

Exploring teachers' perceptions on physical activity engagement for children and young people with intellectual disabilities

Samantha. J. Downs, ¹, Zoe. R. Knowles, ¹, Stuart. J. Fairclough, ¹, Natalie. Heffernan, ¹, Sarah. Whitehead, ¹, Sofie. Halliwell, ¹, and Lynne. M. Boddy, ¹.

1. The Physical Activity Exchange, Research Institute for Sport and Exercise Sciences, Tom Reilly Building, Liverpool John Moores University, Byrom Street, Liverpool, L3 3AF, UK.

Corresponding Author: Samantha Downs,
The Tom Reilly Building,
Liverpool John Moores University,
Byrom Street,
Liverpool,
L3 3AF
Email: S.J.Downs@2012.ljmu.ac.uk
Tel: +44 (0)151 904 6246
Fax: +44 (0)151 904 6284

Type of manuscript: Original Research Article

Word Count: Manuscript = 4507 Abstract = 291.

Conflict of interest statement: There are no known conflicts of interest for the present study.

Source of funding: Liverpool John Moores University, UK provided financial support throughout the duration of this research project and dissemination phase.

Abstract

Aim: To explore teacher's perceptions of barriers and facilitators to physical activity, including enabling, reinforcing and predisposing factors amongst children and young people (CYP) with intellectual disabilities (ID). *Method and procedures:* The Youth Physical Activity Promotion (YPAP) model was used to inform semi-structured focus groups to explore physical activity of CYP with ID. Participants were 23 (9 male) teachers and teaching assistants, from 3 special educational needs (SEN) schools (1 = Primary, 2 = Secondary) within North West England. Three focus groups were held with between 6 and 8 participants, audio and video recorded and data transcribed. Data were inductively and deductively analysed using Nvivo and represented through pen profiles. *Results:* Three pen profiles were developed and structured around YPAP model to display themes within the data. Enabling factors (facilities (n=23) and activity type (n=39)); reinforcing factors (influences of peers (n=23), family (n=10) and teachers (n=19) to physical activity engagement); predisposing factors (healthy lifestyle (n=15), enjoyment of physical activity (n=14), adaptations for physical activity (n=10), structured play (n=10), effects of disability on physical activity (n=8) and the CYPs attitudes towards physical activity (n=8)). *Conclusion:* CYP with ID enjoy engaging in physical activity, particularly activities that are of a fun and unstructured nature which allow for progression of skills and promote independence. Participants recognised that they, as teachers, had an influence on the CYP's physical activity engagement, however suggested that parents have the most influential role. Similar to previous research, participants noted that CYP with ID had a lack of understanding as regards the importance of physical activity engagement and its benefits to health. It is suggested a strong home-school link for CYP within SEN schools could prove to be a key facilitator for active and healthy lifestyles education and choices.

Key words: Intellectual disabilities, physical activity, children, young people, teachers, focus groups

Introduction

Physical activity (PA) is an independent determinant of health with current UK PA guidelines recommending that children and young people (CYP) aged between 5 to 17 years should accumulate at least 60 minutes of moderate to vigorous physical activity (MVPA) everyday (CMO, 2011). Despite these recommendations, recent evidence, suggested that only 51% of

children met the CMO guidelines with boys reported to be more active (63% met guidelines) than girls (38% met guidelines) (Griffiths et al., 2013). The majority of the current PA research is conducted with those defined as healthy, mainstream CYP, and yet little is known about special populations such as CYP with intellectual disabilities (ID) (Hinckson and Curtis, 2013). ID originates before adulthood, either before birth, during birth, or within childhood years (WHO, 2012). Any condition that damages development of the brain can be the origin of ID (The Arc, 2011). People with ID have a decreased ability to comprehend new or complex information and to learn and perform new skills, as a result this reduces their capability to live independently (WHO, 2012). Similar to that of the general population, people with ID are living longer and, as a result, those with ID are expected to have greater physical and mental needs (Jenkins, 2012).

When compared to CYP without disability, children with ID commonly have lower levels of cardiorespiratory fitness, muscular endurance and as a result, overall higher rates of obesity (Murphy and Carbone, 2008). Phillips and Holland (2011) used objective methods (accelerometers) to assess the PA levels of 152 individuals with ID aged between 12-70. Results showed that no participants met current PA guidelines and an age-related decline in PA levels and increase in sedentary behaviour were observed (Phillips and Holland, 2011). A recent review article by Hinckson and Curtis (2013) also described low levels of PA by CYP with ID, with the majority of studies noting that CYP with ID were generally less active than those without disability (Hinckson and Curtis, 2013).

Menear (2007) noted that parents often felt their children had negative attitudes towards PA, resulting in disengagement of PA and adoption of more sedentary activities. Studies since have reported that although parents understood the benefits of their children meeting the recommended PA guidelines (Bodde and Seo, 2009), lack of time to arrange structured PA was an issue. Consequently, parents have expressed the need for someone else

to provide this type of support (Menear, 2007; Mahy, 2010). Barr and Shields (2011) reported concerns linked specifically with safety as a consequence of behavioural difficulties from ID conditions. These factors, in turn, may be contributing factors to that of a more sedentary lifestyle at home due to parents being unable to supervise organised or spontaneous PA.

Understanding the determinants of PA for individuals with ID is essential in order to implement successful interventions to increase current PA levels (Bodde and Seo, 2009). The Youth Physical Activity Promotion (YPAP) Model (Welk, 1999) is a conceptual framework used to understand personal, social and environmental factors which influence PA behaviour in children (Figure 1). This social-ecological framework allows enabling, predisposing and reinforcing factors associated with PA to be acknowledged.

[Figure 1 near here]

For health care professionals and carers within the disability sector, an understanding of barriers and facilitators to PA in CYP with ID would assist with the design and implementation of appropriate PA intervention strategies.

The current research is part of a comprehensive three year multidisciplinary research programme which seeks to investigate PA levels in CYP with ID. The programme includes a substantive formative data collection phase seeking to explore PA aspects of the YPAP model (Welk, 1999) with CYP and their parents (Downs et al, 2013) and that of the current study with teachers. Data from CYP included PA measures involving accelerometry, direct observation in structured (Physical Education) and unstructured (playtime) settings and write and draw activities. To date this research programme has used objective methods to investigate PA with the largest sample of CYP with ID in Europe, with data used to inform the design of an intervention. The primary aim of the intervention is to increase MVPA levels

within primary school aged children with ID during school time via a 12 week intervention period to promote health enhancing PA.

The present study compliments that of previous research by Downs et al., (2013), which explored opportunities and perceived barriers to PA engagement for CYP with Down syndrome (DS). Semi-structured interviews were conducted with one or two parent(s) (5 interviews = 1 parent present) and participants with DS, the interview guides was informed by the YPAP Model (Welk, 1999). Results suggested that CYP with DS in the study typically only engaged in fun, unstructured activities. Key facilitators for PA participation were those linked to social interactions and parental support. Further, it was suggested that by increasing the level of independence for people with DS within adolescence may have beneficial effects for PA participation in later life (Downs et al., 2013). The present study explores components of the YPAP Model (Welk, 1999) further, but from the perspectives of teachers working in SEN schools. The aim of the current study was to explore teachers perceptions of barriers and facilitators to physical activity, including enabling, reinforcing and predisposing factors amongst CYP with ID.

Method

Participants

Initial contact was made to two local authorities in the North West of England who supplied a list of appropriate SEN providers within their respective areas. All SEN schools were invited to take part in the research and three responded in writing: a specialist sports SEN secondary school (11-18 years), a secondary SEN school (11-18 years) and a primary SEN school (4-11 years). The PE co-ordinator from each secondary school and the head teacher from the primary school were sent participant information and consent forms for distribution to staff.

The inclusion criteria set out that participants must have had some direct involvement within the students PA engagement through direct teaching activity within the curriculum or through lesson/club support. A total of 23 participants agreed to take part (9 male). The participants were made up of a range of school staff including, class teachers (9), teaching assistants (6), sports specialists (2), and Physical Education (PE) teachers (6). All the participants met the inclusion criteria; with cited experience to meet this being direct involvement in PE lessons, playtime periods, after school clubs, lunch time clubs, swimming sessions, hydrotherapy, soft play etc. Three focus groups were held and ranged from 6-8 participants with mixed sex participants in each group and were scheduled in venues and at times convenient to the participants.

Procedure

This study was approved by a University research ethics committee. Written informed consent was gained for all participants before each focus group took place. The researchers adapted a semi-structured focus group guide used previously by Downs et al (2013) and is available on request to author 1. The semi-structured guide explored teachers perceptions of enabling, reinforcing, and predisposing factors from the YPAP Model (Welk, 1999) related to the PA engagement, PA opportunities and barriers for CYP with ID to be active. The use of a semi-structured format allowed researchers to quantify themes from the YPAP Model whilst also gaining richer detail with a view to conducting both deductive and inductive analysis. Prior to the focus groups, the guide was discussed between the project team and a Chartered sport and exercise psychologist to ensure face validity, appropriateness of format and tone of the questions. Minor modifications were made post discussion. The guide was also responsive to the participants allowing time for clarification and opportunity to offer illustrative examples from their experiences. Open ended questions were used to allow

participants to contribute in a group discussion expressing opinions and feelings and exploring consensus. Focus groups lasted between 30 and 45 minutes and were recorded using an Olympus WS-450S Dictaphone and video recorded to aid transcription.

Data coding and analysis

Focus groups were transcribed and created 66 pages of typeset data Arial font, size 12, double spaced. Pseudonyms were used throughout all transcripts to ensure confidentiality. Member checking was employed through a process of forwarding focus group transcripts to participants via email for perusal and alterations as appropriate. No subsequent transcript amendments were made. Each transcript was then read several times by each researcher in order to familiarise themselves with the data. Transcripts were deductively and inductively analysed by each researcher independently using NVivo software. The transcripts were reduced to identify quotes indicative of meaningful themes and discard irrelevant quotes with no meaning. Comparing and contrasting the meaningful quotes enabled the researcher to unite quotes with similar meaning and to separate quotes with different meanings, clustering quotes into categories and essentially highlighting common themes between participants' experiences.

The outcomes of the analysis process were then represented as a pen profiles. Pen profiles are considered appropriate for representing analysis outcomes from large data sets via a diagram of composite key emergent themes, frequency data and verbatim quotations and have been used previously as a representative tool in formative research informing school based interventions (Mackintosh et al., 2011, Boddy et al., 2012, Ridgers et al., 2012). Methodological rigour was demonstrated using 'trustworthiness criteria' whereby authors responsible for data collection presented to authors not directly involved in this process that the findings were firstly worthy of attention. Verbatim quotations were initially presented and then were critically questioned through the analysis and cross-examined the data in reverse,

from the pen profiles to the transcripts. This process was repeated, allowing the authors to offer alternative interpretations of the data, until an acceptable consensus had been reached. Verbatim transcription of data and triangular consensus procedures afforded credibility and transferability, with comparison of pen profiles with verbatim citations accentuating dependability.

Three pen profiles were developed to display themes within the data; figures were developed using the YPAP Model Welk (1999) as a framework. Links between primary and secondary themes were displayed with solid lines with tentative links between primary and/or associated secondary themes indicated by dotted line.

Results

Figure 2 displays the enabling factors to PA engagement. There are 4 primary themes: fitness component of PA (n=39), skills linked to PA (n=16), access to PA (n=29) and environmental factors (n=33) and 9 secondary themes with facilities (n=23) and activity type (n=39) being the most frequently cited themes. Positive and negative influences featured in both environmental and access to PA primary themes. Figure 3 displays the reinforcing factors to PA engagement. There are 3 primary themes: peer influence (n=23), family influence (n=10) and teacher influence (n=19) to PA engagement. Positive (n=11, n=6) and negative (n=12, n=4) influences featured in both peer and family secondary themes respectively. Figure 4 displays the predisposing factors to PA with 2 primary themes; how able are the children to be PA (n=28) and is PA engagement worthwhile (n=37). Positive and negative influences featured in both primary themes. Six secondary themes; healthy lifestyle (n=15), enjoyment of PA (n=14), adaptations (n=10), structured play (n=10), effects of disability on PA (n=8) and attitudes towards PA (n=8) are presented. The key emergent themes identified from the data were promotion of a healthy lifestyle and enjoyment of PA.

[Figures 2, 3 and 4 near here]

Discussion

The aim of the current study was to explore teacher's perceptions of barriers and facilitators to physical activity, including enabling, reinforcing and predisposing factors amongst CYP with ID. The following discussion has been structured around the YPAP Model (Welk, 1999) highlighting the enabling, reinforcing and predisposing factors to PA engagement respectively.

Enabling Factors

Participants reported that, in general, PA engagement was thought to be gained from unstructured activity with the majority of activities offered as examples having no set rules. Fun and enjoyment were mentioned as key facilitators to PA engagement and this is consistent with previous research (Mahy et al. 2010, Downs et al. 2013). Swimming was the most popular PA engaged in by the CYP, cited by all participants and concurs with previous studies assessing PA in special populations (Jobling & Cuskelly, 2006; and Downs et al. 2013). For example one participant noted the use of unstructured activities (i.e. water play) and regular engagement in swimming:

Each class has a timetabled swimming session in the hydrotherapy pool. Erm, they're not really meant to like do lengths of the pool...but it's like water play, and water confidence skills... (F2:M1).

Coates and Vickerman (2010) explored experiences of inclusive PE in children with SEN within a mainstream school, with child participants expressing that they enjoyed PE lessons

which further supports the current findings. Other perceived popular activities included trampolining and boccia. Participants reported a need for PA being a vehicle for developing fundamental movement and social skills rather than individual ‘sporting’ skills, to promote independence and interactions amongst the CYP necessary for continuing PA outside of the school domain and ultimately across the lifespan. Downs et al (2013) reported that parents of older children considered a need to develop their child’s independence, particularly regarding transport to and from activities and the provision of support by others in the community such as leisure centre staff and carers outside the family unit.

Participants emphasised the importance of having a wide range of choice and opportunities for CYP of all abilities with PA opportunities available during curriculum time. The current, but somewhat limited, provision of after school opportunities was noted. Providing such choices and opportunities is potentially a key facilitator to the engagement of PA, as the CYP will engage with activities which satisfy their needs for enjoyment (Downs et al. 2013) and skill mastery/achievement. As an example, one participant suggested:

By offering choice it allows for everyone to participate in something they enjoy...increasing PA levels compared to before (when there were less opportunities).
(F1:M4).

Transport was deemed a key facilitator for CYP with ID to allow them to access PA both in curriculum time and after school. The participants express how current school transport arrangements are based around the schools’ ‘normal’ schedules and timed according to geographical location of the pupils’ home addresses. Co-ordinated transport available to take pupils home from after school activities or supplemented by provision from parents would therefore seem appropriate for schools to consider.

Seasonal variation was a key enabling theme and specifically, how ‘good’ weather provided extra opportunities for CYP to engage in PA. For example participants noted being able to use the field and that warmer, drier weather were seen as facilitators to engagement in activities such as athletics and use of outdoor play based equipment. These results correspond with findings by Downs (2013), parents of children with DS noted that certain activities were dependant on the weather (i.e. recreational outdoor trampolining) and during winter months there was a reduction in PA engagement. The authors suggested that more indoor physically based activities should be introduced within winter months to replace outdoor activities that are less suitable in ‘bad’ weather (Downs et al., 2013). Moreover, in the general population when objectively assessed seasonal variation and the length of the day (i.e. sunrise to sunset) has been shown to effect levels of PA engagement (Goodman et al., 2012, Ridgers et al., 2010). Therefore schools should consider activities and space inside that could support PA based activities. These may not be ‘sports hall based’ or Physical Education periods perhaps but indeed that which could be delivered locally in classrooms and around the school at other times in the school day for example, active indoor play during ‘wet playtimes’. This is important as ‘wet playtime’ displaces a potentially active setting with a sedentary one (Harrison et al., 2011).

Reinforcing factors

Participants reported that they themselves, as well as the parents of CYP with ID, play an important role in reinforcing PA engagement. Participants viewed themselves as important motivators to increase PA levels providing reward schemes and demonstrating inclusion and ‘active’ role modelling. For example:

So I know a lot of my class will just go and sit outside unless I say to them come on we're going for a walk around the playground or I'd like to see you going on the bikes. (F2:M4).

Other examples of role modelling:

So we have like staff versus students which encourages them because you know they want to beat the staff and they really enjoy it and that's reinforcement for us to join in more because you know we are competitive. (F2:M6)

Getting involved (F3:M1).

Participants engaging in the activities with the CYP appeared to have a positive influence on PA participation rates. Interestingly parents in Downs et al. (2013) did not mention themselves as a role model in this same way. Participants in the current study also reported that CYPs peers were influential with regards to PA participation. Peer influences were seen as positive motivators to encourage and support CYP with ID to get involved in activities for example:

You often see the boys being quite competitive with things so you know if they see one doing one thing (engaging in PA) it does encourage the rest... (F2:F6).

However, participants also suggested that peers can have a negative influence on PA participation with regards to causing distractions and varying levels of participation and co-operation in team games. For example:

Children's behaviours can then inhibit others from learning (F3:M2).

Silva et al. (2013) assessed social support from parents and peers for adolescents (without disability) and the effect on their engagement in MVPA. Results showed that separately both parents and peers social support had a direct effect on MVPA, which demonstrates the importance of social support and the influence this has on adolescents' MVPA levels within the general population.

Participants reported that parents were both significant barriers and enablers to their children's PA participation. For example:

Obviously the parents have a big influence (on the CYP's PA engagement). (F1: M3).

In contrast, participants discussed support issues with a past PA programme:

So the kids were really making the effort staying but we really didn't have the parental support. (F1:F1).

Previous research has suggested that parents have the ability and control to both facilitate and impede their child's participation in PA (Biddle et al., 2004). Barr and Shields (2011) supported these findings by emphasising the importance of the roles families play on PA engagement within this specific population. Participants conveyed examples of parents acting

as barriers to their children's PA engagement through their promotion of sedentary behaviours over those which are active based. Involving parents, the whole family and wider support network appears fundamental in attempting to increase PA levels of children with ID. Downs et al. (2013) noted that parents had described 'an overall lack of support for PA throughout the child's life' (p.14) and that there was a perceived decline of support once their children started school, one parent explained that 'the connection and communication between health services and education being very poor' (p.14). It is also important to ensure consistent health messages are reinforced between the school and home life, more specifically Hinckson et al. (2013) outlines the importance of developing strong links between family, community and school when promoting PA. A tentative linking of themes was indicated on the profiles (figures 2 and 3), which was representative of an opportunity to explore such information-based and practical support-based opportunities between school and home. Practical suggestions to develop this link may include regular news letters or inviting parents to school-based sports or activity days, to promote family involvement in PA through collaborative activities, signposting to relevant clubs and associations within the CYP locality and sharing of relevant health and activity based information.

Predisposing factors

Participants described that PA seemed to be associated with the severity of ID which influenced the specific adaptations required to facilitate PA such as adapted equipment and individual learning needs. Moreover, Phillips and Holland (2011), through objectively measured PA techniques, described tendencies of individuals with a more severe level of ID to engage in greater amounts of sedentary behaviours and be less physically active. Participants also felt that CYP with ID behaviours generally prevented them from using a

‘mainstream’ sports club, however four participants in the present study felt that there was significant capacity for PA to have a positive overall effect on the CYP. Hinckson et al. (2013) conducted a PA and nutrition based intervention for children with ID demonstrating positive results including, increases in the distance in which participants walked during a 6-min walk test, and reduction in the amounts of confectionary and chocolate consumed. Parents of the participants with ID also noted that there had been fewer visits to the hospital and absences from school during the program period (Hinckson et al., 2013). Participants from the present study suggested that pupils’ preferred unstructured PA as some pupils struggle to follow specific instructions, rules of games and the social interaction expected during sports such as football. Social skills were perceived by parents as a barrier to PA engagement for children with DS (Menear, 2007). Furthermore, the preference of engagement in unstructured PA is supported by Mahy et al. (2010) and Downs et al. (2013) who reported similar findings linked to reasons to participate in PA for CYP and adults with DS including; activities that are informal, fun and/or have an interesting purpose. Downs et al (2013) reported popular activities engaged in by CYP with DS were dancing and bowling, which were usually done with friends or family rather than within the context of joining with ‘external’ groups.

Participants’ views indicated that whilst teachers themselves understood the importance of being physically active and maintaining a healthy lifestyle there was consensus that pupils had a lack of understanding. This is consistent with the work of Jobling and Cuskelly (2006) who investigated the knowledge of young people (aged 11 – 18 years) with DS with regards to health maintenance and prevention of illness. Only 53% of participants understood the benefits of exercise. None of the young people were aware of the frequency of exercise needed to be beneficial and maintain good health. In contrast, research involving children without disability reported good levels of knowledge related to the importance of PA

(Mackintosh et al., 2011). There is a need for further education concerning the benefits of PA and the amount necessary to benefit health for young people with ID. This concurs with, Jobling and Cuskelly (2006) suggestion that prolonged and more explicit teaching methods are needed for individuals with DS, in order to help guide the young people to make healthy choices and as a result take responsibility for their own health. Moreover, Mudge et al. (2013) conducted the 'Living Well Study', which aimed to improve the understanding around leading a healthy life style and the problems that occur for individuals with disabilities. The study reported that not only do people with disabilities come across the same issues people without disabilities do linked to 'living well', but also have added factors to contend with that need to be addressed to provide suitable opportunities for people with disabilities to engage in and make healthy lifestyle choices (Mudge et al., 2013).

The current study used formative research strategies to subsequently inform intervention design, consulting with primary carers and significant adults during the process. However, there were a number of limitations within this study. Firstly, there may be the risk that the data was influenced by sampling bias as each school nominated teacher participants, and the overall participant sample size was small. Secondly, it may be beneficial for future research to use objective methods to accurately assess children's participation levels and physical activity behaviours. Accelerometry and systematic exploration of the types of activities engaged in by CYP when they are presented with times for 'unstructured activity' such as break time would be useful to assess these respectively. Of the three schools involved within the study the variance in the students level of ID was vast, future studies should look to recruit schools with students who have 'similar' severity of ID i.e. mild, moderate or severe level of ID though this categorisation in itself would raise complex assessment issues. Unfortunately due to the small sample size we were unable to explore the differences between primary and secondary schools within the scope of the current project. PA and CYP

with ID is an emerging research area and the research aimed to report an overall view of teachers perceptions in this area. Our findings provide a basis for researchers to explore this further by separating primary and high schools. Future research may also consider the wider context of involving children within the research to ensure representation of the CYP ‘voice’.

Conclusion

To conclude, participants have suggested that CYP with ID enjoy engaging in fun, unstructured physical activities that allowed for progression of skills and promoted a sense of independence. Participants in the present study acknowledged they had an influence on PA engagement but also suggested that, ultimately, parents have the most influential role. The data presented illustrated a lack of understanding amongst CYP with ID regarding the benefits of a healthy lifestyle and the importance of PA engagement and it is suggested that appropriate education is needed for CYP around these topics. The home-school link, whilst somewhat more protracted than that of mainstream schools due to transport arrangements and general parent interaction with teachers on-site, needs to be explored as a key facilitator for promoting PA and healthy lifestyles for CYP with ID within all aspects of life. The current research findings concur with that of Downs et al. (2013), demonstrating through both studies that enjoyment and activities of an unstructured nature were key facilitators to PA engagement for CYP with ID. Such research provides guidance for policy and practice in respect of appropriate intervention and education strategies to increase PA within this population.

Acknowledgements

The authors would like to thank the 3 schools that were involved in the study especially to the teachers and teaching assistants involved within the focus groups.

References

- Barr, M. & Shields, N. (2011). Identifying the barriers and facilitators to participation in physical activity for children with Down syndrome. *J Intellect Disabil Res*, 55, 1020-33.
- Biddle, S. J., Gorely, T. & Stensel, D. J. (2004). Health-enhancing physical activity and sedentary behaviour in children and adolescents. *J Sports Sci*, 22, 679-701.
- Bodde, A. E. & Seo, D. C. (2009). A review of social and environmental barriers to physical activity for adults with intellectual disabilities. *Disabil Health J*, 2, 57-66.
- Boddy, L. M., Knowles, Z. R., Davies, I. G., Warburton, G. L., Mackintosh, K. A., Houghton, L. & Fairclough, S. J. (2012). Using formative research to develop the healthy eating component of the CHANGE! school-based curriculum intervention. *BMC Public Health*, 12, 710.
- Chief Medical Officer. 2011. Start active, Stay active – A report on physical activity for health from the four home countries'. Retrieved April 27, 2013, from http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_128209
- Coates, J. & Vickerman, P. (2010). Empowering children with special educational needs to speak up: experiences of inclusive physical education. *Disabil Rehabil*, 32, 1517-26.
- Downs S. J., Boddy L. M., Knowles Z. R., Fairclough S. J. & Stratton G. 2013. Exploring the physical activity trends in children and young people with Down syndrome. *European Journal of Special Needs Education* DOI: 10.1080/08856257.2013.768453.
- Goodman, A., Paskins, J. & Mackett, R. (2012). Day length and weather effects on children's physical activity and participation in play, sports, and active travel. *J Phys Act Health*, 9, 1105-16.
- Griffiths, L. J., Cortina-Borja, M., Sera, F., Poulou, T., Geraci, M., Rich, C., Cole, T. J., Law, C., Joshi, H., Ness, A. R., Jebb, S. A. & Dezaux, C. (2013). How active are our children? Findings from the Millennium Cohort Study. *BMJ Open*, 3, e002893.
- Harrison, F., Jones, A. P., Bentham, G., van Sluijs, E. M., Cassidy, A. & Griffin, S. J. (2011). The impact of rainfall and school break time policies on physical activity in 9-10 year old British children: a repeated measures study. *Int J Behav Nutr Phys Act*, 8, 47.

- Hinckson, E. A. & Curtis, A. (2013). Measuring physical activity in children and youth living with intellectual disabilities: a systematic review. *Res Dev Disabil*, 34, 72-86.
- Hinckson, E. A., Dickinson, A., Water, T., Sands, M. & Penman, L. (2013). Physical activity, dietary habits and overall health in overweight and obese children and youth with intellectual disability or autism. *Res Dev Disabil*, 34, 1170-8.
- Jenkins, R. (2012). The role of nurses in meeting the health care needs of older people with intellectual disabilities: a review of the published literature. *J Intellect Disabil*, 16, 85-95.
- Jobling, A. & Cuskelly, M. (2006). Young people with Down syndrome: a preliminary investigation of health knowledge and associated behaviours. *J Intellect Dev Disabil*, 31, 210-8.
- Mackintosh, K. A., Knowles, Z. R., Ridgers, N. D. & Fairclough, S. J. (2011). Using formative research to develop CHANGE!: a curriculum-based physical activity promoting intervention. *BMC Public Health*, 11, 831.
- Mahy, J., Shields, N., Taylor, N. F. & Dodd, K. J. (2010). Identifying facilitators and barriers to physical activity for adults with Down syndrome. *J Intellect Disabil Res*, 54, 795-805.
- Mudge, S., Kayes, N. M., Stavric, V. A., Channon, A. S., Kersten, P. & McPherson, K. M. (2013). Living well with disability: needs, values and competing factors. *Int J Behav Nutr Phys Act*, 10, 100.
- Murphy, N. A. & Carbone, P. S. (2008). Promoting the participation of children with disabilities in sports, recreation, and physical activities. *Pediatrics*, 121, 1057-61.
- Phillips, A. C. & Holland, A. J. (2011). Assessment of objectively measured physical activity levels in individuals with intellectual disabilities with and without Down's syndrome. *PLoS One*, 6, e28618.
- Ridgers, N. D., Fairclough, S. J. & Stratton, G. (2010). Variables associated with children's physical activity levels during recess: the A-CLASS project. *Int J Behav Nutr Phys Act*, 7, 74.
- Ridgers, N. D., Knowles, Z. R. & Sayers, J. (2012). Encouraging play in the natural environment: a child-focused case study of Forest School. *Childrens Geographies*, 10, 49-65.

Silva, P., Lott, R., Mota, J. & Welk, G. (2013). Direct and indirect effects of social support on youth physical activity behaviour. *Pediatric Exercise Science*, In Press.

The Arc. 2011. Causes and Prevention of Intellectual Disabilities Retrieved. July 30, 2012, from <http://www.thearc.org/page.aspx?pid=2453>

Welk, J. G. 1999. "The Youth Physical Activity Promotion Model: A Conceptual Bridge between Theory and Practice." *Quest* 51: 5–23.

World Health Organisation. 2012. Definition: intellectual disabilities. Retrieved July 30, 2012, from <http://www.euro.who.int/en/what-we-do/health-topics/noncommunicable-diseases/mental-health/news/news/2010/15/childrens-right-to-family-life/definition-intellectual-disability>.

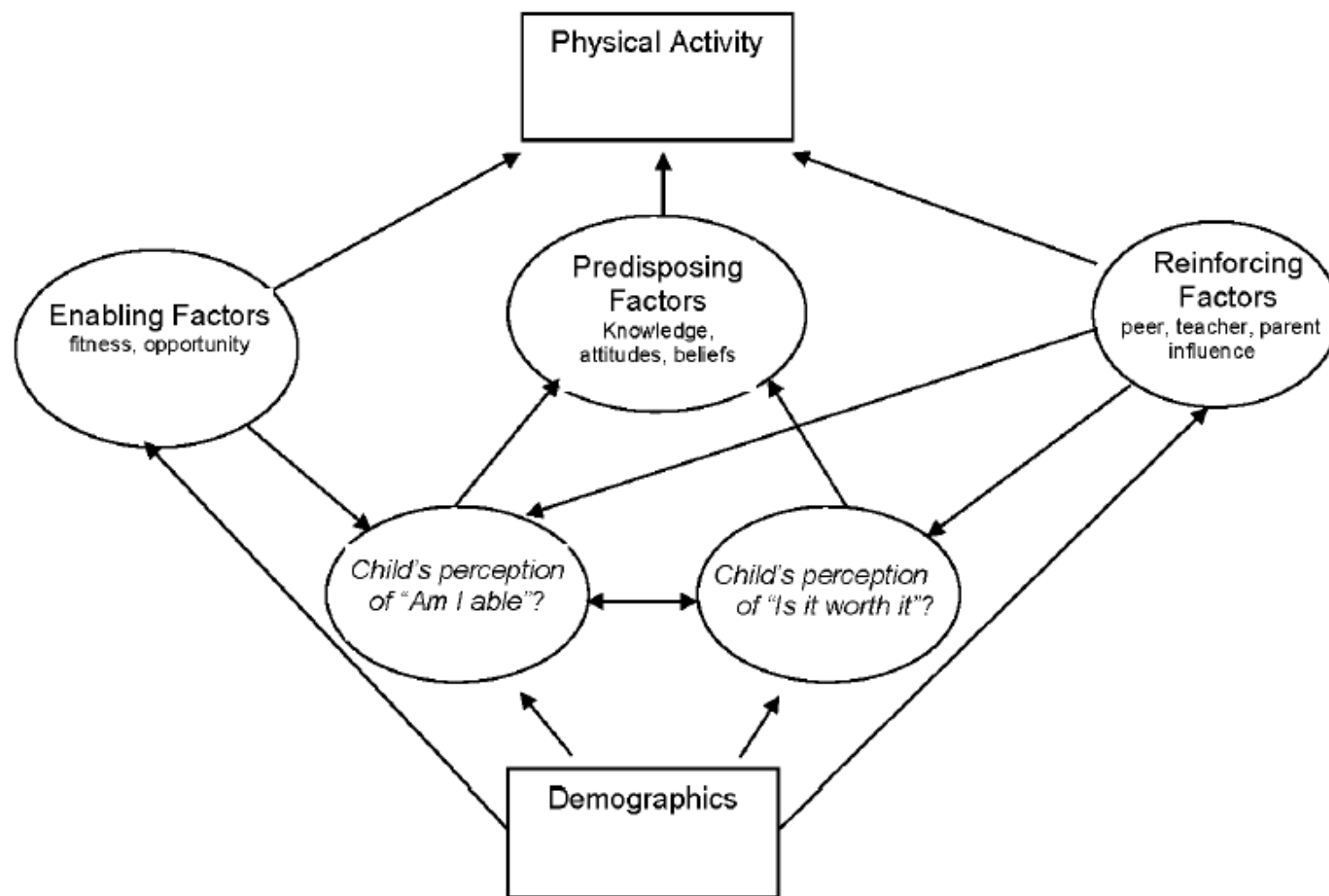


Figure 1. A conceptual diagram of the Youth Physical Activity Promotion Model (Welk, 1999)

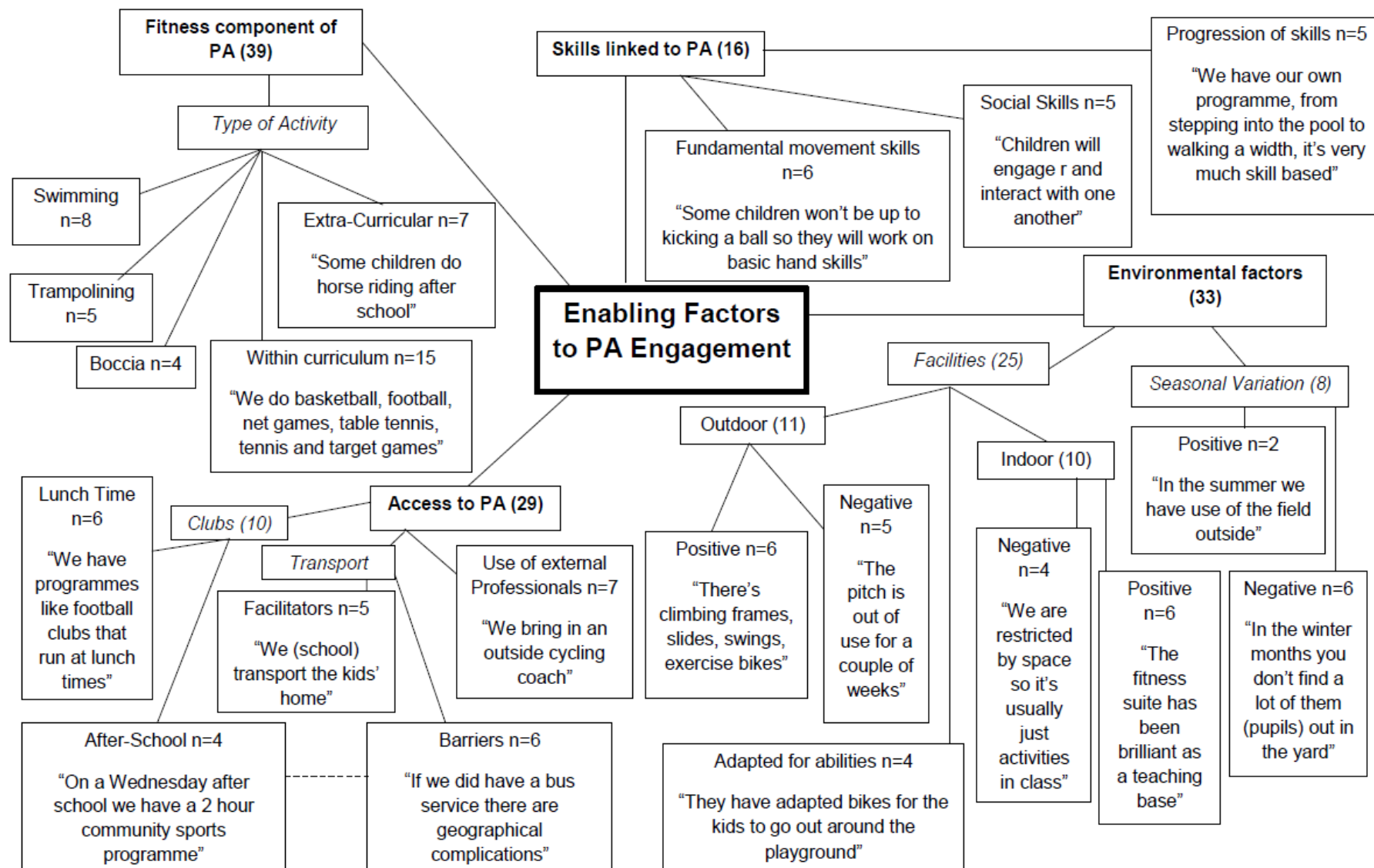


Figure 2. Enabling factors to physical activity engagement for children with intellectual disabilities.

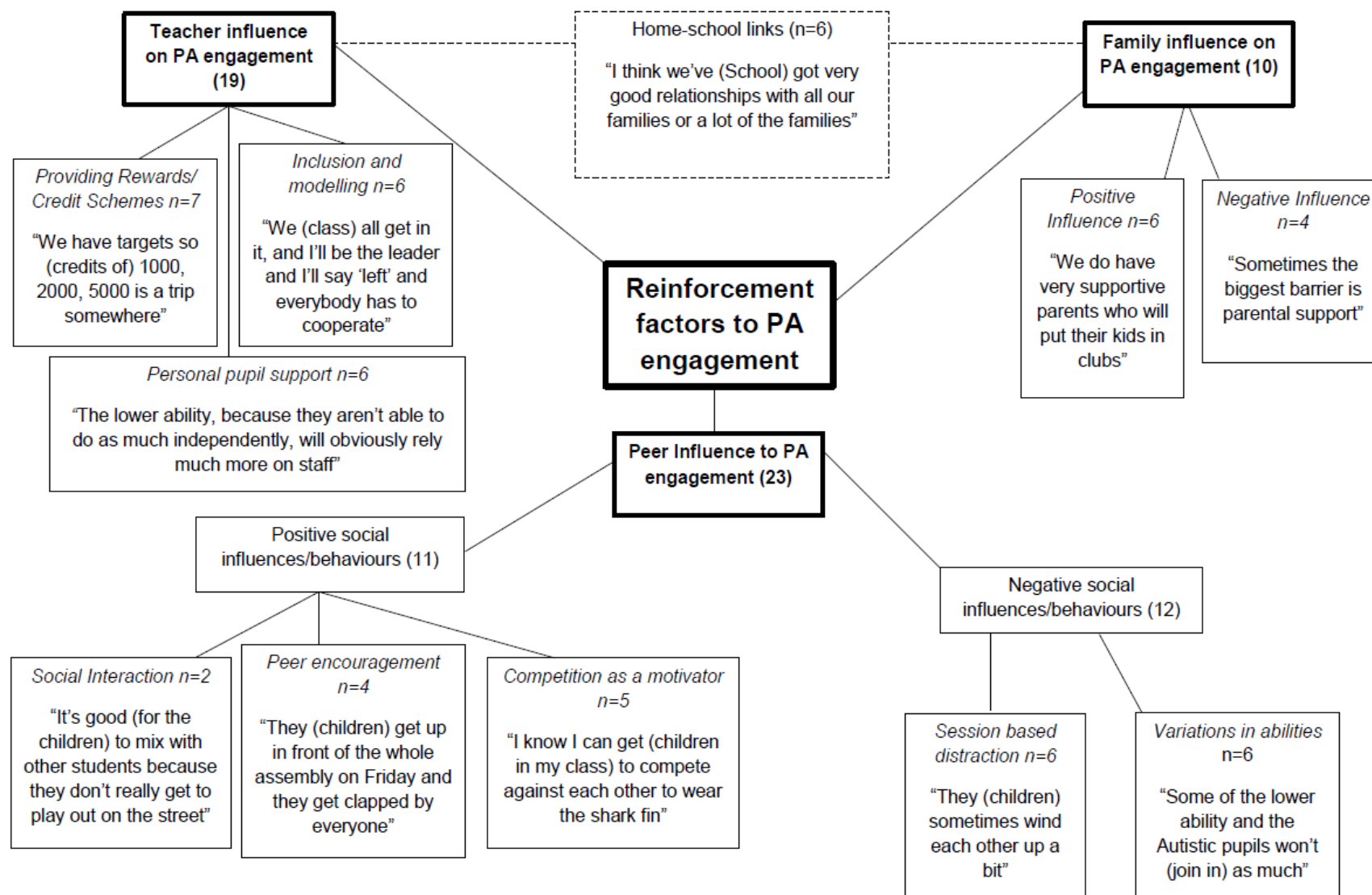


Figure 3. Reinforcement factors to physical activity engagement for children and young people with intellectual disabilities.

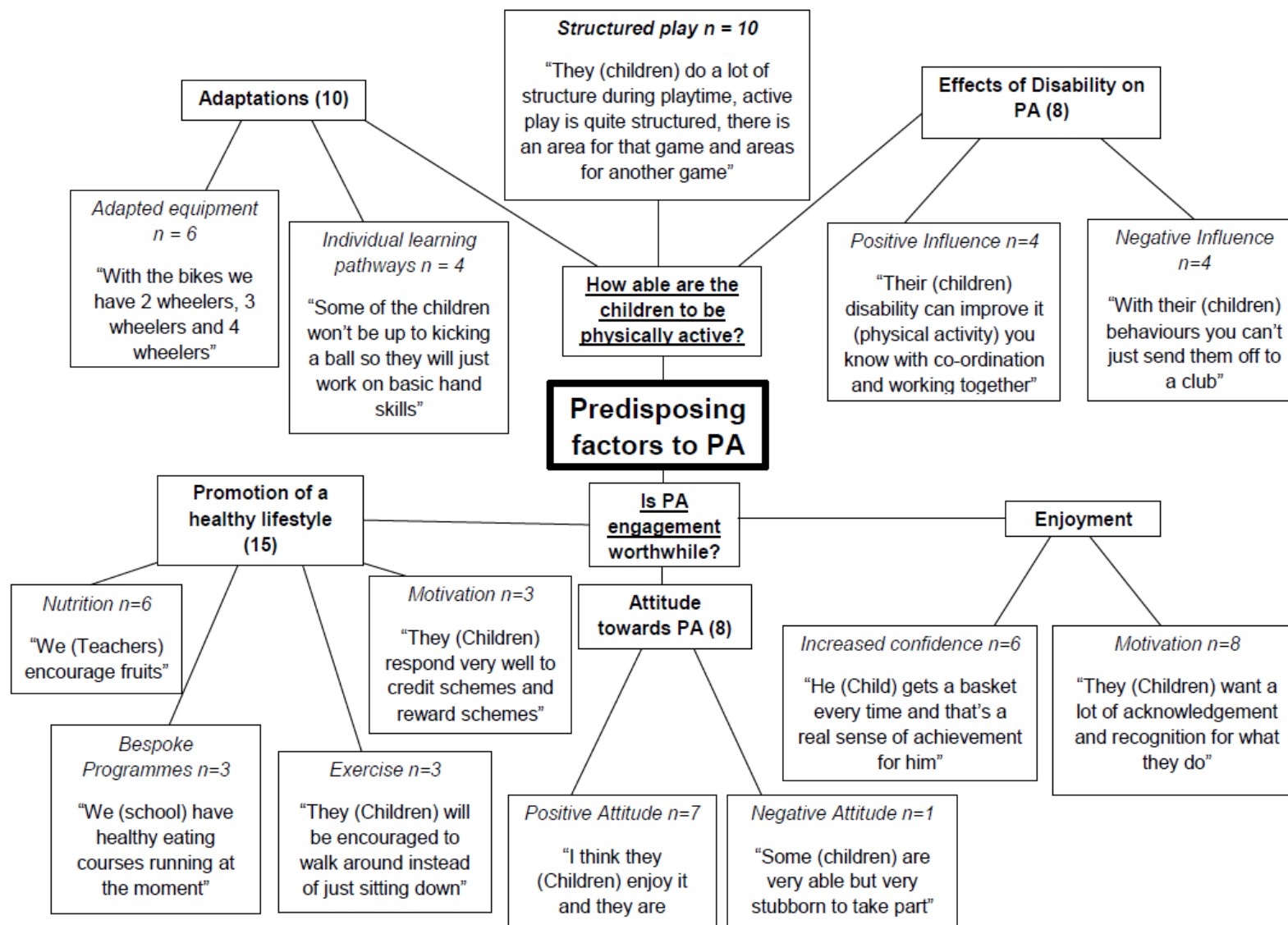


Figure 4. Predisposing factors to physical activity engagement for children and young people with intellectual disabilities.