



Exercise as an intervention for children with Autism Spectrum Disorder: Perspectives of education professionals

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### ABSTRACT

Research indicates physical exercise may have social, cognitive and behavioural benefits for children with autism spectrum disorders (ASDs) and therefore would be a suitable intervention for this population; however the existing literature fails to reach a consensus on the most effective mode of exercise intervention. Five education professionals currently working with children with ASDs participated in semi-structured interviews to investigate their perceptions of the use of exercise as an intervention strategy. A thematic analysis was conducted on the data following the framework identified by Braun and Clark (2006). Participants discussed barriers to exercise, positive outcomes of exercise and core features of a good intervention. Three key themes were revealed: increased adaptive behaviour, social skills and exercise and the need for tailored physical activity. The findings have implications for designing and implementing a successful exercise intervention for children with ASDs and for future research in this area.

KEY WORDS:	AUTISM SPECTRUM DISORDER	EXERCISE	CHILDREN	EDUCATION	THEMATIC ANALYSIS
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## INTRODUCTION

The benefits of regular exercise for children are well-documented. Physical benefits of exercise include a reduced risk of obesity (Laskowski, 2012) and related health problems, increased cardiorespiratory fitness (Peterhans, Worth & Woll, 2013) and improvement in gross motor skills (Cates, Malcolm & Spittle, 2010). There are also psychological benefits of exercise; children show increases in self-esteem and improved mood following exercise (Wood, Angus, Pretty, Sandercock & Barton, 2013); additionally exercise may be effective at reducing anxiety (Khademi & Rahimi, 2012) and protecting against depressive symptoms (Kremer et al, 2014). Acute bouts of exercise have been found to improve various aspects of executive functioning, including inhibition (Chen, Yan, Yin, Pan & Chang, 2014), working memory (Pesce, Crova, Cereatti, Casella & Bellucci, 2009) and attention (Budde, Voelcker-Rehage, Pietraßyk-Kendziorra, Ribeiro & Tidow, 2008). Cognitive benefits also translate to the classroom environment, with children showing improved academic performance after exercise (Hillman et al, 2009). Socially, physical activity contexts may contribute to the formation and strengthening of peer relationships (Smith, 2003).

### Physical exercise and Autism Spectrum Disorder

As well as the benefits for typically-developed children, physical exercise may also have added benefits for children with developmental disabilities, such as those with Autism Spectrum Disorders (ASDs). ASD is a term encompassing several neurodevelopmental conditions characterised by social and communicative difficulties, and repetitive, restricted behaviours and activities (Lai, Lombardo and Baron-Cohen, 2014). The prevalence of ASDs is around 60 in every 10,000 (Levy, Mandell & Schultz, 2009) and occurs more frequently in males than females (Volkmar & Pauls, 2003).

Individuals with ASD show difficulties in socialisation and communication (Anagnostou et al, 2015). In very young children, there is a lack of orienting to social stimuli in the environment and little attention paid to the distress of others (Dawson et al, 2004). Evidence suggests facial processing is also impaired and occurs less holistically, with greater attention paid to the mouth area than the eyes (Neuhaus, Beauchaine & Bernier, 2010), which may lead to deficits in facial recognition and misinterpretation of facial expressions (Celani, Battacchi, & Arcidiacono, 1999). Individuals with ASDs also display difficulty in recognising emotions from verbal and visual cues as well as facial affect (Uljarevic & Hamilton, 2013). This likely also results in the lack of prosocial responding observed in children with ASDs (Russell, Kelly, Ford & Steer, 2012). Individuals with ASDs report significantly less social interaction than their typically developed peers (Orsmond, Wyngaarden Krauss, & Mailick Seltzer, 2004) and stronger feelings of loneliness (Bauminger, Shulman & Agam, 2003). Many children and adolescents also experience social anxiety and this often results in socially withdrawn behaviour (Kuusikko et al, 2006).

Communication in younger children is impaired with children often repeating back what is said to them and using the wrong pronouns (Brown & Elder, 2014). In older children, basic communication matches that of typically developed children, but there are deficits in the comprehension of more expressive language (Lord et al, 2000) and abstract concepts (Minschew, Meyer & Goldstein, 2002).

There is also evidence of executive function impairments in individuals with ASD (Hill, 2004). Individuals with ASD show impairments in areas of executive function such as impaired response inhibition (Luna, Doll, Hegedus, Minshew & Sweeney, 2007), planning deficits (Robinson, Goddard, Dritschel, Wisley & Howlin, 2009), poor mental flexibility (Reed, Watts & Truzoli, 2011), difficulty diverting attention between tasks (Reed & McCarthy, 2012) and deficits within some areas of working memory (Williams, Goldstein & Minschew, 2006). Poorer executive function in children with ASD has also been correlated with more pronounced communicative and social deficits (Gilotty, Kenworthy, Sirian, Black & Wagner, 2002) and repetitive behaviours (Boyd, McBee, Holtzclaw, Baranek & Bodfish, 2009).

Repetitive and restricting behaviours are another defining feature of ASDs (Wolff et al, 2014), including stereotyped movement or self-injurious behaviour (Leekam, Prior & Uljarevic, 2011) and restrictive interests, compulsions and a need for rigid adherence to strict routines or rituals (Mooney, Gray & Tonge, 2006). Sensory abnormalities, such as differences in auditory responding, are also commonly reported in children with ASDs (Klintwall et al, 2011); individuals may be more or less sensitive to sensory information which may lead to sensation seeking or sensation avoidant behaviour (Tomcheck & Dunn, 2007). Another associated symptom of ASD is motor impairment, with gross and fine motor deficits such as hypotonia, motor apraxia and dyspraxia occurring at a high prevalence within this population, particularly in younger children (Ming, Brimacombe & Wagner, 2007).

The most obvious way in which physical exercise may benefit children with ASDs is by increasing their motor skills. For example, swimming was found to improve balance, speed, agility and strength (Yilmaz, Yanardag, Birkan & Bumin, 2004), while 'exergaming' sessions – playing video games that involve physical exertion - facilitated an increase in strength and agility (List Hilton et al, 2014). Horseback riding also benefitted the gross motor skills of children (Hawkins, Ryan, Cory & Donaldson, 2014). Aside from the physical benefits, exercise may also have advantages for children with ASDs in other less obvious domains, such as executive functioning, social skills and behaviour. Carr, Robinson, Taylor and Carlson (1990) suggest that exercise may have a modulating effect on arousal, reducing responses to sensory stimuli that may lead to maladaptive behaviour. A review of the literature reveals significant recent evidence in support of physical exercise as a holistically beneficial activity for children with autism spectrum disorders, and therefore it has strong potential as an intervention strategy.

There is evidence that exercise may lead to an improvement in social skills in children with ASDs. Some social improvements were observed after a week-long swimming exercise program (Pan, 2010) and after long-term participation in a martial arts program (Mohavedi, Bahrami, Marandi & Abedi, 2013). An increase in language usage was observed after several sessions of group athletics (Miltnerberger & Charlop, 2014). Enrolment in a 3-week physical activity and recreational program resulted in an increase in appropriate play and peer interaction and a significant decrease in inappropriate behaviour towards peers for two children with low-functioning ASD (Schleien, Krotee, Mustonen, Kelterborn, & Schermer, 1987). Participation in a school physical education class also produced similar reductions in inappropriate play behaviour (Schleien, Heyne & Berken, 1988). High school students with ASDs expressed that playing team sports allowed them to strengthen their social relationships (Saggers, 2015). Children with ASDs aged 9-13 participated in interviews concerning their feelings towards physical education; many felt that physical education allowed them to make friends and reported enjoying the sense of camaraderie (Healy, Msetfi & Gallagher, 2013). All of the aforementioned studies utilised group methods of exercise which may have facilitated social interaction through necessary team co-operation. A meta-analysis of 16 studies across 133 participants with ASDs revealed that group exercise is more effective than individual for promoting increased social functioning (Sowa & Meulenbroek, 2012) suggesting peer interaction during exercise is the important element for improving social skills.

There are numerous studies that indicate physical exercise may improve academic engagement and performance. A meta-analysis of 18 studies reported the effects of physical exercise on 64 participants with ASDs. Some of the studies reported improvements in the frequency and accuracy of response to questions and demands, and an increase in the time spent attending to allocated academic tasks. A decrease in maladaptive behaviours in the classroom was also noted as a benefit of physical activity (Lang et al, 2010). In another study, a classroom task was administered to individuals with ASD after either 15 minutes of running or no exercise. On-task behaviours and frequency of correct responses were measured. Significantly more correct responses were given after exercising (Oriel, George, Peckus & Semon, 2011). Jogging also increased active academic engagement in primary school pupils (Nicholson, Kehle, Bray, & van Heest, 2011), whilst tri-cycling sessions increased attention span in 2-6 year olds (Beron, Cohen & Pooley, 2013). As the number of exercise sessions increased, the length of attention increased significantly, suggesting effects are not just acute.

Decreasing self-stimulatory behaviours may also boost academic functioning as executive deficits have been correlated with repetitive behaviours (Boyd, McBee, Holtzclaw, Baranek & Bodfish, 2009) and suppressing self-stimulation has been shown to increase learning (Koegel & Covert, 1972). It was found that vigorous exercise results in reductions in stereotypic behaviours (Kern, Koegel & Dunlap, 1984; Petrus et al, 2008) including long-term reduction through a martial arts

program (Bahrami, Movahedi, Marandi, & Abedi, 2012). Jogging sessions were found to decrease self-stimulatory behaviour and increase academic responding and staying on-task in 7 autistic children (Kern, Koegel, Dyer, Blew & Fenton, 1982) and also in 5 teenagers (Rosenthal-Malek & Mitchell, 1997). Lanovaz, Robertson, Soerono, and Watkins (2013) found that reducing stereotyped behaviours through exercise had secondary effects of increased inhibition of inappropriate behaviour and an increase in engagement in activities and correct responding across 7 studies. Exergaming sessions were observed to reduce repetitive behaviour as well as yielding improvements on digits backwards and Stroop tasks, suggesting improvements in mental flexibility (Anderson-Hanley, Tureck & Schneiderman, 2011). The associated increase in executive functioning processes such as attention, inhibition and mental flexibility reported in these studies show that decreasing self-stimulatory behaviours may reduce executive deficits in children with ASDs. However, Kasner, Reid and Macdonald (2012) carried out a quality indicator analysis on studies demonstrating reduction of self-stimulatory behaviours through exercise and concluded that more strictly-controlled research is necessary before exercise can be considered as evidence-based practice.

Despite the promising research suggesting exercise may have social, cognitive, behavioural and motor benefits for individuals with ASDs, many of the studies are limited by a small sample size and there has been little research that has tried to implement a large-scale exercise intervention. Even though there are numerous publications for parents encouraging exercise for children with ASDs (e.g. Jacobs & Betts, 2012; Geslack, 2014), research still shows that these children are not meeting the standard recommended exercise requirements (Pan & Frey, 2006) and engage in less physical activity than typically developed children (Bandini et al, 2013), particularly in adolescence (Memari et al, 2013). Pan, Tsai, Chu and Hsieh (2011) found that children with ASDs require more sources of external motivation, such as encouragement from staff, during physical education to increase their participation levels. In addition, many children with ASDs exhibit a preference for sedentary pastimes such as playing video games over pastimes that require physical activity (Reynolds, Bendixen, Lawrence & Lane, 2011) and are likely to have more screen-time than other children (Must et al, 2014). This lends greater support to the need for further investigations into suitable exercise interventions, as it is unlikely that children, particularly adolescents, will increase their physical activity of their own accord.

There are several reasons children with ASDs may not engage in regular physical activity and these must be considered when implementing an exercise intervention. Difficulty with coordination and movement may impair their ability to participate in certain types of exercise (Johnson, 2013) as individuals with ASDs typically show impaired motor proficiency when compared with typically developed individuals of the same age (Pan, 2014). This can lead to victimisation by peers as the environmental demands during physical education can reveal impairments that

increase bullying (Healy, 2014). In a qualitative study by Healy, Msetfi and Gallagher (2013), children with ASDs professed they felt limited by their physical abilities compared to other children during physical education and were sometimes excluded because the activities were too difficult for them to participate in. However, as physical activity has been shown to reduce motor impairments, an exercise-based intervention may give the child more confidence in their physical abilities and therefore increase the likelihood of them engaging in further exercise. For example, Magnusson, Cobham and Mcleod (2012) found that a 12 week exercise program significantly increased positive attitudes towards physical activity and voluntary participation in exercise.

The social deficits associated with ASDs may also place limitations on children's physical activity as they may struggle to engage with peers during group sports (Srinivasan, Pescatello & Bhat, 2014). Physical education teachers expressed that social impairments and isolation by classmates presented a challenge when including children with ASDs in mainstream P.E. (Obrusnikova & Dillon, 2011). Many children with ASDs reported preferring solitary exercise such as swimming over team activities or sports, although they enjoy exercise just as much as their peers (Potvin, Snyder, Prelock, Kehayia & Wood-Dauphinee, 2013). Some research has identified ways of motivating young people and children with ASDs to engage in more exercise, such as through the use of target-programmed pedometers (LaLonde, MacNeill, Eversole, Ragotzy & Poling, 2014) or via exergaming (Finkelstein, Barnes, Wartell & Suma, 2013). However, these methods involve solitary exercise and therefore are less likely to lead to the social improvements that have been found by research using group physical activity (Sowa & Meulenbroek, 2012).

### **The Present Study**

Exercise has been identified as a suitable intervention for children with ASD based on its ability to decrease stereotypical behaviour and increase adaptive behaviour (Wong et al, 2014). Francis (2005) stipulates that when considering an intervention for ASDs, cost and time efficacy, associated negative effects and evidence of effectiveness are crucial. Physical exercise could easily be implemented at low cost as part of a regular routine, with little to no associated risks. Although there are a significant number of studies indicating physical activity has a positive impact on individuals with ASDs, the lack of methodical rigor in much of the research limits the scope of understanding as it is unclear which benefits of exercise are consistent. Furthermore, there is no consensus on how best to implement a successful exercise-based intervention (Ogg-Groenendaal, Hermans & Claessens, 2014).

The present study aims to gain further insight into the benefits of regular physical exercise for children with ASDs through the perspectives of teachers and others working in the education field, as there is a general lack of involvement of teachers in intervention research (Parsons et al, 2011). According to research by MacDonald,

Esposito and Ulrich (2011) into physical activity patterns, the greatest portion of time children with ASD spend participating in moderate to vigorous physical activity is during school hours. Thus, education professionals are ideally positioned to comment on the perceived effects of exercise. Furthermore, the classroom can present a challenging environment for those with ASDs (Estes, Rivera, Bryan, Cali & Dawson, 2011) with ample opportunity for social interaction and a need for adaptive behaviour, therefore the education professionals should also have a good understanding of the specific needs of the children.

## **METHOD**

### **Design**

A qualitative approach was taken as Leech and Onwuegbuzie (2008) state the exploratory nature of dialogue is useful in education research for identifying positive outcomes of interventions, core features of successful interventions and ways to improve the efficacy of interventions in particular contextual environments. Semi-structured, one-on-one interviews were used in order to encourage participants to speak openly and honestly and provide rich data for interpretation (Nielson, 2007). A data-driven thematic analysis was selected as the most suitable method for analysing the data as it creates awareness of the underpinning themes of the data that may have not been immediately observable (Boyatzis, 1998).

### **Participants**

Purposive sampling was used to recruit suitable participants. Sampling was facilitated through the use of social media, word of mouth and by contacting schools in the region. Potential participants were informed that in order to participate in the study, they must work in the education field, regularly interact with at least one child with autism spectrum disorder and have the ability to comment on that child's behaviour before and after exercise. 6 participants agreed to participate to be interviewed; however one participant was excluded from data analysis as it emerged during the interview that the participant was not confidently aware what exercise the child was engaging in, as she only taught the child after lunch breaks and not physical education. The remaining 5 participants were all female and from the West Midlands area. The occupation of the participants is shown in Table 1.



**Table 1**  
**Occupation of Participants and Relevant Contact with Children with ASD**

<b>Participant</b>	<b>Occupation</b>	<b>Relevant Contact</b>
Jessica	Nursery school Key Worker	1 child with ASD aged 3-4
Susan	Special Education Needs Teaching Assistant (SENTA) in a mainstream primary school	3 children with ASD, aged between 7-11
Serena	Primary school teacher	1 child with ASD, aged 9-10
Louise	Teaching assistant in a special needs primary school	Multiple children with ASD, aged between 5-7
Hannah	Teaching assistant in a mainstream primary school	2 children with ASD, aged 8-9

### **Data Collection**

A literature review on exercise for children with ASDs was carried out in order to formulate a suitable interview schedule. The interview followed a semi-structured approach with pre-determined open-ended questions focusing on the child's normal behaviour compared with their behaviour after exercising (e.g. Have you observed any changes in the child(ren)'s behaviour after exercising?) and addressing the use of exercise as an intervention (e.g. Do you feel that structured exercise would be a useful intervention strategy for children with autism? Why?). Prompts were also included where appropriate; questions were altered or omitted depending on their relevance to the participant and to encourage flexibility during the interview process.

Participants were contacted by telephone or email to arrange an interview after recruitment. Interviews were carried out one-on-one; according to the participant's requests, interviews took place at the participants' homes, places of work or other suitable public locations. Prior to each interview, informed consent was obtained from the participant and it was asserted via an information sheet that all data would be anonymised and confidential. Interviews were taped on an Olympus DM-670 Digital Voice Recorder. All interviews lasted one session, ranging in time from 9 minutes to 16 minutes, with an average of 12 minutes. After the interview, participants were given the opportunity to ask questions, provided with the researcher's contact information and informed of their right to withdraw. The researcher made brief notes after each interview on initial perceptions of the data (Braun & Clarke, 2006). The audio recordings were transcribed verbatim (Humble, n.d.) for data analysis, and then spot-checked for accuracy of transcription.

## **Ethical Considerations**

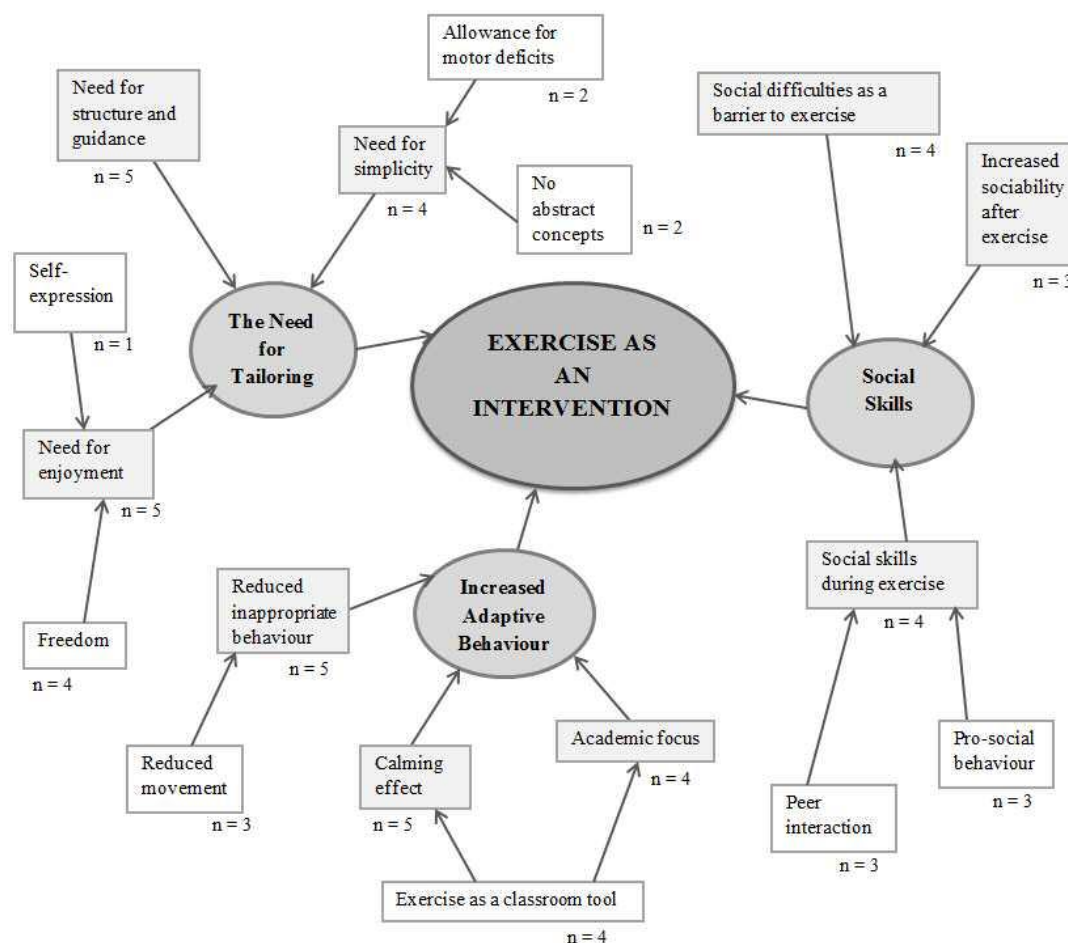
Ethical approval for this research was granted by the Psychology Division Research Ethics Committee of Birmingham City University prior to data collection. The purpose of the research was clearly explained to participants as well as their right to withdraw prior to obtaining written consent to participate. In order to prevent a breach of confidentiality, names have been changed to pseudonyms in this report and any potentially identifying information was omitted from transcription. All audio recordings were password-encrypted and the recording device kept in a locked cabinet to maintain anonymity.

## **Data Analysis**

Thematic analysis took place using the framework specified by Braun and Clarke (2006) to ensure analysis followed an organised methodical approach. Familiarisation with the data occurred both through listening to the audio recordings during the transcription process, and reading and rereading the data once transcribed. Interesting quotes were highlighted. Next, coding took place line by line using QSR NVivo 10, with the researcher identifying emerging patterns in the data thought to be significant. 24 initial codes were generated. The codes were systematically reviewed to identify the most prevalent concepts then collated into groups representing the overarching themes of the data. 4 themes were first identified; after reviewing and refining the themes these were collapsed into three final themes that were considered to accurately reflect the story told by the data. The themes were defined, named and presented as a thematic map, including relevant subthemes.

## **RESULTS**

Participants discussed the effects of exercise on children with ASDs through their individual experiences with the children they work with. Participants also used these experiences to formulate judgements of whether exercise would be a useful intervention and what features would be necessary when designing an intervention for children with ASDs. Through this narrative, three key themes emerged: increased adaptive behaviour, social skills and exercise, and the need for tailored physical activity. Within each theme, several sub-themes were also identified (see Figure 1).



**Figure 1: Thematic map showing the three major themes (social skills, increased adaptive behaviour and the need for tailored physical activity), sub-themes contained within the main themes (e.g. peer interaction, pro-social behaviour) and the number of participants to refer to these concepts.**

### Increased Adaptive Behaviour

Positive changes to behaviour were a key thread of discussion running through all five interviews. 'Letting off steam' was a phrase that frequently occurred throughout the data, and it was clear that participants felt that expending energy left children in a mental state that benefitted their academic functioning. Words such as 'calm' and 'relaxed' were commonly used to express a change in behaviour, as demonstrated in this quote from Louise:

And they're always– they're much more relaxed when we've been swimming or had a P.E. lesson, they always come back and they sit quieter, and they're sort of more chilled and calm and ready. Ready for the next thing I suppose, yeah.

Alongside the calming effect of exercise, increased academic focus was also a sub-theme identified. Hannah said that after exercise, the children she works with were 'both concentrating a lot more. It's a lot easier to keep them on task, and keep their attention to what they're doing'. Susan also spoke of improvements in 'attention

span', 'focus' and 'concentration'. Serena felt that the child was 'likely to write more' after exercise as she was 'more relaxed, not agitated with how she's feeling'. However, some of the participants admitted that these changes were short-term and would wear off after a while. It was suggested that small bursts of exercise could be used within the classroom sporadically in order to integrate exercise throughout the day. Hannah said she would like to see more physical activity combined with learning in order to benefit children with ASDs, but reflected on the difficulty of 'fitting it in amongst all the other stuff'. However, several of the participants revealed they already implemented such things in the classroom; Serena spoke of a program called 'Activate':

We do this thing called 'Activate', which is a series of structured, sort of balancing, and fine motor skills and just moving your body slowly to get your mind and your body just working and getting them ready for the day.

As well as being used to increase focus as described by Serena, Susan stated the same program was 'implemented for a child because of his behaviour' and it had been 'very very good' for him. Similarly, Louise spoke of other simple activities that could be implemented in the classroom:

We do things like 'Brain Gym' where we get them to move their arms and over across their body and things, and 'Beat Baby' where they're tapping and moving their legs and arms, I mean those are sitting things so it's not necessarily intense exercise but those things always work as well.

These few examples demonstrate that schools are already aware of the positive effects that exercise can have on behaviour and attention in the classroom and are taking some positive steps towards including it in the daily routine.

As well as routine exercise, Louise and Jessica also mentioned using exercise specifically at times when the children were exhibiting challenging behaviour, again referring to the concept of 'letting off steam' as a form of behaviour management. Special school teaching assistant Louise said that it's fairly common for the staff to 'just abandon what we're doing if they're getting a little bit upset and challenging' to take the children to 'have a run around'. Behavioural improvements were also mentioned by the educational professionals who did not directly implement exercise as a means of managing difficult behaviour. There was a noted reduction in inappropriate behaviours, such as shouting out in class – 'there's a lot less of the sort of the, I suppose you could say 'silliness', the calling out and stuff'. While there was only one reference to an apparent reduction in repetitive behaviour ('the tapping's a bit less' said in a reference to a boy who is 'always tapping a pencil on the table') there were many comments made about children 'sitting more still' and being 'less fidgety' after exercise, which may suggest somewhat of a reduction in stereotypy, or at least in unwanted movement that may be distracting. Behaviour when no exercise had occurred was repeatedly used to provide contrast by the participants. For example:

Whereas sometimes she might come to school and if she hasn't exercised and done some gymnastics at school in the morning, she'll feel that she needs to faff around a little bit and sort of walk around the classroom and move things and pencils to get herself more, like, relaxed? (Serena)

This difference in behaviour was used to emphasise the importance of regular exercise by Jessica - 'say we had a day where we haven't really gone outside, we notice his behaviour is a lot worse, so yeah I think it's important to do exercise.' Similarly, Susan discussed the harmful effects of denying a child with ASD the ability to exercise, saying 'they need exercise just desperately'. She talked at some length about issues within her school of playtime being removed as a sanction for bad behaviour particularly affecting the children with ASDs. Her feelings on the matter were strong - 'taking away their playtime is not the answer', 'they're missing out on the quality exercise they need' - showing just how important she believes exercise to be for promoting adaptive behaviour.

### **Social Skills and Exercise**

Social skills arose as a frequent topic during all of the interviews. The responses indicated that social deficits are a common barrier to physical activity for children with ASDs, especially during team games and sports. Failing to understand the competitive concepts of team games and unwillingness to 'share or take turns' were stated as problems arising during group physical education. Most participants felt that a lack of social skills could make interacting during P.E. difficult; Serena spoke of the social interaction during physical education making a child nervous:

Yeah, interacting socially with other children is *definitely* a key factor. So, on a Wednesday she'll feel really agitated because she has to go outside and be with peers in her classroom of varying abilities and play cricket, and every Wednesday in the morning she'll say 'I can't, I don't wanna play, I don't feel very well'.

She continued to say that communication was a particular difficulty for this child and this could result in conflicts as 'in her mind it's very black and white, they're offended with her'. However, the participant also felt that the social situation facilitated by P.E. could 'help her to communicate with other children better.' This sentiment was reiterated by many of the other participants, who felt that group exercise would gradually encourage children with ASDs to become more comfortable with social interaction over time and improve their social skills. One participant, Hannah, discussed exercise being recommended by the special education needs coordinator (SENCO) at her place of work as a way to improve social skills, and stated that one child had joined a martial arts club as his parents felt this would encourage him to join in with other children. The ability of physical exercise to foster pro-social behaviour was also discussed. Jessica spoke of a nursery-age boy, who, although he predominantly exercised with an adult rather than his peers, was 'calmer and kinder towards the other children' after exercising. Others felt that particular tasks in physical education could be used to increase pro-social behaviour, such as creating patience with peers through 'sharing things', 'taking turns' and 'working as a team' - many of the same behaviours previously mentioned as

difficulties for the children. This suggests the participants believe physical exercise can assist children with ASDs in overcoming some of their social deficits to an extent.

However, there was not a unanimous belief that group exercise is preferable when considering physical activity for children with ASDs. The degree to which group exercise was viewed as beneficial appears to be modulated by the individual circumstances of each child and the degree to which physical education meets their needs. Louise, who works in a special school, said that while the children do exercise as a group, most of them are 'more on their own... just in their own little world, they avoid the other children'. This suggests that social interaction may not be a barrier for these children to exercise as it might be in mainstream education, as the children are less likely to be engaged in a social situation they don't feel comfortable with. Similarly, an exercise program specifically for children with ASDs was described by Serena as making the child feel more comfortable with social interaction, which led Serena to speak positively of the potential to improve social skills through group exercise. In contrast, Jessica felt that one-on-one exercise would be more appropriate:

If he's doing one-to-one, it's probably better for him, doing exercise like that. Yeah, just sharing really and taking turns [are a barrier for him]. And again, he doesn't like children being in his space, so activity that is with other children, I don't think it's as great as on his own.

The fact that this participant does not have a positive experience with group exercise may be influenced by this particular child's challenging behaviour (e.g. 'if he doesn't get his way he'll scream at you or he'll get angry, and that's with adults or with children. And he'll either hit them or shout at them'). Susan spoke of 'encouraging turn taking, we use the basketball nets and things to encourage interaction, some interaction with other children' but did not go as far to suggest that team sports and games would work well with children with ASDs. The differing stances of the participants on group exercise appeared to be influenced by how inclusive physical education was considered to be for the children in question. While Susan felt that the children with ASDs were more often 'working alongside other children' rather than being fully integrated into the group, Hannah felt that physical education really helped to foster relationships between one boy who was usually 'very withdrawn' and his peers:

I've noticed in P.E., and when he's playing outside, he does engage a lot more, and the kids will encourage him to play with them, and they'll invite him to join in their games he's a lot more social. And that does— when he comes back into the class, that does sort of carry over for a while. Y'know, he'll come back in and they'll all be talking about what they've been playing, and they will be talking to him.

As well as positive social interaction during physical education, there was a sustained increase in sociability after exercise. Other participants also mentioned

children being 'more social' and 'very happy chatting away to other children' after exercise, emphasizing that exercise has lasting benefits on social skills.

### **The Need for Tailored Physical Activity**

The final theme encompassed participants' feelings that exercise needed to be adapted to the specific needs of children with ASDs. Susan stated 'I think the curriculum and physical exercise with autistic children is very hard. Y'know, we have to adapt it for them.' This idea was solidified by the difficulties a lot of the children experienced with physical education - 'one child specifically cannot join in with the P.E. lessons at all, because he just can't grasp the concept of what they are learning.' The participants asserted that exercise needed to be simple in order for children with ASDs to be able to participate:

The simpler the game, or the activity, the better I would say with them. Anything that was like complicated with lots of rules I think then they would struggle, or maybe lose interest or think it's just a bit too difficult. (Hannah)

'Complicated instructions', 'too many rules' and 'not understanding the concept of winning and losing' were repeated as barriers that would discourage children from exercising. Other abstract concepts such as the use of imagination in physical education, for example tasks that require imagination such as 'pretending to be a tree' were reported as particularly difficult for the children to grasp. Susan noted that not understanding the concept of a game could 'have an impact and... affect them for the rest of the day'. It was reiterated by Hannah that an ideal exercise program would have 'very simple rules they can easily join in with'. Motor skill deficits also played a role in making physical activity difficult for certain children, who were not fully able to engage in the same activity as their peers - 'the others are doing more complex ball skills and they're just doing the basics'. Susan thought that any exercise intervention for children with ASDs should be aimed at 'strengthening core strength, because I've found that a lot of children with autistic spectrum have got gross motor skill problems'.

Something that arose from most of the narratives was that, despite their being barriers to physical activity for most of the children, all of the children expressed an enjoyment in exercising. Participants spoke of children being in 'a better mood', 'happier' and 'chirpier' after exercising. What emerged was that the child's good mood was particularly enhanced when they had engaged in their preferred type of exercise; for example Jessica said that the child she works with 'tends to seem much happier when he's exercising, especially when it's outside exercise, that makes him happiest'. In one case the child's preference for a certain activity was even reflected in their school work:

She seems to enjoy more gymnastics and more dance than doing say, rugby for example. So she tends to prefer stuff that she knows she enjoys, then she'll write more stories about what she enjoys, from as a result of the sports all her stories and writing that she writes in class are all gymnastics based. (Serena)

Louise spoke of how some children were opposed to certain types of exercise, such as swimming, but pointed out 'there's that many different sports and physical

activities that they can do, that there's always something else they could do.' All 5 of the participants expressed the idea that an exercise program for children with ASD should take into account what that child enjoys and is considered 'fun'. Most of the participants suggested activities that they felt would promote 'freedom' and 'self-expression' – two aspects of physical exercise that were believed to be of importance for children with ASDs. Suggested activities included athletics and swimming. For example, Serena said 'I'd just have different exercises of just running, moving, jumping, throwing their arms about and just keep it quite free and fun really, so they can just do what they want to do.' Freedom was integral to the idea of adapted exercise for most participants, but particularly for Jessica, whose narrative suggested that exercise was the biggest source of freedom for the nursery-age child she works with:

He tends to seem much happier when he's exercising. Especially when it's outside exercise. And also, when he's outside there's lots more space isn't there, so he's less likely to get triggered by other children cause he's in his own space and free, and that's what he doesn't like, people being in his space so, yeah he seems much calmer when he's been exercising.

Although freedom was thought to be important, there were also many referrals to the need for structure and guidance. Structured exercise, such as physical education or sports clubs, was valued as being more beneficial to the children than unstructured exercise, such as playtimes. Jessica said, 'the children aren't necessarily just gonna go and exercise without guidance', and many of the other education professionals also agreed that the children may need some encouragement to exercise. Louise talked at some length about how the children in her class 'don't necessarily do a lot of exercise at home' and how important it therefore was to regularly include exercise within the school program. Serena discussed an intervention program that was already active within her area, targeting children with ASDs. Her comments on the success of that intervention were particularly encouraging and highlight the benefit of exercise that has been specifically adapted to the needs of children with ASDs:

She has an opportunity to go to a different school, with, I think, 5 other children in the year that are autistic, who go to this other school and do sports specifically for children with autism, and with other children from different schools, they go and they do bowls, squash, and things like that where they're doing sport but they're feeling comfortable because they've got trained professionals who have got a better understanding of their needs. So that's really helped her.

## DISCUSSION

Through interviews, it was revealed that education professionals have generally positive perceptions of exercise as a suitable intervention for children with ASDs. The barriers to exercise, positive outcomes and features of a successful intervention were discussed; three themes emerged: increased adaptive behaviour, social skills and exercise, and the need for tailored physical activity. The perspectives put



forward in this study may have implications for future research and the design of potential exercise interventions.

Increased adaptive behaviour was discussed as a positive outcome arising from exercise. All of the children were reportedly calmer after exercising; this could be a result of the modulated arousal effect of exercise suggested by Robinson, Taylor and Carlson (1990). Alternatively, the relaxation could be related to a decrease in stereotypic behaviours (Bahrami, Movahedi, Marandi, & Abedi, 2012) as reduced movement was also reported. Some improvements in executive functioning were discussed, as participants noticed an increase in attention span as children focused on academic tasks for longer, which has been noted in previous research (Nicholson, Kehle, Bray, & van Heest, 2011). Similarly, inhibition of maladaptive behaviours, such as shouting out, supports existing findings (Lang et al, 2010). Exercise was used as a tool to manage behaviour by some of the participants, or as a regular part of the classroom routine to promote a positive learning environment. This supports the usefulness of exercise as an intervention strategy to be implemented at school and indicates that it may have numerous benefits.

Participants described social deficits as a common barrier to physical activity. This aligns with the findings of previous qualitative research with physical education teachers, who also saw social impairments presenting a challenge during inclusive P.E. (Obrusnikova & Dillon, 2011). Research suggests that exercise can reduce these social deficits however, and narratives from the participants supported the literature on exercise increasing social skills (Pan, 2010) and pro-social behaviour (Shleien, Heyne & Berken, 1988). Sowa and Meulenbroek (2012) found that group exercise was most beneficial for improving the social skills of children with ASDs. The opinions voiced in the interviews on the merit of group exercise were varied, however. The degree to which participants felt group exercise was beneficial appeared to be related to the degree of inclusion in physical activity. In some cases, the social difficulties faced by the children outweighed the benefit of social interaction, leading to children being unable to exercise with their peers.

To add to this, participants spoke of other barriers were experienced by the children which could further isolate them during exercise. Motor deficits may limit children's abilities to perform the same tasks as their peers (Pan, 2014) and an inability to think in an abstract way (Minschew, Meyer & Goldstein, 2002) renders parts of the physical education curriculum difficult to understand and engage in. This led participants to speak about the need for exercise to be tailored specifically to the needs of children with ASDs. This corroborates with the conclusions drawn from research by Healy, Msetfi and Gallagher (2013) who also concluded that children with ASDs required adaptive physical activity after interviewing several children with autistic spectrum disorders about their experiences in physical education, suggesting the perceptions of the teaching staff interviewed in this study are in line with the needs of the children. Predominantly there was focus on a need for simplicity - a lack of complicated rules and no abstract concepts. While research has yet to determine an optimal mode of exercise for use as an intervention, many of the suggestions made by participants have already been used successfully in research, such as athletics (Miltenberger & Charlop, 2014) and swimming (Yilmaz, Yanardag, Birkan & Bumin, 2004). Such activities were also believed to give the children a sense of 'freedom', which was deemed to be important to their well-being.

The educational professionals also emphasized that the exercise should be guided and structured, for fear that the children would not reliably engage in exercise on their own accord. Children with ASDs have previously been found to require more guidance during physical education than their peers (Pan, Tsai, Chu & Hsieh, 2011) and so the participants' recommendations of having trained professionals sensitive to the specific needs of children with ASDs to deliver an intervention are well-founded. Encouragingly however, was the fact that all of the children were stated to enjoy exercise. This falls in line with previous research, suggesting children with ASDs enjoy exercise as much as their peers (Potvin, Snyder, Prelock, Kehayia & Wood-Dauphinee, 2013). Research has also found that 'fun' exercise such as exergaming is more successful at motivating children to engage in physical activity (Finkelstein, Barnes, Wartell & Suma, 2013). In the interviews, participants expressed the need for the exercise to be enjoyable, and that they observed greater improvements in the children's behaviour after their preferred mode of exercise. This suggests that successful interventions could be influenced by the preferences of the children participating in order to increase exercise motivation.

The sample size of this study was limited due to time constraints and all participants worked with nursery to primary aged children, therefore the opinions expressed may only be of relevance to younger children with ASDs. As older children with ASDs are far less physically active than younger children (Memari et al, 2013), the perspectives of secondary school teachers may be quite different. Further research would therefore be needed in order to determine if the implications for a successful intervention are applicable to adolescents. A second limitation is that the findings also may not be relevant to interventions outside of the school environment as children and adolescents have different activity patterns outside of school (MacDonald, Esposito & Ulrich, 2011). Parental perspectives could be examined in future research and combined with findings from the present study, as well as the child's perspective in Healy, Msetfi and Gallagher's (2013) research to form an ethnographic approach to designing a suitable intervention.

Despite the limitations, the perspectives of the education professionals raised some interesting points for further study, as previous research had failed to identify what kind of intervention would be most suitable. Some participants used exercise to manage challenging behaviour and to promote adaptive behaviours. Of particular interest was the fact that some participants spoke about using exercise for very short periods of time (e.g. 10 minutes) or low intensity exercises that could be utilised in the classroom, and expressed that these methods were effective. As only one study was identified measuring the influence of intensity on the effectiveness of exercise (Kern, Koegel & Dunlap, 1984) and focused only on suppressing stereotypic behaviours, further research could investigate the efficacy of different exercise intensities for reducing maladaptive behaviour. If low-intensity exercise was shown to be effective as suggested by the teaching staff, it could be implemented with ease to manage challenging behaviour.

## **Conclusion**

The perspectives of the education professionals on the difficulties and needs of the children in terms of exercise provide insight into the features of a successful exercise intervention. It was felt that the physical education curriculum is not always suited to children with ASDs and without structured guidance children may not get

the exercise they require alone, therefore adapted physical exercise would be useful. Perceived benefits were an increase in adaptive behaviour and academic engagement, improved mood and increased sociability. Although social interaction during exercise reportedly improved social skills for many children, it was also a source of difficulty and fear for some of them. Furthermore, lack of understanding and motor deficits could further isolate them from other children in mainstream physical education. An exercise program specifically for children with ASDs would allow them to interact with each other socially without feeling restrained by any of the limitations they have in comparison to their typically-developed peers. Such a program would take into account the need for simplicity, freedom and enjoyment.

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