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## A sequential mixed-methods approach to exploring the experiences of practitioners who have worked in multi-sensory environments with autistic children

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### ABSTRACT

**Background & Aims:** Multi-Sensory Environments (MSEs) are common in special-needs schools and are widely used with autistic pupils. In this exploratory sequential mixed-methods study, we explored the beliefs and experiences of practitioners who regularly use MSEs with autistic pupils. **Methods:** Qualitative interviews with ten practitioners (9 female, aged 24–62 years) identified six themes reflecting beliefs about MSE use with autistic children. To explore wider relevance of these themes, codes from the themes were converted into a 28-item online survey.

**Results:** Qualitative themes included: (1) MSEs are perceived to benefit behaviour, attention and mood, (2) MSEs have distinct properties that facilitate benefits, (3) MSE use should be centred on the child's needs, (4) MSEs are most effective when the practitioner plays an active role, (5) MSEs can be used for teaching and learning, and (6) MSE use can present challenges. Responses to the survey ( $n = 102$ , 93 female, aged 21–68 years) generally showed good agreement with the original interviews, and there was modest evidence that MSE training affected beliefs about the benefits of MSE use.

**Conclusions & Implications:** These results provide insight into possible benefits of MSE use for autistic children and are relevant when considering the development of practitioner guidelines.

### What this paper adds

Multi-Sensory Environments (MSEs) are widely used with autistic children but there is limited research in this area, with little known about how and why these rooms are used. Indeed, there are currently no evidence-based guidelines on how to use MSEs for maximum benefit with autistic children. This study is the first to explore the beliefs of practitioners about MSE use for autistic children, giving opportunity to learn from their perspectives. Using an exploratory sequential mixed-methods design, initial qualitative interviews were supplemented by confirmation in a larger sample of 102 practitioners. Overall, practitioners believed that MSEs fostered behavioural change and supported learning for their autistic pupils. Practitioners identified distinct properties of the MSE that supported perceived positive outcomes. These included providing environmental control to the child, increasing their motivation, establishing a more comfortable sensory environment, and supporting their relationship building. Our findings not only provide new

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insight about how MSEs are used with autistic children but have the potential to guide the development of future interventions and relevant educational practice and policy.

## 1. Introduction

Multi-Sensory Environments (MSEs; also called sensory or Snoezelen® rooms) are used internationally in the special-educational needs sector, where they are often included in statutory special education plans and curricula (e.g. [Botts, Hershfeldt, & Christensen-Sandfort, 2008](#)). They are adaptive spaces where the user or practitioner can control the sensory equipment, changing the type and amount of sensory stimulation to meet the user's needs. Popular equipment includes a bubble tube, fibre optic cabling, and a tactile board. The majority of MSE equipment target the visual, tactile and auditory senses (see Supplementary Materials, Table S1).

In the UK, non-statutory guidelines recommend at least one MSE in special schools and in mainstream schools where autistic<sup>2</sup> pupils receive special provision ([Department For Education, 2015](#)). Despite their wide use, quantitative findings on their effects are limited, with most studies lacking methodological rigour ([Botts et al., 2008](#); [Cameron et al., 2019](#); [Chan et al., 2010](#)). Observational studies investigating the impact of MSE use on children typically include those with various diagnoses, including autism, and do not explore how different types of children respond (e.g. [Houghton et al., 1998](#); [Shapiro, Parush, Green, & Roth, 1997](#)). This approach means that very little is understood about the specific experiences of autistic children in MSEs. As far as we are aware, only one study has investigated the effect of the MSE on a solely autistic sample ([Mey, Cheng, & Ching, 2015](#)). Following a year of MSE intervention, autistic children showed improvements in sensory functioning, learning, relationship with the facilitator, concentration, adaptive behaviour and relaxation. However, this study only included six participants and does not provide broader insights into how and why MSEs are being used with autistic children.

This limited evidence reflects a paucity of research into educational approaches that are used with autistic children ([Happé & Frith, 2020](#)), particularly in the real world settings in which they are applied ([Kasari & Smith, 2013](#)). There is also a lack of practitioner perspectives, which are key to bridging the gap between research, policy and practice ([Kasari & Smith, 2013](#); [Parsons et al., 2013](#)). Within education settings, there has previously been an assumption that, "practitioners need to 'fit in' with what is prescribed with little attention paid to their needs or perspectives and the contexts within which they work." ([Parsons et al., 2013, p. 270](#)). However, it is now clear that the perspectives of practitioners can provide valuable insight into how educational practice is adapted to individual needs (e.g. [McDougal, Riby, & Hanley, 2020](#); [Stahmer, Suhrheinrich, Reed, & Schreibman, 2012](#)) and "respecting and valuing practitioners' expertise is crucial in understanding how interventions can be carried out in the varied and complex settings of real-world classrooms" ([Parsons et al., 2013, p. 270](#)). Given the widespread use of MSEs across educational settings, it is surprising that no research to date has examined practitioner experiences of using MSEs specifically with autistic children.

The only previous research into practitioners' perceptions of MSE use has focussed on children and adults with a range of special needs ([Ayer, 1998](#); [Bozic, 1997](#); [Carter & Stephenson, 2012](#); [Pagliano, 1998](#); [Stephenson & Carter, 2011b, 2011a](#)). Autism is associated with distinct behavioural and sensory profiles (e.g. [American Psychiatric Association, 2013](#); [Green, Chandler, Charman, Simonoff, & Baird, 2016](#)), and therefore the experiences of practitioners working with autistic children in MSEs may be unique and require their own assessment.

In the current study, an exploratory sequential mixed-methods design was used to investigate the beliefs and experiences of UK-based practitioners working with autistic children in MSEs. Within this framework, an initial qualitative investigation (Study 1) formed the basis for the follow-on quantitative study (Study 2). Therefore, the quantitative study built on the work of the qualitative study (e.g. [Creswell, 2014](#)). This robust approach takes advantage of the strengths of both types of investigation (e.g. [Greene, Caracelli, & Graham, 1989](#); [Tashakkori & Teddlie, 1998](#)). In more detail, in Study 1, semi-structured interviews were conducted to gain in-depth insight into the beliefs and experiences of educational practitioners about MSE use with autistic children. In Study 2, a follow-up survey was distributed to a larger group of practitioners. This enabled quantitative measurement of the endorsement of key beliefs about MSE use and outcomes, as well as exploration of how practitioner experience and training influenced these beliefs. The primary research questions were:

- 1 What are the beliefs and experiences of educational practitioners about the possible outcomes and overall efficacy of using MSEs with autistic children?
- 2 What factors do practitioners believe may affect possible outcomes in the MSE for autistic children?

<sup>2</sup> Identity first language is used throughout this manuscript to reflect the preferences of surveyed autistic individuals ([Bury, Jellet, Spoor, & Hedley, 2020](#); [Kenny et al., 2015](#)).

## 2. Study 1: Practitioner beliefs and experiences of using an MSE with autistic children: Insight from interviews

### 2.1. Method

#### 2.1.1. Participants

Ten practitioners (nine female; 24–62 years old,  $M=44.3$ ,  $SD = 14.0$ ) from six special-needs schools (five in Wales, one in England) with experience of working with autistic children in an MSE were recruited. The practitioners (eight teachers; two teaching assistants) had been working with autistic children in MSEs for 3–25 years ( $M=13.3$ ,  $SD=8.61$ ). The sample size was based on guidance from [Braun and Clarke \(2013\)](#). All participants provided informed written consent. Ethical approval was granted by the Cardiff University School of Psychology Ethics Committee.

#### 2.1.2. Materials & procedure

The interview schedule was based on the research questions and refined using a framework outlined in [Braun and Clarke \(2013\)](#). Each of the participants were interviewed individually within their own school by KU who had received qualitative interview training. Most interviews took place in the schools' MSE ( $n=6$ ), although a meeting room was used ( $n=4$ ) when the MSE was not available. The MSE equipment within each school's MSE was noted for all participants and can be found in Supplementary Materials Table S2. The data collected in each location (e.g. MSE vs. meeting room) were visually compared and no differences were identified. As such, the different locations were not considered when interpreting the data.

The individual interviews lasted 30–83 min ( $M = 49.86$ ,  $SD=15.67$ ), with the variation in time reflecting the amounts that participants had to share. The interview began with demographic questions, followed by questions about the use of the MSE with autistic pupils and whether MSE use was associated with behaviour change for these pupils. The interview then explored the effects on autistic pupils of equipment in the MSE that engaged specific senses. This was followed by broader questions regarding the perceived outcomes of the MSE for autistic pupils, including both benefits and drawbacks. As the interviews were semi-structured, answers were followed-up with further questions if clarity was needed. All questions were answered by each participant and the interviews were audio recorded for later transcription.

#### 2.1.3. Thematic analysis

The interviews were transcribed verbatim and uploaded into NVivo software ([NVivo, 2012](#)). Inductive thematic analysis (TA; [Braun & Clarke, 2006, 2013](#)) within an essentialist framework using a qualitative descriptive approach was used to analyse the data, creating descriptive summaries of each interviews' semantic content and forming these into themes based on similarity. A qualitative descriptive design was used as we endeavoured to capture insights from a poorly understood phenomenon and were interested in direct experiences of our practitioners ([Kim, Sefcik, & Bradway, 2017](#)). The lack of previous research in this area led to the exploratory inductive (i.e. "bottom-up") approach, and the essentialist framework was selected as we assumed a mostly unidirectional relationship between language and meaning (i.e. language used by the practitioners allows us to directly understand their meaning and experiences, [Potter & Wetherell, 1987](#)).

Twenty-percent of the data were coded independently by the primary coder (KU) and a secondary coder to refine the data derived coding scheme and identify coding blind-spots in the primary coder. Both coders then coded another 10 % of the data to further highlight any coding biases. All interviews were then coded by the primary coder, adding in emergent codes where necessary. Codes were then assessed for similarity in topic and themes and subthemes were identified. Themes and subthemes were further refined by the research team.

**Table 1**

Themes (1–6) and subthemes resulting from practitioner interviews on the use of Multi-Sensory Environments (MSEs) with autistic children.

Themes and subthemes
<b>(1) MSEs are perceived to benefit behaviour, attention and mood</b>
Perceived benefits within the session
Perceived benefits beyond the session
<b>(2) MSEs have distinct properties that facilitate benefits</b>
The child being in control of their environment
MSE as motivational
MSE facilitates relationship building
MSE provides sensory stimulation
<b>(3) MSE use should be centred on the child's needs</b>
<b>(4) MSEs are most effective when the practitioner plays an active role</b>
An active practitioner is key for positive outcomes
More training and research are needed
<b>(5) MSEs can be used for teaching and learning</b>
MSE as an effective teaching and learning environment
The MSE offers more possibilities than a typical classroom
<b>(6) MSE use can present challenges</b>
MSE use can lead to negative behavioural outcomes
Benefits require time to emerge
Some of these benefits are not unique to the MSE

## 2.2. Results

Six themes emerged: (1) MSEs are perceived to benefit behaviour, attention and mood, (2) MSEs have distinct properties that facilitate benefits, (3) MSE use should be centred on the child's needs, (4) MSEs are most effective when the practitioner plays an active role, (5) MSEs can be used for teaching and learning, and (6) MSE use can present challenges (Table 1).

### 2.2.1. Theme 1: MSEs are perceived to benefit behaviour, attention and mood

The practitioners believed MSEs brought numerous benefits for autistic children, which they identified as improvements in focus and attention, social interaction and communication, and mood, as well as a reduction in repetitive motor behaviours (RMBs) and anxiety.

**2.2.1.1. Perceived benefits within the session.** Many practitioners believed that the MSE could improve focus and attention in autistic pupils. Some suggested that this was because MSE use removed sensory distractions. This subtheme linked heavily with the 'MSEs can be used for teaching and learning' theme, as improved focus was described as enabling learning both inside and outside the MSE. Practitioners also stated the MSE led to increased social interaction and communication. The autistic children were repeatedly described as "more likely to initiate interaction in this room [the MSE]" and engage more in social interactions. Some stated that this was because the MSE was motivational, linking with the 'MSE as motivational' subtheme. Almost all practitioners believed that the MSE could lead to a reduction in RMBs. Many of the practitioners suggested that because sensory needs were met, RMBs were reduced.

Mood and anxiety were described as positively affected in the MSE and a direct relationship between mood and room use was suggested by some, "This makes them happy, it's as simple as it gets". However, other practitioners described positive mood changes as an indirect benefit, brought about by a reduction in anxiety. Reduced anxiety was also described as facilitating other outcomes, including reducing RMBs.

**2.2.1.2. Perceived benefits beyond the session.** Some practitioners believed that benefits from using the MSE could be continued beyond the MSE session, "They would sort of have that calmness then and transfer into the class". However, not all the practitioners agreed, "As soon as you leave [the MSE], you then haven't got [a] calm and quiet environment because you are back into a busy class and you're less likely to get such good concentration from them". Others provided a more nuanced response suggesting that the environment the child enters after the MSE determines whether benefits continue, with calm environments seen as more facilitating.

### 2.2.2. Theme 2: MSEs have distinct properties that facilitate benefits

The practitioners believed that MSEs had distinct properties that facilitated benefits.

**2.2.2.1. The child being in control of their environment.** This property of being in control of the sensory environment was believed to facilitate benefits such as reducing challenging behaviours. One practitioner explained that control over the MSE enabled modulation of the environment so that it could be tolerated, "Getting them to control [the MSE] so if it's too loud or it's too quiet they can cope with it". It was also described that the controlled environment supported learning, "Having a controlled environment helps you try to eliminate some of those things [external distracting noises] so that you can start to learn".

**2.2.2.2. MSE as motivational.** The MSE was also described as motivational, with practitioners repeatedly stating that the motivational nature of the MSE led to multiple beneficial outcomes including communication, "It's a motivating session for them so you tend to get better communication." It was also suggested that preferred objects needed to be identified within the MSE to enable motivation and subsequently, communication, "I think one of the primary ways that I use it [the MSE] with ASD learners...[is] finding preferred and non-preferred objects, so it's just getting them motivated and going right, they love that, let's get asking for that and you know using it as a form of communication".

**2.2.2.3. MSE facilitates relationship building.** Practitioners described how being in the MSE facilitated relationship building, and that the relationships built in the MSE could bring about other benefits. They believed that the amount of interaction between the child with their practitioner and peers increased within the MSE. It was suggested that because the children were enjoying themselves, they were more willing to accept other people sharing their space. Many practitioners stated that relationships could be built more quickly and were better quality to those built within the classroom, linking closely with the theme of the 'Active practitioner'. It was also reported that the relationships built in the MSE could be transferred to the classroom, linking to the 'benefits continuing beyond the MSE' subtheme.

**2.2.2.4. MSE provides sensory stimulation.** Some practitioners described that the sensory stimulation provided by the MSE led to behavioural change. For example, one practitioner explained that visual stimulation from a light tunnel replaced the need for the child to self-stimulate through RMBs. However, as described in the 'MSE use can present challenges' theme, MSEs were reported as being overstimulating for some individuals.

### 2.2.3. Theme 3: MSE use should be centred on the child's needs

This theme was discussed across all the interviews, emphasising its importance, "[We are] focussing on what that person needs and

tailoring how you use that room to those individual needs.” and that, “They are all different so it’s not a one size fits all...Different things do different things for different children”. This child-centred approach was perceived as key to deciding whether or not to use the MSE. Although they were believed to be beneficial for most pupils, they were described as “too much” for others and likely to cause distress or aggravation. They were also sometimes not considered necessary: “The class I had last year was a class of more able children...we didn’t come [to the MSE]...They didn’t necessarily have sensory needs enough to need, appreciate or want this.” Although more “able” children were sometimes not considered to have the sensory needs to “appreciate or want” the MSE, it was also recognised that more able children could also benefit. As one practitioner stated, “We’ve got a lad in class this year who has come to us from a mainstream school...but his sensory needs are huge and he needs [the MSE] where he can have just down time.”

The needs of the child were considered key determinants in the type of activity or learning experience that was provided withing the MSE. Reference to the importance of Individual Education Plans (IEP) were made, with MSE equipment being used to support IEP targets. Broader reasons for selecting or adjusting activities included the child’s needs and their ability, “We go with what we feel the child is looking for and depending on...the ability of the children, it can be structured or unstructured.” A flexibility of approach in recognising the child’s mood and arousal state on the day was also emphasised, “You don’t bring people in who are really, really tired and do lovely relaxing cloths and smells and then they leave sleeping, because there’s no point”. In summary, practitioners felt the child’s needs, capabilities and preferences determined how the MSE should be used.

#### 2.2.4. Theme 4: MSEs are most effective when the practitioner plays an active role

2.2.4.1. *An active practitioner is key for positive outcomes.* An active practitioner was believed to be the key to achieving positive outcomes for autistic children within the MSE, “The most important piece of equipment is the adult who is working with the child” and, “[The practitioner’s] knowledge of the room, the equipment and the child is really, really key”. This was described as particularly relevant to enabling the continuation of benefits from the MSE to other environments. This theme linked heavily with the, ‘MSE use should be centred on the child’s needs’ theme as an active practitioner was deemed necessary to understand the child’s needs and adapt MSE use accordingly. Some practitioners stated that one-to-one interactions within the MSE were qualitatively better than those in other settings because the child’s sensory needs were met. However, others highlighted the importance of the practitioner over the MSE, “It might not necessarily be the room, it’s the close relationship and working one-to-one”.

2.2.4.2. *More training and research are needed.* Practitioners also stated that more training and research was needed, “I think people’s knowledge of children and equipment and what they can do in the room is really important and training, I think that’s really quite key.” Specifically, some practitioners believed that research would improve their practice, “I think the more I know...the better [the MSE sessions] are going to be.” Although one practitioner believed that a lack of research to support practice was more general, “I would say that one of the things that has been lost from teaching profession, not least special education, is the idea that there is pedagogical research underpinning what we do.”

#### 2.2.5. Theme 5: MSEs can be used for teaching and learning

2.2.5.1. *MSE as an effective teaching and learning environment.* Many practitioners described the MSE as an effective teaching and learning environment and some considered this the main purpose of the MSE. One practitioner reflected, “It’s fun, you know, and they don’t realise that they’re learning when they’re having fun”, which echoed the opinions of many other practitioners. Some practitioners expressed frustration at how the MSE was often used as a, “cop-out” or for, “chill-out time” by other practitioners. They highlighted that the MSE was a resource that must be actively engaged with to bring about positive outcomes including learning, linking to the theme of the active practitioner, “When you come into a sensory room you have to also set up a lesson plan and you know work out what you want your pupil to achieve in there”.

2.2.5.2. *The MSE offers more possibilities than a typical classroom.* Some practitioners suggested that sensory needs are a barrier to learning for autistic children but that, “[The MSE] helps to eliminate some of those [sensory needs] so that they can start to learn”. As such, “The environment in the sensory room can offer what you wouldn’t necessarily get in the classroom.” This concept of the MSE being a unique space that offers more possibilities than a typical classroom arose many times. In addition, practitioners also reported that MSEs support regulation, preparing the child for learning in the classroom, “A really big area is readiness for learning. So stimulating them [in the MSE] to bring them up, ready to learn, to go back to class or bringing them down so that they are ready to learn when they go back to class.”

#### 2.2.6. Theme 6: MSE use can present challenges

2.2.6.1. *MSE use can lead to negative behavioural outcomes.* Some practitioners believed that MSE use can lead to negative behavioural outcomes such as distress and challenging behaviours: “...screaming, high pitched, some slapping behaviour and maybe self-harm and hair pulling and potentially could reach out to bite things.” One practitioner noted a possible reason behind the behaviours, “They become over obsessive with [the MSE], that can cause behaviours in itself.” These codes linked heavily with the ‘MSE use should be centred on the child’s needs’ theme.

2.2.6.2. *Benefits require time to emerge.* Another perceived challenge for MSE use was that the benefits require time to emerge, “I have

**Table 2**

Overall percentage agreement for each theme and percentage agreement for each survey item on practitioner beliefs about Multi-Sensory Environments (MSEs), organised by theme.

	Strongly Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Strongly Disagree
<b>Theme 1: MSEs are perceived to benefit behaviour, attention and mood*</b>					
<b>Overall % agreement: 85%</b>	<b>44</b>	<b>40</b>	<b>10</b>	<b>4</b>	<b>1</b>
Gives them enjoyment <sup>†</sup>	69	29	2	0	0
Reduces their anxiety <sup>†</sup>	57	35	5	2	1
Increases challenging behaviours (e.g. hitting, biting, self-harming) <sup>†**</sup>	0	7	9	29	55
Makes them less likely to initiate communication <sup>†**</sup>	1	3	13	39	44
Increases repetitive behaviours (e.g. repetitively fiddling with equipment, hand flapping) <sup>†**</sup>	2	9	23	44	23
Creates or increases positive mood <sup>†</sup>	42	50	6	0	2
Increases the quality of communication (e.g. eye contact, gesturing, conversation) <sup>†</sup>	32	50	10	6	2
Helps them to focus and pay attention <sup>†</sup>	33	46	14	5	2
<b>Theme 2: MSEs have distinct properties that facilitate benefits</b>					
<b>Overall % agreement: 87%</b>	<b>32</b>	<b>55</b>	<b>10</b>	<b>2</b>	<b>1</b>
Benefits of MSE use continue once the pupil has left the MSE	28	57	8	5	2
Using the MSE brings benefits because it is motivating for the pupil	31	58	11	0	0
Using the MSE with a pupil helps to build your relationship with them	46	47	7	0	0
Using the MSE brings benefits because the pupil can control their environment	24	56	16	2	2
<b>Theme 3: MSE use should be centred on the child's needs*</b>					
<b>Overall % agreement: 89%</b>	<b>53</b>	<b>36</b>	<b>7</b>	<b>4</b>	<b>1</b>
How the MSE should be used is determined by the pupil's needs (e.g. sensory needs, learning needs)	77	23	0	0	0
I can use the MSE in the same way for each pupil and it will be beneficial**	0	5	8	39	48
The pupil's response to the room affects whether or not I use it with them	33	47	13	6	2
The MSE is more beneficial for pupils with ASD than pupils with other special needs‡	2	7	38	14	39
<b>Theme 4: MSEs are most effective when the practitioner plays an active role</b>					
<b>Overall % agreement: 80%</b>	<b>42</b>	<b>38</b>	<b>13</b>	<b>5</b>	<b>2</b>
I have specific goals in mind each time I use the MSE	32	47	10	8	4
Practitioner experience is essential for effective MSE sessions	42	37	15	5	1
More research is needed into the best ways to use MSEs with autistic pupils	44	40	13	3	0
The most important factor in a successful MSE session is an active practitioner working with the pupil	30	42	17	7	4
Training would benefit the way I use the MSE	61	25	10	4	1
<b>Theme 5: MSEs can be used for teaching and learning*</b>					
<b>Overall % agreement: 58%</b>	<b>25</b>	<b>33</b>	<b>14</b>	<b>20</b>	<b>9</b>
The most important outcome from the MSE is that the pupil learns	7	16	21	40	17
The most important outcome from the MSE is that the pupil had fun**	18	38	20	18	7
There are teaching possibilities in the MSE not available in the classroom	49	45	2	1	3
<b>Theme 6: MSE use can present challenges</b>					
<b>Overall % agreement: 33%</b>	<b>6</b>	<b>27</b>	<b>26</b>	<b>28</b>	<b>13</b>
Leads to them becoming over-fixated on a piece of equipment <sup>†</sup>	3	26	32	25	13
Leads to them becoming over-stimulated <sup>†</sup>	1	18	33	35	13
The benefits from using the MSE could be achieved using other school activities (e.g. craft time, storytelling)	11	20	16	35	19
The MSE does not always bring benefits	8	44	23	18	8

\*Theme percentages sum to +/-1 over 100 due to rounding.

\*\*Items are reverse worded from the theme title.

†Items included in the ordinal logistic regressions.

‡Not included in Overall % theme agreement as endorsement could not be interpreted as either agreeing or disagreeing with the theme title.

Darker shading indicating higher percentage endorsement.

Overall agreement % represents the summed percentages of "Strongly agree" and "Somewhat agree", with reverse worded items reverse scored.



seen changes but they're not going to be immediate", and "[It's] just the case of being patient and waiting, playing the waiting game then and seeing how they draw out eventually". However, the effects of the MSE were described as instantaneous for some, especially when used to calm a child that has become agitated. Again, this subtheme links back to the 'MSE use should be centred on the child's needs' theme.

**2.2.6.3. Some of these benefits are not unique to the MSE.** Although MSEs were described as having many benefits, it was recognised that some of these benefits were not necessarily unique to the MSE, "I wouldn't say it's purely just from being down in this room you know... we do get other, you know, equally as good responses in other settings". However, the MSE was still described as being an important tool, "Obviously, [the MSE] is just one piece of a very large puzzle to meet their needs, even though it's really, really ... important piece and a very effective piece."

### 3. Study 2: Practitioner beliefs and experiences of using an MSE with autistic children: Insight from a survey

Study 1 provided insights into what practitioners working with autistic children in MSEs believed about their use. However, it is unknown how widely endorsed these beliefs are. In Study 2, we adapted our qualitative findings to conduct a quantitative survey (Creswell, 2014). The survey, focusing on beliefs about MSE use, was distributed to a large sample of practitioners. Study 1 practitioners believed that experience and training were both relevant to practitioner use of MSEs (Theme 4). Therefore, how practitioner training and number of years' experience in MSEs influenced their beliefs and educational approaches was also explored.

#### 3.1. Methods

##### 3.1.1. Participants

Participants were UK professionals currently working in an MSE with school-aged autistic children. Recruitment occurred through social media, the National Autistic Society website, and a local special-educational needs magazine. In addition, 726 UK head teachers of special-needs schools were emailed to invite staff to take part.

Of the original 105 participants, two were excluded for not having worked with school-age children in an MSE, and another did not provide enough information to confirm that they had worked with autistic children. The final sample included 102 practitioners (93 female) from 56 different organisations (see Supplementary Materials, Table S3) from England (69 %), Wales (25 %), Scotland (4 %) and Northern Ireland (2 %). Participants were aged 21–68 years ( $M = 40.4$ ,  $SD = 10.7$ ) and had 2–35 years ( $M = 11.1$ ,  $SD = 7.7$ ) experience of working in MSEs with autistic children. Sixty-eight percent had received training on the use of MSEs. Seventy-nine percent were teachers or teaching assistants with 93 % of respondents working in schools (see Supplementary Materials, Table S4).

Fifty-seven percent of practitioners used MSEs in both timetabled and spontaneous sessions, with 33 % only using it in timetabled sessions, 5 % only using it in spontaneous sessions, and 5 % using it in another way. The MSE equipment within the participants' MSEs can be found in the supplementary materials (Table S5). Visual inspection of clustered bar charts for each item and Kruskal-Wallis tests for composite scores showed that the pattern of data for the teachers and teaching assistants did not differ from other school-based practitioners or from non-school based practitioners, therefore the full sample were analysed together. All participants provided informed consent. Ethical approval for this study was granted by the Cardiff University School of Psychology Ethics Committee.

##### 3.1.2. Materials

The survey was devised using codes from Study 1. For a code to be included it needed to be highly endorsed within its theme. The level of endorsement of the code was assessed by the number of practitioners who used it and how much the code was repeated across the interviews. Twenty-eight items were chosen. To limit acquiescence bias (e.g. Holbrook, 2008), five codes were reverse worded (e.g. the code 'Makes them more likely to initiate communication' reworded as 'Makes them less likely to initiate communication'). Responses to each statement were on a five-point Likert scale from 'strongly agree' to 'strongly disagree'. The items were pseudorandomised and presented in a survey format using Qualtrics software (Qualtrics, 2005).

Three practitioners assessed the survey for readability and ease of use. Overall, they reported that the survey was easy to follow but they suggested some small changes to wording for clarity.

The resulting survey was distributed widely, with participants taking part via an online survey link. The survey began with a series of demographic questions about the participant, their workplace (i.e. school or clinic), years of experience and the amount of MSE training they had. Following this, questions were asked about the specific MSE that they used with autistic children (e.g. equipment, types of use). Subsequently, the questions devised from the interviews (Study 1) were presented (see Table 2).

##### 3.1.3. Analysis plan

Percentage endorsement of individual codes and whole themes were analysed. Ordinal logistic regressions (OLR) investigated whether training or number of years of experience affected endorsement of items.

#### 3.2. Results

##### 3.2.1. Survey item endorsement

Percentage agreement with each theme and survey statement are presented in Table 2. To account for the reverse worded items, the calculation of the overall theme percentage agreement converted all statements so that strongly agree refers to endorsement of theme.

Within the text, unless otherwise stated, the responses ‘strongly agreed’ and ‘somewhat agree’ and ‘strongly disagree’ and ‘somewhat disagree’ have been summed to create general agreement and disagreement scores, respectively.

Overall, there was highest agreement with theme 3, ‘MSE use should be centred on the child’s needs’ (89 %) and least agreement with theme 6, ‘MSE use can present challenges’ (33 %) themes. Within theme 1, ‘MSEs are perceived to benefit behaviour, attention and mood’, practitioners were highly positive about perceived beneficial outcomes, with the lowest endorsement relating to impact of MSEs on RMBs (67 %). All items in themes 2, 3 and 4 were endorsed by at least 73 % of the respondents. There was less agreement for themes 5 and 6. Within theme 5, ‘MSEs can be used for teaching and learning’, overall theme agreement was influenced by very low endorsement of the item, ‘The most important outcome from the MSE is that the pupil learns’ (23 %). The low overall endorsement of theme 6 was driven by a more consistent pattern of low agreement.

### 3.2.2. Impact of training and years of experience on practitioner beliefs

Cumulative odds OLR with proportional odds were conducted to see whether practitioner training or years of experience of working in an MSE with autistic children predicted the likelihood of endorsing the 10 possible outcomes of MSE use (labelled with † in Table 2; analyses in Table 3). Two analyses violated the proportional odds assumption and were therefore not included in the analyses.

No OLRs were significant with years of experience as the predictor. With training as the predictor, the odds of practitioners with training *disagreeing* that the MSE would make autistic children less likely to initiate communication was .43 times that of practitioners with no training. The odds of practitioners with training *agreeing* that the MSE would lead to increases the quality of communication for autistic children was 2.69 times that of practitioners with no training. Finally, the odds of practitioners with training *agreeing* that MSEs help those with autism to focus and pay attention was 3.73 times that of practitioners with no training. The pattern of findings remained the same when years of experience was controlled for. In summary, having training increased the likelihood of a practitioner believing there are positive benefits for initiating communication, quality of communication, and focus and attention. However, after Bonferroni correction ( $p < .006$ ) only the effect of training on beliefs about focus and attention remained significant.

## 4. Discussion

In this mixed-methods study of educational practitioner experience of using MSEs, we have provided novel insights into how and why MSEs are being used with autistic children. Study 1 used thematic analysis to explore the beliefs of ten educational practitioners and produced six themes: (1) MSEs are perceived to benefit behaviour, attention and mood, (2) MSEs have distinct properties that facilitate benefit, (3) MSE use should be centred on the child’s needs, (4) MSEs are most effective when the practitioner plays an active role, (5) MSEs can be used for teaching and learning, and (6) MSE use can present some challenges. A follow-up survey of 102 practitioners (Study 2) produced findings largely consistent with Study 1, although survey respondents showed relatively low endorsement of challenges to MSE use. Additionally, there was modest evidence that MSE training influences beliefs about the benefits of MSE use.

The interviewed and surveyed practitioners believed that the MSE had an effect on autism symptomatology (APA, 2013), including increasing social and communication behaviours and decreasing RMBs. Other outcomes were also reported, including improvements to focus and attention and enjoyment, and a reduction in challenging behaviours. Practitioners additionally believed in the anxiety reducing effect of the MSE for autistic children. As elevated anxiety levels are associated with atypical sensory functioning in autism (e.g. Uljarević, Lane, Kelly, & Leekam, 2016), one hypothesis is that the meeting of sensory needs within the MSE enables a reduction in anxiety. Reduced anxiety could also explain why RMBs reduced (Joosten, Bundy, Stewart, & Einfeld, 2009). Although there is currently no robust experimental evidence for these MSE outcomes (e.g. Cameron et al., 2019), the testimonies of practitioners provide a compelling argument for further exploration into the cognitive and behavioural changes that may result from MSE use with autistic children.

Many of these behavioural and cognitive factors have been previously identified by practitioners as impacting on learning in autistic pupils (McDougal et al., 2020). Indeed, the practitioners believed the MSE improved learning, and almost all (94 %) of the

**Table 3**

The Impact of having MSE Training on Practitioner Beliefs about Outcomes of MSE use with Autistic Children using Cumulative Odds Ordinal Logistic Regressions with Proportional Odds.

Variable	OR (95 % CI)	Wald $\chi^2$
Reduces their anxiety	1.37 (.58–3.23)	.52
Leads to them becoming over-fixated on a piece of equipment	.97 (.45–2.1)	.01
Increases challenging behaviours	1.07 (.46–2.46)	.02
Makes them less likely to initiate communication	.43 (.19–.98)	4.03*
Creates or increases positive mood	.80 (.34–1.85)	.28
Increases the quality of communication	2.69 (1.15–6.27)	5.22*
Helps them to focus and pay attention	3.73 (1.58–8.80)	9.01** <sup>a</sup>
Leads to them becoming over-stimulated	1.50 (.67–3.19)	.90

OR = Odds Ratio; CI = Confidence Interval.

\*  $p < .05$ .

\*\*  $p < .01$ .

<sup>a</sup> Only variable to remain significant following Bonferroni correction ( $p < .006$ ).



surveyed practitioners believed the MSE provided learning opportunities not available in the classroom. However, only 23 % endorsed learning as the *most* important outcome of MSE use, while 56 % agreed the *most* important outcome was fun. Both learning and leisure were equally highly endorsed as a purpose of the MSE by 89.5 % of Australian practitioners in a previous survey, albeit discussing children with a range of disabilities and without specifying the most important outcome (Carter & Stephenson, 2012). The current findings could reflect endorsement of the original conception of the MSE as a tool for leisure (Hulsege & Verheul, 1986), over more modern ideas around their capacity for educational instruction (see Botts et al., 2008) and intervention (e.g. Lindsay, Black, & Hornsby, 2001). However, they could also reflect the lack of established methods for using the MSE within education.

Fun could also be considered the most important outcome of the MSE because it is tightly coupled with motivation, which our interviewees identified as a mechanism through which learning could occur. The motivating nature of the MSE is also considered important for children with a range of disabilities (Stephenson & Carter, 2011a, 2011b). It has been established that interest and enjoyment in an activity or task can support motivation and subsequently improve learning (e.g. Ryan, Connell, & Plant, 1990). Indeed, technology and game-based tasks have been identified as facilitating motivation and subsequent learning in autistic children (Goldsmith & LeBlanc, 2004). Our practitioners suggested that a way to facilitate motivation in the MSE is to identify the child's preferred equipment. This reflects the results of a meta-analysis, suggesting that integrating the preferences of autistic children into interventions supports positive outcomes (Dunst, Trivette, & Hamby, 2012).

Another factor identified by the practitioners as facilitating positive effects was allowing the user to control their sensory input in the MSE. This reflects the beliefs of practitioners who worked in MSEs with children with a range of disabilities (Ayer, 1998; Pagliano, 1999; Stephenson & Carter, 2011a). The provision of control to the user has been theorised as a mechanism through which MSEs may bring positive change (Moore, Harris, & Stephens, 1994), aligning with wider discussion on the benefits of providing control over the environment for autistic individuals (e.g. Robertson & Simmons, 2015). Computational accounts of sensory perception in autism propose that autistic individuals have difficulties in predicting the sensory environment (e.g. Pellicano & Burr, 2012; Powell, Meredith, McMillin, & Freeman, 2016) and such difficulties could be supported through having control of the sensory environment. The benefit of control also aligns with the high levels of intolerance of uncertainty seen in autistic people (Boulter, Freeston, South, & Rodgers, 2014). Within the MSE, the child can be given complete control of the environment, removing discomfort that relates to poor sensory prediction or related psychological stress around anticipating or experiencing the unknown. These findings might transfer to traditional classroom environments, which also often contain significant sensory stimulation, for example, complex visual wall displays and noise from other children. Sensory issues can negatively impact academic performance for both autistic and neurotypical children (Barrett, Zhang, Moffat, & Kobbacy, 2013; Fisher, Godwin, & Seltman, 2014; McDougal et al., 2020), whilst a recent qualitative study has suggested that controlled sensory stimulation in the classroom environment can support learning (Jones, Hanley, & Riby, 2020).

Although 85 % of our surveyed practitioners believed that the perceived benefits of the MSE could continue once the autistic child had left, there is some debate about whether these outcomes can be transferred to other settings (e.g. Botts et al., 2008). Our interviewed practitioners provided nuanced insight by suggesting that the possibility of continued benefits depended on the activity that followed the MSE session (e.g. calm classroom activity versus outdoor play). This may in part explain why evidence of continued benefits for different disorders has been mixed in observational MSE studies (e.g. Cuvo, May, & Post, 2001; Kaplan, Clopton, Kaplan, Messbauer, & McPherson, 2006).

Practitioners believed the MSE supported relationship building, with interviewed practitioners specifying they can be built more quickly, be of better quality and could transfer to other environments. The only study empirically investigating the outcomes of autistic children using MSEs reported improved relationships after a year of MSE use (Mey et al., 2015). Experienced and active practitioners were also described as integral for perceived benefits by the current practitioners, which aligns with teaching theory (see Petty, 2004) and is implicit in statutory government guidance (Department For Education, 2015b). Relatedly, we provide preliminary evidence that practitioner training is associated with increased belief in perceived positive outcomes for autistic children using MSEs. Specifically, those with training were more likely to report improvements in initiation and quality of social engagement, as well as increased focus and attention in their autistic pupils from MSE use. However, training did not significantly impact perceptions of MSE-related changes in enjoyment, anxiety, challenging behaviours, RRBs or mood. Although other explanations, such as training leading to increased awareness of changes in pupils, are possible, these findings suggest that training may support practitioners in encouraging better communication and focus from their autistic pupils in the MSE. These results require replication, and it should be noted that only the effect of training on improving focus and attention was robust to correction for multiple comparisons. It is also unclear from our data what kind of training best supports changes in MSE outcomes. Importantly, most practitioners in our sample believed that training would improve their MSE practice. Therefore, although these findings should not be overinterpreted, they form part of a growing call to policy-makers to improve and increase their practitioner training of MSEs (Baillon, van Diepen, & Prettyman, 2002; Carter & Stephenson, 2012; McKee, Harris, Rice, & Silk, 2007).

#### 4.1. Limitations

Although the current findings are valuable in understanding the practitioner experience, they do not represent observed outcomes for autistic children. Rather, the practitioner-perceived outcomes provide a springboard for future studies where outcomes can be directly measured. Further, the current research does not include first-hand experiences of autistic children; it is important to ascertain whether the outcomes that practitioners consider important are similarly important to autistic children and their caregivers. Particularly, the practitioners that we interviewed perceived the reduction of core autistic behaviours, such as social communication difficulties or restricted and repetitive behaviours, as positive benefits. This may not be the view of autistic children who, for example, may take pleasure from autistic behaviours (e.g. Joyce, Honey, Leekam, Barrett, & Rodgers, 2017). Framing behavioural or cognitive

changes that occur in the MSE in terms of their potential for supporting learning and wellbeing may be a useful future approach, and echoes comments made by practitioners in the current study about the interplay between behaviours and learning within the MSE.

The number of interviewed practitioners was adequate for thematic analysis (e.g. 6–10 participants; Braun & Clarke, 2013) and common in semi-structured interview studies. However, a small sample may not be broad enough to capture all views. To mitigate this, we sampled practitioners of various ages and experience, capturing beliefs across the educational strata. Our Study 2 survey was based on the most highly endorsed codes from the practitioners in Study 1. This gave a strong methodological justification for item selection and meant we obtained evidence that these beliefs were widespread. However, in focussing in on the most endorsed codes we necessarily limited the data we collected and further practitioner surveys may benefit from a wider range of questions and the opportunity for free-text comments.

#### 4.2. Conclusion

We took an exploratory sequential mixed-methods approach to understanding the perspectives of practitioners who use MSEs with autistic children. Practitioners believed the MSE could enable benefits and foster learning, which could be enhanced through a range of factors including: increasing levels of motivation, providing control, establishing a more comfortable sensory environment, and improved relationship building. Importantly, an active and engaged practitioner was identified as key. Quantitative exploration of these benefits and factors is an important step to enable evidence-based guidance for MSE best practice.

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#### CRedit authorship contribution statement

**Katy L. Unwin:** Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft. **Georgina Powell:** Conceptualization, Methodology, Writing - review & editing, Supervision. **Catherine R.G. Jones:** Conceptualization, Methodology, Writing - review & editing, Supervision.

#### Declaration of Competing Interest

The authors report no declarations of interest.

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#### Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.ridd.2021.104061>.

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