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**Perceptions and measurement of playtime physical activity in English primary school children: the influence of socioeconomic status**

Authors

**Nicola McWhannell<sup>1</sup>, Carmel Triggs<sup>1</sup> and Samantha L Moss<sup>1</sup>**

<sup>1</sup>Department of Sport and Exercise Sciences, University of Chester, UK

**Corresponding Author:**

Nicola McWhannell, Department of Sport and Exercise Sciences, University of Chester,  
Parkgate Road, Chester, CH1 2BJ, UK.

Email: [n.mcwhannell@chester.ac.uk](mailto:n.mcwhannell@chester.ac.uk)

## **Abstract**

Children in areas of low socioeconomic status might face barriers to physical activity during school playtime in comparison to their high socioeconomic status counterparts. However, limited research within the area currently prevents evidence-based interventions to be targeted appropriately. This exploratory study aimed to assess and compare playtime physical activity levels and perceptions of physical activity in primary school children from two schools of different socioeconomic status. Fifty-three children wore an accelerometer during playtime for three school days while 33 children participated in single-sex focus groups to elicit their experiences of physical activity during playtime. Results revealed that children from the low socioeconomic status school spent more time in sedentary activities ( $P=0.001$ ) and spent less time in moderate and moderate to vigorous physical activity ( $P=0.001$ ) than children from the high socioeconomic status school. Despite some between-school similarities in their perceptions of physical activity, differences resonated in their reasons for taking part in physical activity, perceptions of the play environment and ideas to improve physical activity. These findings contribute to current research and provide in-depth information from active users of the play environment that could be useful to inform new interventions for schools of varying socioeconomic status.

## **Keywords**

Accelerometer, recess, mixed-methods, physical activity, playtime, socioeconomic.

## **Introduction**

Despite the well-established benefits of physical activity (PA) for psychological, social and physical health (Floriani and Kennedy, 2008; Janssen and LeBlanc, 2010; Tremblay et al, 2011), research suggests that a high proportion of school-aged children fail to meet the recommended guidelines of at least 60 minutes of daily moderate to vigorous PA (MVPA) (Department of Health, 2010, 2011; Ekelund et al, 2011; Fussenich et al, 2015). In an attempt to address this issue, various initiatives have sought to increase PA within school settings (Efrat, 2012; Kriemler et al., 2011). A recent review (Mears and Jago, 2016) exploring the effectiveness of after school PA interventions at increasing MVPA, found mixed results. Other reviews found that school based interventions increased the proportion of children engaging in MVPA during the school day (Dobbins et al, 2013) and that programmes that ran for one school year were most effective (Kriemler et al 2011). Interventions in physical education (PE) lessons have been successful (Fairclough and Stratton, 2005; McKenzie et al., 2004) at increasing within lesson MVPA, but as PE lessons do not take place daily, PE activity alone has been deemed insufficient to meet the required daily PA guidelines (Biddle et al., 2004; Hollis et al., 2017; Nader, 2003; Singerland et al., 2011).

School playtime periods do however provide daily opportunities for children to be physically active (Jago et al., 2004, Kobel et al, 2017; Wood and Hall, 2015). Despite this, some studies report that as little as 6 % and 9% of activity during school playtime is MVPA (McGall et al., 2011 Wood and Hall, 2015). Thus opportunities for children to be physically active might be dependent on a number of socioeconomic, environmental and personal factors (Pawlowski et al., 2016; Ridgers et al., 2006, 2012). Indeed, many findings support that children from low socioeconomic backgrounds accumulate less PA (Drenowatz et al., 2010; Hardy et al., 2010; Inchley et al., 2005), and that schools in low socioeconomic status (SES) areas have poorer quality PA facilities than schools in more affluent areas (Baquet et al., 2014). A recent study identified built environment (such as space, play facilities) and school policy factors (such as indoor/outdoor play options and organisation of activities) as influencing children's playtime PA

(Pawlowski et al., 2016). Previous studies also report that if children understand that PA is beneficial for health, they are more likely to participate (Brockman et al., 2011), and that children from high and medium SES backgrounds recognise more PA benefits than children from low SES backgrounds (Seabra et al., 2013). Recently, Baquet and colleagues (2014) revealed that boys and girls of higher SES were more active than their low SES counterparts during playtime, spending a greater amount of time in moderate PA (MPA), vigorous PA (VPA) and MVPA. However, a review of school playtime PA and social variables such as SES and adult supervision found inconclusive evidence of any relationships (Ridgers et al., 2012). With this in mind, there is a need to enhance understanding of the role SES plays in relation to the playtime activities of children. This could allow practitioners to establish targeted interventions in relation to group-specific barriers.

In an attempt to achieve a comprehensive understanding of any relationship between SES and PA during school playtime, it is essential to couple objective quantitative data with qualitative data. To date, qualitative data concerning children's perceptions of school-time PA and associated influencing factors has been seldom reported (Humbert et al, 2006; Pawlowski, et al, 2016). Providing children with 'a voice' in this process is integral to learning about the context of any differences influenced by socioeconomic factors, while also enabling them to express the complexities of their school environments. Gaining perceptions of the target group has been favoured by Coveney (2005) suggesting it as fundamental to informing health promotion activities. To the best of our knowledge there is no available research that combines the objective measurement of PA in conjunction with perceptions of children attending schools from different socioeconomic areas. This mixed-methods approach could provide new insights into the reasons for children's PA behaviour during playtime and identify any specific barriers that might be limiting PA engagement. Through gaining this information, policy makers and practitioners would be empowered to

design strategic interventions, which are targeted to eliminate or reduce the barriers imposed by environmental contextual factors.

Therefore, the aims of this exploratory study were twofold: (1) to assess and compare the playtime PA levels of school children from two primary schools of different SES, and (2) to explore the children's perceptions of PA. It was anticipated that this mixed-methods approach could provide qualitative and quantitative insights that could be used to inform future large-scale trials.

## **Methods**

### *Participants and settings*

Two primary schools were invited to participate in the study, based on the researchers' pre-requisites of being similar schools in terms of size, facilities, and different in terms of their respective SES. The SES was determined by the school postcode using English Indices of Deprivation 2015 (Department for Communities and Local Government, 2015) to provide a rank or Index of Multiple Deprivation (IMD) for each school's location. The IMD rank is used to measure relative deprivation of small areas (neighbourhoods) in England. School A (roll  $n=461$ ) was situated in the most deprived 10% of neighbourhoods in England (IMD rank 50/32,844) and School B (roll  $n=367$ ) was situated in the least deprived 30% of neighbourhoods in England (IMD rank 23,788/32,844). For the purpose of this study, School A is described as the low SES school and School B is described as the high SES school. School A (low SES) and B (high SES) were recently rated 1 (outstanding, June 2015) and 2 (good, February 2015) respectively in Ofsted (Office for Standards in Education, Children's Services and Skills) inspections whereby UK schools are inspected on the services they provide to care and educate children and young people. Both schools had similar playground facilities that included an open playground space, a separate

area for ball games, access to portable equipment, fixed equipment, benches and a grass area. Ethical approval was obtained from the institution's Research Ethics Committee prior to commencement of the study. Informed consent was provided by head teachers from both schools, who acted as gatekeepers throughout the research process (Feldman et al., 2003) and assent to participate was also obtained from the children.

Primary school children (n=53) from Year Four (aged 7-8 years) took part in the study, with 28 children from School A and 25 from School B. All children's playtime PA was assessed over three days at each school, and 33 of the children participated in seven single-sex (3x4 boys and 4x5 girls) focus groups (12 boys and 20 girls) to explore their perceptions of PA. This process of data collection occurred during the month of May 2016 and after the Easter period in the school calendar. All of the children within their respective focus groups were known to each other, which alongside the homogeneity of the focus groups proved conducive to the children feeling comfortable enough to express themselves (Krueger and Casey, 2002) and interact with each other (Roulston, 2010).

### *Procedures*

The process of data collection took place via a series of visits to School A and School B. In the first instance the researchers attended the schools to explain the research to the respective head teachers and obtained their consent as gatekeepers (Wanat, 2008) for participation of the children in the study. The researchers also attended the schools on another occasion for the purpose of familiarisation and preparation. During this second visit the researchers met with other staff and spent time observing and interacting with Year Four children both within their classrooms and outside on their playgrounds, specifically during playtimes. This enabled the researchers to establish contact and obtain an insight into the children's behaviour, language and relationships prior to the focus groups.

*Physical activity during playtime.* Children's PA was measured during morning playtime (recess) using a triaxial accelerometer (Model GTX3+, Actigraphcorp, Florida, USA) worn over three consecutive school days. In both schools, morning playtime was scheduled to last approximately 15 minutes. Therefore, each pupils' playtime PA was recorded for the entire 15 minute period, for each of the three consecutive days. A similar recent study (Powell et al, 2016) used a similar monitoring period (10 minutes per child) to assess children's playtime activity via an observational tool (Ridgers et al., 2010). The accelerometers were worn on an elasticated waist belt, positioned on the right hip and were fitted prior to playtime during a morning registration period each day. The accelerometers were set at 10 second epochs to capture duration at different intensities of PA (light, moderate, vigorous) and also sedentary activity. Data was then downloaded from the accelerometer devices using ActiLife software (Actigraphcorp, Florida, USA) at the end of each three day period for further statistical analysis. The age appropriate Evanson (2008) cut-points for sedentary (SED; 0-100cpm), light (LPA; 101-2295cpm), moderate (MPA; 2296-4011cpm) and vigorous (VPA; 4012-∞ cpm) activity were applied to the data to produce time spent at each intensity. The sum of MPA and VPA was calculated to obtain time spent in MVPA. The time spent in each intensity was reported as a percentage of total playtime to allow for minor daily differences in school playtime durations.

*Perceptions of PA and playtime.* Focus groups were separated by sex to create more homogeneous groups, since the flow of interaction was expected to be smoother compared to mixed groups (Morgan, 1996). The focus group size ranged from four to five participants, a number considered manageable by the researchers and supported by Krueger and Casey (2002). The focus groups were semi-structured, lasted approximately 25 minutes and were conducted during school time within a classroom setting. The length of time afforded to the focus groups (up to 45 minutes) was informed by the age of the participants and the time period that head teachers were willing to provide access to the children for. In order to increase the likelihood of the

children's participation, it was considered necessary to conduct the research during the school day within the time confines available.

Focus groups were conducted by two researchers, adopting the roles of moderator and assistant moderator. The management of the focus groups was informed by strategies proposed by Puchta and Potter (2004) to generate group interaction and participation. The moderator was responsible for leading the focus group and the assistant moderator was there to help if and when required. Examples of the duties the assistant moderator aided the moderator with, included: encouraging the children to talk and listen to each other and to be patient when they were waiting to contribute. A sense of informality was achieved by the moderator and assistant moderator via engagement and acceptance of the use of colloquial terms by the children. Participation by all of the children was ensured via the assistant moderator nominating individuals to speak where appropriate, and opinions were sought from the children by asking specific questions that encouraged their evaluations. All focus groups were recorded and transcribed by the moderator and assistant moderator. In accordance with ethical approval and the agreement between the researchers and the head teachers, the content remained confidential and pseudonyms were used to identify the children's narrative.

Questions used within the focus groups to encourage interaction and fulfil the aim of exploring the children's perceptions of PA were informed by previous research findings. For example, Trost et al. (2000) found that children have a limited understanding of the concept of PA and therefore the children were probed on what they thought PA comprised. Also, Willenberg et al. (2010) implied that more children participated in PA when both portable equipment and fixed equipment was available for them to use, such as climbing frames, footballs or skipping ropes. Consequently, the children were asked whether they used and/or particularly enjoyed playing with any equipment (portable or fixed) available to them during playtime. The aforementioned synthesis of research relevant to the aims of the study existed between all questions ( $n=10$ ) within the focus groups. The questions formulated by the researchers sought to provide

contextual accounts from the children on the following themes: the type and range of PA engaged in at playtime on the playground; reasons for engagement in PA; perceptions of playground and equipment available; preferences to be indoors or outdoors during playtime; and suggestions on how to improve the playground and supervision at playtime.

#### *Data Analysis*

The statistical package SPSS (Version 22, SPSS Inc., Chicago, IL, USA) was used to analyse the PA data. Descriptive data comprised mean  $\pm$  standard deviation (SD) of playtime PA values by school and by sex. The dependent variables were percentage of time spent in SED, LPA, MPA, VPA and MVPA. The independent variables were sex and school (high SES, low SES). A two-way ANOVA (sex\*school) analysed sex and school SES differences for the dependent variables. The alpha level was set at  $P < 0.05$ .

Focus groups were digitally recorded and transcribed verbatim. Comments made by children were tagged relative to both the school they attended (School A or B) and their sex (F for female and M for male). Researchers engaged in a process of deductive/theoretical thematic analysis. Therefore, coding was driven by the aims of the research (Braun & Clarke, 2006). The transcripts were read and re-read enabling narrative relative to the themes (type and range of PA engaged in at playtime on the playground; reasons for engagement in PA; perceptions of playground and equipment available; preferences to be indoors or outdoors during playtime; suggestions on how to improve the playground and supervision at playtime) to be identified (Clarke & Braun, 2013). Specifically, differences and similarities in the children's perceptions were also highlighted. In order to strive to ensure rigor and quality during the data analysis process, critical dialogue occurred between the researchers regarding their interpretations of the data. This served to encourage reflexivity and was a resource used to challenge and develop interpretations that had been made (Smith & McGannon, 2017).

## Results

### *Quantitative results*

Playtime PA data was obtained from a total of fifty-three children from two schools (A:  $n=28$ , Girls  $n=14$ , Boys  $n=14$ ; B:  $n=25$ , Girls  $n=13$ , Boys  $n=12$ ). Children's playtime PA characteristics (M and SD) by school and by sex are reported in Table 1. A two-way ANOVA was conducted that examined the effect of sex and school SES on the proportion of playtime spent in SED, LPA, MPA, VPA and MVPA activities.

### **Table 1.**

Sex had an effect on the proportion of playtime spent in MVPA ( $P=0.29$ ) and MPA ( $P=0.049$ ), with boys spending a significantly higher proportion of their playtime in these intensities. School SES had an effect on the percentage of playtime spent in different activity intensities. Children from School A (low SES) spent a significantly higher proportion of playtime in SED activities (52-55%) compared to those from School B (36%,  $P=0.001$ ). Children from School A also spent a lower proportion of time in LPA (31% vs. 34-44%,  $P<0.001$ ), MPA (6-8% vs. 11-14%,  $P<0.001$ ) and MVPA (15-17% vs. 20-29%,  $P=0.001$ ) compared to children from School B. Neither sex nor school SES appeared to affect the proportion of time children spent in VPA activities during playtime. The only significant interaction between the effect of sex and school SES was found in participation of LPA  $F(1,49)=6.869$ ,  $P=0.012$ ). Whilst no sex differences were apparent in LPA participation in children attending School A, sex differences were apparent at School B with girls spending significantly more of their playtime (9%) in LPA than boys.

### *Qualitative results*

*Narrative aligned with the theme: Types and range of PA engaged in at playtime on the playground.*  
Children from both schools cited similarities in terms of the sports and games played (e.g. football,

basketball, racing, tag, hopscotch, 'British Bulldogs' - a chasing invasion game). More specifically, ball games and 'chasing' games seemed particularly popular at both schools: *"you can like play erm like on the field you can play like football and stuff but then you can play other ball games too... we've got a stage here that we play netball games on"* (School A, F). Children from School B revealed that they were no longer allowed to play 'British Bulldogs' because it was deemed too aggressive by teachers. However, they did refer to a game called 'off ground tag' and explained it as *"where someone is 'on' and runs around, and you have to, you have to like go on something to get off the ground and not let them catch yer"* (School B, F).

*Narrative aligned with the theme: Reasons for engagement in PA.* Children were able to articulate a number of reasons for engagement in PA. Specific examples from School A included:

*"So I can like run around and erm... have more energy in my legs when I'm kicking the ball"*  
(School A, M)

*"So then I can get more energy and then I get more fitter, and stronger"* (School A, M).

Children from School B revealed that they engaged in PA to *"...become healthy, stronger..."* (School B, M). The narrative arguably revealed that children from School B articulated more specific and contextual responses with regard to why they engaged in PA in comparison to children from School A; *"One you get to play with your friends, two erm it keeps you healthy and strong and three it's just a lot of fun"* (School B, F).

The aforementioned quote reinforced the multiple benefits of physical activity, which children from school B articulated they had experienced, specifically, physical, social and emotional.

*Narrative aligned with the theme: Perceptions of playground and equipment available.* Children at School A revealed that they perceived their playground predominantly negatively, specifically as “*cack*” (School A, M). A desire for more line markings to play games on was expressed and the children revealed how they used the current line markings “*We use them for football, or free-kicks and penalties*” (School A, M). In contrast, children from School B conveyed satisfaction and excitement about their playground:

*“there’s a big amount of space and you’re not all huddled up” (School B, F)*

*“you have a lot of space, you can like play erm like on the field you can play like football and stuff but then you can play other ball games erm and you can play like tennis” (School B, F).*

Furthermore, children from School B claimed they received new equipment for their playground each year, which more recently had included tennis balls and hula-hoops. Children from School A commented positively on the ‘cages’ in their playground that afforded them the opportunity to play football and basketball with the respective goals and nets being a feature of the ‘cages’. However, they also communicated their frustration with having to “*take turns*” in the ‘cages’.

Children from both schools expressed a desire for more equipment and/or improvements in their playground. Children from School B wished they still had line markings in their playground but attributed age, “*too old for them*” (School B, F) as a potential reason for not having them. Children from School A concluded to their own amusement that they want “*a playground like the nursery or reception yard*” (School A, F).

Safety emerged as an issue within the narrative of the children from both schools. Children from School A reported how “*no one would bump in to each other*” (School A, F) when playing in the ‘cages.’ Children from School B commented on the tyres available for them to play on as “*wet and dangerous*” (School B, F). Furthermore, children from School A complained about the “*fly-away*” (School A, M) balls they had

to use to play football with, instead of what they referred to as “*proper footballs... Caseys*” (School A, M). Subsequently it was deduced from the focus group narrative, that despite the awareness from children at both schools regarding safety in the playground, children from School A seemed increasingly frustrated and disgruntled by the measures taken to provide a safer play environment.

*Narrative aligned with the theme: Preferences to be indoors or outdoors during playtime.* A variety of responses were evoked from children at both schools, within which they highlighted a relationship between staying indoors at playtime and sedentary behaviour. One child from School A was frustrated by how “*Lego, reading and drawing*”(School A, M) were only available if the weather was bad during playtime. On the other hand, the children at School B revealed that their choices of activity during indoor playtimes also included access to computers, although one child said that they were not allowed too much time on the computers because it “*could make your eyes waste away*” (School B, M). The consensus of opinion from children at School A was a preference to be outdoors at break time. However, this was not the case at School B with children evidencing a preference for a choice to be outdoors or indoors during break time. Reasons provided by children in support of their preference to be indoors included; “*don’t have to rush work before being sent out*” (School B, F) and also because they could “*get things out of the cupboard... play games and draw*” (School B, F).

*Narrative aligned with the theme: Suggestions on how to improve the playground.* Children from both schools confidently and eagerly suggested a variety of potential improvements for their respective playgrounds that were related to being physically active during playtime. For example, children at School A suggested a swimming pool, a cycle racing track and a climbing wall “*where you hang on to the wall and you like try to get up*” (School A, F). Furthermore, the range of equipment the children were aware of

was exemplified within the following quote from a child at School A *“those things that have straps that you put round your foot, like where it’s like you put your foot in there, it’s these things that have got things at the end...stilts, yeah stilts”*. Children from School B suggested an obstacle course, hockey pitch and athletics track: *“Maybe an athlete’s stadium. Erm like what they call those places you run around”*. One child from School B also suggested a creative futuristic improvement: *“Make gravity come up on the walls so we can fly and run on the walls”*. However, unlike the children at School B, children at School A provided a comparative listing for improvements that also included requests for availability/access to PlayStations and Xboxes during break time.

*Narrative aligned with the theme: Supervision at playtime.* The importance of safety was emphasised most frequently within this theme by children from both schools. Specifically, children from School B perceived supervision during break time as necessary in order to prevent the playground from being chaotic and as one child stated, to stop children *“from being mean to each other”* (School B, F). Furthermore, the children from School B revealed how supervisors could help them if they got injured. The involvement of supervisors was also commented on with specific reference to their direct involvement in the organisation of PA/games via a rota, which children from School B cited as enabling everyone to participate in team sports within assigned areas of their playground. Children from School A revealed how the direct involvement of supervisors who used a ‘big skipping rope’ for them was particularly enjoyable. The children’s perceptions (at both schools) of the supervisors as ‘strict’ or if they *“didn’t look very fast!”* seemed to impact their opinion on whether they would like them to be directly involved in their engagement in PA at break time.

## **Discussion**

This exploratory study aimed to adopt a mixed-methods approach to (1) to assess and compare the playtime PA levels of school children from two primary schools of different SES, and (2) to explore the children’s

perceptions of PA. The key findings from this study indicated that children from the low SES school spent more time in sedentary activities and spent less time in moderate and MVPA than children from the high SES school. Qualitative data detailing children's perceptions of PA revealed some similarities between schools. However, differences were apparent with regard to reasons for taking part in PA, perceptions of the play environment, and ideas to improve PA. These findings contribute to current research and provide in-depth information from active users of the play environment that could inform new interventions for schools of varying SES.

#### *Playtime PA levels of school children*

The findings indicated that primary school children spent between 16% (School A, low SES) and 25% (School B, high SES) of the allocated morning playtime in MVPA. Previous research reports both lower (Waring et al., 2007; Wood and Hall, 2015;) and higher (Powell et al., 2016; Ridgers et al., 2005) values than those reported in this study. Whilst methodological differences, play environment (Wood and Hall, 2015) and factors such as seasonal variation (Kolle et al., 2009) might account for some varying outcomes between studies, previous accelerometer-derived playtime PA research (Ridgers et al., 2005; Wood & Hall, 2015) also demonstrates inconsistent findings between studies. As such, this necessitates further understanding of the reasons underlying differences in playtime activity. School SES differences were found for playtime PA, where children from School A (low SES) engaged in significantly higher levels of sedentary (sitting-based) activity and spent reduced time in light, moderate and MVPA compared to children from School B (high SES). These findings were reflective of most previous research within this area (Baquet et al 2014; Inchley et al., 2005), but contrasted with findings from a recent Swedish study (Beckvid Henriksson et al., 2016) reporting that low SES was associated with higher levels of PA and reduced sedentary behaviours in daily PA.

Given that playtimes provide children with the freedom and opportunity to be active in an unstructured environment with peers (Pate et al., 2006; Ridgers et al., 2010), the level of inactivity (over 50% of playtime in SED) reported by the children in the low SES school warrants concern as it appears children are not embracing the opportunity to participate in PA during playtime. Sedentary pursuits at playtime such as sitting-based activities (chatting, socialising) are low energy expenditure activities and are among a cluster of sedentary behaviours associated with increased health risks (Tremblay et al., 2010), adding to the growing concern within paediatric public health (Biddle et al., 2014). The qualitative findings highlighted the appeal of such activities to girls in particular, from both the low and high SES schools. For example, a girl from School B revealed *“sometimes we are inside because there's a lot of things going on like er we had to design a poster for the school cake sale tonight and erm me and my friend were designing a poster for the school concert...”* Similarly, as the following exchange reveals, girls from school A expressed what they would like to do during break time as an alternative to PA:

*“I would play on my ipad, watch tv, or play on my laptop”*

*“...or playing dolls, playing with your dolls if you bring them...”*

Boys spent significantly more of playtime engaged in MPA and MVPA than girls. These findings are consistent with previous studies (Powell et al., 2016; Ridgers et al., 2005; Stratton, 1999; Waring et al., 2007) and could suggest that boys prefer to engage in activities with greater energy expenditure during playtime. Observational research (Blachford et al., 2003; Powell et al., 2016) suggests that boys spend much of their playtime engaged in large same-sex groups in sport or game related activities utilising available equipment (e.g. balls). Within this study, there was no narrative to suggest that the girls were excluded from the sports-related spaces or equipment, or excluded from playing with the boys. Engagement in such activities during playtime may account for the sex differences in MPA and MVPA due to the greater movement demands associated with these activities. The differences may also be attributed to the social

environment, as Powell et al. (2016) found that engaging in large groups was a predictor of boys' vigorous activity. The qualitative findings from this study suggest that boys, more than girls, enjoy opportunities to play team games and environments that enable them to do this are conducive to their engagement in PA. The following exchange from boys at School A evidences this:

*Researcher: "So why is it your favourite part (cages) of the playground then?"*

*School A, M: "Because there's goals there to play football"*

*School A, M: "Because there it's big and you can play basketball or football"*

*School A, M: "Because you can play basketball and football because there's a goal and net"*

The interaction between sex and school SES in LPA suggests that girls' participation in LPA is affected more by the SES of the school compared to boys. The findings suggest that whilst the girls from the high SES school demonstrate more favourable PA behaviours (less SED activity compared to those from the low SES school), their preference is to engage in more light activity (walking activities) rather than in higher energy expenditure activities (MPA and MVPA) demonstrated by their male counterparts. This preference for girls to engage in light activity (walking and socialising) for the largest amount of their playtime has been previously reported (Powell et al, 2016). The suggestion by Powell et al (2016) that this behaviour limits the opportunity girls have to participate in activities of a higher intensity, encourages the involvement and support from adults during playtime to increase girls' PA.

#### *Children's perceptions of PA*

Children at both schools reported some similarities with regard to their reasons for taking part in PA (e.g. fun, to be stronger, health-related), though articulation of more specific reasons, stated with greater contextual understanding were apparent from School B (high SES). For example one male child highlighted

that, “*football is two exercises for your legs, running and kicking*” and “*it helps with catching if you’re a goalkeeper*”(School B, M). Based on this finding, it could be argued that children, particularly from School A (low SES) might benefit from educational sessions that highlight the various physical, social and emotional benefits of PA. Indeed, previous findings highlight that PA is higher in children who consider it to be beneficial for their health and well-being (Brockman et al., 2011). Moreover, involving significant others in the child’s support network (e.g. family, community members) might aid children’s understanding and assist to improve the effectiveness of school-based interventions (Brown, 2009; Kriemler et al., 2011; Salmon et al., 2007). Therefore, when considered in conjunction with the lower level of overall MVPA in children of School A, it is possible that health education programmes for both children and members of their associated support network could be a worthwhile inclusion into an intervention programme that could be of particular benefit to children in School A (low SES).

There were some between-school differences in children’s responses concerning their playground and equipment. Children from School B (high SES) commented that they received new equipment each year and generally had more favourable perceptions of their ‘play’ environment. On the other hand, children from School A (low SES) called for a greater variety of equipment and referred to the playground in more negative terms (e.g. it was described by one child as “*cack*”). Children from School B cited a greater number of restrictions on equipment for PA compared to School A. For example, in School A (low SES) children commented on having to “*take turns*” to play in the most popular areas (the basketball nets and football goals). In addition, the use of skipping ropes was confined to the Year Three playground and use of ‘proper’ footballs was prohibited. Although research concerning the efficacy of equipment provision on enhancing PA is lacking (Delidou et al., 2016; Escalante et al., 2014; Ridgers et al., 2012), it is possible that such restrictions could have reduced the number of preferred choices available for PA and played a role in the higher sedentary behaviour of children from School A. It is well known that providing children

with autonomy (via choice) is more likely to manifest into intrinsic motivation (Roemmich et al, 2012) and subsequent sustained involvement.

Pupils from both schools relayed a number of suggestions to improve PA within their respective schools. Our results showed that children from both schools noted that their playground offered fewer playing options and equipment than the nursery playground, with some of the children specifically expressing their preferences for similar types of activity (i.e. line markings, running track, slides, climbing frames). Consequently, the results from this study suggested that children aged 7-8 years are still encouraged by the creative and innovative methods used to engage pre-school children.

Moreover, children from both schools were able to offer a wide range of ideas to improve their respective playgrounds. Notably, almost all suggestions involved structural alterations of the playground environment (School A: *“racing track and ramps to ride your bike”, “monkey bars”, “climbing frame”*; School B: *“world’s best obstacle course”, “athletics track”, “swimming pool”, “zip wire”*), while other comments called for line markings to be re-painted as *“they faded really quickly”*. Interventions incorporating physical structures and playground markings have been deemed successful in improving short term (6 weeks; Ridgers et al., 2007a), and medium term (6 months; Ridgers et al., 2007b) but not long term (52 weeks; Ridgers et al., 2010) MVPA and VPA. A more recent review (Escalante et al., 2014) suggested that this approach (playground markings plus physical structures) was the most efficacious to improve playtime PA while interventions based on playground markings alone, game equipment alone, or both in combination do not increase PA. These suggestions seem to be in line with children’s preferences from our study, as the pupils noted physical structures and playground marking updates as aspects they felt would retain engagement. This brings obvious financial costs, which the UK government has aimed to offset in socially deprived areas by subsidising each primary school child via the ‘pupil premium’ (£1,320 per pupil as of 2015) alongside other associated schemes. However, schools are subjected to manage complex budgetary

demands (Ridgers et al., 2006) and with the impact of sports participation on academic achievement being described as ‘positive but low’ (Education Endowment Foundation, 2017), any push for increased resources could prove problematic. According to a recent report by The Sutton Trust (a non-profit organisation aiming to improve social mobility in education) just 1% of the ‘pupil premium’ is spent on ‘improving the classroom or school environment’ (page 9). Most primary schools in the UK also receive annual ‘PE and sport premium’ government funding, based on the number of pupils on the roll. The fund aims to improve the quality and breadth of PE and sport provision, and improve participation so that all pupils develop healthy and active lifestyles (DfE, 2015a). Schools are provided with guidelines as to how the funding could be used (staff training, curriculum and extracurricular opportunities, playground spaces/development) but ultimately head teachers decide how the ‘PE and sport premium’ is spent each year (DfE, 2015b). However, with increasing emphasis being placed on the impact that spending within a particular area (e.g sports participation) has on academic achievement (Education Endowment Foundation, 2017; Ofsted, 2017), it is important to consider that improving PA through playground developments or provision is unlikely to be high on the list of priorities for schools in the UK and might pose an even greater challenge for schools in socially deprived areas, despite these extra monetary aids. Future studies are needed to evaluate the cost-effectiveness of interventions to ascertain those most appropriate for the budget available (Escalante et al., 2014).

Aside from structural alterations, children from School A (low SES) also referred to the use of a “PlayStation”, and “xbox” as methods to improve PA in school. These ideas were not reiterated by children from School B. Such suggestions may reflect cultural issues and expectations of how ‘free time’ may be spent outside of school by the children from the school with a lower SES.

Involvement of adults in playtime physical activities was welcomed by children from both schools; however, this was under the proviso that teachers were capable of meeting the children’s physical

expectations, specifically being able to participate fully in a similar way to that of the children. For example, they were unwelcome if “*they didn’t look very fast*” (School A, M). Playtime supervision was appreciated by children from both schools and perceived as necessary for safety, with children from School A highlighting that organisation was needed to prevent domination of the playground (particularly from football) by older children. The importance of adults to support PA has previously been emphasised by school children from high and low socioeconomic backgrounds (Humbert et al., 2006). During focus groups, pupils called for adults who could protect, participate and have fun with them in physical activities:

*“I quite like them being there because it feels a bit more safe... because say if someone fell over and they weren't there you'd have to take them inside and walk around...”* (School B, F)

*“It’s actually funny”* (School A, M).

*“Once erm I was passing a ball around and one of our teachers Mr X joined in and started like bouncing the ball and taking it away and everybody started chasing after him”* (School B F).

Consequently the vast majority of children had a favourable attitude towards the direct involvement of adults during playtime. Similar to our findings, Humbert et al. (2006) emphasised that if adults did not possess or demonstrate the ability to meet the needs of the pupils’ PA, pupils would be less inclined to take part in the activity. Taking this into account, it might be reasonable to suggest that playtime periods could benefit from the inclusion of supervisors who are able to organise and support playground activities (Huberty, et al., 2011; Larson et al., 2014). When incorporated as an intervention (where supervisors ran an obstacle course), this approach was deemed successful at increasing the amount of accumulated MVPA during playtime (Connolly & McKenzie, 1995). Moreover, Larson et al. (2014) found that the use of semi-structured playtime periods where supervisors organise and support some activities, increased children’s total number of steps and MVPA, compared to unstructured periods. With this in mind, it could be useful

for teachers or supervisors to engage in semi-structured PA with children during some playtime periods. Alongside the benefits of improved classroom behaviour post-playtime, structure also provides children with the chance to receive encouragement and feedback (Larson et al., 2014), which could be pertinent for children whereby their lower levels of self-efficacy restrict engagement in PA (Humbert, 2006).

### *Limitations*

The limitations of this study include the short time period of analysis (three days) and the assessment of one playtime period each day. Furthermore, the authors are aware that assessment of two schools of different SES limits generalisability of findings, but anticipate that this mixed-methods design provides quantitative and qualitative insights for future larger-scale trials. Some of the strengths of this study included the use of objective PA assessment during playtime, and the opportunity for children to speak out about their perceptions of PA, thus allowing researchers a privileged insight into their thoughts and feelings regarding PA and the respective playground areas available to them. Consequently, future research might consider affording more attention to the voices of the target group, which could help to better inform interventions to improve PA outcomes.

### **Conclusion**

Utilising a mixed-methods approach, this study provided insight into the PA levels during playtime and PA perceptions of pupils from two primary schools of different SES. Children from both schools spent the majority of playtime in sedentary or light activities, with MVPA constituting between 15-30% of allocated playtime. It was revealed that children from the low SES school spent significantly more time in SED activities and less time in MVPA compared to their high SES school counterparts. Compared to males, female participation in MPA and MVPA was lower and time spent in SED activities was higher in both

schools. The findings also suggest that high SES female pupils may prefer to engage in light activities (walking activities) over higher energy expenditure activities (MPA and MVPA) during playtime.

Narrative from the focus groups revealed that children from the low SES school failed to articulate a clear comprehension of PA and were unable to provide a similar contextual understanding of the importance of participation in PA compared to children from the high SES school. Whilst PA promotion, education, guidance and opportunities should be provided to all pupils and the people within their immediate support network, these findings perhaps highlight a greater need for this provision in schools within areas of low SES. We suggest that children's understanding of the importance of PA for health should be enhanced through classroom and playtime discussions, the PE curriculum and whole school initiatives. While this is pertinent for children from low SES schools, such interventions could also benefit those from high SES schools. Moreover, the introduction of training for playtime supervisors to provide them with the knowledge and leadership skills to initiate PA could contribute to ensuring participation for all children on regular occasions throughout the school week. Head teachers could utilise the government funded 'PE and sport premium' allocated to schools to finance areas such as staff training and playground spaces/development with the aim to improve participation in PA (DfE, 2015b).

Children from both schools provided commentaries on the PA that they engaged in during playtime, within which references to the school environment were made. The more favourable perceptions of their school environment from children at the high SES school were also reflected in their participation in more vigorous PA behaviours. Children from both schools were able to provide a wide range of suggestions regarding activities and changes to their respective playtime environments that they considered would enable them to become more active. As active users of the play environment, schools could benefit from incorporating some of the suggestions made by children to inform innovative strategies (financed by their respective budgets) targeting improvements in PA. All schools should therefore provide encouragement and

opportunities to promote MVPA during playtime. Schools situated in low SES areas should focus on reducing time spent in sedentary activities and increasing MVPA opportunities through enhanced playtime support from adults and education.

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