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Evaluating the effectiveness of key components of Zones of Regulation™ curriculum training on teachers' self-efficacy at managing self-regulation needs in autistic pupils

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Abstract

There has been a rise in autistic pupils in the mainstream classroom. Teachers have often reported frustration caused by a lack of training on managing autistic pupils' presentations. The aim of this study was to investigate the effect of an online training programme comprising the main paradigms and resources of the Zones of Regulation™ curriculum on teachers' sense of self-efficacy when managing autistic pupils' self-regulation needs in the mainstream primary school classroom. Purposive sampling was used to identify primary 5, 6 and 7 teachers with at least one autistic pupil with self-regulation needs in their current class. An occupational therapist with post-graduate qualifications in autism and sensory processing provided a 2.5-hour online training session on the Zones of Regulation™ curriculum for participants. The Teachers' Sense of Efficacy Scale (TSES) was completed pre- and post-training and at two-month follow-up. The Usage Rating Profile-Intervention Revised was completed post-training and a survey exploring participants' experience of implementing the Zones of Regulation™ curriculum with their autistic pupils was completed at two-month follow-up. Findings showed that online training in the use of the Zones of Regulation™ curriculum significantly improved TSES scores for teachers ($p < 0.001$). The curriculum was also shown to be an acceptable, understandable and feasible intervention for primary school teachers in the mainstream classroom. This study suggests that education authorities should consider providing training opportunities on the Zones of Regulation™ curriculum to support teachers in the mainstream classroom. It also demonstrates the important role occupational therapists, with post-graduate qualifications in autism and sensory processing, have in capacity building within education.

KEYWORDS

autism, mainstream classroom, occupational therapy, online training, self-efficacy, self-regulation, zones of regulation™ curriculum

Key Points

- This study shows that the Zones of Regulation™ curriculum is an acceptable, understandable and feasible intervention for primary school teachers in the mainstream classroom. Training on the use of the Zones of Regulation™ curriculum significantly improved self-efficacy in teachers when dealing with self-regulation needs in autistic pupils.
- When using self-regulation tools, a combination of visual presentation and concise language contributes to teachers and autistic pupils using the same

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terminology, thus helping resolve self-regulation issues in partnership. This study also suggests that movement-based breaks are especially beneficial compared to other strategies used in classrooms.

- Improvements in educational practice should support all children with special educational needs rather than singling out a group of children with particular needs.
- Occupational therapists, with post-graduate qualifications in autism and sensory processing, have an important role to play in capacity building for educational professionals.

INTRODUCTION

Autism is an umbrella term for a neuro-developmental condition characterised by social communication differences, differences in what is commonly called ‘theory of mind’, differences with adjusting to unexpected change, a preference for sameness, highly focused interests, and sensory hyper- and hypo-sensitivities (Baron-Cohen, 2017). Autism is also associated with strengths such as attention to detail and a drive to detect patterns (Baron-Cohen, 2006). In the UK, autism diagnoses for children are given by specialised health services, commonly carried out by a multidisciplinary team. While previous UK studies presented conflicting findings as to whether rates of autism diagnoses are increasing, Russell et al. (2022) have shown that over the last 20 years there has been an exponential increase in autism diagnoses over time. This has brought with it a rise in autistic pupils in the mainstream classroom (Roberts & Simpson, 2016). Teachers in mainstream education often report frustration about not having adequate tools to handle the emotional and behavioural manifestations of autism (Emam & Farrell, 2009) and Mintz et al. (2020) state that many teachers lack confidence in supporting neurodivergent pupils. As a result, teachers of autistic pupils frequently experience high levels of stress (Lecavalier et al., 2006). Lack of training for teachers can also contribute to autistic pupils being excluded from school (Aitken & Wang, 2021; Brede et al., 2017; Kulz, 2015; Sproston et al., 2017). Many studies underline the need for more autism-specific training both for teachers in training and qualified teachers (McConkey & Bhlirgri, 2003; Syriopoulou-Delli et al., 2012). The term ‘autism-specific training’ refers to different types of seminars or workshops which aim at providing information and skills on various aspects of autism. In 2017, a UK parliamentary report found that only one in four teachers received specific autism training during university, while eight in 10 qualified teachers received in-service training on autism (APPGA, 2017).

Impact of training and professional development on teachers' self-efficacy

Horan and Merrigan (2019) investigated teachers' perceptions of the effect of training on their efficacy to

teach autistic pupils in special classes. Their study showed that well-trained teachers reported significantly higher self-efficacy levels compared to those who had received little or no training. The concept of self-efficacy was coined by the psychologist Albert Bandura who defined self-efficacy as people's belief in their ability to control their functioning and events that affect their lives (Bandura, 1977). Literature on teachers' self-efficacy underlines that those teachers with a high sense of self-efficacy are more likely to implement educational innovations, classroom management approaches and adequate teaching methods, than teachers with a low sense of self-efficacy (Cousins & Walker, 1995; Guskey, 1988). These teachers are also more likely to take responsibility for pupils with special educational needs (Cook & Ogden, 2022; Wilson et al., 2020), and to manage classroom problems (Chacon, 2005). Hui (2013) showed that the use of a training workshop and follow-up occupational performance coaching improved teachers' self-efficacy when working with students with self-regulation needs.

Autism and self-regulation in the classroom

It is well documented that autistic children struggle with self-regulation (Chang et al., 2012; Daluwatte et al., 2015). Self-regulation is defined as a process that enables a person to adapt and respond effectively to the internal and external environment (Forgas et al., 2009). The ability to self-regulate plays a major role in successful school participation, and is a predictor for academic achievement (Duckworth & Carlson, 2013) and quality of life (Dijkhuis et al., 2017). Poor self-regulation skills in autistic children also appear to predict poorer adaptive functioning (Uljarević et al., 2018). Self-regulation education for pupils with autism is attracting much research interest, especially for autistic pupils in mainstream educational settings (Jahromi et al., 2013).

The zones of regulation™ curriculum

The Zones of Regulation™ curriculum (Kuypers, 2011) is an approach that can be used with children who

exhibit needs in successfully regulating themselves with regard to their emotional and sensory processing. It was designed by Leah Kuypers, an occupational therapist, as a systematic, cognitive behavioural approach to teach self-regulation, based on learning to label and categorise emotions.

Currently, there is widespread use of the Zones of Regulation™ curriculum in occupational therapy practice for children with neuro-developmental conditions (Kuypers, 2022). A preliminary study by Nowell et al. (2019) showed initial promising outcomes of its use for autistic children; however, due to the small sample size, it is difficult to generalise these findings. Six studies were found in which the Zones of Regulation™ curriculum was implemented in mainstream classrooms in elementary schools in the USA and Canada. Three of the studies involved implementation of all 19 teaching lessons of the Zones of Regulation™ curriculum (Dunn, 2019; Karhoff, 2017; Munro, 2017), two used some of the sessions (Hoffman, 2018; Quale, 2019) and one did not specify (Kisiel, 2019). All of these studies concluded that there were positive outcomes both in teachers' perceptions of the use of the Zones of Regulation™ curriculum and in improvement of self-regulation skills in pupils. The small sample sizes of these studies did not allow for calculations related to statistical significance or generalisation of the results to practice. A recent evidence summary of all studies to date on the Zones of Regulation™ curriculum (Romanowycz et al., 2021) recommended that more empirical studies using rigorous research designs should be undertaken.

Research on the Zones of Regulation™ curriculum to date has focused mainly on its effectiveness in relation to pupil outcomes, with limited research investigating the impact on teachers. No studies have specifically investigated the effect of Zones of Regulation™ curriculum training on teachers' self-efficacy, despite the importance of training in increasing self-efficacy (Horan & Merrigan, 2019) and the increased likelihood that teachers with higher self-efficacy will be involved with pupils with special educational needs (Cook & Ogden, 2022) such as autism.

The aim of this study was therefore to evaluate the effectiveness of an online training programme on key components of the Zones of Regulation™ curriculum for teachers' self-efficacy when managing self-regulation needs of their autistic pupils in the mainstream classroom.

STUDY OBJECTIVES

The specific research objectives for this study were:

1. to compare teachers' self-efficacy at managing their autistic pupils' self-regulation needs before and after 2.5 hours of online training on the Zones of Regulation™ curriculum using the short form

of the Teachers' Sense of Efficacy Scale (TSES) (Tschannen-Moran & Hoy, 2001) before training, immediately after training and at two-month follow-up

2. to determine the general acceptability of the Zones of Regulation™ curriculum as an intervention to support teachers of autistic pupils in the mainstream classroom using the Usage Rating Profile-Intervention Revised (URP-IR) (Briesch et al., 2013) immediately after training
3. to explore changes in teachers' practice in managing their autistic pupils' self-regulation needs after implementing some key principles and resources of the Zones of Regulation™ curriculum using a qualitative survey two months post-training

METHODOLOGY

Research design

This study was conducted from April to June 2022. It used quantitative and qualitative methods to evaluate an online Zones of Regulation™ training programme developed to enhance primary school teachers' self-efficacy at managing self-regulation needs in autistic pupils. Purposive sampling was used to identify teachers with at least one autistic pupil with self-regulation needs in their current class. Approval to carry out this online training and use its findings for the current study was obtained from the Education Authority Northern Ireland (EANI). Ethical approval was obtained from Ulster University (FCNUR-21-102-B).

Setting

This study was carried out across primary schools in Northern Ireland. In 2021–2022 approximately 4.7% of school-aged children in Northern Ireland were identified as having a diagnosis of autism (Rogers & McCluney, 2022), of which 17% did not have any special educational needs, and 58% were classified at Stage 3 of the Special Educational Needs Assessment (EANI, 2022) indicating that these children benefit from specialist external resources to support their learning or medical needs.

Sampling and recruitment

Teachers with the designated role of SENCo in all 806 primary schools in Northern Ireland received an email from the primary investigator of this study to forward to their school's primary 5, 6 and 7 teachers inviting them to participate in this study. Pupils in primary 5, 6 and 7 are between eight and 11 years old.

Inclusion criteria were:

- to be employed by the EANI as a full-time teacher (to allow for continuity) of a mainstream primary 5, 6 or 7 class in Northern Ireland;
- to have a minimum of one autistic pupil with self-regulation needs in their current class;
- not to have previously used the Zones of Regulation™ curriculum with their current class;
- to be willing both to take part in the online training and to complete the outcome measures and the qualitative survey before, immediately after and two months post-training;
- to be able to access a WiFi connection strong enough to allow for attendance at the online delivery of the training.

Participants were invited to use a link in the email invitation to access a detailed information sheet about the study and complete a consent form. Participants in this study attended 2.5 hours of online training on the use of the Zones of Regulation™ curriculum (Kuypers, 2011) in the mainstream classroom, and outcomes were evaluated pre-training, immediately post-training and two months post-training.

Online delivery of the training on the zones of regulation™ curriculum

The training was delivered by the main investigator (an occupational therapist with post-graduate qualifications in sensory processing and autism) via the online platform Microsoft Teams. Permission to use the Zones of Regulation™ curriculum for this study was obtained from Emily LaShorne Waltz from the Zones of Regulation™ team. The online training focused on the main paradigms of the Zones of Regulation™ curriculum and its practical applications in the mainstream primary 5, 6 and 7 classrooms.

The Zones of Regulation™ curriculum describes four 'zones' as four different states of experiencing internal and external events. The 'red zone' refers to intense feelings where individuals may feel out of control. The 'yellow zone' identifies feelings that are not as overwhelming, but possibly escalating towards the 'red zone'. The 'green zone' is where individuals are focused and feel generally good. The 'blue zone' is referred to as a low state of alertness, in which individuals may experience tiredness or a lack of focus. The Zones of Regulation™ curriculum is intended to teach individuals to label their emotions and to express them adaptively. It also teaches individuals to recognise triggers of emotional dysregulation and skills (tools) to take more responsibility for self-regulation.

For the current study, training was delivered in one session, with the option of three different dates to maximise participation. During the training, some of the main paradigms of the Zones of Regulation™ curriculum and resources were introduced and shared with participants via

email after the training. The main paradigms used for this training included using visual resources and concise language when explaining the Zones of Regulation™ curriculum to pupils, and clarifying that there is no 'bad zone', rather that all zones are experienced at different times and that the goal is not to get back to the green zone but to learn to manage the emotional state one is presently finding oneself in. The resources included the Zones of Regulation™ poster which visually depicts the different zones and associated feelings, and the Triggers worksheet which supports teachers in explaining to pupils what triggers for emotional dysregulation are and how to identify them. Participants were also given access to handouts of a variety of self-regulation strategies (tools) to use with pupils. The fourth resource shared with participants was a Toolbox worksheet which functions as a visual aid for pupils to write down or draw those tools that they find useful for their self-regulation.

Data collection

Data for this study were collected from April to June 2022. Similar to the pilot studies by Mellor et al. (2023) and Lightfoot et al. (2022), the Jisc Online Surveys® platform (Jisc, 2020) was used to collect demographic information on participants, to distribute the outcome measures and to deliver a qualitative survey. At timepoint 1 (before the training), participants were asked to complete the short form of the TSES (Tschannen-Moran & Hoy, 2001).

Demographic data, including teaching experience, number of autistic pupils, year group, rural/urban school, and self-rated confidence in general knowledge of autism, were also collected. At timepoint 2 (immediately after the training), participants were asked to complete the URP-IR (Briesch et al., 2013) and repeat the short form of the TSES. At timepoint 3 (two months after the training), a qualitative survey asked open-ended questions to explore participants' experience of the implementation of the Zones of Regulation™ curriculum with their autistic pupils. These questions were developed by the primary investigator in collaboration with education professionals who had previous experience in the use of the Zones of Regulation™ curriculum with autistic pupils in mainstream education. At timepoint 3, participants were also asked to repeat the short form of the TSES.

Outcome measures

Short form of the teachers' sense of efficacy scale (TSES)

The short form of the TSES (Tschannen-Moran & Hoy, 2001), consisting of 12 items, was used to measure participants' perceived self-efficacy with regard to managing their autistic pupils' self-regulation needs. The TSES asks respondents to rate their self-efficacy on questions

based on classroom management, instructional practices and pupil engagement; for example, 'How much can you do to calm a student who is disruptive or noisy?' or 'How much can you do to motivate students who show low interest in school work?' Respondents answered on a nine-point Likert-type scale ranging from 1 (nothing) to 3 (very little) to 5 (some influence) to 7 (quite a bit) to 9 (a great deal). Various studies have shown that the TSES both in its short and long version can be considered a reasonably valid and reliable tool (Tschannen-Moran & Hoy, 2001).

Usage rating profile-intervention revised (URP-IR)

The URP-IR (Briesch et al., 2013), with 29 questions, is a tool used to understand multiple factors that influence whether or not a given intervention is adopted and whether its usage is subsequently maintained. It focuses on six factors: acceptability, understanding, feasibility, home-school collaboration, system climate and systems support. On the URP-IR, respondents rank their agreement with statements using a six-point Likert scale (1 – strongly disagree, 2 – disagree, 3 – somewhat disagree, 4 – somewhat agree, 5 – agree, 6 – strongly agree). Sample questions include 'I understand how to use this intervention' and 'The intervention is a fair way to handle the child's behaviour problem'. The URP-IR has been shown to be an efficient tool that can be used to examine those variables that influence usage of an intervention across a wide range of contexts (Briesch et al., 2013).

Qualitative survey on the application of zones of regulation™ training

At timepoint 3, participants completed a qualitative survey involving 16 questions on their use of the Zones of Regulation™ poster, the Triggers worksheet, the self-regulation tools and the Toolbox worksheet since the online training. The questions explored changes in their practice, including which Zones of Regulation™ resources they had used, whether these had supported them to identify and manage self-regulation issues, which were most useful, and whether they would continue to use these resources. Questions included Likert scales with a rating of 1 indicating, for example, that the use of a specific resource supported them 'not at all' and 9 indicating that it supported them 'very much' in managing their autistic pupils' self-regulation needs. Opportunity was also provided for free-text responses to give examples of changes they had made in their practice through application of the Zones of Regulation™ resources. Qualitative questions were developed by the main researcher in consultation with primary school teachers who were established users of the Zones of Regulation™ curriculum in their classrooms.

Data management and analysis

All collected data were copied from Jisc Online Surveys® (Jisc, 2020) into an Excel® spreadsheet and anonymised by the secondary investigator. The primary investigator exported the anonymised quantitative data to SPSS® software version 28.0.0.0 (IBM Corp., 2020) for analysis by the chief and primary investigators, supported by a third investigator. Demographic data were analysed using descriptive statistics, calculated as percentages.

TSES scores were compared before (timepoint 1) and immediately after the training (timepoint 2) using *t*-tests. A repeated measures analysis of variance (ANOVA) was completed to examine the effect of the curriculum on TSES scores across the three timepoints and Bonferroni pairwise comparisons were applied if significant. URP-IR scores (timepoint 2) were analysed by calculating means and standard deviations of its subscales.

Qualitative survey data on the application of the Zones of Regulation™ training in the classroom collected at timepoint 3 were imported from SPSS® software to Microsoft Word® and content analysis was used to identify overarching themes (Elo & Kyngäs, 2008).

Participant information

The consent form for this study was completed by 150 teachers. Out of these, 128 teachers completed outcome measures at timepoint 1 and attended the online training. At timepoint 2, 87 participants completed the TSES and 89 participants completed the URP-IR. Forty-one participants completed the TSES at timepoint 3. A full dataset was retrieved from 37 teachers. The reason for this lower number was due to the fact that not all participants responded consistently across all three timepoints. Some details of participants, who completed the qualitative survey and outcome measures at timepoint 3, could not be matched to either the first or second timepoint. There were no significant differences found between participants who completed all three timepoints, two timepoints or one timepoint only in year group taught, school setting, number of autistic pupils in the classroom, number of years teaching and self-rated confidence in autism knowledge.

Sample demographics

Out of the 128 teachers who participated in the training, more than half (67%) were teaching in an urban school. Regarding year groups, 58 participants were primary 5 teachers, 35 participants were primary 6 teachers and 35 participants were teaching primary 7 pupils. Details of their teaching experience, self-rated confidence in their knowledge of autism and the number of autistic pupils in their classes are presented in Figures 1–3.

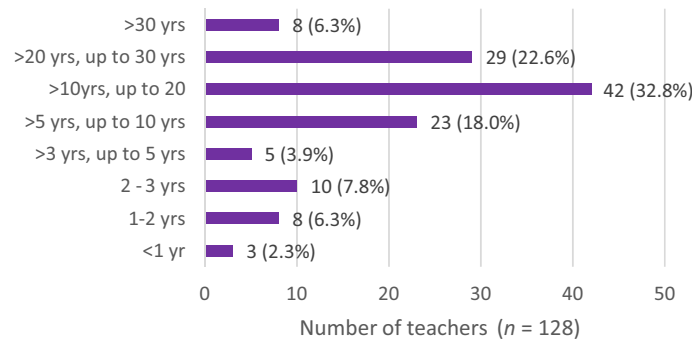


FIGURE 1 Distribution of participants' years of teaching experience.

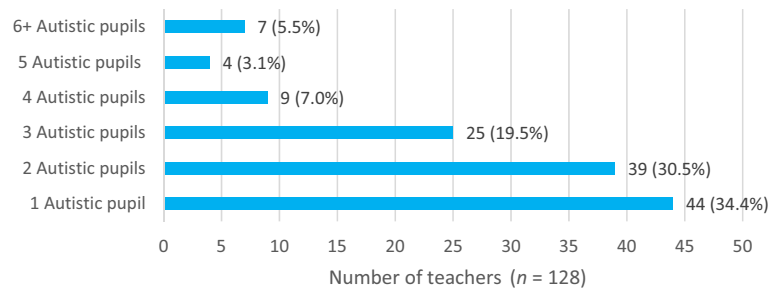


FIGURE 2 Distribution of number of autistic pupils in participants' classes.

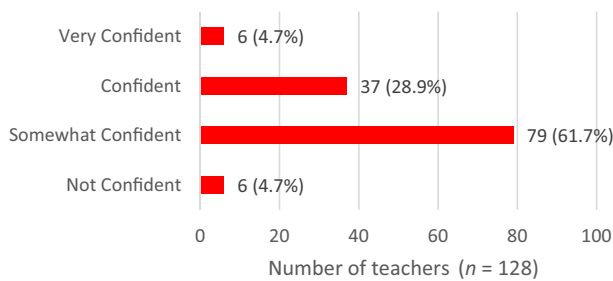


FIGURE 3 Participants' self-rated confidence level in general knowledge of autism.

QUANTITATIVE FINDINGS

Teachers' self-efficacy

On average, teachers rated higher on the TSES after the training ($M=7.41$, $SD=0.85$) than before the training ($M=6.48$, $SD=1.16$). This improvement, 0.936 (95% confidence interval [0.718, 1.153]), was statistically significant, $t(86)=8.538$, $p<0.001$.

For the 37 teachers who completed the TSES before attending the training, immediately afterwards and two months post-attendance, a repeated measures ANOVA showed a significant main effect on their TSES scores ($F(1.408, 50.678)=22.518$, $p<0.01$). Bonferroni pairwise comparisons showed that TSES scores after training significantly increased between timepoint 1 (before the training) and timepoint 2 (immediately after training)

(0.899, 95% CI, 0.4831 to 1.314), and between timepoint 1 (before the training) and timepoint 3 (two months after training) (0.885, 95% CI, 0.419 to 1.351).

Acceptability of the zones of regulation™ curriculum

For the 89 teachers who completed the URP-IR, analysis of the ratings suggests that they found this intervention to be acceptable ($M=5.22$; $SD=0.49$), understandable ($M=5.19$; $SD=0.43$) and feasible ($M=4.91$; $SD=0.58$). Participant answers also indicated that after having completed the training they do not require a lot of additional support to carry out this intervention ($M=2.99$; $SD=0.98$). Teachers suggested that this intervention fits well with the overall ethos and goals of the school they teach in ($M=5.29$; $SD=0.46$). They rated the need for good collaboration between caregivers and teachers to implement this intervention as moderately necessary ($M=4.51$; $SD=0.93$).

QUALITATIVE FINDINGS

Two months after attending the online training programme, 46 teachers answered open-ended questions on the implementation of the training in their day-to-day teaching practice. At that timepoint, participants also rated their experience of the use of the Zones of Regulation™ poster, the Triggers worksheet, the self-regulation tools, the Toolbox worksheet and the

usefulness of this training in regard to their sense of self-efficacy on a nine-point Likert-type scale ranging from 1 (not at all) to 3 (very little) to 5 (some influence) to 7 (quite a bit) to 9 (a great deal).

Forty-four teachers (95.6%) who provided qualitative feedback reported that the online delivery, in comparison to face-to-face delivery, was equally useful. Many ($n=15$; 32.6%) highlighted that online delivery is their preferred means of access to training as there is no need to travel. Not needing to avail of sub-cover for their class was another positive feature noted in participant responses ($n=3$; 6.5%). Many teachers ($n=36$; 78.3%) stated that they would like further training on the Zones of Regulation™ curriculum. In terms of format, 37% ($n=17$) stated they would find online group training useful, 30.4% ($n=14$) wanted face-to-face group training, 30.4% ($n=14$) said they would benefit from regular online mentoring and coaching, and 17.4% ($n=8$) stated they would find monitored message boards useful. Regarding further application of the Zones of Regulation™ curriculum, 45 teachers (97.8%) stated that they will use the learning gained from the online training in the future.

Usefulness of the zones of regulation™ poster, the triggers worksheet, self-regulation tools and toolbox worksheet for managing autistic pupils' self-regulation needs

Most of the participants who answered the open-ended questions at timepoint 3 (80.4%; $n=37$) reported that they used the Zones of Regulation™ poster with their class after the training and stated that it supported them in talking to their autistic pupils about how they feel ($M=5.57$; $SD=2.12$). They also reported that the poster is a supportive tool for managing their autistic pupils' self-regulation needs ($M=5.89$; $SD=1.91$).

Twenty-two teachers (47.8%) reported that they used the Triggers worksheet with their pupils in the classroom and that it supported them 'somewhat' in identifying and managing their autistic pupils' triggers for dysregulation ($M=4.6$; $SD=1.81$). Seven of the 24 teachers (52.2%) who had not used the Triggers worksheet reported that they were planning to use it at a later stage. One teacher said, 'we have focused on the Zones of Regulation™ poster first, to avoid introducing too many new things at once' (P9).

Twenty-eight teachers (60.9%) reported that they used the Toolbox worksheet and stated that they found it a useful support for managing their autistic pupils' self-regulation needs ($M=6.24$; $SD=1.90$). Seventeen teachers (37%) reported that they used individualised Toolbox worksheets for their autistic pupils; 10.9% ($n=5$) used it as a whole-class intervention and 13% ($n=6$) did both. Three teachers (6.5%) reported that they had shared their autistic pupils' completed Toolbox worksheet with their parents.

Content analysis

Content analysis of the open-ended questions regarding the use of the Zones of Regulation™ poster, the Triggers worksheet, the self-regulation tools and the Toolbox worksheet was based on the method presented by Elo and Kyngäs (2008). This involved familiarisation with the data, followed by categorisation and coding of the text by the chief and the main investigator. After analysing the data independently, the chief and the main investigator met to compare their coding and to discuss and agree the emerging themes regarding the implementation of the Zones of Regulation™ curriculum. The following four themes emerged.

Theme 1: Usefulness of zones of regulation resources for the whole class

Participants highlighted the usefulness of the Zones of Regulation™ poster, the self-regulation tools and the toolbox not only for their autistic pupils but for all pupils. They explained that using the Zones of Regulation™ poster with all pupils in a class had the advantage that autistic pupils did not feel singled out, or as one teacher put it: 'as I did it with my whole class, the pupils with autism felt comfortable and able to define their feelings and were able to verbalise them' (P42).

Using self-regulation tools with the whole class rather than only for autistic pupils was a key feature of participant responses for 44 teachers (95.7%). One teacher said, 'I felt that although I had more breaks in the day, on the whole the children were more productive' (P45), while another commented that 'whole class work keeps the ASD pupil "anonymous" and benefits all' (P34).

Similar to the use of the Zones of Regulation™ poster and the self-regulation tools, teachers commented on the usefulness of the Toolbox worksheets' application for the whole class. One teacher answered that 'the toolbox is useful for children without ASD as well' (P44). Twenty-eight teachers (60.9%) reported that they used the Toolbox worksheet and stated that they found it a useful support for managing their autistic pupils' self-regulation needs ($M=6.24$; $SD=1.90$). Seventeen teachers (37%) used the individualised Toolbox worksheets for their autistic pupils, 10.9% ($n=5$) used it as a whole-class intervention and 13% ($n=6$) did both. Three teachers (6.5%) reported that they had shared their autistic pupils' completed Toolbox worksheet with their parents.

Theme 2: Communication support between autistic pupils and teacher

The usefulness of the Zones of Regulation™ poster as a communication tool between teachers and autistic pupils was frequently reported ($n=14$). Twelve participants highlighted its visual clarity as supportive when talking to autistic pupils about their feelings and associated behaviours.

One teacher stated that *'the poster gives both the visual and the language to support self-regulation'* (P19), while another said that *'it has been a great communication support between me and an autistic pupil'* (P12). One teacher poignantly expressed it as *'the poster supports both the children and me speaking the same language'* (P20). Another said that an *'autistic child was upset after lunchtime – a row with a friend. They put themselves in the red zone, so we were able to talk about feelings and resolve the situation'* (P39). Interestingly, one teacher highlighted that the Zones of Regulation™ poster does not require pupils to use verbal language and pointed out that *'the child circles the appropriate feeling and handed them to the adult. Sometimes the child is so upset they can't speak and this gives us a starting point'* (P38). A comment about the Triggers worksheet being a useful tool for raising teachers' awareness of their autistic pupils' triggers indicated that *'it has helped me identify and respond to triggers and how to help the child avoid and recognise how to deal with these'* (P2).

Theme 3: Support for autistic pupils' taking ownership of their self-regulation

A key feature in participant responses was the recognition of the usefulness of having individualised Toolbox worksheets on autistic pupils' desks. One teacher stated that *'the triggers worksheet allows me to quietly sit down with the pupil and they can focus and verbalize what scenarios can become a trigger. This allows me to pre-empt incidents and them to have ownership of their feelings'* (P20), while another teacher noticed that *'thinking about triggers when the child is calm, meant that they were able to think about triggers in a less emotional way'* (P12). Regarding the use of the Toolbox worksheet, a teacher commented that *'each child has taken ownership of their toolbox and will refer to it as a support when they are dysregulated in class'* (P1).

Theme 4: Positive impact of movement breaks on autistic pupils' self-regulation

Interestingly, the self-regulation tool most often used by participants was *'whole class movement breaks'* ($n=41$; 89.1%). Some teachers ($n=12$; 26%) commented on the beneficial effect on self-regulation of using movement breaks. One said that *'movement breaks (walking) allow my pupil to self-regulate. It also allows me time to talk to the pupil. Breathing sometimes works but movement certainly does'* (P30). Another said that *'movement breaks helped to keep the children calm and regulated'* (P6).

DISCUSSION

The aim of this study was to investigate the effect of an online training programme comprising the main

paradigms and resources of the Zones of Regulation™ curriculum on teachers' sense of self-efficacy when managing autistic pupils' self-regulation needs in the mainstream primary school classroom. Research has shown that teachers who rate themselves as self-efficacious employ strategies that are flexible, are responsive to pupils' strengths and needs, are focused on pupil success, and are encouraging of their pupils' own self-regulation (Woodcock et al., 2022). Analysis of the data in the current study has shown that the online Zones of Regulation™ training significantly increased teachers' sense of self-efficacy when dealing with their autistic pupils' self-regulation needs ($t(86)=8.538$, $p<0.001$). Content analysis of the open-ended questions showed that the paradigms of the Zones of Regulation™ curriculum delivered at that training, and access to a variety of resources related to this intervention, changed teachers' practice (using the visual resources and self-regulation tools taught at the training) and so increased their skills in talking to autistic pupils about their feelings and supported teachers in managing their pupils' self-regulation.

Autism is often described as a spectrum condition, with considerable differences between individuals. This demands different educational approaches and indeed there are a variety of strategies for teaching autistic pupils. It is suggested that while autistic pupils struggle to associate meaning with verbal instructions, this is not equally true of instructions that include visual relation of information (Tissot & Evans, 2003). Participant responses in this study showed that the Zones of Regulation™ poster is an efficient communication tool between autistic pupils and their teachers. Participant answers also suggested that the combination of visual presentation and the concise language of the poster contributed to teachers and autistic pupils *'speaking the same language'* with regard to self-regulation and so contributing to resolving these issues in partnership.

Kinnaird et al. (2019) suggest that alexithymia, referring to difficulties in recognising and distinguishing between different emotions and bodily sensations, is a co-occurring feature in about half the autistic population. Research has shown that learning to give language to emotional experiences calms the nervous system (Lieberman et al., 2007). By labelling emotions, feelings and moods, the amygdala's activity is regulated by pre-frontal cortex activity and the possibility for adaptive self-regulation is created (Davidson et al., 2000). Applying this in the educational setting, Macklem (2010) underlines that teachers need to have an understanding of the importance of labelling and talking about feelings, know how to react to them, and have a collection of pupil- and classroom-friendly practices that can be used to teach self-regulation strategies. Participants' responses in the current study highlighted that both the Zones of Regulation's™ conceptual framework and the worksheets offered not only provided teachers with skills and resources to talk to pupils about their feelings and behaviours but also gave them effective strategies

to manage needs in this area. This finding correlates with the study by Wyman et al. (2010), who showed that when emotional regulation strategies are taught in the classroom, pupils are more likely to show improved behavioural regulation, social skills with peers, and a decrease in off-task behaviours or withdrawals.

The current study highlights a possible practical application of the findings of the study by Parsons et al. (2009), who strongly recommend that improvements in educational practice should support all children with special educational needs rather than singling out a group of children with particular needs. Participants' responses in the current study highlighted that the resources offered (the Zones of Regulation™ poster, the Triggers worksheet, the self-regulation tools and the Toolbox worksheet) were successfully used with the whole class, demonstrating that with this course of action, autistic pupils benefit without feeling singled out. Jordan (2005) states that children with autism have specific learning needs that are recognised as a difference specific to children with autism as a group but are not only determined by membership of that group. This is very much in line with teachers' responses related to the Zones of Regulation™ curriculum also benefiting children in the classroom who have self-regulation issues for reasons other than autism.

A surprising outcome of this study has been that the self-regulation tool most used by teachers was whole-class movement breaks. Many participants described the beneficial effect of movement on their pupils' self-regulation. Fedewa et al. (2018) suggest that pupils who were given movement-based breaks rather than academic-based breaks had better learning outcomes. This suggests that movement-based breaks are more beneficial than other self-regulation strategies used in classrooms.

The important role that teachers have in promoting self-regulation in children is highlighted by Macklem (2010), who states that teachers are uniquely placed to promote positive emotional regulation simply by talking about emotions, labelling them, and discussing and modelling strategies for coping with these emotions. Participant responses in the current study have highlighted that the Zones of Regulation™ curriculum is perceived by teachers as a valid intervention to equip teachers to provide the above.

This study has shown that the Zones of Regulation™ curriculum is an acceptable, understandable and feasible intervention for primary 5, 6 and 7 teachers in the mainstream classroom. Nearly all participants in the training rated the online delivery of this intervention as equally useful to face-to-face training. It is also encouraging that a large majority of participants reported that they will continue to use the learning gained from the online training in the future.

LIMITATIONS

The Zones of Regulation™ curriculum contains 19 lesson plans to teach pupils to become more aware of their

feelings, and to manage their behaviours and sensory processing needs. The online training programme was a short introduction to some of the key principles of the Zones of Regulation™ curriculum and offered only four resources to teachers. Therefore, the outcomes of this study are limited to a narrow snapshot of the Zones of Regulation™ curriculum. In the current study, teachers underlined that they needed more time to implement the Zones of Regulation™ poster, the self-regulation tools and the Toolbox worksheet before introducing the topic of triggers. This highlights that the timeframe may not have been long enough to capture a change in practice after the training.

The open-ended questions asked as part of the qualitative survey at timepoint 3 elicited answers on a wide variety of topics. While this gave insight into how teachers changed their practice after having attended the training, it is likely that the number of participants who highlighted a specific aspect is not conclusive as the questions were broad and generic. For example, three study participants reported the beneficial aspect of sharing the resources of the Zones of Regulation™ curriculum with parents/caregivers of their autistic pupils; however, this result is to be interpreted with caution, as parental involvement was not specifically addressed in the training or the survey.

Out of the 128 teachers who completed the first TSES questionnaire and took part in the training sessions, 87 teachers completed the second questionnaire, and only 41 teachers completed the third questionnaire which included open-ended questions. Knapp and Heidungsfelder (1999) showed, based on a summary of nine web surveys, that increased drop-out rates can be expected when using open-ended questions. This may have been a reason why a lower number of participants completed the third survey.

Finally, it is acknowledged as a limitation of this study that outcomes with regard to the implementation of the paradigms and specific resources of the Zones of Regulation™ introduced during online training were only collected from teachers and not from pupils. It is recommended that future research in this area should investigate all 19 teaching lessons of the Zones of Regulation™ curriculum, and complete outcomes measures with pupils in addition to teachers.

RECOMMENDATIONS

This study indicates that the Zones of Regulation™ curriculum is an intervention that increases teachers' self-efficacy in the mainstream classroom when managing self-regulation needs of autistic pupils. It is therefore recommended that the Zones of Regulation™ curriculum is considered an effective intervention for mainstream primary school teachers who teach autistic pupils with self-regulation needs. This study also shows the important

role that occupational therapists, with post-graduate qualifications in autism and sensory processing, have in capacity building within education. In particular, it is recommended for occupational therapists who work in mainstream educational settings to train their teaching colleagues specifically on the use of movement as self-regulation breaks.

Many of the study participants expressed a preference for online delivery ($n=44$; 95.6%) versus face-to-face delivery ($n=2$; 4.4%). The high acceptability rate of the online delivery of the training highlights that this new means of engaging teachers, after the Covid-19 pandemic, in continuous professional development is a feasible method to allow for improved uptake of training. It is recommended that online training is increasingly considered to deliver training to a high number of participants in a time-efficient and cost-effective way. Many study participants indicated that they are interested in further training in the Zones of Regulation™ curriculum. It is recommended that occupational therapists who foster capacity building among their education colleagues investigate which modalities are best for maintaining the learning gained from initial training.

CONCLUSION

This is the first published study that has used standardised outcome measures to evaluate the Zones of Regulation™ curriculum with a noteworthy number of participants. Outcomes suggest that training on the main paradigms and specific resources of the Zones of Regulation™ curriculum significantly improves the self-efficacy of teachers when dealing with self-regulation needs in autistic pupils. The current study also suggests that these same paradigms and specific resources of the Zones of Regulation™ curriculum are acceptable, understandable and feasible interventions for primary school teachers in the mainstream classroom. These findings support the recommendation that education authorities should consider more training opportunities on the Zones of Regulation™ curriculum to support teachers in the mainstream classroom.

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CONFLICT OF INTEREST STATEMENT

There is no conflict of interest in this study.

DATA AVAILABILITY STATEMENT

Study data will be available on request.

ETHICAL APPROVAL

Ethical approval was obtained from Ulster University (FCNUR-21-102-B). Approval to carry out online training for primary 5, 6 and 7 teachers across Northern Ireland and use its findings for the current study was obtained from the Education Authority Northern Ireland (EANI). Informed consent was obtained from participants prior to taking part in the study.

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