

MASTEROPPGAVE

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Navn: Jonas Mathiesen

Parental estimation of and participation in their children's physical activity levels.

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Abstract

Background

This study aimed to investigate the correlation of both parental estimation of and participation in their children's physical activity levels. Previous studies have researched the estimation of own activity, and not parents estimation of their children's activity. Parents expectations of kindergarten children's physical activity may affect how the parents affect their children's activity habits, and therefore it's important to do more research on this topic. Previous research has shown different results on how parental participation in physical activity with their child affects their children's physical activity.

Methods

The study includes 364 fulltime children at the age of 4-6 from 13 randomly selected preschools. 244 of the children (125 boys and 119 girls) had valid accelerometer data, which gives a 67 % response rate. The study also included a questionnaire to 722 parents (361 mothers, 361 fathers), and 392 parents answered the questions, which gives a response rate on around 54 %.

Results

The results show that both mother and father on an average basis overestimate their children's activity levels by claiming their children are approximately three times more active than they actually are according to the objective measurement. Furthermore, it's a big variation in this estimation, only approximately 5% of the parents estimate an activity level that is close to being correct, while approximately 5% of the parents overestimates their children's physical activity levels with 10 times or more. No significant correlation is found between parent's estimation of their children's activity level at leisure time, and the children's objectively measured activity level at leisure time. The pattern itself in the estimation of physical activity levels is shown to be relatively similar between the father and mother. The results also show that there is no significant correlation between the kindergarten children's physical activity levels at leisure time, and the parent's participation in physical activity with their child. This applies to both mother and father.

Conclusion

The results show that parents on an average basis overestimate their children's activity levels by claiming that their children are approximately three times more active than they actually are according to the objective measurement. No significant correlation is found between parents estimation of their children's activity level at leisure time, and the children's objectively measured activity level at leisure time. The pattern shows that the estimation of physical activity levels is shown to be relatively similar between both mother and father. The results also show that there is no significant correlation between the kindergarten children's physical activity levels at leisure time and the parents participation in physical activity with their child. This applies to both mother and father.

Introduction

This study will be about physical activity level among children. Physical activity can be defined as every movement that is produced by skeletal muscles which demands more energy than at resting level, and can furthermore be defined with intensity, duration, frequency and type of activity. In national recommendations for physical activity for children and adolescents, it's said that the activity should be as versatile as possible to facilitate for optimal development of fitness, flexibility, muscle strength, mobility, speed, reaction time and coordination (Samdal et al., 2015). Physical activity reduces the risk of getting diseases, improves the quality of life, and increases the functional ability. Physical activity also strengthens the muscles and the skeleton, develops skills, reduces anxiety and depression, creates confidence, and contributes to social interactions. The health recommendations for children when it comes to physical activity is 60 minutes each day with moderate or vigorous intensity (MVPA). Previous research has shown that the level of physical activity among the population is too low (Kippe & Lagestad, 2018). The main reason for this is that obesity among children and adolescents is an increasing problem in today's society (Bürge et al., 2010). It's interesting to follow this from an early age, for example from kindergartens, where much of the foundation for further physical activity and development is put down. I wish to essentially look at the activity levels among children in the age of 4-6 years old, and how parent's estimation of and participation in physical activity affect their children's activity levels. Even if the parent's stands for the main care of the children, the children under the age of 6 spend much time in the kindergarten. In Norway is 97% of the children in the age of 3-5 in kindergartens, which is a higher percentage than in the rest of Europe, there 90% of children

in the same age is in kindergartens. Norwegian kids spend approximately 33 hours a week in kindergartens. As a consequence of this, the environment that the kindergartens provide is potential significant impact on children's behaviour and physical activity (Nilsen et al., 2019). In a study done by Kippe & Lagestad (2018), they found out that MVPA in kindergarten is the main contributor to kindergarten children's total MVPA during weekdays, by contributing with approximately twice as much MVPA in weekdays than MVPA at leisure time.

It is important that kindergarten provides equalize differences in the children's activity levels. But Kippe & Lagestad (2018) shows that there is a correlation between MVPA in kindergarten and MVPA at leisure time. When MVPA in kindergarten increase, will MVPA at leisure time also increase. In other words, kindergarten does not contribute to reducing the inequality in activity levels among kindergarten children at leisure time. We can therefore say that kindergarten is a contributor to create an even larger difference between the children who are inactive and the active children.

One of the biggest challenges in the society today is to maintain the activity level the children has today and prevent the development of inequality in activity levels based on socioeconomic variables (The Public Health Report, 2012). These variables have shown to be an important factor for activity levels among children and adults. Previous research has shown deviant results when it comes to the importance of socioeconomic status, like income and education which affect children's physical development. Cotrell et al. (2015) found out that children (aged 5-15) from families with lower income, received more approval for being more physical active outdoors, and their parent's participated more often in the activity with their children. Kimbro et al. (2011) says that children in kindergarten from families with lower socioeconomic status had more unstructured time, which contributed to more physical activity than children from families with a higher socioeconomic status. However, Pate et al. (2004) claim that there is a little difference in MVPA between children aged 3-5, considered in relation to parental education (Kippe & Lagestad, 2018).

Research has shown that parental attitude towards physical activity affect children's attitude to active participation in various forms for physical activity (Zametkin et al., 2004).

Furthermore, if we look more specific, Dennison et al., (2002) found out that children who had been exposed with too much sedentary behaviour at home were more likely to adapt this behaviour (Clement et al., 2009). When we see this, it is important to look closer at some sociological theories in this introduction which can say something about how parental attitude influences children's attitude towards physical activity.

Marx (1851-1852/1970) claimed that persons create their own history. But he specified that they don't create it through their own wishes or under circumstances they self has chosen, but rather under conditions that has been passed on to them. Marx pointed out that persons always act in defined roles, as constituents of social categories, and that these roles determine their personal and moral qualities. It is asserted that individuals are what they are within the strict framework of sociomaterial structures, and historical legislation decides the development of these structures. A study show that what family member have and have not done do related to physical activities before determines the roles of their children activity today (Lagestad, Bjølstad, and Sæther, 2019). Bordieu's (2000) term of habitus is the idea that individuals incorporate the objective social structures within which they grow up and in which they are trained. According to this concept, although cognitive dispositions guide individuals into thinking, acting and perceiving in a specific manner, they do not determine ways of thinking, acting and perceiving, habitus is a schemata for action. Essentially, habitus directs what is possible and impossible for individuals. As a result of that, various types of habitus could unconsciously direct different families to participate in certain activities and to decide what is natural for them.

One previously posed explanation for the limited effectiveness of physical activity interventions is that it is possible that people lack awareness of their health behaviour, for example believing to be healthier than they really are (Onema & Brug, 2003). This misperception is common for complex behaviours such as physical activity, for which thresholds between healthy and unhealthy behaviours may be unclear. This may result in those who overestimate their physical activity level, seeing no need to alter their behaviour as they are not aware that it is insufficient (Ronda et al., 2001).

Previous studies of physical activity awareness have all focused on adult Dutch populations, using self-reported physical activity to assess activity levels. They have shown that 48% to 61% of the inactive population overestimates their physical activity level. The method they used in these three Dutch studies, was that the divided the participants into four groups, where the participants who overestimated their own physical activity level was an own group of subjects. The results from our study showed that parents overestimated their children's physical activity level three times higher than they really had. Those who overestimated their physical activity level tended to have a healthier lifestyle (Sluijs et al., 2007), and more favourable anthropometric characteristics (Lechner et al., 2006) than those who were aware of their low physical activity level. In these studies, the participants estimate their own physical activity, and not parental estimation of their children's physical activity. Corder et al. (2010)

points out that there is a lack of research in physical activity awareness among young people. Self-reported physical activity is prone to bias (Corder & Ekelund, 2008) and using objective measurement like accelerometer should allow a thorough assessment of the gap between perceived and actual physical activity levels. Corder et al. (2010) creates a hypothesis on the basis on the literature in adults, that parents of children with a more favourable body composition are more likely to overestimate their children's physical activity levels. Previous studies have researched the estimation of own activity, and not parents estimation of their children's activity. Parents expectations of kindergarten children's physical activity may affect how the parents affect their children activity habits, and therefore it's important to do more research on this topic.

The purpose of this study is operationalized into the following two research questions:

1. Do parents succeed to estimate their kindergarten children's physical activity levels at leisure time correct?
2. Is there a correlation between parents participation in physical activity with their kindergarten child at leisure, and their children's objectively measured physical activity levels at leisure time?"

Two hypotheses can be drawn after what we have seen in the introduction. Number one is that parents will overestimate their children's physical activity level. And number two is that parental participation in physical activity with their child can possibly increase children's MVPA.

Methods

The data in this study is from the published article written by Kippe & Lagestad (2018). Their study used accelerometers were used among preschool children and the staff at the kindergartens, and questionnaires among the children's parents. However, the purpose of this study does not include the activity levels of the kindergarten staff. So only accelerometer data at leisure time among the children and questionnaires among the children's parent's was included in the study.

Subjects and procedures

Out of 122 preschools in four different councils in the county Nord-Trøndelag, 13 preschools were selected randomly to participate in the study, independently of type and size of the kindergartens. The 13 randomly selected kindergartens in the study were located in the same socioeconomic area. An important condition for participating in the study was that the children were in preschool full-time. After the data collection from the 13 kindergartens, the study included 364 full-time at the age of 4-6 years. 244 children (125 boys and 119 girls) had valid accelerometer data, which gives a response rate of 67%. The data from the accelerometers and the questionnaires were collected in the time period from May to June in 2017. Before signing the written consent form and the data collection, preschool staff and parents received both written and oral information about the procedures and ethical standards for testing related to sports science.

Accelerometers

Actigraph GT1M accelerometers (ActiGraph, Fort Walton Beach, FL, U.S.A.) were used to measure preschool children's (aged 4-6 years) physical activity levels objectively over a time period of seven consecutive seven days, which is recommended by several researchers. The people that attended in the study were instructed to wear the accelerometer on the right hip, which is recommended by Kolle et al. (2012) and had to be worn every day except during the night when sleeping, or in the shower or other activities that involved water. During the time period of the collection of data, the children's parent received an SMS every morning, to remind the kids to wear the accelerometer. Raw data output that came from the accelerometers are expressed as count per minute (CPM), which refers to all acceleration the accelerometer has been exposed to, divided by the number of minutes the accelerometer has been used. According to the test protocol of Kolle et al. (2012) counts per minute are set to intervals on 10 seconds in order to capture as precise data as possible. The accelerometer data were divided in to three different categories. Sedentary, light, moderate and vigorous physical activity, according to international health recommendations, moderate and vigorous physical activity (MVPA) per day is the most relevant and used to measure physical activity level. In this task we will focus on MVPA among the children at leisure time as a dependent variable. For initializing the accelerometers, to download accelerometer data, and to validate and create accelerometer data (MVPA), Actilife v6.13.3 (ActiGraph, LLC, Pensacola, FL, U.S.A.) was used. The accelerometers were set to start measuring at 06.00 in the morning, the day after they were distributed and put on, in order to avoid the Hawthorne Effect. According to the test

protocol, at least 480 minutes of daily recorded activity was necessary to get enough data to a valid day, and when the accelerometers had zero counts in a time period of 20 minutes, or more were interpreted as non-wear time and removed. The preschool children were required to have at least two valid days to be included in the study. Data between 12:00-5:59 a.m., were excluded due to instructions concerning no accelerometer-wearing during sleep. The MVPA among preschool children at kindergarten (school day) was categorized as 8:00 a.m., - 3:29 p.m., and MVPA among preschool children at leisure on weekdays was categorized as 6:00-7:59 a.m., and 3:30-11:59 p.m. Weekend was categorized as 6:00 – 11:59 a.m., Saturday and Sunday. These operationalisations were made according to feedback from several of the preschool staff and parents of the preschool children, who identified these times as time spent in kindergarten and at leisure, respectively (Kippe & Lagestad, 2018).

Questionnaire

The questionnaire in this study was made by Kippe & Lagestad (2018) and was designed by using already validated and reliability-tested questions from former studies by Hansen et al. (2015) and HUNT3 (2008). Kippe and Lagestad (2018) pre-tested the questionnaire by 10 parents of children in preschool-aged 4-6 that came from a kindergarten that was not included in the study. The following questions were asked in this study: “When your child is physical active at leisure time, how often will you say that you participate in your child’s physical activity (%)?” and “The health recommendations = 60 minutes each day for children. How many minutes will you estimate that your child is in physical activity outside of the time spent in kindergarten in weekdays?”

Statistics

Pearsons’s correlation was used to identify bivariate associations between children’s activity level in leisure, and their parents estimates of their children’s activity level and participation in activity together with their children, respectively. Statistical significance was set at $p \leq 0.05$ Statistical analyses were performed in SPSS statistical software version 26 (SPSS Inc., Chicago, IL, USA).

Table 1: Descriptive characteristics of the participants

	Mean (standard deviation)
Participation in physical activity with their child, mother (%)	50.8 (22)
Participation in physical activity with their child, father (%)	44 (23.8)
Estimation of children's minutes of MVPA each weekday at leisure, mother	99.7 (63.7)
Estimation of children's minutes of MVPA each weekday at leisure, father	98.3 (68.1)
Children's MVPA at leisure weekdays (minutes)	32 (12.3)
Children's fulfilment of health recommendations (%)	84

MVPA, moderate and vigorous physical activity

Results

The results from question one, shows that both mother and father on an average basis overestimates their children's activity levels by claiming their children are approximately three times more active than they actually are according to the objective measurement. Furthermore, the spreading shows in **both figure 1** and **figure 2** that it's a big variation in this estimation, and it's only approximately 5% which is near to estimate a correct activity level, while approximately 5% overestimates their children's physical activity levels with 10 times or more. There is no found significant correlation between parent's estimation of their children's activity level at leisure time, and the children's activity level at leisure time. The pattern itself in the estimation of physical activity levels is shown to be relatively similar between the father and mother.

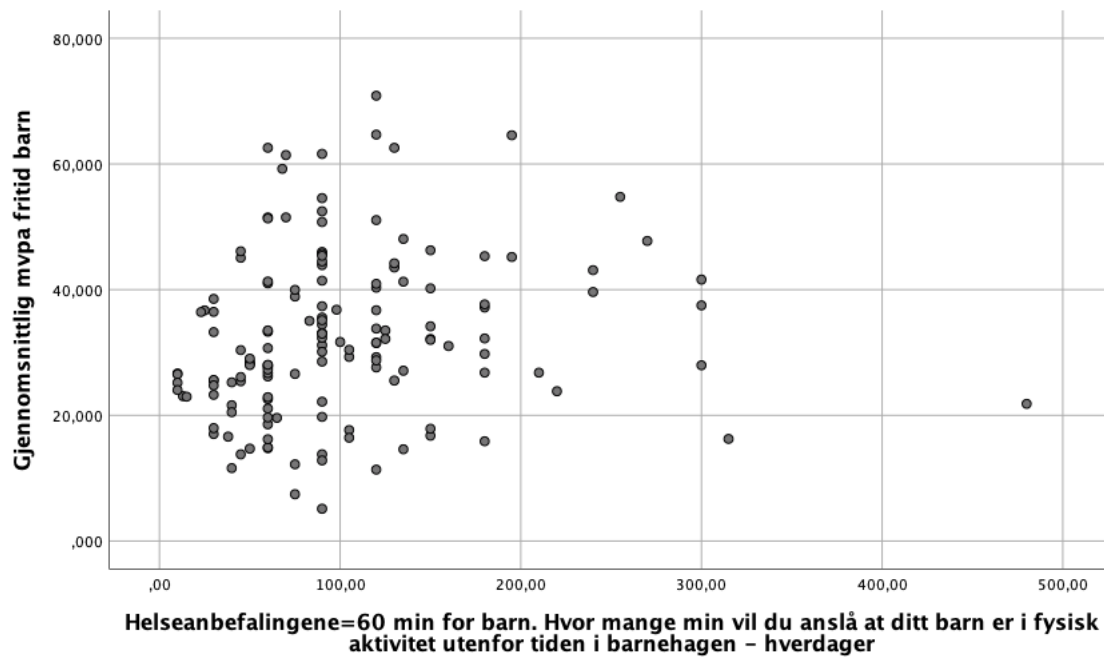


Figure 1 Scatter plot with preschool children's MVPA at leisure time on the X-axis, and father's estimation of their children's physical activity level on the Y-axis.

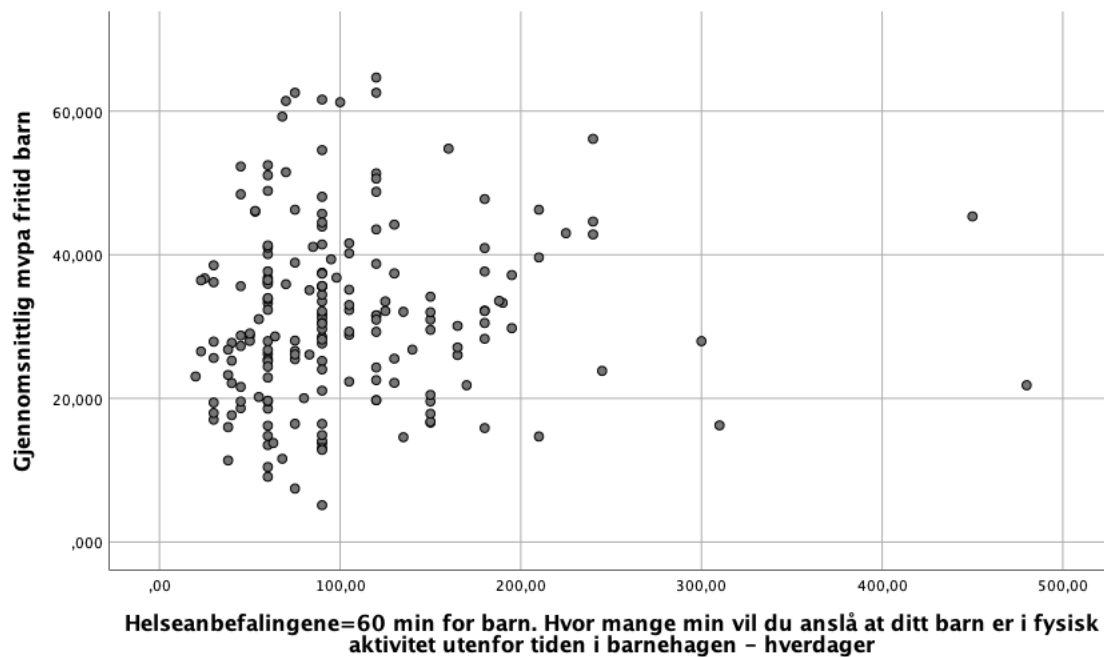


Figure 2 Scatter plot with preschool children's MVPA at leisure time on the X-axis, and mother's estimation of their children's physical activity level on the Y-axis.

The results from **table 2** shows that there is no significant correlation between the kindergarten children’s physical activity levels at leisure time, and the parent’s participation in physical activity with their child. The correlation coefficient is between 0 and 1, and this is close to 0. This applies to both mother and father.

Table 2: Correlations (Pearsons r) between kindergarten children’s physical activity levels at leisure time, and parent’s participation in physical activity at leisure time with their child.

	Children’s MVPA at leisure time
Mothers participation in physical activity at leisure time with their child	-.134
Fathers participation in physical activity at leisure time with their child	-.053
Mothers estimation of the child’s physical activity level	.092
Fathers estimation of the child’s physical activity level	.158

MVPA, moderate and vigorous physical activity

Discussion

The main findings from question one, shows that both mother and father on an average basis overestimate their children’s activity levels by claiming their children are approximately three times more active than they actually are according to the objective measurement.

Furthermore, the spreading shows in **both figure 1** and **figure 2** that it’s a big variation in this estimation, and it’s only approximately 5% which is near to estimate a correct activity level, while approximately 5% overestimates their children’s physical activity levels with 10 times or more. There is no found significant correlation between parent’s estimation of their children’s activity level at leisure time, and the children’s activity level at leisure time. The pattern itself in the estimation of physical activity levels is shown to be relatively similar between the father and mother. The result from this analysis confirms the hypothesis that parents overestimate their children’s physical activity level.

Lechner et al. (2006) found out that 33% of the subjects in the study did not meet the guideline for physical activity. Of the subjects that did not meet the guideline for physical activity, 48% had a misperception of their physical activity, as they estimated their physical activity to be sufficient or high. Level of agreement between meeting the physical activity guideline and the more subjective estimation of the physical activity was low. The group that

overestimated their physical activity used social comparison more often than the three other groups in the study (high realists, underestimators and low realists).

Ronda et al. (2001) reported in their study that most of the respondents were realistic about their adequate physical activity levels (57.1%), but a substantial proportion of the respondents (35.6%) were overestimating their physical activity level, and a small minority (7.2%) underestimated their physical activity level. In the study done by Sluijs et al. (2007) they reported that of the 632 participants, 43.2% correctly described themselves as active, 31.2% overestimated their level of physical activity, 19.6% correctly described themselves as inactive and only 6.1% underestimated their level of physical activity. Consequently, of the 321 people who were classified as inactive according to the self-reported data, 61.4% rated themselves as sufficiently active. It is difficult to compare the three Dutch studies with this study, because of the self-reported data. However, it may say something about how good parents are to see how active their child is. As we see in these three studies, the overestimation of physical activity level is common. So, it's possible to say that if people overestimate their physical activity level, how can they estimate their child's activity level correctly?

In a study from Corder et al. (2010) about objectively measured and child- and parent-perceived physical activity level, 69% of the parents accurately perceived their child's PA level (62.5% realistically active, 6.2% realistically inactive), which is interesting because the result we got from our study is that only 5% of the parents which is near to estimate a correct activity level. Of the 30.9% of parents whose children were inactive, 80% overestimated their child's PA level (24.5% of all participants). 54% of children aged 9-10 accurately reported their own PA level (18.9% realistically inactive; 34.9% realistically active). Of the 30.9% who were inactive, 40% overestimated their PA level (12% of all participants).

80% of the parents in this study wrongly thought that their child was fairly active. 40% of inactive children overestimated their PA level. Compared to our findings, it's surprisingly to see that 2/3 of the parents estimates a correct activity level for their children, however, as the parents were asked to assess their children's activity level by these categories: Very inactive, fairly inactive, neither inactive or active, fairly active, and very active, it may not be so surprisingly because "realistically active" is a very general term. That 1/4 of the parents overestimates their inactive children's activity level, is partially the same results as we got in our study, but we have concrete numbers to an estimation of physical activity levels, and Corder et al. (2010) does not. A possible explanation to why the parents in Corder et al. (2010) study estimates their children's activity level so correctly may be because they

estimated activity level from only five categories. It's possible to say that parents have a reasonable clue about their children's activity level. The study showed that the lower the children's fat mass index were, the more likely it was that their parents overestimated their children's PA level. Parents overestimated their children's activity levels more than adults have overestimated their own PA in previous studies. This overestimation could come from many factors, like social desirability bias and not be aware of their children's PA when they are not with them. This latter statement is supported by discrepancies between parentally reported and objectively measured PA in studies comparing measurement methods in children (Corder et al., 2010). Parents that had girls were more likely to overestimate their children's activity level, and girls were on average less active than boys. Even though parents were asked not to compare their child to other children of the same age and gender when judging their child's PA level, it is possible that the parents did this anyway (Corder et al., 2010). Children who had parents who overestimated their PA levels reported higher levels of social support than the children who had parents that were realistic about their inactivity. Although these children appear to be receiving support for the activity that they are currently doing, it does not necessarily mean that this activity is at recommended levels. Parents of children who have a lower fat mass index may perceive them as active enough and then see no need to facilitate or encourage them to increase their PA over their current levels (Corder et al., 2010). Corder et al. (2010), mentions that there is a lack of research in the estimation of physical activity levels. And mentions in the study three previous studies of physical activity awareness that have focused on adult Dutch populations, using self-reported physical activity to assess activity levels. This can be important in this study because of the little research that has been done in the area, but an estimation of physical activity levels has to be seen up against objective numbers to know how good the estimation is. Even though estimation of your own physical activity levels and estimation of your children's physical activity levels are two different things, it can say something about a person's ability to estimate activity levels correctly. Another thing is that even though the people in the three Dutch studies are estimating their own physical activity levels, they can be representative for other adults as we have in this particular study. The main emphasis of the study done by Corder et al. (2010) was on the differences between those who are realistic about their inactivity and those who overestimate their physical activity level. This is because inactive children are most likely to be targeted in interventions to increase physical activity.

The main findings in question two (**table 2**) shows that there is no significant correlation between the parent's participation in physical activity with their child and the kindergarten children's physical activity levels at leisure time. This applies to both mother and father. The results from this analysis show that the hypothesis is not confirmed. All of the studies in this article looked at the correlation between physical activity and family support. In the variable "family support" they included parental participation in their children's physical activity. Loprinzi & Trost (2009) refers to findings from school-aged children (Gustafson & Rhodes, 2006; Trost et al., 2003), that parental support for PA was found to be a significant positive influence on PA at leisure time. This indicates that parents can increase their child's participation in activities at home by playing with their child, providing transportation to parks and other facilities related to activity, and providing reinforcement for PA participation. The research done by Loprinzi & Trost (2009) showed that parental support was not related to children's PA participation at childcare. This result may be expected since it is not possible for the parents to participate in their child's activity at childcare. Verloigne et al. (2014) explored associations between parental variables and physical activity among adolescents (14 years old) and found a close to significant association between co-participation and adolescents MVPA on weekdays and weekend days. Zecevic et al. (2010) found out that parental support of PA approached statistical significance. Dowda et al. (2011) findings showed that parental role modelling of PA was not directly related to children's MVPA. However, even if parental modelling may not affect child PA directly, parents who are active may be more likely to participate in PA with their child and to support their children's PA. Pfeiffer et al. (2009) showed in their study, that family support for activity was associated with non-sedentary activity ($r=0.10$, $p<0.10$). Several studies on this topic has shown various results. A possible explanation is that kindergarten children are too young to already have been socialized into activity/passivity, as mentioned by Bourdieu (2000) and the concept of habitus. Another explanation may be that children possibly are born to be active. Zecevic et al. (2010) also write that the more parents supported their child's activity, the more likely the children were to engage in the recommended amount of physical activity. Parental support of PA predicted children's membership in two out of three categories of perceived intensity of PA; Highly active and moderately active. Because child daily PA is a measure of the amount of time a child spends engaged in physical activity and the child's PA levels is a qualitative measure of PA, it is possible that parents used different criteria to assess these two components. So, the case can be that parent's estimated their child's daily activity based on their knowledge of the child's routine. It follows that related measures such as TV

time and enjoyment of PA (which is likely to be associated with families' PA and leisure time) predicted the child's PA. On the other hand, parents' assessment of the child's level of PA may depend on their perception of the child's level of development (younger children requiring more supervision and care might be perceived as more active), and perception of their supportive behaviour of PA including their own level of PA (Zecevic et al., 2010). Also, parents may not see the importance of PA abilities for children who are at preschool age or they may simply just accept that such abilities develop later. Parental enjoyment of PA, their PA habits and the support they provide their children to be active were cogent predictors and certainly underline the importance of social learning (Zecevic et al., 2010). However, it is unclear if parents who provide a highly supportive environment for their child to be active cause the child to become more active or if it is an active child that influences the degree to which parents provide support for his or her active pursuits (Zecevic et al., 2010).

In the study done by Tandon et al. (2016), they focus on physical activity during specific time periods (critical window and on weekends), as former studies have focused on overall physical activity. When they used specific time periods, the family physical environment may be expected to have the most influence on youth's physical activity. Of the family environment features assessed, maternal and sibling coparticipation in physical activity were directly associated with average change in MVPA among girls. This result indicates that having a family member to participate in physical activity with girls, rather than observing or receiving support or praise from other family members, may be an important factor for promoting physical activity. A limited number of studies have looked at the relationship between parental or sibling participation in activities with children. However, few studies have examined the sex of the coparticipating parent, which can possibly explain previous null findings. Furthermore, no previous research has examined coparticipation using a longitudinal study design, using objective measures of physical activity, or assessing physical activity during the critical window.

Dowda et al. (2011) found a significant direct relationship between child's MVPA and family support, which includes the variable of participation in PA with the child. This study says that a similar study from Loprinzi and Trost (2009) found an indirect effect on child PA that was mediated by parental support. Dowda et al. (2011) says that it is possible that active parents may be more likely to participate in PA with their child and to support the child's PA. However, it can be difficult for the parents to estimate how often they participate in physical activity with their child, in the same way, that it's difficult for the parents to estimate their children's activity levels. Because of the self-report data were used to measure parents

estimation of their children's activity levels and parents participation in physical activity with their children, which poses problems for the reliability of the data being collected given that social desirability and recall bias have been associated often with self-report data (Loprinzi & Trost, 2009).

Strength and Limitations of the study

This study has several advantages. The study has a large number of participants, reflecting the distribution of boys and girls in Norwegian kindergartens. Different types and sizes of kindergartens were also included in the study, as a result of being randomly selected, which gives a representative sample (Kippe & Lagestad, 2018). To my knowledge, this is the first study to objectively assess children's physical activity both at kindergarten and spare time with accelerometers, and at the same time examine correlation parents has through participation with their children's activity and the parent's estimation of their children's activity levels. Accelerometer as an objective measurement, decrease subjectivity (Sirard & Pate, 2001), and eliminate bias, such as social desirability, and recall problems (Evenson et al. 2008). Furthermore, several researchers identified accelerometers as the optimal method to capture physical activity in free living situations (Plasqui & Westerterp, 2007; Brage et al., 2015). The ActiGraph GT1M is validated and reliability-tested for measuring physical activity levels for children aged 0-5 (Cliff et al., 20009; Pate et al., 2006), and against the international health recommendations (Hansen et al., 2015). However, this study is not without limitations. Self-reported questionnaires might have reliability issues as they rely heavily on the individual respondent's own concentration, memory and perception (Boon et al., 2008), but also allows comparing results across studies (Johannessen et a., 2010). And also, although accelerometry is considered to be an optimal measurement when assessing physical activity in free-living situations, it underestimates activities related to cycling or riding vehicles (Sirard & Pate, 2001), which is unfortunate when riding vehicles has been considered an important factor of physical activity for preschool children (Nicaise et al. 2011). Also, neither swimming nor other water activities (due to the instruction of no water-contact) were included in the data analysis, which might lead to an error estimation of the children's physical activity level (Kippe & Lagestad, 2018).

Conclusion

The results show that parents on an average basis overestimate their children's activity levels by claiming that their children are approximately three times more active than they actually are according to the objective measurement. No significant correlation is found between parents estimation of their children's activity level at leisure time, and the children's objectively measured activity level at leisure time. The pattern shows that the estimation of physical activity levels is shown to be relatively similar between both mother and father. The results also show that there is no significant correlation between the kindergarten children's physical activity levels at leisure time and the parents participation in physical activity with their child. This applies to both mother and father. Further research should focus on which factors lead to parent's overestimation of their children's physical activity levels. It's a lack of research done on this topic and it will be wise to investigate this further. Furthermore, it is necessary to do more research on both mother and father separately when it comes to the estimation of their children's physical activity level. Most of the previously done research on parental participation in physical activity with their child has been on the variable "family support" which includes many different factors, further research should focus on the correlation between parental participation in activity with their child and MVPA at leisure time. Most of the previous research has focused on family support and overall physical activity and not physical activity at leisure time. It is also important to do more research on both mother and father separately when it comes to parental participation in physical activity. It can also be important to do some longitudinal to see how parental participation develops over time.

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