

An evaluation of sensory processing training on the competence, confidence and practice of teachers working with children with autism

Aideen Ruttledge

Middletown Centre for Autism, Middletown, UK, and

John Cathcart

Ulster University, Newtownabbey, UK

Abstract

Purpose – At present, there is no research to support teachers' use of sensory interventions in the classroom. This study aims to investigate the extent to how participation in a sensory processing training session would improve teachers' competence, confidence and practice towards supporting children with autism.

Design/methodology/approach – A pilot study design with mixed qualitative and quantitative methods was used to evaluate the impact of sensory processing training on six teachers who taught at least one child with autism in a mainstream school. The Autism Education Trust Competency Framework and face-to-face semi-structured interviews were completed with participants both pre (Time 1) and post (Time 2) training session.

Findings – Quantitative findings presented statistically significant differences ($p < 0.05$) in results with large effect sizes in the areas of confidence, knowledge, implementing sensory strategies, adjusting sensory environments, reviewing and reflecting. Qualitative data provided by participants corroborated this and indicated a need for further and more detailed training in the area. There was no change in the practice of teachers consulting with pupils about their sensory needs.

Practical implications – This study found that the attendance of teachers at sensory processing training is justified and the promotion of sensory processing training is therefore warranted.

Originality/value – Findings of this pilot study indicate that sensory processing training for teachers does improve competence, confidence and practice towards supporting children with autism. Review of the session to allow more detail, including consulting with the children themselves, is recommended.

Keywords Autism, Sensory processing, Teacher training

Paper type Research paper

Introduction

Latest reports state that 1.5 per cent of the school population in Ireland has a diagnosis of autism (National Council for Special Education, 2016a). Many children with autism require



additional support and accommodations to facilitate their successful participation in the school setting. In the Republic of Ireland, the range of placements include mainstream classes with and without support, autism-specific special classes and special schools ([Health Service Executive, 2012](#)). Schools should be adapted to meet the needs of children with autism, and this includes the need for teacher training programmes ([Department of Education and Skills, 2006](#)).

Sensory processing differences are now recognised as a core feature of autism with their inclusion in the *Diagnostic and Statistical Manual of Mental Disorders – 5th Edition* ([American Psychiatric Association, 2013](#)). Estimates on the prevalence of sensory features in autism vary from 80-95 per cent ([Tomcheck and Dunn, 2007](#); [Ben-Sasson et al., 2009](#)). Sensory processing difficulties limit a child's ability to achieve and maintain an optimal range of performance for adaptation and learning ([Tomcheck et al., 2014](#)).

The *Education for People with Special Educational Needs Act* ([Government of Ireland, 2004](#)) ensures all children with special educational needs receive a full learning experience in an inclusive school environment. Classrooms are typically challenging sensory settings. The nature of being seated in small groups leads to the likelihood of unpredictable tactile input. Furthermore, modern classrooms with interactive whiteboards and various wall displays can provide highly stimulating visual feedback. Concerns have been highlighted in relation to the presentation of academic material through verbal instruction and the effect of excessive noise on learning and attention ([Ashburner et al., 2008](#)).

Occupational therapists traditionally address sensory processing differences through therapy sessions and/or support and recommendations across home and school settings. Access to occupational therapy services in the Republic of Ireland involves extensive waiting lists. Reports show 3,611 children and young people under the age of 18 in Ireland are waiting for their first occupational therapy assessment ([Murphy O'Mahony, 2016](#)). Capacity to provide advice and support to teachers who are responsible for educating children with autism and sensory processing differences for approximately five hours each day, five days per week is extremely limited. This results in provision of an inclusive learning environment being compromised.

Continuous professional development for teachers in Ireland is essential to meet Teaching Council requirements for registration. At present there is no research to support teachers' use of sensory interventions in the classroom. [The National Council for Special Education \(2016b\)](#) recommended that appropriate training programmes should be funded and available to ensure that all teachers can acquire the requisite knowledge and skills to educate students with autism, whether in mainstream or special settings. The importance of educating and training teachers as to how to choose and implement evidence based therapeutic interventions within the context of their classroom is therefore necessary ([Reinson, 2012](#)).

The training at the focal point of this study is on the topic of sensory processing and is provided on average twenty-seven times per year throughout Ireland for parents and educational professionals by Middletown Centre for Autism. The centre is a cross-border government-funded organisation which provides learning support, assessment and training to parents and professionals of children and young people who have autism throughout the island of Ireland. According to the Department of Education and Skills' key statistics 2015/2016, there are 34,576 primary school teachers in Ireland. In 2016, 757 primary school teachers received sensory processing training by Middletown Centre for Autism ([Middletown Centre for Autism, 2017](#)). The session lasts for 2 hours and examines how the sensory processing differences associated with autism, impact on learning, play, social interactions and behaviour in the school environment. It aims to facilitate the development

of simple strategies to alleviate sensory differences and customise the environment to accommodate sensory needs. In-depth evaluation of the impact such training has on teaching students with autism has not been undertaken to date.

Modification of the school environment has been increasingly recognised in the scientific literature to support the effective inclusion of children with autism and sensory processing differences. Research has demonstrated that sensory stimulation, in particular visual (Kanakri *et al.*, 2017) and auditory (Miller-Kuhaneck and Kelleher, 2015), has a significant impact on the arousal of children with autism in the classroom. This in turn has been found to negatively affect performance on classroom tasks. Piller and Pfeiffer (2016) examined the perspective of 13 teachers and therapists on sensory related environmental impediments to participation within the preschool setting. The study was solely qualitative in nature and relied on participants' verbal descriptions of perceived experiences. It also focussed on environmental components of sensory functioning within the classroom and did not consider other aspects such as use of sensory strategies. Themes which emerged were that sensory aspects of the environment played a significant role in children avoiding a task. Participants in the study identified environmental modifications as essential to promote participation for the child with autism in the classroom. This finding supports a previous study by Kinnealey *et al.* (2012) which examined the effects of environmental adaptations on the attention and engagement of four students with autism. The environmental adaptations in this study were restricted to lighting and sound modifications (halogen lighting and sound absorbing walls). It was found that these adaptations increased the frequency and stability of attending and engagement for these students.

Howe and Stagg (2016) used a qualitative research study to investigate the experiences of sixteen children with autism while they are in the classroom at school. They found that sensory sensitivity effected participants learning, and that the sensory experiences of children in school were largely negative. The study was carried out with adolescents who completed a questionnaire without the researcher present which resulted in very little detail being obtained about the classroom experience. Fernandez-Andre *et al.* (2015) found that in a group of children with autism, teachers reported greater dysfunction in the classroom environment than parents in the home environment. Reasons suggested for this included the presence of certain environmental factors in the classroom such as stimulation overload produced by excessive noise or unpredictable physical contact from peers. This is in keeping with a study by Ashburner *et al.* (2008) which was cited in 237 subsequent articles and recommended that classroom acoustics and tactile input within school environments need to be addressed. These studies recommend that schools need to create sensory profiles for each student with autism. It is suggested that increasing the understanding of school staff in this area will further enhance the quality and appropriateness of interventions, thus enabling these students to access the curriculum and realise their own potential in the classroom.

Worthen (2010) critically appraised 13 studies examining sensory-based interventions in the general education classroom. It was concluded that school staff should be required to increase their understanding of research in this area and how it can be applied in the classroom environment. Implications for future research included the need to determine the extent to which sensory-based techniques are being implemented in the general education classroom and to establish the most effective ways of increasing teacher knowledge of sensory processing. Some sensory approaches used in school settings, such as strategies to increase attention and the use of dynamic seating (Bagatell *et al.*, 2010), have shown encouraging results. Oriel *et al.* (2011) and Nicholson *et al.* (2011) demonstrated the positive effects of physical exercise on academic engagement for children with autism. Following on from this, Ashburner *et al.* (2014) also highlighted the effectiveness of movement breaks as a

sensory strategy in schools. Mills *et al.* (2016) examined the effectiveness of a sensory activity schedule in supporting participation and increasing classroom task performance in four students with autism. This study concentrated on sensory strategies only and did not consider the impact of the environment on performance. It was found that targeted sensory activities may have a positive effect on classroom task mastery and that there is little guidance about how to instruct school staff as to how to best to utilise sensory-based activities in the classroom.

Method

This research project was carried out as a pilot study using mixed qualitative and quantitative methods. Purposive sampling was used to identify teachers to participate in this study and all teachers received the training. The following criteria was applied to ensure teachers with rich information on the topic were included:

- Be a full-time primary school teacher in a mainstream school.
- Have a minimum of one child with autism and sensory processing differences in their class.
- No previous sensory processing training.

The independent variable in this study was:

- The training session attended by teachers.

The dependent variables in this study were:

- Measuring changes in the confidence of teachers in identifying sensory processing differences in the pupils they work with.
- Measuring changes in teachers' competency in making environmental adaptations to suit the needs of pupils with sensory processing differences.
- Measuring changes in teachers' competency to practice basic sensory strategies to meet the sensory processing differences of pupils in their class.

The hypothesis being tested was that participation in a two hour sensory processing training would improve teachers' self-reported competence, confidence and practice towards identifying and supporting children with autism. If the hypotheses are confirmed, this study will further develop the evidence base for teachers to engage in continuous professional development in sensory processing.

The training was carried out by a member of staff from Middletown Centre for Autism who has completed post graduate training in sensory integration and was not involved in this study.

The Autism Education Trust (AET) developed a set of competencies to describe the knowledge, understanding and skills required for staff to work effectively with children with autism aged between 5 and 16 years. The *AET Competency Framework* (Wittemeyer *et al.*, 2015) details 57 competencies, 5 of which are specific to sensory processing and were used in this particular study. These competencies were rated as either *Not yet developed/Developing/Established*. The participant (i.e. the teacher) was also required to rate the priority level of each competency based on the current population of children with autism in their class. Priority levels were further rated as *High/Medium/Low*. If a competency was rated as *Established*, the teacher was required to provide evidence in the form of documentation (D) (policy document, accounts from pupils, staff or parents, records on

training events), for relevant practice to be observable (O) within the school setting and for colleagues, parents/carers or pupils to be able to voice (V) their views on the competency if asked. The five sensory processing specific competencies were used as a baseline measure prior to the sensory training session (Time 1) and as a post measure eight weeks following the session (Time 2). The *AET* framework was used to collate both qualitative and quantitative data.

As no research was currently available on this topic, this study also aimed to explore the experiences and views of teachers on supporting children with autism and sensory processing differences in the school environment. A pre-training face to face semi-structured interview collected general demographic data using questions such as how many children with autism were in the class and how many years teaching experience participants had. The pre-training interview content also collected data to inform confidence and current practice regarding how the needs of children with sensory processing were met prior to attending training. A mix of closed- and open-ended questions in a Likert scale were used to allow the interviewee flexibility to facilitate the collection of exploratory data. This interview was completed along with the *AET Competency Framework* nine weeks before the training (Time 1). Eight weeks post training (Time 2), the *AET Competency Framework* and face-to-face interviews were repeated. A dictaphone was used to record the face to face semi-structured interviews. Content of the interviews were then transcribed verbatim.

Ethical considerations

Ethical approval to undertake this study was granted by Ulster University Ethics Committee.

Participants

Eleven teachers participated at Time 1 of the study, which commenced in January 2018. The sensory processing training then took place in March 2018. After the training, at Time 2, a full data set was obtained for 54.5 per cent of the original sample set, with six female teachers returning to participate in April 2018. The reason for dropout was severe weather conditions at the time of the training; this resulted in five teachers being unable to attend the training and therefore unable to participate at Time 2. The teachers came from a mainstream mixed gender school in Dublin, Ireland. The school had a total of 410 children enrolled, 26 of which had a diagnosis of autism. None of the teachers had experience in liaising with a professional regarding sensory processing in the past. Each participant was identified A-F. The number of children with autism taught by each of the teachers was between one and two, and the age range was from 4 to 10 years. The number of years of teaching experience of each of the teachers ranged from 1 to 10 years.

Data analysis

Dependent sample t-tests were used to analyse quantitative data gathered from participants using the *AET Competency Framework*, Likert scale and closed questions. Differences between mean scores from participants before (Time 1) and after (Time 2) receiving the training were analysed using *IBM SPSS version 24 for Windows* (2016) software. The guidelines proposed by [Cohen \(1988\)](#) were used to interpret the eta squared effect size values (0.01 = small effect size, 0.06 = moderate effect size, 0.14 = large effect size).

To analyse the qualitative data, repeated readings of interview transcripts took place to search for meanings and patterns. Recurring items of interest were highlighted and coded as they related to one another. The *QSR International's NVivo 11 Qualitative Data Analysis Software* (2015) was then used to collate and organise all relevant data extracts into themes.

Thematic analysis was used as it can produce trustworthy and insightful findings (Braun and Clarke, 2013).

Results

Quantitative results

Quantitative results were derived from semi-structured interviews which used both open- and close-ended questions on a Likert scale at Times 1 and 2. Table I demonstrates the questions which yielded the quantitative data. No significant change occurred in participant's ability to identify sensory processing concerns between Time 1 and Time 2, ($p > 0.05$). A significant increase in the use of sensory strategies was found when mean scores for all participants were compared between Time 1 and Time 2 ($p = 0.025$) with a large effect size (0.6 eta squared). Furthermore, participant's knowledge and confidence in the area of sensory processing significantly improved between both time points ($p < 0.05$) with large effect sizes (0.91 and 0.74 eta squared respectively).

In addition to the semi-structured interviews, participants also provided ratings to the *AET Competency Framework's* five sensory processing specific competency questions at Time 1 and Time 2. As shown in Table II, significant increases in ratings were obtained for three of the five questions ($p < 0.05$) between Time 1 and Time 2. Two of these questions related to environments: *AET* Question 50 Creating Suitable Learning Environments and *AET* Question 52 Enabling Sensory Friendly Environments; with large effect sizes (0.83 and 0.6 eta squared, respectively). The third question (*AET* Question 53) related to reflecting and reviewing practices to address sensory processing needs. Question 53's eta squared statistic (0.59) indicated a large effect size.

Each of the *AET* competency questions also came with a priority rating. There were no significant changes in how participants rated the importance of each of the five sensory processing specific competencies between Time 1 and Time 2. No significant changes were found for *AET* question 55 ($p > 0.05$), which related to consulting with children about their needs within their learning environment. This indicates that participants had not yet implemented any changes in this competency area between Time 1 and Time 2.

Qualitative results

Two overarching themes were derived from the qualitative data using thematic analysis: training and development (Theme 1) and sensory strategies (Theme 2). Table III details participant responses within the training and development theme, which was further developed into subthemes.

Theme 1: Training and development

Identifying sensory processing differences. Participants were asked at Time 1 and Time 2 about their ability to recognise sensory processing concerns in the children they worked with. Descriptions given by participants about the presenting sensory concerns indicated an increase in competence as shown in Table III. At Time 1, some descriptions given by participants did not refer to sensory processing. In contrast, each participant gave a more detailed response that was related specifically to sensory processing at Time 2. Additionally, three participants gave detailed information on sensory concerns at Time 2, which were not reported at Time 1.

Reviewing and reflecting on the sensory approach taken. At Time 1 and Time 2, participants described their current use of reflection and review in relation to their practice. Whilst at Time 1, this practice was already in place, by Time 2, participants were more explicit in how this was carried out. They referred to an expansion of their practice within

Table I.
Changes in semi-
structured interview
responses between
Time 1 and Time 2

Variable	Time 1 Mean (SD)	Time 2 Mean (SD)	T	df	Sig (2 tailed)	Mean decrease	Confidence interval	Eta squared
Identifying sensory processing concerns	0.83 (0.40)	1.00 (0.00)	-1.0	5	0.363	-0.17	From -0.60 to 0.26	N/A
Use of sensory strategies	0.33 (0.52)	1.0 (0.00)	-3.16	5	0.025	-0.67	From -1.21 to -0.12	0.6 (Large)
Knowledge	2.33 (0.52)	3.5 (0.55)	-7.0	5	0.001	-1.17	From -1.60 to -0.74	0.91 (Large)
Confidence	2.33 (0.52)	3.5 (0.55)	-3.80	5	0.013	-1.17	From -1.96 to -0.38	0.74 (Large)

Variable	Time 1 Mean (SD)	Time 2 Mean (SD)	<i>t</i>	<i>df</i>	Sig (2 tailed)	Mean decrease	Confidence interval	Eta squared
Question 1: Identifying Strengths and Challenges in Sensory Processing	0.83 (0.41)	1.17 (0.41)	-1.56	5	0.175	-0.33	From -0.86 to 0.21	N/A
Question 1: Priority Rating	2.0 (0.00)	2.0 (0.00)	N/A	N/A	N/A	N/A	N/A	N/A
Question 50: Creating Suitable Learning Environments	1.00 (0.00)	1.83 (0.41)	-5.00	5	0.004	-0.83	From -1.26 to -0.40	0.83 (Large)
Question 50: Priority Rating	1.83 (0.41)	2.0 (0.00)	-1.00	5	0.363	-0.17	From -0.60 to 0.26	N/A
Question 52: Enabling Sensory Friendly Environments	1.00 (0.00)	1.67 (5.16)	-3.16	5	0.025	-0.67	From -1.21 to -0.12	0.6 (Large)
Question 52: Priority Rating	1.83 (0.41)	2.0 (0.00)	-1.00	5	0.363	-0.17	From -0.60 to 0.26	N/A
Question 53: Reflecting and Reviewing Practices	0.83 (0.41)	1.67 (0.52)	-2.71	5	0.042	-0.83	From -1.62 to -0.04	0.59 (Large)
Question 53: Priority Rating	1.83 (0.41)	2.0 (0.00)	-1.00	5	0.363	-0.17	From -0.60 to 0.26	N/A
Question 55: Consulting with Children	1.17 (0.41)	1.33 (0.52)	-1.0	5	0.363	-0.17	From -0.60 to 0.26	N/A
Question 55: Priority Rating	2.00 (0.00)	2.00 (0.00)	N/A	N/A	N/A	N/A	N/A	N/A

Table II.
Changes in AET
competency
framework between
Time 1 and Time 2

	Theme		Time Point
	Theme 1: training and development	Time 1	Time 2
Identifying sensory processing differences		“With him it’s more muscular, it’s not really sensory processing” – Teacher A	“So I would have a child who would have issues around sort of noise levels, seating issues and sort of where things are placed within the room, em so sort of visual” – Teacher A
Reviewing and reflecting on sensory approach taken		“Big reviews happen at the end of the year” – Teacher B “I would review with SNA, now obviously because she is spending a lot of time one on one with this child and you know when they are out of the classroom together” – Teacher C	“Ya know I suppose since the training I’ve joined with colleagues to discuss and reflect on pupils with sensory processing issues in the school em to share ideas of things we’ve tried since the training, things that work and things that em maybe are helpful” – Teacher B “Now that we have more ideas we are checking in and reflecting more and now that we’ve gotten to know the child more as well” – Teacher C
Current training needs		“If I was to be critical of myself and ask do I have a list of strategies that I currently employ? I probably need more knowledge to be honest with you if that’s what the training might give me . . . do you know what I mean?” – Teacher B “Well I would like to know as much as possible to be quite honest with you, em, pretty much any facet that would be available to help you in the school situation as every case is different. I can’t wait for the training, just to find out more, see what I can be doing” – Teacher C	“Yeah I’d like to attend more training on the topic em, ya know to have more in-depth knowledge em ya know although I think we learnt lots of practical strategies ya know I’d like to develop my skill set even more em and to attend further training” – Teacher B “I’d still like to learn more . . . cause it was only one afternoon. I think I’d like to learn more strategies I can use. So I think I’d love a bit more information about things I can do in the classroom with her to help with a number of different things you know the way . . . nearly a list of things that I can say Ok I’ve tried this tick it off if it has or hasn’t worked. But probably for me as well I just need to go to a few more seminars like that just to learn more for myself and to grow in confidence too” – Teacher C
Training feedback	Theme		“Em I think what I found really helpful in the training were some of the things that you could use within the class, I know they were talking about the band that goes around the chair- the theraband. I think things like that are really helpful to know they are out there” – Teacher D “Em, getting actual first-hand information from someone with autism. Em, the little boy I teach hates going to the canteen then it showed what it was like going into a supermarket you know that completely made me not understand but I could totally see where he was coming from then if the canteen sounds like that to me what does it sound like to him? Probably ten times worse now I feel bad bringing him there” – Teacher F

Table III.
Participant quotes
within training and
development theme

this area due to the new information they received at the training and a desire to now discuss and reflect on which sensory approaches were helpful or effective.

Current training needs. At Time 1, participants emphasised the significance of attending the training session and indicated their motivation to learn more about sensory processing. At Time 2, they continued to highlight how further training was necessary in this area, specifying their need for additional sessions and more detailed knowledge and information on how to support the children they work with. Reference was also made to the length of the session, *it was only one afternoon*, and the limitations this had on the impact of their learning.

Feedback from training session. An additional theme to qualitative data at Time 2 was feedback from participants regarding the training session. Participants highlighted the benefits and value of attending the training to improve their awareness of sensory processing differences experienced by people who have autism. The demonstration of how various resources can be used to help children in the classroom was also noted by participants as being helpful.

Theme 2: Sensory strategies

Table IV details participant responses within the sensory strategies theme, which was further developed into subthemes:

Tactile. Four of the participants referred to an increase in the use of tactile strategies, these included specifics such as feely boxes, fidget toys and messy play materials. Resources demonstrated at the training had been sourced by the teachers and were in use by Time 2: *I had a fidget box now that I didn't have before.*

Visual. Three participants had introduced visual strategies at Time 2. No reference had been made to the use of visual strategies at Time 1 by any of the participants. Strategies included environmental adaptation such as reducing visual stimuli within the class and positioning the child directly in front of the white board.

Calm area. One participant detailed their successful use of a calm area at Time 1 as a break from sensory stimuli. By Time 2, three additional participants had implemented the use of calm areas for the children they worked with and described the strategy as being *helpful* and a *preventative classroom management strategy*.

Movement. Two participants had been using movement strategies at Time 1. This included the use of a *wiggle cushion* and movement breaks on the trampoline. At Time 2, these participants detailed new movement strategies they had used, such as the use of a TheraBand. Two additional participants had implemented movement breaks by Time 2, these included going on short messages around the school for the purpose of movement and the use of a trampoline. Positive observations on using movement break strategies were also reported by participants: *She's reacting well to having those things.*

Discussion

This pilot study set out to investigate the extent to how participating in a two hour sensory processing training for teachers would improve their competence, confidence and practice in working with children with autism. Quantitative findings presented statistically significant differences in results from a semi-structured interview and the *AET Competency Framework* which were used before (Time 1) and after (Time 2) attending the training. Although this was a pilot study with a small sample size, the inclusion of quantitative results was intended to add scientific rigour to the study design. Qualitative findings also showed a contrast between responses at Time 1 and Time 2.

There was disparity between quantitative and qualitative results on participant's ability to recognise sensory processing concerns in children they worked with. Quantitative results were

Theme Theme 2: sensory strategies	Time Point	
	Time 1	Time 2
Tactile	“We let him bring a soft toy to resource teaching and then if he goes to the sensory room or ball pool as well we let him bring a soft toy. So that he can feel it on the way” – Teacher F	“I had a fidget box now that I didn’t have before and I got those beads and the theraputtty which I wouldn’t have had before. Even the theraputtty I would give out to him if he was unsettled or upset and he would use it” – Teacher F
Visual	No reference by any participants	“Since the training I’ve tried to reduce the amount of visual displays cause suppose I’m conscious that it can be overwhelming for the little boy” – Teacher B “He is sitting up against a wall so there’s just a wall in front of him and he has his words on the wall so that they are directly in front of him whereas before I would have been putting them on the table. Em, so that’s one way I’ve altered it that I wouldn’t do for other children” – Teacher F
Calm Area	“If there was an area in the class that he could go to it would mean he wouldn’t have to step out, he could go there and calm himself down for a while . . . that would be nice” – Teacher A No reference made by Teacher E	“So he would have his own space in the calm corner now” – Teacher A “Having a calm corner as well was another thing that we implemented em” – Teacher E
Movement	No reference made by Teacher C or E	“Yeah well since doing the course I’ve made sure to have like things like the theraband on the chair which seems to be quite good, she seems to like it cause she would have been a bit of a tapper do ya know things like that so there’s less of that which is brilliant. So yeah no, she’s reacting well to having those things so she needs them” – Teacher C “Em yeah providing more opportunities I suppose for movement breaks and for sensory needs as well throughout the day” – Teacher E

Table IV.
Participant quotes
within sensory
strategies theme

not statistically significant; however, teachers gave more detailed interpretations at Time 2 of sensory processing concerns compared to Time 1. Teacher A did not recognise any sensory concerns at Time 1 however at Time 2 she gave a comprehensive account of sensory concerns noted in one child. Most of the teachers were aware of sensory processing concerns at Time 1, which may explain why there was only a modest increase by Time 2 in quantitative data. In contrast, the qualitative information provided was much more detailed by Time 2, indicating teachers were more competent at recognising sensory processing concerns at Time 2.

There was a statistically significant increase in the use of sensory strategies by the teachers between Time 1 and Time 2. These findings were corroborated by qualitative data provided by the participants. At Time 1, five of the teachers referred to sensory strategies they had in place prior to the training. At Time 2, all six teachers had used new sensory strategies. Teacher C introduced sensory strategies for the first time in her class following the

training. The strategies used by teachers included tactile, movement and visual. Visual strategies specifically had not been referenced by any of the teachers at Time 1, which would indicate they had been introduced to the concept during the training. This study responds to the work of [Mills et al. \(2016\)](#) which had concluded that there is little guidance about how to instruct school staff as to how best to utilise sensory based activities in the classroom.

Self-reported ratings of knowledge and confidence on the topic of sensory processing yielded statistically significant increases between Time 1 and Time 2. Qualitative feedback however indicated that teachers still felt they required additional training in sensory processing. Teachers A, B, C and F stated that they required further education and development in this area. A review on the length of the training session to accommodate additional content or consideration of a more detailed follow up training session may therefore be necessary.

The *AET Competency Framework* generated both quantitative and qualitative data. Three out of the five questions produced statistically significant results. Two of these questions relating to sensory friendly environments (Questions 50 and 52) also delivered qualitative information detailing approaches introduced by the participants. These included the setup of calm areas and other environmental strategies such as adjusting visual stimuli within the classroom. This supports previous recommendations by [Smith-Roley et al. \(2015\)](#), who posited that part of the occupational therapist's role in providing intervention for students with sensory difficulties should involve the delivery of professional development programmes based on sensory integration theory and methods to teachers. They suggested training should include input on sensory processing patterns and ways to adapt the classroom or playground environment to enhance student engagement. This also reflects the proposal by [Ashburner et al. \(2014\)](#) for the development of a clinical reasoning framework which involves strategies to optimise participation of students with autism experiencing sensory challenges. It was also proposed that it may be worthwhile for occupational therapists to invest time in educating teachers about the need to improve the sensory characteristics of school environments. This study has aimed to evaluate the effectiveness of such education.

Another statistically significant outcome in this study was demonstrated by *AET* Question 53 which showed an increase in reviewing and reflecting on the practice used within the area of sensory processing. Teachers further endorsed this finding by describing an increase in meetings with colleagues to review and reflect on new strategies they had implemented following the training. *AET* Question 55, which was related to consulting with children themselves about their sensory needs within the class setting, did not result in significant change between Time 1 and Time 2. Furthermore, qualitative data did not show any evidence of change in this area. As teachers did not refer to any attempts to initiate collaboration following the training, this may indicate that the training content did not address this competency area. Explicit advice and support in how to initiate collaboration between teachers and pupils in addressing sensory needs may be necessary as part of training content.

At Time 2, all teachers referred to aspects of the training they found helpful and which broadened their understanding of the subject. Similar feedback was given by several teachers, including the impact of the video footage in helping comprehend the experiences of having sensory processing needs. Seeing resources in person and learning what specifically they can be used for within the classroom was also highlighted.

Priority ratings did not change between Time 1 and Time 2. Both before and after the training participants rated all sensory processing areas of the *AET Competency Framework* as high priority. This would suggest that the teachers in this study were motivated and valued sensory processing as an important factor to consider within their roles.

This study departed from previous studies in so far as it acted on recommendations that training on sensory processing was necessary and set out to evaluate the impact of such training on the performance of teachers. As the dependent variables were observed, the attendance of teachers at sensory processing training is justified and the promotion of sensory processing training is warranted. This may facilitate the implementation of evidence-based sensory strategies within the classroom routine to improve outcomes for children with autism (Prizant *et al.*, 2003).

This has implications for occupational therapy practice. Occupational therapists traditionally address sensory processing differences through therapy sessions and/or support with recommendations across home and school settings. The provision of such training to teachers may impact on immediate caseload management. However, one could argue in the longer term that the impact of raising awareness and competence of teachers in this area will reduce referral numbers as sensory processing needs will be accommodated within the classroom. This may allow greater capacity for occupational therapists to allocate time to address complex sensory processing concerns in children with autism and also reduce waiting lists.

Confounding variables of this study include the possibility that teachers accessed other sources of information to develop their knowledge on sensory processing such as relevant literature. A bias which may have influenced the internal validity of this study is the fact that participants enrolled on the training of their own volition and were therefore likely to be motivated to learn and acquire new skills in the area of sensory processing. It is therefore not possible to say definitively that changes in practice are due solely to teachers having attended the training. Teachers were aware that they would return to complete interviews at Time 2 and may have furthered their knowledge independently to prepare.

Future research may involve examining the impact sensory processing teacher training has on the presentation of children with sensory processing differences in the classroom. Consideration of the influence that teacher sensory processing training has on the performance of children with autism in class may yield powerful findings. As this was a relatively short time frame (eight weeks between the training and Time 2 data collection), it would be beneficial to know if changes in teacher practice within this area were sustained over a longer time frame. A larger sample and consideration of the inclusion of a control group may also be beneficial. Comparisons could be drawn from outcomes of interviews between participants who had attended the training and those who had not. The control group could then attend the training following the Time 2 data collection.

Limitations

This study was limited in that there was one main researcher. Rigour in qualitative and quantitative data analysis is therefore compromised as it was completed solely by the researcher. The sample dataset was small due to the non-attendance at the training by a number of the original sample of teachers. Having a small, non-randomised sample size and no control group has implications for the generalisability of the results obtained. The purposive sample was quite homogeneous with regard to age, gender and number of children being taught with autism and sensory processing needs. Therefore, caution should be exercised if generalising these findings to a larger population. Another factor to consider is that teachers knew they were participating in an evaluative study and may have felt that some responses were more desirable.

Conclusion

To conclude, the significant findings of this pilot study indicate that sensory processing training for teachers can improve competence, confidence, and practice towards identifying

and supporting children with autism who have sensory processing differences. Review of the length of the training session to allow more detail or a follow up session is recommended. Revision of the content to include support on how to involve the children themselves in meeting their sensory needs is also indicated. The results of this study should however be treated with caution given the small sample size and absence of a control group. Further research is also warranted to determine sustainability of change in practice and the impact of training teachers in this area has on the functioning of children with autism.

Key findings

- Sensory processing training for teachers improves competence, confidence, and practice.
- Further improvements on training content are warranted to include greater detail and how to consult with children on their sensory processing needs.

What the study has added

This is the first study, to the authors' knowledge, to evaluate the impact of sensory processing training on the competence, confidence and practice of teachers of children with autism.

References

- American Psychiatric Association (2013), *Diagnostic and Statistical Manual of Mental Disorders, DSM-5*, American Psychiatric Association, Washington, DC.
- Ashburner, J., Rodger, S., Ziviani, J. and Hinder, E.A. (2014), "Optimizing participation of children with autism spectrum disorder experiencing sensory challenges: a clinical reasoning framework", *Canadian Journal of Occupational Therapy*, Vol. 81 No. 1, pp. 29-38.
- Ashburner, J., Ziviani, J. and Rodger, S. (2008), "Sensory processing and classroom emotional, behavioural, and educational outcomes in children with autism spectrum disorder", *The American Journal of Occupational Therapy: Official Publication of the American Occupational Therapy Association*, Vol. 62 No. 5, pp. 564-573.
- Bagatell, N., Mirigliani, G., Patterson, C., Reyes, Y. and Test, L. (2010), "Effectiveness of therapy ball chairs on classroom participation in children with autism spectrum disorders", *The American Journal of Occupational Therapy : Official Publication of the American Occupational Therapy Association*, Vol. 64 No. 6, pp. 895-903.
- Ben-Sasson, A., Hen, L., Fluss, R., Cermak, S.A., Engel-Yeger, B. and Gal, E. (2009), "A meta-analysis of sensory modulation symptoms in individuals with autism spectrum disorders", *Journal of Autism and Developmental Disorders*, Vol. 39 No. 1, pp. 1-11.
- Braun, V. and Clarke, V. (2013), *Successful Qualitative Research: A Practical Guide for Beginners*, Sage, London.
- Cohen, J.W. (1988), *Statistical Power Analysis for the Behavioural Sciences*, 2nd ed., Lawrence Erlbaum Associates, Hillsdale, NJ.
- Department of Education and Skills (2006), *Evaluation of Educational Provision for Students with Autistic Spectrum Disorders*, The Stationery Office, Dublin.
- Fernandez-Andre, M.I., Pastor-Cerezuela, G., Sanz-Cervera, P. and Tarraga-Minguez, R. (2015), "A comparative study of sensory processing in children with and without autism spectrum disorder in the home and classroom environments", *Research in Developmental Disabilities*, Vol. 38, pp. 202-212.

- Government of Ireland (2004), *Education for Persons with Special Educational Needs Act*, The Stationery Office, Dublin.
- Health Service Executive (2012), "National review of autism services past, present and way forward", available at: www.hse.ie/eng/services/Publications/services/Disability/Autismreview2012.pdf (accessed 1 March 2017).
- Howe, F.E.J. and Stagg, S.D. (2016), "How sensory experiences affect adolescents with an autistic spectrum condition within the classroom", *Journal of Autism and Developmental Disorders*, Vol. 46 No. 5, pp. 1656-1668.
- Kanakri, S.M., Shepley, M., Tassinary, L.G., Varni, J.W. and Fawaz, H.M. (2017), "An observational study of classroom acoustical design and repetitive behaviours in children with autism", *Environment and Behaviour*, Vol. 49 No. 8, pp. 847-873.
- Kinnealey, M., Pfeiffer, B., Miller, J., Roan, C., Shoener, R. and Ellner, M.L. (2012), "Effect of classroom modification on attention and engagement of students with autism or dyspraxia", *The American Journal of Occupational Therapy : Official Publication of the American Occupational Therapy Association*, Vol. 66 No. 5, pp. 511-519.
- Middletown Centre for Autism (2017), *Attendance Figures for Teacher Professional Development in Sensory Processing*, MCA, Middletown.
- Miller-Kuhaneck, H. and Kelleher, J. (2015), "Development of the classroom sensory environment assessment (CSEA)", *American Journal of Occupational Therapy*, Vol. 69 No. 6, pp. 1-9.
- Mills, C., Chapparo, C. and Hinit, J. (2016), "The impact of an in-class sensory activity schedule on task performance of children with autism and intellectual disability: a pilot study", *British Journal of Occupational Therapy*, Vol. 79 No. 9, pp. 530-539.
- Murphy O'Mahony, M. (2016), "Budget must address rising waiting lists for occupational therapy", available at: www.fiannafail.ie/budget-must-address-rising-waiting-lists-for-occupational-therapy-omahony/ (accessed 11 July 2017).
- National Council for Special Education (2016a), "NCSE press release 15 July 2016 major education report finds 14,000 students have autism diagnosis", available at: http://ncse.ie/wp-content/uploads/2016/07/6_Press_release_ASD.pdf (accessed 21 February 2019)
- National Council for Special Education Policy Advice (2016b), "Supporting students with autism spectrum disorder in schools: a guide for parents/guardians and students", available at: www.ncse.ie/policy-advice-on-supporting-students-with-Autism-spectrum-disorder-in-schools (accessed 14 March 2017).
- Nicholson, H., Kehle, T.J., Bray, M.A. and Van Heest, J. (2011), "The effects of antecedent physical activity on the academic engagement of children with autism spectrum disorder", *Psychology in the Schools*, Vol. 48 No. 2, pp. 198-213.
- Oriel, K.N., George, C.L., Peckus, R. and Semon, A. (2011), "The effects of aerobic exercise on academic engagement in young children with autism spectrum disorder", *Pediatric Physical Therapy : The Official Publication of the Section on Pediatrics of the American Physical Therapy Association*, Vol. 23 No. 2, pp. 187-193.
- Piller, A. and Pfeiffer, B. (2016), "The sensory environment and participation of preschool children with autism spectrum disorder", *Otjr: Occupation, Participation and Health*, Vol. 36 No. 3, pp. 103-111.
- Prizant, B.M., Wetherby, A.M., Rubin, E. and Laurent, A. (2003), "The SCERTS model: a transactional, family-centred approach to enhancing communication and socioemotional abilities of children with autism spectrum disorder", *Infants and Young Children*, Vol. 16 No. 4, pp. 296-316.
- QSR International (2015), "NVivo qualitative data analysis software, version 11",
- Reinson, C. (2012), "A collaborative decision tree system for designing a sensory diet curriculum for children with autism in the classroom setting", *Journal of Occupational Therapy, Schools, and Early Intervention*, Vol. 5 No. 1, pp. 61-72.

-
- Smith-Roley, S., Bissell, J. and Frolek Clark, G.J. (2015), "Occupational therapy for children and youth using sensory integration theory and methods in school-based practice", *American Journal of Occupational Therapy*, Vol. 69 No. 1, pp. 1-20.
- Tomcheck, S.D. and Dunn, W. (2007), "Sensory processing in children with and without autism: a comparative study using the short sensory profile", *The American Journal of Occupational Therapy : Official Publication of the American Occupational Therapy Association*, Vol. 61 No. 2, pp. 190-200.
- Tomcheck, S.D., Huebner, R.A. and Dunn, W. (2014), "Patterns of sensory processing in children with an autism spectrum disorder", *Research in Autism Spectrum Disorders*, Vol. 8, pp. 1214-1224.
- Wittemeyer, K., English, A., Jones, G., Lyn-Cook, L. and Milton, D. (2015), *Schools Autism Competency Framework*, AET, London.
- Worthen, E. (2010), "Sensory-Based interventions in the general education classroom: a critical appraisal of the topic", *Journal of Occupational Therapy, Schools, and Early Intervention*, Vol. 3 No. 1, pp. 76-94.

Further reading

- Department of Education and Skills (2017), "Key statistics 2015/2016", available at: www.education.ie/en/Publications/Statistics/Key-Statistics/Key-Statistics-2015-2016.pdf (accessed 12 March 2017).
- IBM Corporation (2016), *SPSS for Windows, Version 24*, IBM Corp, Armonk, New York, NY.

Corresponding author

Aideen Ruttledge can be contacted at: aideenmcmanus@hotmail.co.uk

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgrouppublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com