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Understanding the accuracy of parental perceptions of child physical activity: a mixed methods analysis

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Abstract

Background

Interventions to increase children's physical activity (PA) have achieved limited success. This may be attributed to inaccurate parental perceptions of their children's PA and a lack of recognition of a need to change activity levels.

Methods

Fifty-three parents participated in semi-structured interviews to determine perceptions of child PA. Perceptions were compared to children's measured MVPA (classified as meeting or not meeting UK guidelines) to produce three categories: "accurate", "over-estimate", "under-estimate". Deductive content analysis was performed to understand the accuracy of parental perceptions.

Results

All parents of children meeting the PA guidelines accurately perceived their child's PA; whilst the majority of parents whose child did not meet the guidelines overestimated their PA. Most parents were unconcerned about their child's PA level, viewing them as naturally active and willing to be active. Qualitative explanations for perceptions of insufficient activity included children having health problems and preferences for inactive pursuits, and parents having difficulty facilitating PA in poor weather and not always observing their child's PA level. Social comparisons also influenced parental perceptions.

Conclusions

Strategies to improve parental awareness of child PA are needed. Perceptions of child PA may be informed by child "busyness", being unaware of activity levels, and social comparisons.

Background

Despite evidence suggesting that physical activity (PA) is beneficial for children's physical and mental health ^{1,2}, most children between 5-7 years in the United Kingdom (UK) do not achieve the recommended minimum of 60 minutes per day of moderate-to-vigorous PA (MVPA)^{3,4}.

Interventions to increase children's PA commonly involve parents⁵. However, there are few interventions that exclusively focus on the family, and those that do have shown limited success^{6,7}. Given this evidence, more family-focused interventions are needed to understand whether involving parents is an effective strategy for increasing child PA⁸. One reason why these efforts are ineffective may be that parents do not perceive child PA levels accurately and therefore do not recognise that they need to encourage more PA. Overestimating personal PA levels is associated with a reduced intention to change PA levels in adults⁹. Therefore, it is possible that parents who do not perceive their child's PA to be inadequate may not see any need to encourage higher levels of this behaviour.

A high proportion of parents whose children do not meet recommended levels of PA, over-estimate their child's PA levels¹⁰⁻¹². Compared to children of parents who accurately perceived their child as inactive, parental overestimation of the PA levels of children (aged 10-11), has been associated with a child having a lower body fat mass index, having a female child, and higher levels of parental and peer support¹¹. Similarly, parental overestimation of child (aged 4) PA, compared to parents accurately perceiving their child to be active, has been shown to be associated with being an only child, parents perceiving the child to have inadequate skills to be active, and the child attending a nursery full-time¹⁰.

Using quantitative surveys¹⁰⁻¹² to examine parental perceptions of child PA limits the ability to probe perceptions of physical activity in-detail. Previous qualitative research suggests that many parents perceive children to be sufficiently active^{13,14} and as not requiring additional activity¹⁴. These qualitative studies are unable to explore the accuracy of parental perceptions. Exploring parental perceptions of child PA levels by mixing objective PA measurement with qualitative data may offer a novel, more comprehensive, in-depth understanding of parental perceptions¹⁵, and generate broader insights of experiences than those which could be produced from qualitative or quantitative methods alone^{16,17}. This study aimed to understand the accuracy of parental perceptions of their 5-6 year old child's PA levels using a mixed methods approach.

Methods

Study details

Participants were recruited from a large cross-sectional study (B-ProAct1v) which aimed to identify factors associated with PA and screen viewing among 5-6 year olds. Full details of B-ProAct1v's sampling and recruitment methods are published elsewhere^{18 19}. In brief, 5-6 year old children and their parents were recruited from 57 primary schools within the wider-Bristol area. The study was approved by the School for Policy Studies Ethics Committee at the University of Bristol and written informed consent was obtained from parents for both their own and their child's participation.

Measurements

A purposive sub-sample of parents was recruited to achieve a sample broadly reflecting the main B-ProAct1v cohort in terms of child PA and household deprivation by stratifying according to tertiles of the time (in minutes) the child spent in accelerometer-estimated MVPA and the Index of Multiple Deprivation (IMD) at the household level (a relative measure of deprivation²⁰) producing nine sampling cells (1 = low PA & low deprivation and 9 = high PA & high deprivation) (Table 1). A sub-sample of 274 parents were invited to participate in an interview with the aim of achieving an interview sample with variation in relation to child PA and household level of deprivation. The latter has been shown to be associated with child physical activity behaviour^{21 22}. Of these 53 parents agreed to take part and were interviewed. Interviewing continued until theoretical saturation was reached for the entire sample and the sub-groups.

Child physical activity was assessed over five days (three weekdays and two weekend days) using an Actigraph GT3X accelerometer¹⁹. Parents were included in the current analysis if their child had at least 2 weekdays of valid accelerometry data (defined as the provision of at least 500 minutes of data). Minutes spent in MVPA were derived using population specific cut-points for children²³. Children were categorised as sufficiently active if they achieved the UK PA guidelines³ (at least 60 minutes of MVPA per day) on average across the total number of days with valid wear time.

Semi-structured interviews were conducted by telephone as this is a cost effective way of collecting information. The interviews explored parental perceptions of child PA and screen viewing (Please see the Supplementary material for the interview guide). This analysis focuses on perceptions of child PA. Parents were asked about their perception of their child's level of PA including the types, locations and timings of PA, and the co-participants. Parents were then asked whether they were concerned

about the amount of time their child spends being physically active, how the child's behaviours were perceived to be influenced by others, and the strategies parents used to manage PA behaviours. Lastly, parents provided suggestions for interventions aimed at increasing child PA. The interview questions did not specifically address whether parents believed their child achieved the UK PA guidelines of 60 minutes of MVPA per day. Questions were posed in a non-leading manner to allow participants to shape the direction of the interview. Issues that emerged were probed.

Analysis

The analysis was conducted in two stages (Figure 1). Firstly, a comparison was made between quantitative accelerometer data and qualitative interview data to understand the accuracy of parental perceptions. Responses to the question *"How active do you think [child's name] is?"* were extracted to classify parental perceptions of child PA levels and collapsed into three categories based on the language used by parents: "very active"; "moderately active" and "less active" (Table 2). Using the convergence coding matrix approach for integrating qualitative and quantitative data²⁴, parental perceptions were compared to the PA data. From this comparison, the following three possible accuracy categories were produced: "accurate", "over-estimate", "under-estimate" (Table 3). Perceptions were coded by two researchers and inter-rater reliability of the assignment to these categories was calculated using Cohen's Kappa (Index of Inter-rater Reliability). This process resulted in 0.96 agreement for the coding of MVPA into 'low', 'moderate' and 'very active' and 0.81 agreement for the coding of parental perceptions into 'accurate', 'over-estimate' or 'under-estimate' between researchers. Divergent views were discussed and consensus was reached between the two coders.

Secondly, deductive content analysis²⁵ (using QSR N-Vivo 10) was performed to explore parental perceptions of child PA levels, how these perceptions are formed, and any explanations for the accuracy of such perceptions. Analysis involved three phases: preparation; organisation and reporting²⁵. Preparation began with repeated readings of the transcripts. Units of analysis were identified as themes that emerged from the literature. In the organisation phase, these themes were used to develop a categorization matrix into which the data were coded. Coding was iteratively refined using an unconstrained matrix to allow for the creation of additional categories. There were frequent peer debriefing discussions throughout the analysis process and the researchers agreed theme names and a description of what the themes covers.

Illustrative quotes have been selected for each of the four themes elicited and include a description of the child's gender, socio-economic position (SEP), as determined from the sampling matrix (Table 1), PA (mean MVPA) and accuracy of parental perception for context. Names have been replaced with pseudonyms.

Results

Participant characteristics

Fifty-three parent (49 mothers) interviews were conducted. On average, parents were aged 37.5 years (standard deviation = 5.92). Eleven per cent of participants had one child, 60% had two and 29% had more than two children. 86% of the sample was predominantly White British, 23% were unemployed or full-time parents, 48% worked part-time and 29% worked full-time. On average, the interviews lasted 26 minutes (range = 12 to 50 minutes). The majority (95%) of the children of the interview participants provided at least three valid weekdays of accelerometry data. Of these approximately 60% provided two valid weekend days. The average minutes per day of MVPA across the total number of valid days was 66.3 (range = 31.6 to 115.3) minutes per day. Four participants were excluded from the analysis: one participant's audio file became corrupted, one participant's perception of their child's PA level was not elicited in the interview and two participants' children did not meet the accelerometry inclusion criteria.

Accuracy of parental perceptions

The PA guidelines of at least 60 minutes of MVPA per day were met by 34 out of 49 children. All parents of children meeting the recommendations accurately perceived their child's PA as either "moderately active" or "very active" (Table 3). In contrast, only two of the parents of the 15 children who did not meet the PA recommendations accurately perceived their child's PA as "lessactive", whilst 11 perceived their child to be "moderately active" (over-estimate) and two perceived their child to be "very active" (over-estimate) (Table 3). No parents were categorised as underestimating their child's PA levels.

Adequate amount of PA

Most parents were unconcerned about their child's PA level and did not feel a need to encourage more activity. Explanations for this included parents consciously considering the amount of activity that their child performs, viewing children as naturally active and willing to be active.

“We don’t need to encourage the PA because he is quite keen, always running around”

Male, High SEP, 71 minutes MVPA /day, Accurate.

Most children (including those not meeting the recommended PA guidelines) were described by parents as participating in a diverse range of unstructured (e.g. playing in the garden or park, cycling or scooting) and structured activities (e.g. afterschool sports clubs).

“He cycles to and from school, you can guarantee the first thing he will talk about when he comes home is the school football at lunchtime, and he has this football training after school on Tuesday [...] There is a game most Sunday afternoons, and then if he can he will be outside at some point after school”

Male, High SEP, 71 minutes MVPA /day, Accurate.

Children classified as “very active” according to parental accounts were described as being “busy”, “non-stop”, “always on the go” and having “lots of energy” etc. These terms suggest that parents use an assessment of child busyness to inform their views of child PA.

Some parents who viewed their child as “very active” appeared concerned about the high level of their child’s activity. These parents described difficulties in stopping their child being active in order to accomplish other tasks or being unable to meet their child’s demands for PA both on their own and involving parental participation.

“George always does everything with such enthusiasm that we end up paying for all these clubs. And every term we say are you sure you still want to do this?, ‘oh yes’. And you, you sort of think ‘oh crikey’, so in terms of PA, we think you know, sometimes we think he does too much”

Male, High SEP, 89 minutes MVPA /day, Accurate.

Many parents appeared to consider the balance between their child’s sedentary behaviours and PA levels when determining whether they should be concerned about their PA level.

“I don’t think she’s too active or gets too much screen time, I think she gets a nice balance”

Female, Medium SEP, 64 minutes MVPA /day, Accurate.

Some parents who perceived their child as “very active” said that sedentary tasks were performed to recover from excessive activity.

“He always wants to be doing something, so you know, so if we’re not scooting to the park or whatever ... he just uses telly just to chill out when he’s tired”

Male, High SEP, 70 minutes MVPA /day, Accurate.

Two parents defined their children as “very active” despite the accelerometer data indicating that they did not meet the PA guidelines. Both of these parents considered their child’s activity levels to be sufficient and felt no need to encourage them to be more active. These perceptions appeared to stem from a sense that these children are “*always on the go*” participating in either structured or unstructured activities. One of these parents recognised that her child could benefit from participating in more structured activity because of the ‘discipline’ it could offer rather than the PA. Both of these parents indicated that they were responsive to the child’s desire to be active and supported the child’s choices.

“It’s more down to her, because we’re comfortable that she gets enough exercise but yeah how much she does in terms of getting her to do more physical exercise, but if she doesn’t want to do it, then that’s fine as well, she does plenty in that respect”

Female, Medium SEP, 45 minutes MVPA /day, Over-estimate.

Inadequate amount of PA

Two parents appeared to view their child’s level of PA as insufficient and a small number of parents indicated some level of concern regarding their child’s activity levels.

“I try and encourage him and he knows that he needs to do more exercise”

Male, Medium SEP, 41 minutes MVPA /day, Over-estimate.

The following were given by parents as reasons for children being less active than parents would like: health problems; child preferences for sedentary pursuits; and barriers to PA such as weather conditions and working parents reported being tired after work.

“She might watch a little more TV than she should but because she’s got asthma you see, when it’s freezing cold outside, she can’t go out, because it kicks her asthma off, so she entertains herself with the DS”

Female, Low SEP, 34 minutes MVPA /day, Over-estimate.

The two parents who described their children as “less active” used the terms “*academic*” and “*not very*” when talking about their child’s activity level. One of these parents categorised his children as either active or academic, which suggests that he did not expect them to change and, therefore, may be less compelled to encourage greater levels of PA in the children that he defines as academic.

“I’ve got four children, two are physically active...and two aren’t, they are more academic, they’ll sit down and read, they’ll sit down and draw and things like that. Liam is not one of those, just not very physically active”

Male, Low SEP, 32 minutes MVPA /day, Accurate.

Similar descriptions of academic or creative personality types were given by other parents as an explanation for preferences for sedentary pursuits amongst children.

“I am concerned about her exercise so I do want to try and get her active [...] but yeah she’s never, you know, she’s more of a writer (...) and a reader than she is a [run around] yeah.”

Female, Low SEP, 54 minutes MVPA /day, Over-estimate.

The parents of children described as “less active” discussed how their child had tried different activities but had been unable to find an activity that they enjoyed.

“We have tried him with Judo, we have tried him with other clubs, Beavers, but it’s just not something he’s interested in.”

Male, Low SEP, 32 minutes MVPA /day, Accurate.

One such parent was keen to continue encouraging their child to try new activities until they found something that he enjoys thus valuing the importance of enjoyment and supporting the child's choice.

“He wants to try karate and things like that. So we'll have a look into that as well, because I'm kind of, I'm happy for them to give everything a go”

Male, High SEP, 37 minutes MVPA /day, Accurate.

This attitude suggests that the parent sees their child's PA as amenable to change, and perhaps the inability to find an activity that the child enjoys is an explanation for them not meeting the PA guidelines. In contrast, whilst the parent who described their child as “academic” also talked about being willing to let her son try new activities, their view appeared to be more fatalistic regarding whether he would be likely to become an active child, perhaps because this parent could relate to this child's preferences.

“He has said that he'd try kickboxing but I don't know. We'll try him but like I said he's not the, he's more the academic one. The oldest girl, she's academic, and Jamie is. As I am”

Male, Low SEP, 32 minutes MVPA /day, Accurate.

Parental awareness of child PA

Some parents acknowledged that it is difficult to know the amount of PA children do at school because they do not witness this activity. By not directly observing all child activity it could be that parents are unaware of the total amount of PA their child engages in.

“They come home and say we done PE today or you know it might be twice a week and I'm thinking oh maybe they could do more but I'm not there to watch, do you know what I mean? I don't really know.”

Female, Low SEP, 51 minutes MVPA/day, Over-estimate.

In contrast, three parents described being aware of their child's activity levels at school either through child reports or direct observation.

“When I see her in school she’s always running around the playground”

Female, Medium SEP, 80 minutes MVPA /day, Accurate.

Aside from the above, the majority of parental descriptions of child PA included either organised activities (such as school or community clubs) or activity in which the parent participates or which they facilitate. This may indicate that parental views are informed more by formal PA that they observe than informal activity away from the parent.

Social comparison

Terms used to describe child PA such as *“normal active child”*, *“bit more than average”*, *“relatively”* suggest that social comparisons play a role in the formation of perceptions. Social comparisons were made with siblings and the child’s peer group and with the parent’s own activity as a child.

“I was a child that was quite happy to sit home and do something for like quite a long period of time. Kate has a much shorter attention span at those kinds of things and wants to be up and be doing the next thing [...] and that’s really what I’m comparing it to”

Female, Low SEP, 82 minutes MVPA /day, Accurate.

Some parents reported that their child’s friends were equally physically active or “busy,” whereas others felt their child was more active than their friends.

“I think she would be more active [than her friends] because most of them do watch telly and stuff. So I’d say she is probably a bit more active”

Female, Medium SEP, 66 minutes MVPA /day, Accurate.

Despite acknowledging social comparisons, there were mixed accounts of the perceived influence of other families on parent perceptions and practices. Whilst some parents described being aware of physical activities that other parents encourage their children to do and considering trying similar activities with their own children, others did not feel that they would be influenced by others.

“I don't feel that I have to be doing something with him every day, where I know some parents do”

Male, High SEP, 70 minutes MVPA /day, Accurate.

Discussion

All parents in this sample accurately perceived their child's PA if their child met the PA guidelines. The majority of parents (~87%) whose children did not meet the PA guidelines inaccurately perceived their child's PA levels. This is an important finding because it suggests that these parents are unaware of the need to encourage greater activity levels in their children. This is of particular concern given that in the UK the majority of children do not achieve the recommended amount of PA³.

This study extends previous quantitative assessments¹⁰⁻¹² by exploring parental perceptions qualitatively and amongst those with accurate compared with inaccurate perceptions. As found by previous qualitative research¹³, most parents in this sample perceived their child's PA level to be adequate, indeed some parents felt the need to limit this behaviour at times. Perceiving a child to be physically active appeared to be informed by parents consciously considering the amount of activity in which their child engages, viewing their child as naturally active, and describing their child by his or her willingness to be active.

In contrast, a limited number of parents reported some level of concern regarding their child's activity levels. Reasons for this perception included health problems, child preferences for inactive pursuits, and difficulty in finding ways to be active in unfavourable weather. Consistent with these findings, previous studies have found that parents report child preferences for sedentary pursuits and bad weather as barriers to PA^{13 26}.

This study's findings suggest that inaccurate parental perceptions of child PA levels may be based on: misperceiving child busyness as sufficient PA; being unaware of activity levels when the child is not with them; and social comparisons.

The use of visual cues to assess child activity levels amongst parents has been reported by others¹³. Parental overestimation of child PA (at 4 years old) has been associated with the child attending a nursery full-time¹⁰, which suggests that not observing a child for periods of time may contribute to inaccurate perceptions¹⁰. Children who do not meet the PA guidelines may not be perceived as such because their parents assume that they are more active when not in their care. Difficulty determining child activity levels has also been acknowledged by parents in a previous qualitative study¹³.

Therefore, opportunities to encourage parents to monitor child PA using pedometers or other devices may be a useful strategy for improving parental awareness.

Previous work has found that parents make social comparisons to other children in determining whether children are overweight or obese²⁷. Given that PA levels appear to be similar within peer groups²⁸, it may be that parents are unconcerned by their child's PA because they perceive their levels to be similar to those within their child's social group.

Efforts to improve the accuracy of parental perceptions of child PA may be a useful intervention component, especially given the positive association between parental support and child PA²⁹. However, more research is needed to determine whether the accuracy of parental perceptions is related to parental support of child PA. Furthermore, a randomised controlled trial in adults found that awareness of PA increased following the provision of PA feedback but PA behaviour did not change³⁰. However, this finding would need to be replicated amongst parents to determine whether feedback of child PA levels would have any impact on parents' efforts to change child PA levels.

Strengths and limitations

This is the first study to utilise both objective data and qualitative interviews to explore parental perceptions of PA levels in 5-6-year olds. As such, it has allowed for a more in-depth exploration of parental perceptions than previous quantitative studies¹⁰⁻¹². The study does however have some limitations. Parental overestimation may reflect social desirability bias and an unwillingness to disclose that they are concerned about their child's PA levels. In this study parents were asked whether they viewed their child as active, rather than whether they met the 60 minutes of MVPA guidelines. Using this approach meant that children with MVPA levels close to the 60 minutes threshold were classified as 'inactive', therefore parents of these children may have been misleadingly classified as overestimating their child's PA. Seven parents of children with MVPA levels of 50 minutes per day or greater were classified as over-estimators. However, the approach used to categorise the sample according to the UK PA guidelines has been adopted by others^{10 11}, and is an appropriate approach as it reflects the guidelines to which parents are exposed.

The strengths of conducting telephone, instead of face-to-face interviews, include their convenience and cost-effectiveness. However, the absence of visual cues in telephone interviews can make

building rapport with interviewees more challenging and responses can be more difficult to probe in the absence of visual, contextual information ³¹.

The use of accelerometer scores to assess parent accuracy is limited because they are only able to capture a snap-shot of PA which is dependent on the days the child was measured whilst parental perceptions are presumably formed over years. Accelerometers also cannot capture activities such as cycling or water-based activities³².

Conclusions

The majority of parents in this sample did not feel a need to encourage greater PA in their children, and the findings from this study indicate that parents of children who do not meet the UK PA guidelines may have a tendency to overestimate their child's activity level. Both of these findings may in part explain the inadequate levels of PA amongst young children. Parental perceptions of children's PA may be informed by the "busyness" of children, parents not always observing their child's activity levels and social comparisons with others. Given the proportion of children who do not meet the PA guidelines in the UK, the findings from this study have important implications for public health research. Research into effective strategies to improve parental awareness of child PA, accompanied with assessments of the impact of such improvements on any changes in the level of child PA, are needed.

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References

1. Strong WB, Malina RM, Cameron JR, Blimkie CJ, Daniels SR, Dishman RK, Gutin B, Hergenroeder AC, Must A, Nixon PA, Pivarnik JM, Rowland T, Trost S, Trudeau F. Evidence based physical activity for school-age youth. *J Pediatr.* 2005; 146: 732-737.
2. Landry BW, Driscoll SW. Physical activity in children and adolescents. *PM R.* 2012; 4: 826-832.
3. Start Active, Stay Active. A report on physical activity from the four home countries' Chief Medical Officers. *Department of Health*, London; 2011.
4. Scholes S, Mindell J. Chapter 3: Physical Activity in Children. Leeds, The Health and Social Care Centre, 2013.
5. O'Connor TM, Jago R, Baranowski T. Engaging parents to increase youth physical activity a systematic review. *Am J Prev Med.* 2009; 37: 141-149.
6. van Sluijs EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. *BMJ.* 2007; 335.
7. Salmon J, Booth ML, Phongsavan P, Murphy N, Timperio A. Promoting physical activity participation among children and adolescents. *Epidemiologic reviews.* 2007, 29:144-159.
8. De Bock F, Fischer JE, Hoffmann K, Polster H. A participatory parent-focused intervention promoting physical activity in preschools: design of a cluster-randomized trial. *BMC Pub Health.* 2010, 10: 49-62.
9. van Sluijs EM, Griffin SJ, van Poppel MN. A cross-sectional study of awareness of physical activity: associations with personal, behavioral and psychosocial factors. *Int J Behav Nutr Phys Act* 2007, 4: 53-62.
10. Hesketh KR, McMinn AM, Griffin SJ, Harvey NC, Godfrey KM, Inskip HM, Cooper C, van Sluijs EM. Maternal awareness of young children's physical activity: levels and cross-sectional correlates of overestimation. *BMC public health.* 2013, 13:924-933.
11. Corder K, van Sluijs EM, McMinn AM, Ekelund U, Cassidy A, Griffin SJ. Perception versus reality awareness of physical activity levels of British children. *Am J Prev Med.* 2010, 38:1-8.
12. Corder K, Crespo NC, van Sluijs EM, Lopez NV, Elder JP. Parent awareness of young children's physical activity. *Prev Med.* 2012, 55: 201-205.

13. Bentley GF, Goodred JK, Jago R, Sebire SJ, Lucas PJ, Fox KR, Stewart-Brown S, Turner KM. Parents' views on child physical activity and their implications for physical activity parenting interventions: a qualitative study. *BMC pediatrics*. 2012, 12:180-189.
14. De Craemer M, De Decker E, De Bourdeaudhuij I, Deforche B, Vereecken C, Duvinage K, Grammatikaki E, Iotova V, Fernandez-Alvira JM, Zych K, Manios Y. Physical activity and beverage consumption in preschoolers: focus groups with parents and teachers. *BMC Pub Health*. 2013, 13:278-291.
15. Moran-Ellis J, Alexander VD, Cronin A, Dickinson M, Fielding J, Slaney J, Thomas H. Triangulation and integration: processes, claims and implications. *Qualitative Research*. 2006, 6:45-59.
16. Baum F. Researching public health: behind the qualitative-quantitative methodological debate. *Soc Sci Med*. 1995, 40: 459-468.
17. Bryman A. Barriers to Integrating Quantitative and Qualitative Research. *Journal of Mixed Methods Research*. 2007, 1: 8-22.
18. Jago R, Thompson J, Sebire S, Wood L, Pool L, Zahra J, Lawlor D. Cross-sectional associations between the screen-time of parents and young children: differences by parent and child gender and day of the week. *Int J Behav Nutr Phys Act* 2014, 11:54-62.
19. Jago R, Sebire S, Wood L, Pool L, Zahra J, Thompson JL, Lawlor DA. Associations between objectively assessed child and parental physical activity: a cross-sectional study of families with 5-6 year old children. *BMC public health* 2014; 14: 655-662.
20. **Communities and Local Government: Indices of Deprivation.**<https://www.gov.uk/government/collections/english-indices-of-deprivation>
21. Wijtzes AI, Jansen W, Bouthoorn SH, et al. Social inequalities in young children inverted question marks sports participation and outdoor play. *Int J Behav Nutr Phys Act* 2014; 11:155-165.
22. Brockman R, Jago R, Fox K, et al. "Get off the sofa and go and play": Family and socioeconomic influences on the physical activity of 10-11 year old children. *BMC public health* 2009; 9:253-260.
23. Evenson KR, Catellier DJ, Gill K, et al. Calibration of two objective measures of physical activity for children. *Journal of sports sciences* 2008;**26**(14):1557-65.
24. O'Cathain A, Murphy E, Nicholl J. Three techniques for integrating data in mixed methods studies. *BMJ*. 2010, 341: c4587.
25. Elo S, Kyngas H. The qualitative content analysis process. *J Adv Nurs*. 2008, 62:107-115.

26. Pocock M, Trivedi D, Wills W, Bunn F, Magnusson J. Parental perceptions regarding healthy behaviours for preventing overweight and obesity in young children: a systematic review of qualitative studies. *Obes Rev.* 2010, 11:338-353.
27. Jones AR, Parkinson KN, Drewett RF, Hyland RM, Pearce MS, Adamson AJ, Gateshead Millennium Study Core. Parental perceptions of weight status in children: the Gateshead Millennium Study. *Int J Obes* 2011, 35:953-962.
28. Macdonald-Wallis K, Jago R, Sterne JA. Social network analysis of childhood and youth physical activity: a systematic review. *Am J Prev Med.* 2012, 6: 636-642.
29. Gustafson SL, Rhodes RE. Parental correlates of physical activity in children and early adolescents. *Sports Med.* 2006, 36: 79-97.
30. Godino JG, Watkinson C, Corder K, Marteau TM, Sutton S, Sharp SJ, Griffin SJ, van Sluijs EM. Impact of personalised feedback about physical activity on change in objectively measured physical activity (the FAB study): a randomised controlled trial. 2013, 8: e75398.
31. Carr ECJ, Worth A. The use of the telephone interview for research. *Nursing Times Research.* 2001;6:511-524.
32. Adamo KB, Prince S, Tricco AC, Connor-Gorber S, Tremblay M. A comparison of indirect versus direct measures for assessing physical activity in the pediatric population: a systematic review. *Int J Pediatr Obes.* 2009, 4:2-27.

Table 1 –Sample characteristics

	Low IMD³ n (%)	Medium IMD n (%)	High IMD n (%)
Low PA^{1,2} n (%)	4 (19.0)	4 (26.6)	6 (35.2)
Medium PA n (%)	12 (57.1)	7 (46.6)	7 (41.2)
High PA n (%)	5 (23.8)	4 (26.6)	4 (23.5)

Total n (%)	21 (100)	15 (100)	17 (100)
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¹ PA=Physical activity, ² Low PA range in the interview sample = 32-57 minutes in MVPA across weekday and weekend day, Medium PA range in the interview sample = 59-74 minutes in MVPA across weekday and weekend day), High PA range in the interview sample = 76-115 minutes in MVPA across weekday and weekend day, ³ IMD= Index of Multiple Deprivation

Table 2 - Key terms used by parents to describe their child's physical activity levels

Activity categories	Key terms
Very active	"Very"; "High"; "70/30 active"; "Very busy"; "Does a lot of activities"; "Really"; "Extremely"; "Constantly/always on the go"; "Doesn't often sit still"
Moderately active	"Normal active child"; "Half and half"; "Moderately"; "Bit more than average"; "Fairly"; "Medium"; "Pretty"; "As physically active as I can get her"; "Relatively"; "Quite active"; "Mostly physically active"
Less active	"Not very"; "Academic"

Table 3 - Convergence coding matrix between qualitative parental perceptions and objective child physical activity levels

	Objectively assessed physical activity		Total n (%)
	<60 MVPA n (%)	≥60 MVPA n (%)	
Parental perceptions			
Very/moderately active	Over-estimate 13 (86.6)	Accurate 34 (100)	
Less active	Accurate 2 (13.3)	Under-estimate/inaccurate 0 (0)	
Total	15 (100)	34 (100)	49 (100)

Supplementary material

Appendix - Interview topic guide

At the start of the phone call the parent was welcomed and told the purpose of the study.

<p>Ice-breaker:</p> <p>Can you tell us the name of your child in year 1 and what their favourite physical activity/physically active thing to do is?</p> <p>We want to focus on your year 1 child, but could you tell us who else lives in the house hold, does (child name) have any brothers/ Sisters (and how old are they?)</p>		
<p>Part one: Some children are less physically active than others and some children spend more time in front of a screen than others, whether that is a TV, computer or computer games.</p>		
Questions	Points of clarification/definitions	Prompts
<p>How physical active do you think your year 1 child is?</p>	<p>(PA is anything that gets the body moving –it can be in the form of structured exercise or it can be free play, running around the garden, walking to school)</p>	<p>Why?(do you think that)</p> <p>What or who are they comparing against?</p>
<p>What about screen time?</p> <p>Are you concerned about your child’s screen time/amount of screen time?</p> <p>How do you feel about the amount of time spent screen viewing?</p>	<p>By screen viewing we mean computers, laptops, games consoles, iPad, iPhone/smart phones, not just TV)</p>	<p>What is the reason you are/ are not concerned? Do you feel SV is a good or bad thing?</p> <p>Why?</p> <p>Why?</p>

Part two: For some families/parents, it may be easier to encourage their children to be active. For others, it may be easier to try and reduce their children's' screen-time

Questions	Points of clarification/definitions	Prompts
Do you have a preference for which of these activities you try to change?		Why?
How easy do you find it to reduce your child's SV time?	Are there times when it's easier or more difficult to change/stop?	Why these times? How do you do this?
How easy do you find it to increase/find ways to increase your child's PA?	Are there times when it's easier or more difficult to change?	Why these times? How do you change it?
1b) Are there specific times /situations when you need to challenge your child's PA behaviour? Bi) And what about screen viewing?	Can you give me an example of a time? How do they challenge?	

<p>When do you not challenge? (the PA behaviour, the SV behaviour?)</p>		<p>If not sure suggest i.e. morning/ evening/ when the family is tired.</p>
<p>Are there any times when you have encouraged your child's PA and discouraged SV? Or when you have suggested PA as a direct alternative to SVing?</p>	<p>What did you try? Did it work?</p>	<p>Any tactics you have, any incentives you use etc. Can you give me an example?</p>
<p>1c) Do you feel you are able to give consistent messages to your child? For example, 'you cannot watch TV after 5pm'. If not, what reasons make it difficult for you to do this?</p> <p>Relaxing Rules: Do you sometimes relax these rules? Why?</p>	<p>E.g. it gives you a bit more time to yourself, it gives you the chance to be active, get other things done...</p>	<p>Is this different at weekends or during school holidays?</p> <p>Do you have any rules on PA, for example, always have to play outside before being allowed SV time at the weekend?</p>

<p>Part three: I now want you to think about your child's PA and the choices that you make</p>		
<p>Questions</p>	<p>Points of clarification/definitions</p>	<p>Prompts</p>

<p>How much do you think that these choices are influenced by you and how much by your child?</p> <p>Do your child's requests (pester power) influence your decisions on screen viewing?</p>	<p>How does it influence you?</p>	<p>How strong an influence is it? Do you pay attention? (to the pester power)</p>
<p>How about requests in relation to PA?</p>	<p>How does it influence you?</p>	<p>How strong an influence is it? Do you pay attention?</p>
<p>Do you ever have disagreements with your child about screen viewing?</p>	<p>What are they about?</p>	<p>How do you resolve those arguments?</p> <p>What specifically causes arguments? i.e. time spent SV/ Content of SV.</p>

<p>Part four: We now want to think about how your child's friends can affect you and your child's decisions</p>		
<p>Questions</p>	<p>Points of clarification/definitions</p>	<p>Prompts</p>
<p>We know that children's friends can sometimes influence <i>their</i> preferences and choices for SVing. Is this the case for your child?</p>	<p>Examples: certain programmes, game choices</p>	<p>If so how does it influence your child? How do you respond to these questions?</p>

<p>And what about his/her siblings? How do they influence their SV choices?</p> <p>Does the sibling's preferences for particular TV shows affect this child's preferences?</p> <p>How?</p> <p>If more than one sibling, explore any differences by sibling age</p>		
<p>Do their friends influence their choices or preferences for PA?</p> <p>And what about his/her siblings? How do they influence their PA choices/preferences?</p> <p>Does the sibling's preferences or what they currently do affect preferences?</p> <p>How?</p> <p>If more than one sibling, explore any differences by sibling age</p>	<p>Examples: certain clubs or sports, types of free play</p>	<p>If so how? How do you handle requests based on friends/siblings input?</p>

<p>Part six: The next questions are about possible alternatives to screen-viewing.</p>		
<p>Questions</p>	<p>Points of clarification/definitions</p>	<p>Prompts</p>
<p>Do you use SVing as 'down/quiet time?</p>	<p>Dinner time, before bed, in the morning</p>	<p>Why? What factor affect this decision? Time, need to get other things done etc.</p>

Can you think of any “quiet time” alternatives to screen-viewing?		
Do you think you need additional support in reducing SVing and increasing PA? (If yes- ‘What would be helpful’?) If no’ ‘What if anything do you think would be helpful to other families?’)	list/booklet of dry and wet weather activities, workshops to practise games, personal support	How could that information best be shared? E.g face to face, web/phone or email?

Part seven: These next questions focus on ways to be active as a family or with other families	
Questions	Points of clarification/definitions
Is this (being active with your family) something that you do as a family? What about being active with other families?	Can you give me a recent example
What are the barriers?/what factors stop this from taking place?	Siblings/ age of siblings/ time
What could be done to make being active together as a family easier or more enjoyable?	

CLOSING (2-3 minutes)

- Is there anything else you’d like to tell us about the things we talked about today?
- Do you have any questions for me?