it´s important to mention that children´s upbringing is strongly influenced by other factors in their environment (Petersen, et al., 2020). However, Hu et al. (2021) argues that parents' income is a determinant of which neighborhood their children grow up in. Pearce et al. (2022) explored the relationship between neighborhood walkability and children´s PA levels based on a British survey. The findings reveal neighborhood environment having a significantly impact on children´s PA development. Walkable neighborhoods with accessible amenities and safe infrastructures are associated with higher levels of PA among children (Pearce et al. 2022). Hu et alt. (2021) calls for further research concerning the uncertain impact parents SES have on children PA level. Puggina et al. (2018) states that spending more time outdoors have a positive impact on children´s PA engagement. Hu et al. (2021) persists that this requires working towards maintaining safe

communities with accessibility of facilities to let children perform safe PA outside of school. This is an area where policy makers and public health promoters have a great influence (Hu, et al.,2021).

An example of a determinant from the macrosystem could be policies and regulations related to active transportation (Weiss et al., 2016). Weiss et al. (2016) revealed recognizable and consistent factors supporting the development of health-promoting policies and the implementation of local health programs. Aziz et al. (2018) emphasizes that such local implementations influence the population´s PA level. The determining factor of sidewalks and bike lanes makes individuals engage in more active transportation (Aziz et al., 2018). Policies that prioritize the development of bike lanes, sidewalks and accessible public transportation systems encourage individuals to engage in active transportation (Aziz et al., 2018). Aziz et al. (2018) found significantly more active transportation where these priorities were made. The beneficial impact of health-promoting policies lay a foundation for local initiatives aimed at tackling the social determinants of health. Additionally, these policies have the potential to guide the development of a framework to enhance action at the local level (Weiss et al. 2016).

Parents as determinants

As mentioned above, parents have a big impact on whether their children are PA or not, by both instilling their own PA habits, and through encouraging and supporting their children to participate in sports (Petersen, et al., 2020). Petersen et al. (2020) has systematically compared 39 articles addressing the association between adults´ and children's PA. Encompassing sample sizes of parent-child pairs ranging from 15 to 1267 (mean = 319 pairs, median = 227 pairs). Most of the studies were published between 2008 and 2018 and employed accelerometers to assess PA. Most studies were categorized as having a moderate, serious, or critical risk of bias (Petersen et al., 2020). The "albatross plot" depicting data from all studies collectively indicated that the majority observed a positive association between parental and child PA. The plot suggested an average correlation across studies of approximately 0.13, with a consistent pattern observed across children's age groups and parental genders within parent-child pairs (Petersen et al., 2020). Clear evidence supporting the notion that the strength of the relationship depends on the

PA measurement of both parents and children (total PA, MVPA and steps) was not found; however, the relationship appeared weaker for light PA (Petersen et al., 2020). Solomon-Moore et al. (2017) analyzed data collected from 1067 parent-child pairs, where the children were between the ages of 5 and 6 years. Parents reported their exercise motivation according to self-determination theory, along with their intention to participate in family activities. PA levels were measured using accelerometers, and statistical models were applied to analyze the relationships. The results revealed that parents' intrinsic motivation was positively associated with their own PA. Conversely, parents' extrinsic motivation was linked to lower levels of PA in children, it was a reduction of 2.93 minutes of MVPA per day. The study (Solomon-Moore et al., 2017) concludes that future PA interventions should concentrate on assisting parents in discovering personal value in exercise while avoiding the use of external control or coercion to motivate behavior (Solomon-Moore et al., 2017).

There are several environmental factors that play a significant role in children's PA habits (Petersen, et al., 2020). This may be an explanation as to why parents play a weaker, than previously assumed, determinizing role in influencing their children´s PA level (Petersen, et al., 2020). Although a health focused parenting style correlates positively with greater leisure time PA among adolescents, there appears to be a transition in influence from parenting behaviors to adolescent independence as they grow older (Dishman et al., 2021). Enhancing recognized parenting behaviors, fostering adolescent decision-making skills, and promoting peer support among adolescents could make them continue to make healthy lifestyle decisions (Dishman et al., 2021). However, the level of parental social support provided seems to play a crucial role in determining their children´s PA level (Jaeschke et al., 2017). Behavioral determinants of PA among youth are tied to their daily routines, including active transportation and independent PA, without adult supervision (Condello et al., 2017). However, Aziz et al (2018) revealed that family members using non-motorized transportation increases the chance of the rest of the family choosing active transportation (Aziz et al., 2018).

2.3 Measurement methods for physical activity

Ensuring the quality of measurement methods in studies is primary in research assessments (Parry, 2021). This involves rigorous validation of instruments and methodologies to accurately capture data. While self-reporting is a common approach, it's prone to biases such as social desirability and recall errors (Parry, 2021). Thus, employing objective measurement methods like accelerometers or heart rate monitors enhances data reliability. Additionally, adhering to the FAIR principles (Findable, Accessible, Interoperable, Reusable) promotes transparency and reproducibility in research (Jacobsen et al., 2020). By making data findable and accessible, researchers facilitate collaboration and scrutiny, ultimately strengthening the scientific foundation. Integrating these practices elevates the credibility and robustness of research findings, fostering trust within the scientific research community, as well as society in general (Jacobsen et al., 2020).

DLW – the gold standard

The best available methods in the specific field of research are referred to as gold standards (Cardoso et al., 2014). To ensure an evidence-based data-selection it´s crucial to ensure the project´s feasibility, by assessing whether the data collection process within the project is achievable (Bowen et al., 2009). In scientific objective research methods concerning PA some methods are considered gold standards. Because of the high cost and feasibility, cheaper measurement methods have been compared to gold standard methods and can be considered both reliable and feasible through financial availability (Steene- Johannessen et al., 2018, p.64- 65). Doubly labeled water (DLW) is the most precise method measuring energy conversion in an everyday context (Steene- Johannessen et al., 2018, p.64- 65). The DLW method is a scientific technique used to accurately measure total energy expenditure in individuals over time. Water containing isotopes of hydrogen and oxygen is consumed and then eliminated through urine. Total energy expenditure is measured by collecting urine samples from the individuals at multiple time points throughout the study period. By analyzing the isotopic composition of these urine samples researchers can determine the rates at which the isotopes are being excreted from the body (Speakman et al., 2021). Although DLW is the gold standard for PA assessment, the high cost of conducting this method calls for other methods previously being measured against it, such as pedometers and accelerometers (Steene- Johannessen et al., 2018, p.64- 65).

Accelerometers

A pedometer is limited to counting the steps taken by various family members throughout the day and thus does not capture valuable information regarding intensity levels and body position (Steene-Johannessen et al., 2018, p. 69-72). In contrast, an accelerometer can capture information regarding the intensity and duration of various physical activities by recording changes in speed over time, in other words the body's acceleration (Steene-Johannessen et al., 2018, p. 69-72). The formula used to measure participants' acceleration is in meters per second squared (m/s^2). Physical activities are commonly classified into four categories based on their Metabolic Equivalent of Task (MET) values. These categories provide an indication of the activities´ intensity and the approximate amount of energy required to perform it. Therefore, it is possible to categorize family members' physical intensity levels into four categories: Sedentary, Light, Moderate, and Vigorous intensity. Sedentary time refers to time spent below 1.5 MET, when the body is in a relaxed state. From 1.5 MET to 3 MET, participants are in the light intensity zone, which includes everyday activities. Moderate intensity is measured at MET 3-6, encompassing activities like cycling, jogging, or fast walking. Furthermore, participants' vigorous intensity is measured at MET 6 or above, such as playing a soccer game or sprinting (Steene-Johannesen et al., 2018, p. 69-72). ActiGraph is the name of the most widely recognized accelerometer (Steene-Johannessen et al., 2018, p. 69-72).

Motion sensors like accelerometers, provide a cost-effective, reliable, and valid means of measuring movement by tracking steps (Steene- Johannessen et al., 2018, p.70-72). Since nearly all bodily movement involve the entire body, utilizing an accelerometer to monitor participants´ daily activity will generate trustworthy results (Steene- Johannessen et al., 2018, p.70-72). Accelerometers have been validated against the DLW method, which has become the validation gold standard when assessing PA behavior (Westerterp, 2009; Plasqui et al., 2007). Although ActiGraphis the most precise and widely used accelerometer, it´s compliance varies compared to the DLW method. However, unlike DLW, accelerometers can detect changes in movement from day to day (Steene- Johannessen et al., 2018, p.70-72).

PAQ

Although the validity and reliability of questionnaires are low, it serves as a supplement through ability for activity-ranking (Westerterp, 2009). A questionnaire cannot precisely measure the amount of PA performed, but this subjective method provides contextual information which can rank the participant´s PA level. On the other hand, an objective method can estimate the intensity and amount of PA, but cannot pick up information about context and type of activity (Steene-Johannessen et al., 2018, p.62). By combining an accelerometer approach with a questionnaire, we gain information about context, intensity and amount of PA (Westerterp, 2009; Steene-Johannessen et al., 2018, p.62). Combining an accelerometer approach with a questionnaire offers a comprehensive assessment of PA levels by bridging the gap between subjective and objective methods. While questionnaires may lack the precision of direct measurement, they excel in capturing contextual details and nuances of various activities (Westerterp, 2009). Conversely, accelerometers provide accurate data on the intensity and duration of PA but may miss out on the qualitative aspects (Steene-Johannessen et al., 2018, p. 62).

This integration allows researchers and practitioners to obtain a comprehensive understanding of an individual's PA patterns, considering not only the quantity but also the quality and context of their physical exertion. For instance, a questionnaire can capture information about the type of activity performed, such as leisure-time activities, occupational tasks, or household chores (Westerterp, 2009), while accelerometers offer insights into the intensity levels and duration of each activity (Steene-Johannessen et al., 2018, p. 62). By leveraging both approaches synergistically, researchers can derive more nuanced interpretations and recommendations for promoting healthier lifestyles and designing tailored intervention strategies (Aunger, 2022). This combined methodological approach enhances the validity and reliability of PA assessment, facilitating more informed decision-making in fields such as public health, sports science, and sedentary behavior (Aunger, 2022).

3.0 Methodology

This research is part of the Determinants of Physical Activities in Settings (DE-PASS, 2022) study which employs a pilot cross-sectional approach with a multi-centre, multi-national study design. The data collection for the DE-PASS Proof of Concept (PoC) is set to occur across 10 European nations, involving collaboration with 15 academic institutes. DE-PASS (2022) is funded by COST action, which is a funding organization for research initiatives across Europe. The PoC serves as an initial trial for the DE-PASS data collection tool, specifically focusing on measuring PA Behaviours (PABs) and their associated determinants. Aligned with the broader DE-PASS mission, the successful demonstration of the PoC is anticipated to pave the way for a future longitudinal and expanded data collection effort spanning across Europe. The newly established European database of determinants of PABs will pave the way for future expansion. The PoC phase will open doors for the potential launch of a longitudinal cohort study in Norway creating opportunities for ongoing research and exploration of PABs over time (DE-PASS, 2022).

This pilot study is a cross-sectional study, a part of the process of testing and refining a larger, more extensive data collection effort. The initial pilot aims to establish a baseline database that can be easily compared and analyzed across different countries (DE-PASS, 2022). By doing this, we can generate hypotheses, examine trends, and understand the variations and differences between countries. Additionally, this pilot study helps in developing models that can predict PABs based on factors like gender and age, which is essential for effectively promoting PA and public health (DE-PASS, 2022). Norway contributed to this data collection in both the University of Agder and The Norwegian Sports Academy (NiH). The pilot study aimed to include 50 children across each country. In Norway there was 25 children from Oslo, and 25 children from Agder. The pilot study for Norway, including both the data collection from NIH and UiA in Agder was approved by SIKT - Norwegian Agency for Shared Services in Education and Research (Ref.nr. 304360) and the Research Ethics Committee at the Faculty of Health and Sport Sciences at the University of Agder (Ref.nr. RITM0235213)

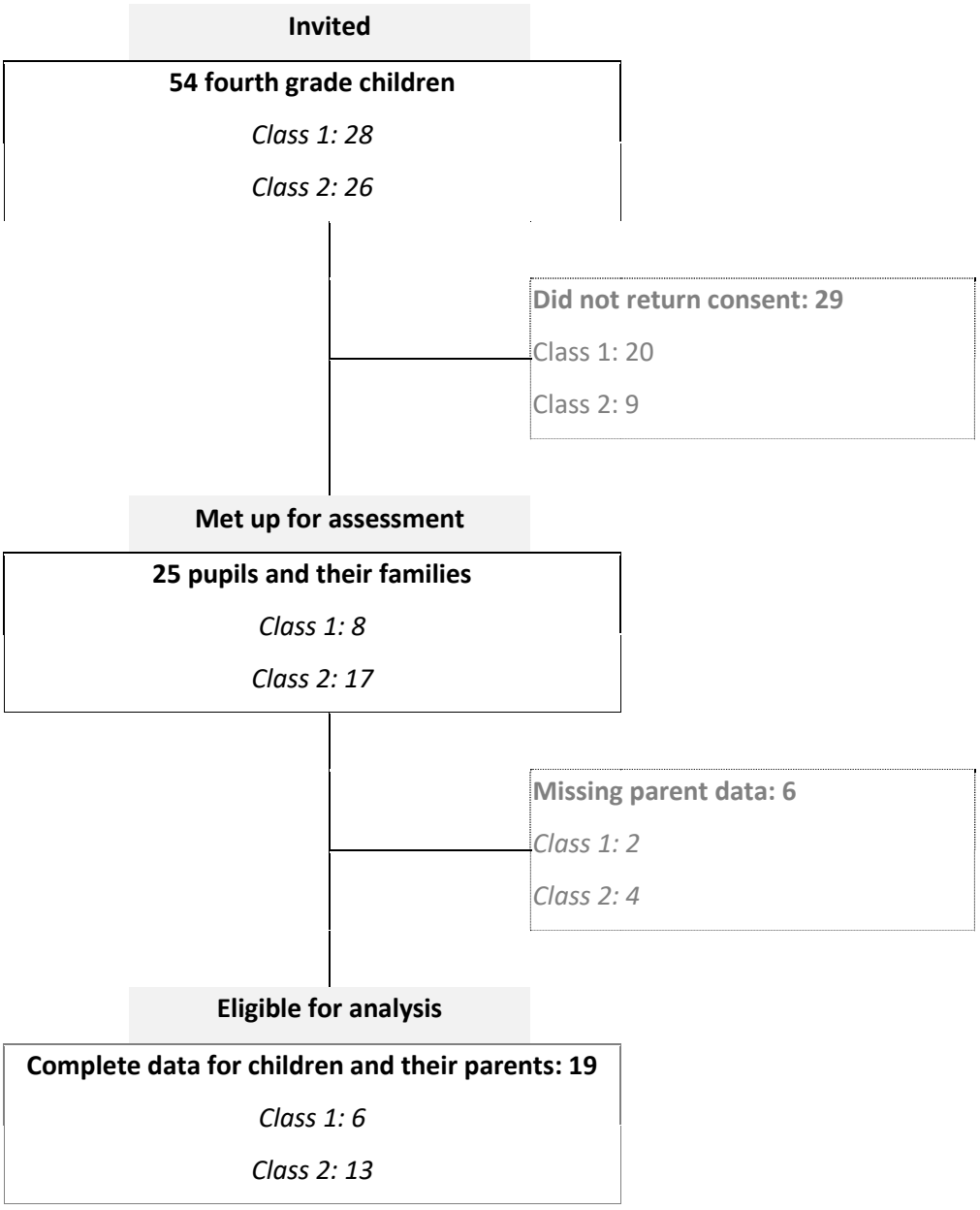
3.1 Design

Sample

As the target sample for the pilot study in Agder were 25 children aged 9-10 years and their families, this study employed School-Based Recruitment. Thereby the school principal of two selected local schools were contacted in December of 2023 and invited to take part in the study. One school accepted the invitation, and the principal was contacted shortly after to schedule a meeting wherein the principal received detailed information about DE-PASS study, along with a Headmaster/Principal consent form (Appendix 2). After recruiting the school, children from two out of the three fourth grade classes and their families who met the following inclusion criteria for age and gender were selected: The primary participant in this study was the study child, aged between 9-10 years who attended the participating school. For a sibling to participate, they had to be between 8-17 years of age. We aimed at including study children of both genders, preferably half and half. If the study child had multiple siblings and they fulfilled the inclusion criteria, more than one sibling could participate in the study. The primary caregiver was defined as "the parent that has the greatest knowledge and awareness of the study child".

With assistance from the principal and the class head-teacher, an information meeting was arranged per class as part of their school day, where representatives from the research group informed the children about the study. Following the information meeting in the representative classes, a "Primary Caregiver Invitation Letter" (Appendix 4), Primary Caregiver Information Sheet (Appendix 5), Study Child Information Sheet (Appendix 6), Sibling Information Sheet (Appendix 7), and a Primary Caregiver and Study Child Consent Form (Appendix 8) were given to each study child to take home. Thereafter, the parents/caregivers of the children in one of the two selected classes were invited to an information evening, where additional information about the study was provided. This information evening was hosted at the participating school by the research group. The participants had one week to return the signed consent forms to the head teacher of each class in order to accept the invitation to take part in the study. For a study child to participate, written parent consent, written informed study child consent, and parental consent for siblings to participate were required.

3.2 Flow chart



Data collection and procedures

Prior to data collection each family were given an identification code, which included a national identifier, a number identifying the school and a number representing the child and their family (ex. NOR100, NOR 101 etc.). Upon recruitment, each participant was allocated their ID code, and the data was collected using Family ID Coding Sheet (Appendix 9). All information about the participants and their ID code was protected in a password protected excel spreadsheet. Data entry was undertaken using ID code only, to ensure that all data was anonymous.

The data collection took place at the school the study children attended. Based on the measuring methods it was essential for us as researchers to meet both the study child and their primary caregiver face-to-face. Based on the families flexibility and logistics of the project the data collection was spaced out over five afternoons per class during February and March of 2024. Before the families arrived at the data collection, we organized several evenings, where families could sign up for a data-collection appointment. The scheduling was done through phone calls and SMS. The data collection appointments were scheduled at different times and days during a week or two, ensuring that the test period would be flexible in conjunction with children having different leisure time activities to attend at set timepoints.

In collaboration with the principal, we were able to utilize the schools facilities to complete the data collection. The employee break room had various areas where families could sit down at separate tables and complete the questionnaires and get the accelerometers set up for them. There was also a designated space for researchers to set up their equipment. Additionally, a separate adjacent room was available for measuring height and weight.

Upon the arrival of the study child and primary caregiver, we welcomed them and directed them to their seating area. Each family got a study care pack, wich included one DE-PASS Study Child Determinant Questionnaires (Appendix 14) per Study Child, one printed Primary Caregiver Questionnaire (Appendix 16) and a Primary Caregiver Maturity Questionnaire (Appendix 17). In addition, the study care pack included a number of pre-numbered ActiGraph Devices for each family, supplementary ActiGraph Diary (Appendix 18) and an information sheet about the ActiGraph device.

3.3 Measurement methods

ActiGraph administration

In order to assess PA levels, we utilized accelerometers registering the families´ PA for a seven-day period. The accelerometer used was ActiGraph wGT3X-BT Activity Monitor, which captures and records high resolution raw acceleration data. Prior to the face-to-face meeting, the researcher meticulously pre-numbered all ActiGraph devices for all participant within each family, which were then carefully included in the study care pack. Upon completing other aspects of data collection, the ActiGraph devices were distributed to the study child, study child´s sibling and their primary caregiver. The researcher provided detailed instructions on how to operate the ActiGraph to all family members, demonstrating proper usage. Subsequently, the researcher reviewed the ActiGraph Diary with the family, explaining the appropriate entries for activities such as waking up and attending practices. As well as giving an information sheet about the accelerometer.

Throughout the measurement period, primary caregivers who opted for reminder text messages received them accordingly. On the morning of day 3, a reminder was sent prompting caregivers to reattach their ActiGraph devices, ensuring proper adherence for both themselves and their family members *"We hope that everything is well. We just wanted to send a reminder text to ensure that everyone is wearing the ActiGraph devices, and that they are reattached this morning. If you have any questions please feel free to let me know. Have a great day, and thank you"*. On the evening of day 4, another reminder was sent to ensure completion and accuracy of ActiGraph diaries for both the caregiver and their family *"We hope that everything is well. We just wanted to send a reminder text to ensure that the ActiGraph diaries are being kept up to date. These are really important for us, and we are very grateful for you to assist us by completing these. If you have any questions please feel free to let me know. We hope you had a great day, and thank you".* Finally, on the morning of the 8th and final day, a reminder was dispatched prompting the caregiver to return the completed study care pack to the school *"We hope that everything is well. Thank you so much for being involved in our project. We just wanted to send a reminder that today is the day for the return of the devices, the Study Care Pack and all the ActiGraph diaries. In the Study Care Pack, you will see we have included a document called "Instructions for Parents on returning the Study Care Pack". If you could*

review this, place all information in the Envelope Provided and ask your child to return this pack to their teacher, we would be very grateful. Thank you so much again for your support over the past few weeks. We hope you had a great day, the DE-PASS research team". The Primary Caregiver received their reminder text message to deliver the Study Care Pack back to the teacher on school the final morning.

Study child height and weight

Anthropometric is the study of the human body´s shape and size. It´s a quantitative assessment of different dimensions and physical aspects of the human body which is used to gain a better understanding of the human size, shape, and composition. Anthropometry is a branch of morphometry, which is a quantitative research approach that studies the relationship between disease and the human body (Utkialp et al., 2015). When measuring the height and weight we were using an anthropometric approach, which in our case only applied to the study child.

After completing the questionnaire, the researchers invited the study child and their primary caregiver to join them in a separate room. Here, the researchers conducted measurements of the child's height and weight, with the primary caregiver present. Each measurement was taken twice, and recorded to the nearest 0.1 cm and 0.5 kg. When recording the height, the study child removed their shoes to ensure the most precise measurement. The study child was then told how they should stand on the calibrated height stadiometer. Similarly, when measuring weight, the study child removed their shoes and sweater (if wearing a t-shirt underneath) to achieve the most accurate recording. We ensured that the weight recording was done on a calibrated weighing scale. The data was then documented on Height and Weight Record Sheet (Appendix 13).

Descriptive data

Upon arrival we provided an overview of the content of the study care pack to the families, detailing which questionnaires the primary caregiver and the study child were to answer, respectively. Throughout the questionnaire session, we circulated among the participants, offering assistance if needed, especially being available for the study children in case they required guidance in completing their questionnaire. The primary giver´s questionnaire included questions about themself, aswell as their child, we chose to use the questions "*What is your*

highest educational level?, "What is the highest educational level of the child's other caregiver?", "Does your family own a car, van or a truck" with the option to write how many cars if there was more than one, and finally "*How many computers does your family own?"*. The questionnaire the study child answered was about their social status, what they were allowed to do, if their parents participated in their PA and their geographical location in relation to where activities are held.

Ethics

Ethical considerations in a study help maintain credibility and trust between researchers and participants, but also between researcher and society (Sürücü et al., 2020). Informed consent is one of the ethical considerations we took, both consent for the participating child, as well as their parent and sibling. The participant's privacy is also taken seriously, through their data being anonymized, making sure the data is not able to track back to individuals. The participants were also free to withdraw from the study at any time during the research period. Data handling was done under strict guidelines and there was secure storage and transmission of the data. Standards in a study´s ethics is essential for validity, reliability, and being socially responsible (Sürücü et al., 2020). Threats in a study´s validity and reliability is referred to as biases. A theoretical bias can occur when a researcher is not considering the literature which is already published about the subject when creating the hypothesis (Sürücü et al., 2020). Leading up to our data collecting period, we did thoughtfully literature research concerning the specific theme we wanted to explore. In our case this was children´s PA level and what determinants that affects it.

A high validity study is measuring what it was intended to measure. This makes the study trustworthy, credible and of higher value (Sürücü et al., 2020). A study´s validity consists of several different categories, with the most common to address being internal and external validity (Sürücü et al., 2020). Reliability in a study is measuring consistency and verifiability in the research method (Sürücü et al., 2020). To ensure a high degree of validity and reliability in our research project we used accelerometers of high quality and standardized questionnaires.

Sample bias, as discussed by Sürücü et al. (2020), arises when the sample group fails to reflect the characteristics of the broader population. Our study encountered this issue as all data was

collected from one school in a well-off neighborhood, limiting the diversity of our sample. Consequently, the generalizability of our findings beyond this specific context may be compromised. To address this limitation, future research should aim to expand the sample size and include participants from diverse socio-economic backgrounds and geographical locations to enhance the external validity of the results.

3.4 Statistical analysis

After completing all data collection, two researchers were involved in the data entry process. They both worked on inputting data from various questionnaires into Excel spreadsheets, developed by the DE-PASS project group. Each questionnaire had its own spreadsheet, with a drop-down menu containing different answer options for each question. Some questions required a text variable to provide detailed responses.

In our sample characteristics, we included children's height and weight, as well as parents' education level and ownership of cars and computers. We also created a new BMI variable (weight / (height * height)). This comprehensive set of variables provided a detailed overview of the demographic and socio-economic characteristics of the participants. Descriptive statistics, including mean, median, and standard deviation, were calculated for continuous variables such as height, weight and BMI. Frequency distributions were generated for categorical variables such as parental education level and ownership of cars and computers.

Descriptive analysis on SPSS was used to calculate the descriptive data, such as children's height, weight and BMI. As well as other descriptive data concerning parents´ and the families´ SES. A sample t-test in SPSS was used to find gender differences in PA levels. To find differences between parent’s and children’s PA levels, a paired sample t-test between the variables in SPSS was used. Scatterplots were created in Excel to visualize the associations

between parental and child PA level. Lastly a regression analysis in SPSS was used to explore the relationship between variables, and to identify significant predictors of children's PA levels. Due to a low number of participants, some of the assumptions for the included statistical analyses (i.e. linear regression) were not met. This limitation is elaborated on in the discussion section. Statistical analyses were performed using Statistical Package for the Social Sciences of Windows, version 29.0 (SPSS Inc., Chicago, IL, USA), as well as Microsoft® Excel® for Microsoft 365 MSO (Version 2403 Build 16.0.17425.20176). Statistical significance level was set to $p \leq 0.05$, and all tests were two-sided.

4. Results

4.1 Descriptive data

Sample characteristics are presented in table 1. A total of 11 girls and 14 boys were included. Mean height is 139.9 cm among girls and 142.1 cm among boys. Mean weight is 34.1 among girls and 36.2 among boys. This provided a BMI of 17.8 for girls and 17.2 for boys, with a mean gender difference of 0.6 (95 CI: -2.91, 1.74). A total of 20 parents were included. Most of the parents had a higher education (90%), with the remaining a secondary education (10%). All the parents owned a car (100%), half of them own multiple (50%) and 95% of the parents owned a computer.

Table 1. Participating child´s mean height (cm), mean weight (kg) and body mass index (BMI). Participating parent´s education level and ownership of cars and computers.

	Girl	**Boys**	**Parents**
n	11	14	20
Mean height (cm)	139.9	142.1	
Mean weight (kg)	34.1	36.2	
BMI	17.8*	17.2*	
Education secondary (%)			2 (10%)
Education higher (%)			18 (90%)
Owns Cars (%)			20 (100%)
Own multiple cars (%)			10 (50%)
Owns Computer (%)			19 (95%)

*p= 0.606

4.2 Gender differences in PA levels

Boys and girls had a daily average sedentary time of 497.7 (SD 53.7) and 476.9 (SD 45.7), with a mean gender difference of 20.8 (95 CI: -62.78, 21.17), respectively with no significant differences across genders. Boys and girls had a daily average light PA of 216.2 (SD 35.6) and 223.0 (SD 33.7), with a mean gender difference of 6.8 (95 CI: -22.13, 35.82), respectively, with no significant differences across genders. Boys and girls had a daily average MVPA time of 69.4 (SD 24.9) and 50.1 (SD 17.2), with a gender difference of 19.3 (95 CI: -37.56, -1.06) respectively, with a statistically significant difference between the genders (p= 0.039). Boys and girls had a daily step average of 11 549 (SD 3278) and 9428 (SD 1994), respectively. There was no significant gender difference (95 CI: -206.8, 4449.2).

Table 2: Daily sedentary time, light PA, MVPA and steps (means and 95% confidence intervals) for boys and girls.

	n	Boys (mean)	Girls (mean)	95 CI	P-value
Sedentary time (min/d)	25	497.7	476.9	(-62.78- 21.17)	0.316
Light PA (min/d)	25	216.2	223.0	(-22.13-35.82)	0.630
MVPA (min/d)	25	69.4	50.1	(-37.56 - (-1.06)	0.039
Steps Per Day	25	11 549	9428	(-206.8 – 4449.2)	0.072

4.3 Differences between parental and child physical activity levels

Parents and children had an average sedentary time of 10.9 hours (SD 75.9) and 8.2 hours (SD 52.9), with a mean difference of 33.1 %, respectively (95 CI: 118.7, 207.3). Parents and children had an average light PA time of 179.1 minutes (SD 35.7) and 221.9 minutes (SD 35.2), with a mean difference of 19.3%, respectively (95 CI: 22.0, 63.6). Parents and children had an average MVPA time of 35.7 minutes (SD 15.8) and 62.5 minutes (SD 25.1), with a mean difference of 42.9 %, respectively (95 CI: 10.5, 38.9). Parents and children had an average steps per day of 7040 (SD 2163.3) and 10 704 (SD 3260.2), with a mean difference of 34.2 %, respectively (95

CI: 1842.5, 5485.3). There was a significant parent child difference concerning MVPA (P=0.002) and all the other variables above (p=<0.001).

Table 3: Parental and child physical activity levels (means and 95% confidence intervals)

	n	Children	Parents	95 CI	P-value
Sedentary time (min/d)	19	491.0	653.7	(118.7 - 207.3)	<0.001
Light PA (min/d)	19	221.9	179.1	(22.0- 63.6)	<0.001
MVPA (min/d)	19	62.5	35.7	(10.5 - 38.9)	0.002
Steps per day	19	10 704	7040	(1842.5 - 5485.3)	<0.001

4.4 Associations between parental and child physical activity levels

Figure 1 displays the association between parental and child levels of sedentary time, and no statistically significant correlation between the variables is apparent (r=0.16, p=0.948).

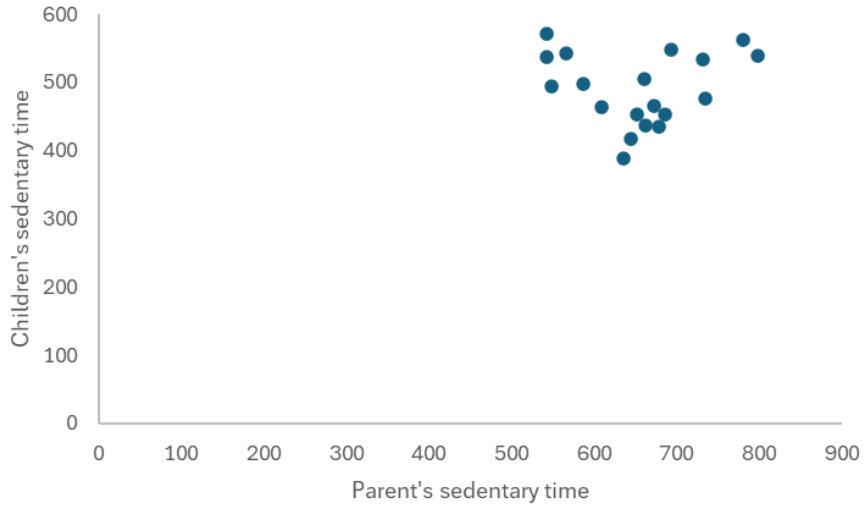


Figure 3: Correlation between children and parents daily sedentary time with a r-square of 0.16, and a p-value of 0.948.

Similar to what is shown in figure 1, figure 2 shows no significant correlation between child and parental levels of MVPA (r=0.013, p=0.957).

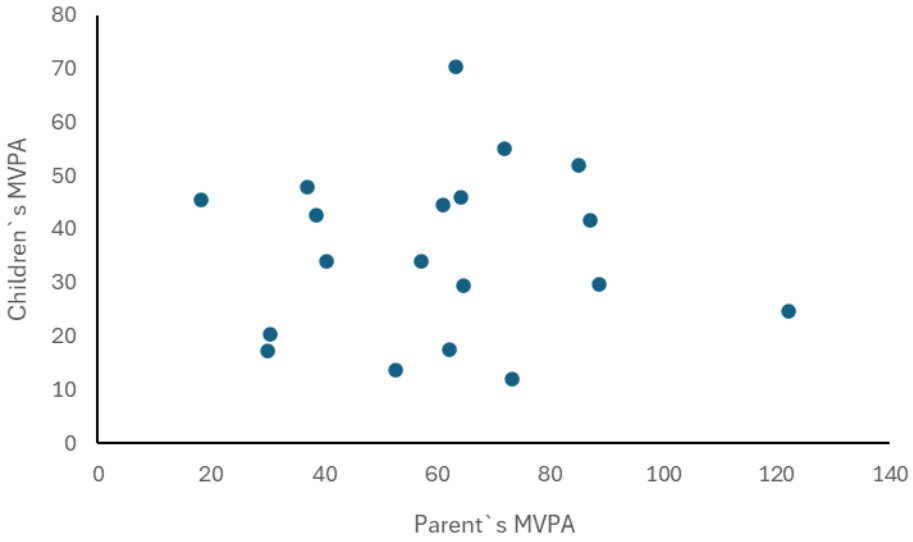


Figure 4: Correlation between children and parents daily MVPA with a r-square of 0.013 and p-value of 0.957

Finally, figure 3 portraits the same picture as figures 1 and 2, with no apparent correlation between child and parental number of steps per day (r=0.073, p=0.767).

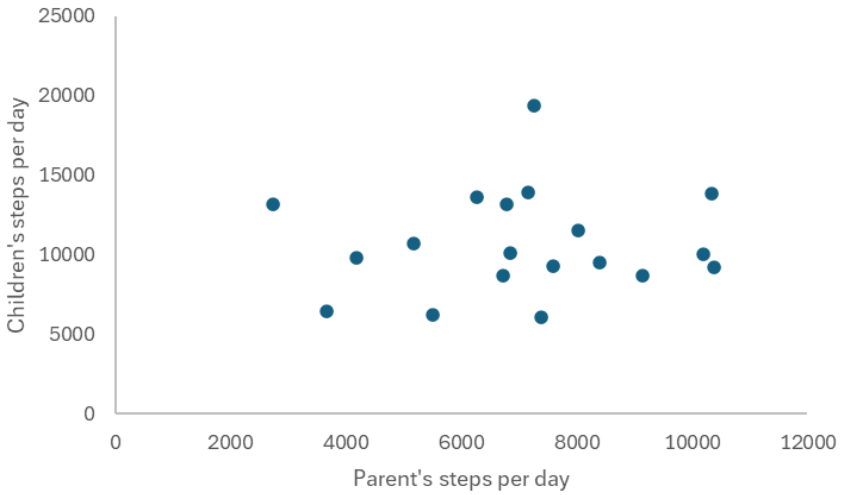


Figure 5: Children's and parent's steps per day with a r-square of 0.073 and p-value of 0.767

4.5 Regression analysis

A regression analysis was conducted to further clarify underlying factors indicating children and parents PA level. While the absence of a direct correlation does not suggest a straightforward relationship between the variables, a regression analysis offers a nuanced approach to explore potential predictors and undercover any hidden associations that may not be evident through scatterplot correlation measure alone.

Table 4 shows the regression model with the child`s sedentary time as the dependent variable and the child`s gender and BMI and parental sedentary time as independent variables. The coefficient of 0.030 suggests that for every unit increase in parents' sedentary time, there is a corresponding expected increase of 0.030 units in the child's sedentary time. However, the relationship is not statistically significant (p= 0.909). The coefficient between child's sedentary time and their BMI is 0.019. However, the relationship is not statistically significant (p= 0.943). The coefficient of 0.168 suggests that being a boy (coded as 2) is associated with an expected increase of 0.168 units in sedentary time compared to being a girl (coded as 1). However, the relationship is not statistically significant (95 CI: -38.92, 73.57). The R-value of 0.171 suggests that there is a moderate positive correlation between the predictors and child's MVPA. However, the independent variables are not useful to explain child's sedentary time (adjusted r-square = -.165)

Table 4. Regression analysis of child's sedentary time versus parent's sedentary time, child's BMI and the gender of the child.

	Coefficient	**95 CI**	**p-value**
Parent's sedentary time	0.030	(-0.36 - 0.40)	0.909
BMI	0.019	(-9.94 - 10.65)	0.943
Gender	0.168	(-38.92 - 73.57)	0.521

The coefficient of 0.192 suggests that for every unit increase in parents' steps per day, there is a corresponding expected increase of 0.192 units in child's steps per day. However, the relationship is not statistically significant (p: 0.430). For every unit increase in BMI there is a

corresponding expected decrease of –0.32 units in child's steps per day. However, the relationship is not statistically significant (p= 0.891). The coefficient of 0.511 suggests that being a boy (coded as 2) is associated with an expected increase of 0.511 units in child's steps per day compared to being a girl (coded as 1). The relationship is statistically significant (p= 0.043). This indicates that gender has a significant effect (95 CI: 119.00, 6380.96), with boys tending to take more steps per day than girls. The R-value of 0.501 suggests that there is a moderate positive correlation between the predictors and child's MVPA. The independent variables can explain 10.1% of the variance in Childs MVPA (adjusted r-square: 0.101).

Table 5. Regression analysis of child's steps per day versus parent's steps per day, child's BMI and the gender of the child.

	Coefficient	95 CI	p-value
Parent 's steps per day	0.192	(-0.47 - 1.05)	0.430
BMI	-0.32	(-611.01 - 536.29)	0.891
Gender	0.511	(119.00 - 6380.96)	0.043

The coefficient of 0.196 suggests that for every unit increase in parents' MVPA, there is a corresponding expected increase of 0.196 units in child's MVPA. However, the relationship is not statistically significant (p: 0.432). For every unit increase in BMI there is a corresponding expected decrease of –0.096 units in child's MVPA. However, the relationship is not statistically significant (p= 0.686). The coefficient of 0.527 suggests that being a boy (coded as 2) is associated with an expected increase of 0.527 units in child's MVPA compared to being a girl (coded as 1). The relationship is statistically significant (p= 0.043). This indicates that gender has a significant effect (95 CI: 0.89 - 50.66), with boys tending to have higher MVPA per day than girls. The R-value of 0.496 suggests that there is a moderate positive correlation between the predictors and child's MVPA. The independent variables can explain 9.5% of the variance in Childs MVPA (adjusted r-square: 0.095).

Table 6. Regression analysis of child's MVPA versus parent's MVPA, child's BMI and the gender of the child.

	Coefficient	95 CI	p-value
Parent's MVPA	0.196	(-5.11 - 1.13)	0.432
BMI	-0.096	(-5.27 - 3.56)	0.686
Gender	0.527	(0.89 - 50.66)	0.043

5.Discussion

This study aimed to answer the following research question: “What is the relationship between parents´ and their children’s physical activity?” By including data from 25 Norwegian children and 19 of their parents, we analyzed the average difference in parent-child PA level, as well as gender differences in PA level and BMI. The analysis for PA level included daily sedentary time, light PA, MVPA and steps. Our results reveal that children on average have a higher PA level than their parents. Additionally, there is no correlation in parent-child PA level. Moreover, both daily minutes of MVPA and steps per day are significantly correlated with gender. Boys take an average of 2121 more daily steps than girls, giving an 18.37% gender difference. Additionally, boys spend 19.3 more daily minutes engaging in MVPA than girls, giving a 27.8% gender difference. In the following we will discuss the results in light of parent-child PA dynamics, gender differences, additionally determinants for children´s PA and determinants for PA in a public health context.

Our analysis found no significant correlation between parents´ and children’s PA levels, however there was a significant difference between parental and child PA levels. Our results reveal that children (62.5 min) on average engage in significantly more minutes of daily MVPA, compared to the parents (35.7 min). Furthermore, parents (7040) took significantly fewer daily steps than children (10 704). The results reveal that children on average have a higher PA level than their parents. Additionally, there is no correlation in parent-child PA level. Significant results reveal that children on average engage in 24.7 more minutes daily of MVPA than their parents, and on average take 3663.9 more steps than their parents daily. Furthermore, parents have 163 minutes more sedentary time daily on average. Thus, there is no correlation between children and parental PA level.

Matos et al. (2021) performed a systemic review from 2001-2020 revealing a significant relationship between parents and children aged 6-12 PA level. The study concluded that parents who meet the recommendations for PA are more likely to instill these habits in their children, particularly MVPA. Moreover, Petersen et al. (2020) reviewed 39 distinct articles from 2008-2018 revealing a weak positive correlation between parental and child PA in various age groups. This was regardless of the type of PA and age of the child. However, it should be emphasized that half of these studies included in the review by Petersen et al. (2020) used questionnaires to indicate parents PA. Questionnaires are often convenient and cost-effective when gather self-reported data on PA levels (Westerterp, 2009; Plasqui et al., 2007), as well as providing information on what kins of activity was performed (Steene- Johannessen et al., (2018, s.62). However, objective measurements, such as accelerometers, provide more accurate and reliable data on precise PA behavior (Westerterp, 2009; Plasqui et al., 2007). Continuuously, Petersen et al (2020) specifically refers to a weaker correlation between parents and children concerning light PA. Similarly to Matos et al. (2021) and Petersen et al. (2020), our study contributes additional insights into the parent-child PA dynamics.

Our results reveal no correlation between parent-child PA level. However, both Matos et al. (2021) and Petersen et al. (2020) reveal parent-child PA correlations of different degrees. Matos et al. (2021) conducted a meta-analysis, revealing that parents meeting the recommendations for PA is a significant determinant shaping their children´s PA habits. Petersen et al. (2020) reveals a weak significant positive correlation, also suggesting that parental PAB may serve as a determinant influencing PA habit among children. Similarly to Matos et al. (2021), Petersen et al. (2020) also emphasizes that parents who meet the recommendations for PA are more likely to have children who also engage in PA. This indicates that while parents may influence children´s PA, their impact may not necessarily be reflected in their own engagement in PA. However, Bronfenbrenner (1979) points out parents as significant determinants regarding children´s immediate environment. Hu et al. (2021) revealed that parent's SES serves as a determinant for what kind of neighborhood their children grow up in.

Other factors within the microsystem (Bronfenbrenner 1979), such as neighborhood, school and immediate community has a significant impact on children´s development of PA habits (Carlin et al., 2017). This includes how safe the neighborhood is and availability of sidewalks and bike lanes, fostering a more active lifestyle (Aziz et al., 2018; Carlin et al., 2017). Parents who are able to let their children grow up in a safe neighborhood (Hu et al. 2021), where school distance is walkable would be a significant determinator for children´s facilitation for a high PA lifestyle (Aziz et al., 2018; Carlin et al., 2017). Aziz et al. (2018) further advances this topic by addressing family members influencing each other´s choice of transport; if a family member is choosing active transportation, the rest of the family is more likely to instill these habits in themselves (Aziz et al., 2018) making parents a significant role model for their children (Matos et al., 2021). This might help to explain the complexity of parental influence on their children´s PA behavior. Hansen et al. (2023) reveal a social gradient in PA level, where adults with higher SES engage in more PA. Such health disparities resulting from a social gradient call for early health-investments. Through encouraging and facilitating participation in health- promoting activities it can result in enhanced long-term societal health (Patton et al., 2016; WHO, 2017). Diving deeper into neighborhood and social gradient as determinants for children´s PA level would be interesting to assess in future research.

While Matos et al. (2021) and Petersen et al. (2020) focused on the correlation between parental and child PA across various age groups and types of PA through a combination of questionnaires and accelerometers, our study specifically examined PA level through minutes of sedentary time, light PA, MVPA and daily steps using accelerometers. Moreover, while both Matos et al. (2021) and Petersen et al. (2020) found positive correlations between parental and child PA, our research identified no apparent correlation in PA levels between children and their parents. This underscores the necessity of further research into parents as potential determinants for children´s PA. By addressing more diverse sides of the parental role, beyond their own PA levels, it might provide deeper knowledge concerning parental influence on children´s PA habits. Such tailored interventions could address the unique dynamics of family units and promote an active lifestyle among both children and parents.

Our results reveal a significant gender difference in PA level, with girls (9428) on average taking 18.37% less daily steps than boys (11 549). Significant results also reveal boys (62.5 min/daily) on average spending 27.8% more time engaging in MVPA than girls (35.7 min/daily). By reviewing six European databases from 1997-2014, examining variations in accelerometer-measures PA and sedentary time Steene- Johannessen et al. (2020) found that European boys engage in more PA than girls. This applied to all age groups (2-18 years) (Steene- Johannessen et al., 2020). Gender serves as a significant determinant for children´s PA level, correlating with both daily steps and daily minutes of MVPA. All over our results show boys are more PA than girls. Gender represents a primary intrapersonal behavioral determinant (Hu, et al.,2021), and are among the core health inequalities in adolescents (Patton et al., 2016; WHO, 2017) making it crucial to include when discussing why children are PA.

Overall gender differences in PA among children are evident, with boys typically exhibiting higher levels of PA compared to girls. In line with results from the Norwegian adult population (Hansen et al., 2023), Steene-Johannessen et al., (2019) revealed gender inequalities among Norwegian children aged 6, 9 and 15, showing girls engaging in less PA than boys. Steene-Johannessen et al. (2019) revealed that Norwegian children´s gender difference in PA levels increase with increased age. Gender differences in our study are notable, with boys displaying significantly higher levels of PA compared to girls and an insignificant higher BMI among girls. Although girls only had an average of 0.6 higher BMI than boys, it´s interesting to discuss the consequences these trends can lead to. High levels of inactivity (Katzmarzyk et al., 2022), and a higher BMI are linked to various health related diseases. Among these are both colon and breast cancer (Friedenreich et al., 2021; Katzmarzyk et al., 2022), and type 2 diabetes and obesity (Santos et al., 2023; Perez-Rodriguez, 2012; González, 2017; DeFronzo et al., 2015; Elagizi et al., 2020). However, further research should aim to delve into the underlying factors contributing to these disparities, exploring both societal norms and individual preferences to develop targeted interventions that promote equitable participation in PA across genders. PA inequalities between genders being acknowledged as determinants for health (Patton et al., 2016; WHO, 2017) should set the stage for gender specific facilizing initiatives to fill the PA level gap. By implementing

customized initiatives to enhance PA among children, policymakers can proactively lay the foundation for sustained PA habits later in life (Petersen, et al., 2020).

As anticipated, in line with findings from Unkan3 (Steene-Johannessen et al., 2019) and Kan3 (Hansen et al., 2023), children are more PA than their parents. Unkan3 (Steene-Johannessen et al., 2019) reveals a declining trend in Norwegian children´s PA level with an increasing age. Simultaneously, Norwegian nine-year olds engage in less PA now than they did ten years ago (Norges idrettshøyskole, 2019). According to Bronfenbrenner's (Paquette & Ryan, 2001) socioecological system theory, parents are categorized as immediate determinants for children´s behavior, situated in the microsystem. According to our regression analysis parents have a small positive correlation to their children's PAB. Within Bronfenbrenner´s (1979) microsystem, parents influence their children by role modeling through their own actions. However, values and attitudes shape their children´s development and behavior just as much (Paquette & Ryan, 2001). Perhaps concerning children´s PA, the direct actions of parents might not have as significant impact as their parental support, encouragement, and active involvement. Examining the various impact parents alongside classmates, teachers, school and immediate environments have on children´s PA development could provide valuable insight for future research explaining the PA-relationship between parent-child relationships.

Determinants affecting children´s PABs is a complex subject (Condello et al., 2016), making it central to explore in order to examine why children are PA or not (Bauman et al., 2012, Hu et al., 2021). However, existing studies seem to lack such evidence (Carlin et al., 2017, Brug et al., 2017). Physical literacy lays the foundation for a lifetime of active living by instilling the skills and attitudes needed to participate in various physical activities and sports with competence and confidence (Caldwell et al., 2020). Encompassing this, Rhodes et al. (2020) found triangulated evidence from six Canadian reviews concluding that families play a crucial role determining child PA and sedentary time. Parental support, role modeling and a supportive home environment seemed to be positively associated with children´s higher PA levels (Rhodes et al., 2020). However, further aspects of the microsystem (Bronfenbrenner, 1979), such as school and other determinants surrounding the child substitute parental PA influence (Rhodes, 2020). Thus,

these substitutional determinants within the microsystem might explain our results showing parents´ PA not correlating with their children´s PA.

Farooq et al. (2020) specify that as children grow older, their MVPA declines. Adding to this, Steene-Johannessen et al. (2020) points to a trend of a declining PA level and increased sedentary time occurring around age 6-7 years. Dishman et al. (2021) might explain this trend by adding research revealing a shift in parental influence among teenager´s PA, where peers start to gain greater determination in their lifestyle choices. The 4th graders in our study are entering a more independent phase of their life. By addressing the trend towards an earlier puberty development among Norwegian children (Oehme et al., 2020), it might explain the lack of parental PA influence revealed in our study. Furthermore, it would be interesting to further investigate a puberty correlation considering the shift of parental PA influence in children´s transition to adolescence (Dishman et al., 2021).

Additionally, Bronfenbrenner (1979) addresses classmates and teachers as influential factors within the microsystem, as they contribute to the child´s social interactions, values and behaviors. Bronfenbrenner (1979) highlights that environments such as neighborhood and school decide children´s access to resources and opportunities for PA engagement. Pearce et al. (2022) emphasized the role of neighborhood walkability in shaping British children´s PABs and underscores the importance of urban design and planning in fostering active communities. Furthermore, children participating in organized sports positively influences their PA level (Mooses, 2020) and several physical and mental health benefits (Bjørnarå, 2021). However, high dropout rates make this a less reliable determinant explaining children´s PA (Westerbeek et al., 2021). Westerbeek et al. (2021) suggests the high dropout level in sport participation is influenced by several factors and emphasizes that the traditional focus on competitive club-based sport isn't enough to tackle the dropout rates in PA. A shift towards integrating sport into everyday leisure activities has appeared, leading to Westerbeek et al. (2021) proposing a framework called PASP which main focus is to increase overall PA levels. Key strategies include focusing on physical literacy in childhood (Westerbeek et al., 2021), referring to the development of both fundamental movement skills, but also motivation to engage in in PA (Caldwell et al., 2020). Westerbeek et al. (2021) also highlights creating environments for

activity and improving physical education classes as a key strategy. Sport organizations need to adapt to people's preferences to retain participants, especially during crucial transition stages in early life (Westerbeek et al., 2021). This leads us to connect the children´s PA level to school related sports and peer motivation. Further research should compare parental and school/peer influence on children´s PA level to gain a deeper understanding of what makes children more PA. Furthermore, this can be helpful for decisionmakers when deciding where new initiatives should be placed (Dahlgren et al., 2021). Furthermore, initiatives such as active school breaks can be incorporated to raise PA level among school children (Dahlgren et al., 2021).

From a public health perspective, increased PA serves great benefits (Keadle et al., 2021). Hence, policymaking and developing guidelines based on knowledge concerning determinants for PA is crucial when aiming to establish a more active population (Connor and Norman, 2017). UngKan3 (Steene-Johannessen et al., 2019) clearly states a decline in Norwegian children´s PA level over the past decade. This concerning trend is a big threat to future public health (De Craemer et al., 2018), and calls for a better understanding of which determinants decision makers should prioritize when towards a healthier population (Skivington et al., 2021). Various research supports that an increase in PA (Pratt, 2020; González, 2017; Pratt, 2020) and a reduction in PinA have a positive effect on reducing the risk of the most common NCDs (Geidl et al., 2020; Cleven et al., 2020; Reiner et al., 2013), resulting in positive socioeconomical outcomes, such as enhanced productivity, decreased healthcare expenses, improved academic achievements, and increased economic potential (Santos et al., 2023; WHO, 2014; Dempsey et al., 2020). The public health and socioeconomic benefits of PA means reducing the risk of developing NCDs, such as CVD (Ramakrishnan et al., 2021; Mavrovouniotis, 2012), type 2 diabetes, obesity (Santos et al., 2023; Perez-Rodriguez, 2012; González, 2017; DeFronzo et al., 2015; Elagizi et al., 2020), cancer (Katzmarzyk et al., 2022; Friedenreich et al., 2021; Katzmarzyk et al., 2022; Santos et al., 2023), mental health problems (Andermo et al. 2020; Mavrovouniotis, 2012; Rodriguez-Ayllon et al., 2019; Paluska et al., 2000; Castelpietra et al., 2022; Petersen, et al., 2020; Potrebny, et al., 2017; Singh et al., 2019), dementia (Santos et al., 2023) and osteoporosis (Pinheiro et al., 2020). By exploring what determinants influencing children´s PA level, we aimed to provide information that decisionmakers can utilize when working towards improving the public health, hence including reducing the risk of developing NCDs. Parent´s PA level

might not be a strong predictor concerning this, which makes us suggest further research concerning children´s different determinants of health.

5.1 Strengths and limitations

Our study possesses several strengths that contribute to a comprehensive understanding of family PA levels and the correlation between parents and children. A significant strength lies in the study's focus on the family setting. By examining the entire family, the study provides a unique perspective on PA within the dynamics of the family unit. Through analyzing the PA levels of all family members, we as researchers were able to gain comprehensive insights into the collective PA levels and habits of each family member. The children were motivated to try the accelerometer, which made the recruitment of the families more achievable.

The main strength of our study lies in the utilization of objective methods for assessing PA. This approach, as demonstrated by Petersen (2020), has been shown to yield more robust findings, particularly concerning the correlation between parental and child PA. Studies employing objective assessments have consistently revealed a stronger association between parental and child PA levels (p-value 0.04) compared to those relying solely on self-reporting methods (p-value 0.16). By employing objective measures, our study enhances the reliability and validity of the findings, providing a more accurate depiction of the relationship between parental and child PA.

The integration of PA monitoring in a family setting using the Actigraph GT3X+ accelerometer is a notable strength of the study. By employing accelerometers worn by all family members for at least four days, we have obtained detailed and objective data on the family's daily PA patterns. This longitudinal approach enables capturing variations in PA levels over time and understanding PABs within the family setting. The use of objective measurement methods, such as accelerometers, enhances the reliability and validity of the study (Steene-Johannessen et al., 2018, pp. 69-72). By using objective methods as the accelerometer when measuring PA, we were able to secure accuracy and quantification of the intensity of children’s PA. Eliminating the bias of both parents´ and children´s ability to recall their PA level. When assessing PA and sedentary

time, it´s important to specify that sedentary time is more than just the absence of PA. It also includes low intensity movements (Reilly et al., 2008). The accelerometer is the most accurate way of measuring PA and sedentary time. Traditionally questionnaires have been the main way of measuring children's and adolescents' PA levels, while accelerometers now provide great advantages for quantifying the data. Questionnaires are criticized for being biased, because of the tendency of parents over-reporting their children´s PA and under-reporting their energy intake. The intensity of PA that accelerometers are able to confidently provide, generates valuable information needed when working towards bettering the society´s health (Reilly et al., 2008).

The use of accelerometers has evolved into a practical, dependable, and valid tool for measuring the quantity and intensity of PA, as well as sedentary behavior in children (Reilly et al., 2008). It´s an improved use of method, compared to the traditionally used questionnaires. One of the benefits is the contribution to a deeper understanding of the connections between PA, sedentary behavior, and health. For these reasons it´s safe to assume the use of objective methods, such as accelerometers, would be the best way to execute assessment of interventions of sedentary and physical active time (Reilly et al., 2008).

Universal surveys, as standardized tools for data collection, present both advantages and disadvantages. On the positive side, they provide a simple and efficient means of gathering data, thereby saving time and resources (Lukina et al., 2016). Their consistency also ensures that the data are comparable across different groups or time periods, which can be useful for identifying PA trends or patterns. On the other hand, universal surveys may also have limitations (Lukina et al., 2016). They may lack the necessary adaptation to specific study populations or research questions, leading to the loss of relevant data or an incomplete understanding of respondents' experiences. Moreover, they may limit the ability to explore complex topics in depth, resulting in superficial data collection and limited insight into respondents' experiences. Being a part of a bigger international project, our questionnaires are universally made. This is to assure correctly comparison between children from each of the countries participating in the study (Lukina et al., 2016). A problem that occurred in our data collection was misunderstanding and/or the participants finding it confusing answering some of the questions listed. An example of this is whether their garden has a fence or not. Culture differences in different countries have a big

impact in what these answers mean for children's PA. In Norway most children are able to play safely outside whether they a have a fence or not. But in other countries this isn´t necessarily the case and having a fenced backyard has a lot to say about their ability to spend a lot of time being active outside.

The flexibility inherent in a qualitative approach, coupled with the possibility of fostering a relaxed environment for respondents through open-ended questioning, often leads to more comprehensive and in-depth responses (Edwards et al., 2005). While this methodology has been subject to criticism for its perceived inaccuracies and potential bias, it offers the distinct advantage of capturing culturally influenced perspectives that may be overlooked in more objective approaches (Edwards et al., 2005). This cultural sensitivity is crucial for obtaining a valid and holistic picture of the situation under study. For instance, Edwards et al. (2005) argue that cultural nuances and context-specific factors are more likely to emerge in qualitative research settings, enriching the understanding of complex phenomena. Thus, while qualitative methods may not always adhere to strict objectivity, they provide valuable insights into the subjective experiences of individuals within their cultural contexts (Edwards et al., 2005).

The study also presents other limitations that should be considered. The limited sample size may reduce the generalizability of the findings. With only 25 children and 20 parents included, statistical analyses may yield less precise estimates, resulting in wider confidence intervals and potentially less reliable p-values (Hackshaw, 2008). Siblings were not included in our sample size, due to a lack of siblings completing the measurement period, by including the families with siblings the sample size would be even smaller. The limited sample size also limits the results with respect to the statistical analysis carried out, and particularly regarding the assumptions for some of the analyses. As an example, a rule of thumb when doing multiple linear regression, there is a need for at least 20 participants for each independent variable. In our sample we violate this assumption, with only 19 out of the 20 parents choosing to use the accelerometer. Nevertheless, we have chosen to include this analysis, believing that as long as we are transparent on this matter and nuanced when interpreting the findings, it provides relevant explorative information potentially serving as hypotheses generating for future studies with larger sample sizes. Another limitation is the limited cultural diversity in the sample, illustrated

by the limited variation displayed in some of the descriptive variables (for instance level of education). This most likely limits the study's relevance to the broader Norwegian population. Participants were recruited from an area with minimal cultural diversity, and the study findings may not reflect the PA levels and habits of the general population. Lastly, the study may be susceptible to selection bias. Participants who voluntarily chose to participate in research on PA levels may have already been interested or engaged in such behaviors. This may have led to a skewed representation of PA levels within families, as those who were willing to wear accelerometers may differ from the general population.

Participation rates differed significantly between Class 1 (n = 8) and Class 2 (n = 17), despite Class 1 having a larger total population by two (n = 28) children. In both classes, some parents opted not to use the accelerometer during the measurement period, resulting in six participating families from Class 1 and 13 families from Class 2. While the exact reasons for higher participation in Class 2 are unclear, several factors may have influenced this trend. The teacher of Class 2 was involved in the study from the beginning and had nearly three months to prepare students and faculty, whereas Class 1 only had 3-4 weeks. Additionally, an informational event was organized for Class 2 parents, providing insight into DE-PASS and an opportunity to meet the research team. Limited information is available regarding families who declined participation initially or parents who did not wear the accelerometer throughout the study period.

5.2 Implications

In our analysis we found no correlation between parent-child PA level, however other parental determining factors might affect children´s PA level (Bronfenbrenner 1979). Previous research (Petersen, et al., 2020) has pointed out determining factors within the parent-child dynamic, such as parental support and encouragement in sports. This topic would be interesting to further investigate. Matos et al. (2021) drew a similar conclusion, suggesting a quest for knowledge around influence of mediator variables on the interaction process between parents´ and children´s PA. Additional, Matos et al. (2021) highlights the need for research concerning potential mediator variables influencing children´s PA, such as neighborhood characteristics,

transportation options, and further parental determination (Matos et al., 2021). This could lead to a better understanding of how determinants contribute to promoting adherence to PA amongst young children.

Rhodes et al. (2020) found that PA interventions show that family plays a crucial role in determining children's PA level and sedentary time. However, school and the community surrounding the child serves as a substitution and can support families influencing their children (Rhodes et al., 2020). A noteworthy factor warranting further investigation is the role of school as a determinant for children's PA levels. This is the arena where children engage in the most PA, making friends, teachers and school administration crucial determinants for children's PA (Hu, et al.,2021). A familial and societal preventative work through investments in school curricula could empower children to adopt healthier lifestyle choices (Lascar et al., 2018). On related topics, the preventative work against childhood obesity calls for school-based interventions. A variety of strategies seem to be the most affective, since a one-size fits all approach doesn´t cover the variety of childhood obesity incidences (Lambrinou, 2020). Moreover, we would like to take into consideration that Norwegian adults´ SES impact individual´s PA level (Hansen et al., 2023), and research (Petersen, et al., 2020) concluding that parents seem to determine their children´s PA level. Parents acts as high impact determinator for children´s engagement in PA through instilling their own habits, as well as through encouraging their children´s enrolment in sports (Petersen, et al., 2020). This indicates health disparities among children resulting from a social gradient, making it crucial to attack from an early age (Patton et al., 2016; WHO, 2017). For children not growing up surrounded by a home environment reflecting high SES, school might serve as an arena for positive PA influence. With the socioecological systems being an interactive process (Bronfenbrenner, 1979), children growing up in high SES families might positively impact attitudes of PA in school and among their classmates. A public health related social gradient leads to concerning disparities withing the population (Patton et al., 2016; WHO, 2017). Dahlgren et al. (2021) recommends incorporating active breaks during school hours to promote PA and reduce sedentary behavior among children. Furthermore, motivation can from a psychological perspective, be generated through different arenas and nurture one another, such as positive PA experience in school generating motivation to perform PA outside of school (Cortis et al., 2017). By investigating

school as a determinant for children´s PA, it would be interesting for further research to dive deeper into this arena when attacking the existing social gradient in public health (Patton et al., 2016; WHO, 2017). These results might foster knowledge that policy makers can utilize when developing high quality interventions minimizing these concerning health disparities.

Research (Puggina et al.,2018) has shown a positive correlation between spending time outdoors and having a higher PA level among children. Moreover, neighborhoods safety, walkability and distance between home and school (Pearce et al., 2022) would also be interesting to consider conducting further research upon. These are determinants policy makers have a big impact on (Hu, et al.,2021). Children being able to walk safely to and from school, and schools being within a reasonable distance to home rely heavily on urban design (Pearce et al., 2022). By investigating neighborhoods and urban design as determinants for PA among children, it might foster deeper knowledge around family SES impact on PA levels. It may also provide policy makers with necessary information on how to improve environments seeking to promote public health through urban design.

Furthermore, prioritizing studies concerning interpersonal and environmental determinants (van Sluijs et al., 2021), with a standardized PA definition and objective measurement methods (Aleksovska et al., 2019, Condello et al., 2017) could make the complexity of public health work more manageable and useful for decision makers (Skivington et al., 2021). Research concerning determinants affecting an active or sedentary lifestyle, will more effectively develop and execute customized interventions, policies, and infrastructures aimed at promoting PA (Connor and Norman, 2017). Meaningful retrospective analysis of existing European datasets is restricted concerning the determinants of PABs (Lakerveld et al., 2017). Key challenges include a lack of relevant datasets, the absence of comprehensive determinant lists, and not following the FAIR data management principles (De Creaemer et al., 2018). The importance of ensuring the study´s findability, accessibility, interoperability and reusability (Wilkinson et al., 2016) has been lacking in previous studies concerning parent-child PA level (De Creaemer, et al., 2018). Thus, future research should focus on addressing these challenges to enhance the quality and applicability of studies on PA determinants, ensuring they can effectively inform public health

strategies. This approach can enhance the effectiveness of interventions, policies, and infrastructures, ensuring the accessibility and reusability of study findings.

6. Conclusion

In conclusion, this study shed light on the complex relationship between parent-child PA levels, highlighting various determinants shaping children´s PABs. We aimed to answer the following research question: “What is the relationship between parents and their children’s physical activity?” By assessing daily minutes of sedentary time, light PA, MVPA and daily steps, we ought to determine PA levels among the 25 children and 19 parents included in the study. Children engage in higher levels of PA compared to their parents. Despite a lack of correlation between parent-child PA levels, we discussed the complexity of determinants for PA in children's microsystem. Furthermore, we found a significant gender difference among children, revealing boys on average engaging in more PA than girls. From a public health perspective, our study emphasizes the urgency of addressing declining PA trends among children and underscores the importance of evidence-based policymaking to establish a more active population. By implementing tailored initiatives that recognize the unique dynamics of family, immediate environments and gender differences, policymakers can proactively lay the foundation for sustained PA habits, ultimately enhancing long-term societal health outcomes.

Overall, our findings leads us to suspect that the multifaceted nature of PABs within family dynamics. While children may be influenced by various internal and external factors, including parental role modeling and societal norms, parental engagement in PA does not necessarily correlate with children´s PA levels. This suggests the presence of individualized ways to PA adaptations and maintenance, emphasizing the need for customized interventions and specific strategies promoting an active lifestyle across age groups and within various family environments.

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Sikt

Vurdering av behandling av personopplysninger

Referansenummer
304360

Vurderingstype
Standard

Dato
22.12.2023

Tittel
DE-PASS - harmonisert datainnsamling av fysisk aktivitetsatferd og tilhørende determinanter i en familiesetting

Behandlingsansvarlig institusjon
Universitetet i Agder / Fakultet for helse- og idrettsvitenskap / Institutt for idrettsvitenskap og kroppsøving

Felles behandlingsansvarlige institusjoner
Norges idrettshøgskole / Institutt for idrettsmedisinske fag

Prosjektansvarlig
Mette Stavnsbo

Prosjektperiode
01.09.2023 - 31.12.2028

Kategorier personopplysninger
Alminnelige
Særlige

Lovlig grunnlag
Allmennhetens interesse (Personvernforordningen art. 6 nr. 1 bokstav e)
Arkivformål i allmenhetens interesse, eller for formål knyttet til vitenskapelig eller historisk forskning eller for statistiske formål (Personvernforordningen art. 9 nr. 2 bokstav j)

Behandlingen av personopplysningene er lovlig så fremt den gjennomføres som oppgitt i meldeskjemaet. Det lovlige grunnlaget gjelder til 01.01.2029.

Meldeskjema

Kommentar
Personverntjenester har vurdert endringene som er registrert i meldeskjemaet og nærmere beskrevet i meldingsdialogen.
Da innsamlingen ikke er påbegynt, og deltakerne ennå ikke er kontaktet, har det vært mulig å oppdatere valg av behandlingsgrunnlag, for samtlige utvalg.

Informasjonsskrivene er oppdatert i tråd med disse endringene.

Vi har også registrert 01.01.2029 som ny sluttdato for behandling av personopplysninger.

TYPE OPPLYSNINGER OG UTVALG
Utvalg 1: Barn i 4.-7. klasse (9-12 år). For dette utvalget vil det behandles særlige kategorier av personopplysninger om helse og etnisitet, i tillegg til alminnelige personopplysninger
Utvalg 2: Foreldre til skolebarn invitert inn i prosjektet. For dette utvalget vil det behandles særlige kategorier av personopplysninger om helse og etnisitet, i tillegg til alminnelige personopplysninger
Utvalg 3: Søsken til inviterte skolebarn, i alderen 8-17 år. For dette utvalget vil det behandles særlige kategorier av personopplysninger om helse og etnisitet, i tillegg til alminnelige personopplysninger

Det er oppgitt at rapportering underveis, fra primær omsorgsperson om studiebarnet, vil innebære Tredjepersonsopplysninger. Vi vil presisere at vår videre vurdering av behandlingsgrunnlag gjelder for samtlige registrerte, og det fremgår av meldeskjema at alle som deltar vil få full informasjon om prosjektet og gi sin tilslutning.

BEHANDLINGSGRUNNLAG
For samtlige registrerte vil den planlagte behandlingen av personopplysninger være nødvendig for å utføre en oppgave i allmennhetens interesse, jf. personvernforordningen art. 6 nr. 1 e).

Ifølge art. 6 nr. 3 b) skal grunnlaget for slik behandling fastsettes nærmere i nasjonal rett. Personopplysningsloven § 8 stadfester at behandling av personopplysninger for arkiv-, forsknings- eller statistikkformål er i allmennhetens interesse og kan gjøres på grunnlag av art. 6 nr. 1 e).

Prosjektet behandler særlige kategorier av personopplysninger, jf. personvernforordningen art. 9. Behandlingen er nødvendig for formål knyttet til vitenskapelig forskning. Forbudet i personvernforordningen art. 9 nr. 1 gjelder ikke, ettersom vilkår for unntaket i art. 9 nr. 2 j) er oppfylt.

Vi vurderer at tilhørende krav i personopplysningsloven § 9 om at samfunnsnytten klart overstiger ulempene for den enkelte er oppfylt: Prosjektets formål er å frembringe ny kunnskap om fysisk aktivitetsatferd og faktorer som påvirker deltakelse i fysisk aktivitet i en familiesetting.

Prosjektet gjør også nødvendige tiltak for å ivareta de registrertes rettigheter og friheter, jf. art. 89 nr. 1. I vår vurdering har vi lagt vekt på at

Opplysningene skal ikke brukes til andre formål
Det bare samles inn opplysninger som er nødvendig for formålet
De registrerte får god informasjon om behandlingen og sine rettigheter
Prosjektet vil innhente samtykke/tilsutning fra foresatte til behandlingen av personopplysninger om barna.
De registrerte kan protestere mot behandlingen (reservasjon)
Kun prosjektmedarbeidere har tilgang til opplysningene
Personopplysninger minimeres fortløpende
Varigheten for behandling av personopplysninger er relativt kort

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg. Behandlingen kan fortsette.

OPPFØLGING AV PROSJEKTET
Vi vil følge opp annethvert år og ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet.

Lykke til videre med prosjektet!

Mette Stavnsbo

Tidspunkt for godkjenning: : 10/10/2023

Søknad om etisk godkjenning av forskningsprosjekt - DE-PASS - harmonisert datainnsamling av fysisk aktivitetsatferd og tilhørende determinanter i en familiesetting - RITM0235213

Vi informerer om at din søknad er ferdig behandlet og godkjent.

Kommentar fra godkjenner:

Hilsen
Forskningsetisk komite
Fakultet for helse - og idrettsvitenskap
Universitetet i Agder

UNIVERSITETET I AGDER

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