

Professional and Pedagogic Studies: Researching
the Learning: what, how and why am I teaching?

Word Count: 4617

Research Context

This research aims to answer the question: What are the effects of sensory circuits on the engagement of year 2 pupils? One aim of this research is to explore the impact of sensory circuits on pupils and increase focus on engagement. The issue of student engagement will be investigated and the impact of sensory circuits on this will be measured.

The school is a large Welsh medium primary school, on the outskirts of Llanelli, Wales. The school has 434 pupils, 19% of which have an identified ALN (My Local School, 2023), a 2% increase since their last inspection (ESTYN, 2017). The research will investigate the effects of sensory circuits on the pupils in a year 2 class. The sample of students includes two children with an identified ALN and have an IDP, some other pupils have been identified as having attributes of ALN but do not have an IDP and therefore will be considered as neurotypical. None of the students in the class access specialised or specific interventions including speech and language, emotional support, Lego therapy, or input from occupational therapy within school hours.

In discussions with the class teacher, it was mentioned that the children could be challenging and found it difficult to focus on tasks or listen during lessons. During the initial observation days within the school, disruptive behaviour was observed regularly. This was in the form of shouting out or talking over the teacher. It was also observed that several children found it difficult to focus during carpet time, a period lasting no more than 20 minutes. This involved looking away from the teacher, playing with various objects or clothing and lying down. During previous experiences, I observed that physical activity, such as movement breaks, benefited student engagement. This led to me questioning if it would be effective as a strategy for this class. However, due to the young age group, it was decided that a more structured way of facilitating this would be better suited.

Overview of relevant literature

Literature suggests that student engagement has been worsening over time (Schlechty, 2001) and that this issue usually begins at primary school age (Krauss, Kornbluh, & Zeldin, 2017; Marks, 2000; Stipek & Byler, 2004). In addition, according to

Alatupa et al. (2011) the impact of disruptive behaviour on attainment is evident in pupils throughout their school career. Disruptions are a common issue in the progression of learning within the classroom environment and can prevent teachers from achieving the objectives of their lessons (Westwood, 2015). Disruptions impair the quality of teaching and learning and can destroy a positive classroom atmosphere. Brewster and Fager (2000) argue that improved engagement and motivation lead to higher achievement and student performance.

PISA (2018) report suggests that teachers should create learning environments that facilitate and support students' active engagement in learning and emphasizes that what occurs in school impacts attitudes to learning. Children who have sensory disorders, common in individuals with autism spectrum disorder (ASD), coordination acquisition disorder, and attention deficit/hyperactivity disorder (ADHD), are more likely to develop poor interest and engagement in school (Ouellet et al. 2021). Research suggests that teachers, parents and researchers recognise that challenges in processing sensory information can hinder the academic advancement of students with ASD, impacting learning experience and participation (Butera et al., 2020; Jones, Honey & Riby, 2020). Despite an emphasis on engaging classroom environments and the need to support those with ALN, there is a shortage of evidence-based sensory integration interventions available for educators (Dynia et al., 2022). Educators are suggested to frequently employ sensory integration strategies (Dynia et al., 2022). Crandall (2022) goes on to say all students can benefit from motion, but it is important for the teacher to keep movement breaks on tasks as Chisholm et al. (2017) states that it is easy for these tasks to diverge from their goal.

Many therapeutic modalities are suggested in literature to reduce the impact of sensory issues and promote self-regulation (Ouellet et al., 2021). However, according to Ouellet et al. (2021) the available evidence from studies is not efficiently organised, uses inconsistent terminology, and often consisted of nonoverlapping definitions which posed difficulties for those who wish to investigate its true effectiveness. Terms such as sensory integration and movement breaks are interchanged regularly. There is a clear need for research into the impact of sensory integration programs on student engagement,

particularly for neurotypical children as most of the available research appears to be based on children with ASD or ADHD. According to Schmidt, Benzing, & Kamer (2016) classroom-based physical activity breaks are said to positively impact children's attention during their school day. There was no research found for the specific use of Sensory Circuits on student engagement. Again, the inconsistent terminology became a problem with engagement and motivation being interchanged, Gregory and Kaufeldt (2005, p.1) argue "Engagement and motivation—what's the difference?".

Although sensory circuits and movement breaks are beneficial for those with ALN the research for neurotypical children is not clear. According to Horwood (2009) there are several signs that may indicate that a child (without identified needs) has sensory integration issues. Schmidt, Benzing, & Kamer (2016) conducted their study on random children therefore included both children with ALN and neurotypical children and found that a short cognitively engaging activity was more successful in engaging children than having a movement break. Although conducted on adults Peiris et al. (2021) found that university students perceived movement breaks to be beneficial for concentration, engagement and productivity.

Not only will implementing sensory circuits or movement breaks support children's learning engagement, but it will also battle their increasingly sedentary lives. Hills, King and Armstrong (2007) argue that individuals such as parents and teachers should be facilitating a healthy lifestyle. By introducing children to movement breaks in the classroom children are gradually introduced to fun movements and not forced into physical education lessons which a lot are reluctant to participate in. According to PE Blog (2023) this reluctance can come from physical barriers, confidence, or lack of support, especially in children with ALN. Physical brain breaks can include anything from yoga to running on the spot (OT Toolbox, ND) therefore there is an activity available for every level and completing it for a short period of time rather than a whole hour means a child may engage because they know the activity won't last.

Explanation of Case Study

This research will employ an exploratory case study method. According to McLeod (2024) a case study involves examining an individual or a group, typically collecting data from diverse sources such as questionnaires, observations, and interviews. A case study is commonly used in research and can explore the attitudes and experiences of all involved (Cowe et al., 2011) within a real-life context that the researcher has little control over (Yin, 2002). Exploratory case studies allow for a thorough examination of a multifaceted issue within an authentic environment (Crowe et al., 2011) while allowing the researcher to make new discoveries about a specific topic (Swedberg, 2020).

When conducting any form of research, the strengths and limitations of the method must be considered. According to Collier (1993) Case Studies have considerable advantages when compared to statistical methods or other more formal methods of data collection. One of the biggest advantages of the case study method according to Sprinz & Wolinsky-Nahmias (2004) is the ability to achieve high construct validity. This research has taken measures to try to ensure the construct validity of its results by using multiple measures and multiple methods in measurement, as suggested by Campbell and Fiske (1959). However, Sprinz and Wolinsky-Nahmias (2004) says that one limitation of using Case Study as a research method is the inability to evaluate how often and how well specific cases represent the average impact of variables. In addition, it is difficult to establish cause and effect relationship due to the real-life context of the research and the other extraneous variables which could impact the results.

Crowe et al. (2011) suggests that employing the case study approach proves advantageous when there's a necessity for gaining a thorough understanding of a particular issue through its in-depth analysis of real-life contexts. In contrast Swedberg (2020) argues that this same aspect of real-life context can carry risk, as there is uncertainty about whether the study will yield substantial findings. According to Swedberg (2020) without exploratory case studies research would come to a standstill with nothing but repetition without moving understanding forward and being unable to form new hypotheses. McLeod (2024) supports this saying that that case studies provide a good starting point for further research but argues that there are subjective factors and bias to consider which may impact the validity of results.

This case study adopted an exploratory method using various data collection methods including observations, questionnaires, and semi-structured interviews. This mixed methodology is sometimes referred to as a mosaic method (Clarke and Moss, 2011). Using this method allows the researcher to gather information in various ways from different viewpoints, in this case, the view of the teacher, pupils, parents and the researchers' own observations. This allows the rich picture of the case study to be built by gathering small elements and pieces of information together and form a coherent whole from which to draw conclusions (Clarke and Moss, 2011).

The data was collected from a year 2 class with 26 pupils. Consent was obtained from 22 pupils. No pupils or parents withdrew their consent during the research. Although 4 pupils did not consent, they were still able to participate in the movement breaks, but we're not observed or counted in the data. Within the sample there was a range in academic ability and the sample included pupils with ALN which contributed towards the sample being more representative of an average year 2 classroom. There were two students who were diagnosed or identified as having an ALN who were included in the research. However, of the case study sample, there were 16 males and 6 females. Grafstrom and Schelin (2013) describe a representative sample as simply being a scaled-down representation of the population containing all its characteristics. Due to the underrepresentation of female participants the sample may not be considered as a wholly representative sample of this age group.

Research Methods

An observation schedule was used (Appendix C) to efficiently document changes in levels of disruptions and engagement. Observations occurred during carpet time and assemblies where pupils had to sit relatively still and maintain attention for extended periods. The observations were documented prior to the sensory circuit program starting and during the program period to understand its effects. According to Capel, Cliffe & Laurence (2021) observation schedules are a useful means of unveiling patterns exhibited either by the teacher or pupil and are usually completed by a non-participant observer. For this study's purposes, the researcher observed when not teaching and took a tally of the disruptions that occurred. Disruptive behaviour is defined as anything which

disrupts the flow of learning including students talking out of turn, making unnecessary noises, or hindering other students in their learning (Cooper and Olsen, 2001). Fidgeting behaviours such as movement around the carpet or playing with objects will also be documented as disruptive if it interferes with the flow of the lesson to such an extent that the teacher is required to react to it. These behaviours were counted by tally during carpet time so that the researcher could focus their attention and observe as a by-stander. Any disruptive behaviour will be counted over the two weeks (the week prior to sensory circuits and during a week of sensory circuits) along with fidgeting behaviour and teacher intervention or “sushing” (Appendix C).

A semi-structured interview was conducted with the class teacher (Appendix D) at the end of the sensory circuits programme to investigate if they had noticed changes in the pupil’s behaviour. According to Cohen and Manion (1989) interviews are used to gather data to develop hypotheses. Through the interview process, Abdullah and Raman (2001) argue researchers can gain useful insights into the beliefs, thoughts and feelings of the respondent. They further argue that semi-structured interviews offer increased openness, granting both the researcher and respondent more flexibility whilst providing purposeful information within context. Semi-structured interviews can provide rich qualitative data which can be analysed to support the drawing of hypotheses and conclusions. A limitation of all interview methods is that they can be time consuming for both the researcher and respondent (Choy, 2014). In addition, the validity could be questioned as there may be participant bias as the respondent may decide to provide responses that they think would be desirable and appreciated by the researcher (McDowell and MacLean, 1998). The semi-structured interview was recorded allowing for a transcript to be made to analyse the information collected. The recording was deleted once the transcript was made and the transcript will be destroyed along with all other data gathered on 31st of July 2024 on the research completion date.

Questionnaires were used to gather data from the participants about how they felt about school. They were given a simple single-question questionnaire, with images to aid their understanding, to be completed independently and anonymously, and a more in-depth multiple-choice questionnaire to be completed with the support of an adult (to read

the questions and answer options). The latter also had visual aids to support the students understanding.

This study will utilize both quantitative and qualitative approaches as methods for data collection. As outlined by Streefkerk (2023), quantitative research aims to validate or test hypotheses (such as examining the impact of sensory circuits on the engagement of year 2 pupils), while qualitative research aims to gain insights and understand phenomena (such as exploring the perceptions and opinions of the class teacher, parents, and pupils).

Quantitative data will be gathered by observation through use of a tally, though the emotions questionnaire and the student engagement questionnaire. Choy (2014) suggests that qualitative research is valuable as it can be applied quickly, and the results are able to be swiftly and easily analysed. Quantitative data also produces data, which is concrete and unlike qualitative data, it is less likely to be skewed due to an opinion. Despite this, Choy (2014) states that quantitative research lacks the consideration of the importance of the varying characteristics within a participant sample and how this may impact results as the data is only numerical.

Qualitative data will be gathered through additional notes taken during observations, pupils' comments regarding their emotional state and using teacher interviews following the initial observation period. This type of data, as described by Bhandari (2013), lacks numerical values but aims to understand the opinions and experiences of those involved. Qualitative researchers, delve into the natural settings where what they are studying occurs and aims to interpret it (Denzin & Lincoln, 1994). Velez (2008) emphasises this, stating that qualitative methods are often characterized by rich narratives of the natural environment and detailed descriptions, focusing on processes rather than only the outcomes. Conducting qualitative studies allows the participants' words to contribute to further exploration of how and why instances occur, fostering a dynamic research process and opportunity to identify a scope for future research (Johnson & Onwuegbuzie, 2004). However, Choy (2014), states that acquiring and processing qualitative data can be very labour-intensive taking much time and effort on the researcher's part.

From understanding the positives and negatives of both qualitative and quantitative research it seemed that a mixed-methodology approach was most appropriate for this research. This is supported by Neuman (2006) who suggests that it is crucial to integrate both qualitative and quantitative data into research, though it may require considerable time and effort understand them and use them in a way that makes the most of the strengths of both.

Factors which may impact the ability to conduct these research methods are the age of the participants (6–7-year-olds) and their attainment levels (such as their reading comprehension and basic understanding). One limitation which may impact on the validity of the research due to the researcher being a non-participant observer. George (2023) argues that this approach carries a significant risk of researcher and observer bias and may inadvertently impact participant behaviour, leading to the Hawthorne effect. To mitigate bias, the researcher has addressed their own positionality and observed during carpet times while they were not teaching so they could make the appropriate notes of observations in real time to avoid bias based on teaching their own lesson.

Data Presentation and Analysis Method(s)

Data will be reported using direct quotes from teacher interview and graphs using numerical data. Credibility of data means that it is complete and accurate. Korstjens & Moser (2018) states that credibility is the confidence that is placed in the findings. According to Patton (1999) to increase trustworthiness of data and pay attention to the validity and reliability of the data. Individuals reading the research should question if this data is believable and a true representation of the findings of the study.

Meeting the dependability criteria is difficult in qualitative work, it is often difficult to repeat studies exactly (Shenton, 2004). Dependability is intertwined with credibility, ensuring reliability in data and accountability. According to Korstjens & Moser (2018) dependability can be achieved by an outside person performing an audit of the data. This was not possible during this study. Dependability can also be achieved by having a broad population sample.

To ensure confirmability the researcher confronted their own positionality as to ensure neutrality. Shenton (2004) states that the findings should emerge from the data and not the opinions of the researcher. The researcher remained trustworthy by not being influenced by any external influences or biases by conducting an interview with the teacher once the observation period was concluded to ensure no opinions were influential.

The researcher chose to conduct a study into sensory circuits to enhance, to employ transferability the researcher should conduct further studies. The researcher should seek to more answer questions, ensuring this research is adaptable to other year groups, primary school environments and if it is not only suitable for universal provision but also a targeted intervention for those who not only have an ALN with sensory integration problems but also perhaps fine and gross motor skills.

Ethical Considerations

The potential implications of participating in a case study must always be considered carefully considering the potential harm that may occur. An ethics form (see Appendix A) was complete to ensure adherence to ethical standards. By studying at the University of Wales Trinity St Davids (UWTSD) and being employed in Wales, considerations must be given to the EWC Code of Professional Conduct and Practice (2023), the UWTSD Ethics and Integrity Code of Practice and the UWTSD Research Management policy. In addition to this, in accordance with the BERA Ethical Guidelines for Educational Research (2018) all participants will remain anonymous, and data was and will be handled with confidentiality. The school has not been named in any of the research and the pupils are only referred to according to letters e.g. pupil A. Information is stored on a password-protected two step verification one drive. This information will be destroyed on July 31, 2024.

Transparency will be ensured by providing information about the case study to parents (Appendix B), pupils, and teachers, in both English and Welsh. Consent was given by parents through the completion of a consent form (Appendix B) and the pupils provided verbal assent for their participation in the study. Verbal assent was seen as the

best method due to their young age. Consent from both pupil and parent was a requirement for the pupils to be included in the study. Both parents and the pupils were informed that they may withdraw from the study at any time and that this would not have any negative implications.

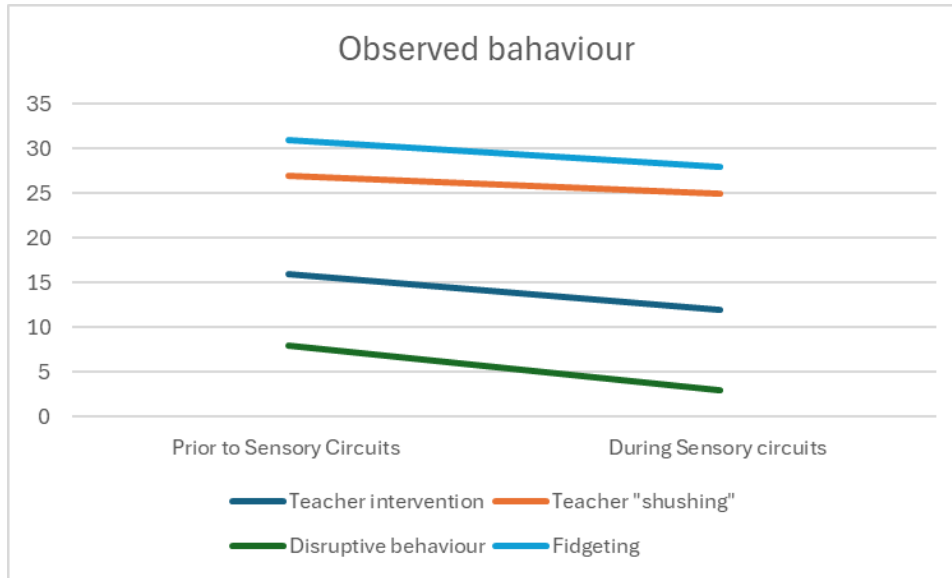
During the research study and processes, consideration was given to my positionality and how it may impact the implementation and results of the study. Wilson, Janes and Williams (2022) stated that researchers must critically evaluate their positionality by questioning and reflecting on their own assumptions. I have personal experience of relatives and friends with ALN who have expressed to me the challenges they faced in school to remain still and focused. Due to this I understand that I may have developed a positionality that movement could benefit other pupils who have difficulty remaining focused and still in school.

Results and Discussion

The number of disruptive and fidgeting behaviour was tallied during the research. The definition of disruptions has previously been defined. The number of times that the teacher was required to intervene by “shushing” students or stopping the lesson to speak to them was also counted.

By the end of the study the number of times the teacher was required to “shush” the pupils or intervene by stopping the lesson remained nearly the same with a very insignificant decrease since starting the sensory circuits program (Graph A). The number of disruptions which included children moving around the carpet or playing with objects also remained fairly consistent. However, the number of children speaking over the teacher decreased. Children's overall disruptive behaviour seemed to decrease most significantly (Graph A).

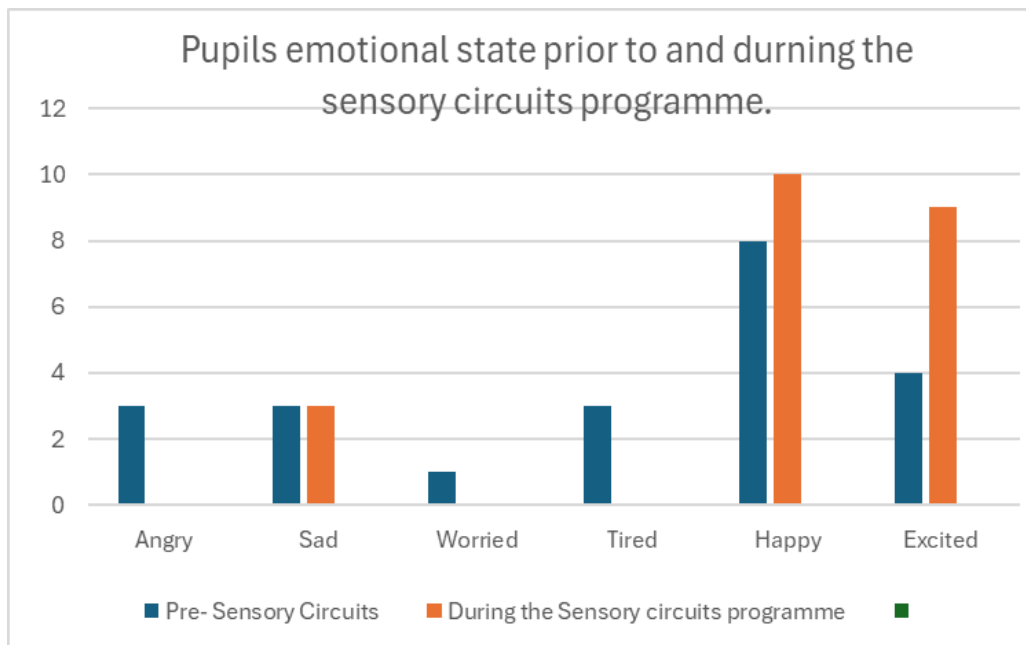
Graph A:



How the children felt about coming to school and learning was tracked with a simple single question with images of

emotions to circle (Appendix E). Pupils felt generally happier during the sensory circuits' weeks (Graph B). The children seemed to have a better understanding or were better able to communicate their feelings during the sensory circuits' week. One child changed from feeling excited to feeling sad but when prompted for their reasoning explained that this was due to having moved house, therefore there may be factors that affect the children's feelings outside of participating in the sensory circuits' activities.

Graph B:

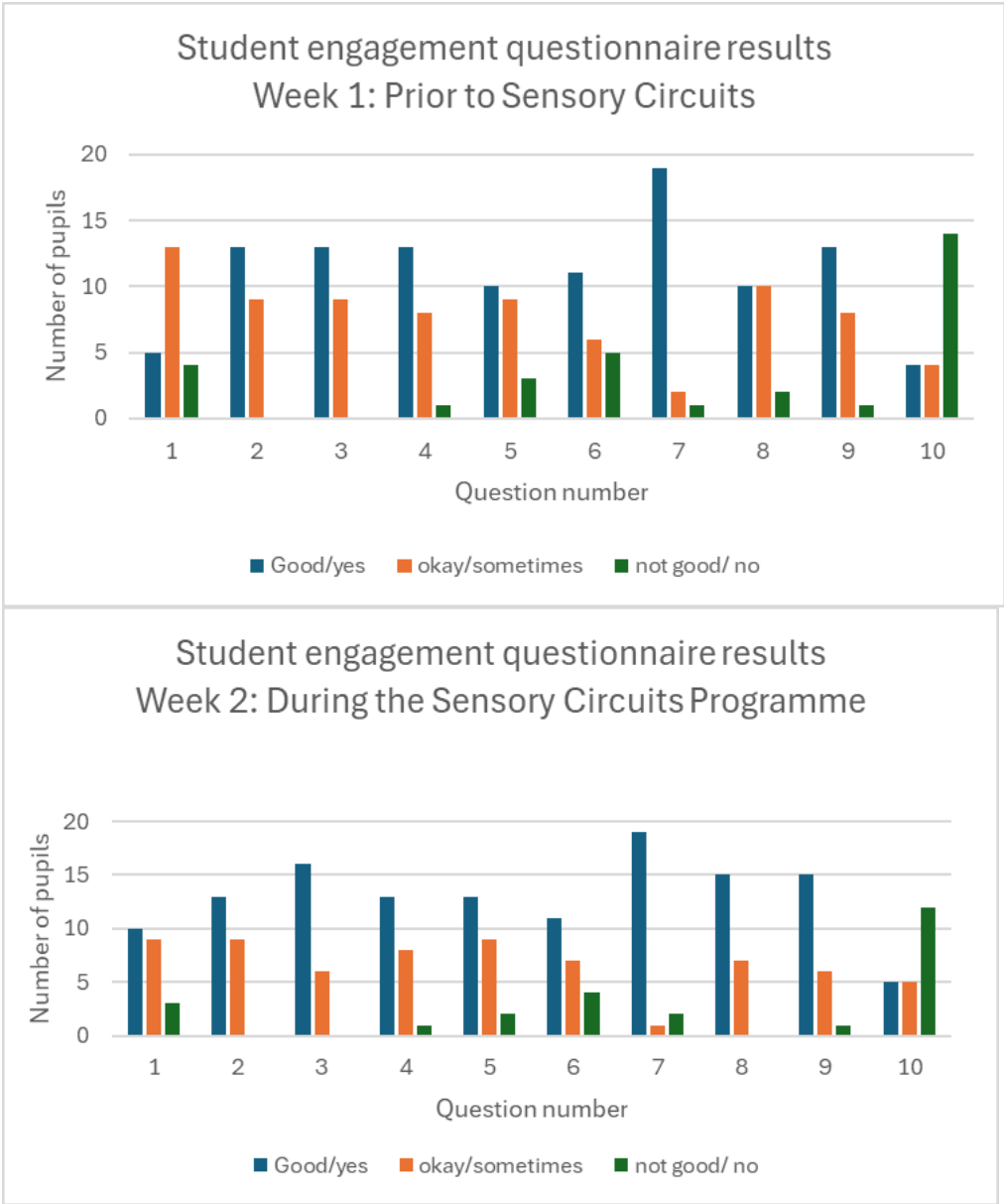


The student engagement

questionnaires (Appendix D) showed that the pupils appeared to feel slightly happier

about attending school, with 10 out of 22 pupils compared to 5 pupils prior to the sensory circuits program (Graphs C.1 and C.2). Out of the 22 pupils all showed improvement in attitude towards school in at least 2 areas. Interestingly some areas did not show any change, such as question 2 and 4 (Appendix D). In addition, despite most pupils noting that they were able to concentrate and listen to instruction slightly better during the week of sensory circuits, most pupils still felt that carpet time was too long.

Graph C.1



Graph C.2

The semi-structured interview with the teacher at the end of the sensory circuits program showed that the class teachers' observations were consistent with that of the researcher. The teacher stated that results of the sensory circuits on the student's engagement appeared to be positive but relatively inconsistent at this early stage. The teacher stated that the program would require run longer to see any significant correlation between pupil engagement and the sensory circuits program. The teacher was also asked if they thought circuits could be realistically integrated into the classroom routine. The teacher stated that for this to be a long-term programme it would need to be consistent across the school and a protected time such as play-time and lunchtimes for the sessions to not be disrupted by school-wide activities such as assemblies. It was also stated that this may be difficult to incorporate daily due to the impact on teaching time as each sensory circuit takes 10-15 minutes and would ideally be implemented first thing each morning and afternoon. The comments made by the teacher such as "Roedd angen fwy o amser i weld gwahaniaeth cadarn". It was also mentioned that some children became overly excited when participating in sensory circuits, this therefore was having the opposite effect than what was intended.

Though there was no statistically significant improvement in overall student engagement during the study certain pupils showed an improvement in behaviour and participation. This was supported by the teacher who stated "Mae plentyn X wedi dangos gwelliant mawr yn ei hagwedd". It appears Sensory Circuits did improve the engagement of some year 2 pupils but not all. One pupil displayed worsening behaviour during carpet time but continued to engage with lessons this was also noted by the class teacher who stated "Mae agwedd plentyn A wedi gwaethygu". However, the negative behaviour of this child could be explained due to their trusted adult having recently left their role in the school and no longer working with them or due to a change in routine.

There was a limited time for data analysis once the data was collected and thus it was not possible to analyse and compare the data of each individual pupil as thoroughly as the researcher would have liked.

Conclusion

There is limited research which confirms that participation in sensory circuit programs aids in improving student engagement, few have been conducted with neurotypical children (Schmidt, Benzing, & Kamer, 2016) and even one with adults (Peiris et al., 2021). The sample is not representative of society. The aim of the study was to answer: What are the effects of sensory circuits on the engagement of year 2 pupils? After analysing the data, it is apparent that in the short period of time there is little increase in engagement, concentration and productivity. Therefore, when conducting future research, I would like to expand the timeframe I have to complete. Having more time to conduct the study over multiple year groups would give me a greater insight into if sensory circuits is a viable universal provision.

This research can be linked to multiple teaching standards including but not limited to: managing the classroom environment, sustained effort and resilience in learners, enabling improvement and wider reading and research findings. This has been beneficial for my own professional development giving me the foundation to conduct future more in-depth research and to support others who are contemplating research in the same area.

Recommendations

There are several recommendations that could be made for future research. Due to the limited timescale for this research, it would be recommended to conduct future research over a longer time period and become an integrated routine for better results. It would also be interesting to conduct a more in-depth study observing the impact sensory circuits on improvement of self-regulation and behaviour. Further study, including other classes and year groups, is also needed to ascertain if sensory circuits can be used across the school as an effective form of universal provision. Further study including other year groups is also needed to ascertain if sensory circuits can be used as a whole school universal provision.

The limitations of this research include the lack of balance between male and female (underrepresented) participants in the sample, leading to an unrepresentative sample.

Due to the limited timescale, the researcher had to exclude some data collection methods that were listed in the Ethical consent form (Appendix A) including the parent's questionnaire and the Leuven Scale. Having time to include the Leuven Scale would have provided a specific quantitative scale for student engagement to be compared to the pupil engagement questionnaire results. Additionally, being able to gather data from parents would have provided a picture of the effects of Sensory Circuits on behaviour at home.

Having noticed the improvement in the effort of the children in their schoolwork and their improved willingness to learn it would be beneficial to continue to incorporate sensory circuits into the school routine, sustaining the positive outcomes for learning.

In my future practice as a researcher, I intend to incorporate sensory circuits into my daily timetable with my pupils. As previously stated, movement breaks and sensory integration activities are shown to increase student engagement and productivity, given the time and resources. Therefore, it is my opinion that it should become a normal part of the school day.

Word Count: 4617

References:

- Abdullah, S. H., & Raman, S. (2001). Quantitative and qualitative research methods: Some strengths and weaknesses. *Jurnal Pendidik dan Pendidikan*, Jilid, 17(1), 120-134.
- Alatupa, S., Pulkki-Råback, L., Hintsanen, M., Mullola, S., Lipsanen, J., & Keltikangas-Järvinen, L. (2011). Childhood disruptive behaviour and school performance across comprehensive school: A prospective cohort study. *Psychology*, 2(6), 542-551.
- BERA (2018) Ethical guidelines for educational research. [Online] 4th edn. Available at: <https://www.bera.ac.uk/researchers-resources/publications/ethical-guidelines-for-educational-research-2018> (Accessed: 11 March 2024)

Bhandari, P. (2023) What Is Qualitative Research? Methods and Examples [Online] Available at: <https://www.scribbr.co.uk/research-methods/introduction-to-qualitative-research/> (Accessed: 4 April 2024)

Brewster, C., & Fager, J. (2000). Increasing student engagement and motivation: From time-on-task to homework. Portland, OR: Northwest Regional Educational Laboratory.

Butera, C., Ring, P., Sideris, J., Jayashankar, A., Kilroy, E., Harrison, L., Cermak, S. and Aziz-Zadeh, L. (2020). Impact of Sensory Processing on School Performance Outcomes in High Functioning Individuals with Autism Spectrum Disorder. *Mind, Brain, and Education*, 14(3), pp.243–254.
<https://onlinelibrary.wiley.com/doi/abs/10.1111/mbe.12242>

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56(2), 81–105.
<https://doi.org/10.1037/h0046016>

Capel, S.A., Cliffe, J. and Lawrence, J. (2021) A practical guide to teaching physical education in the Secondary School. London: Routledge, Taylor & Francis Group.

Chisholm, A., & Spencer, B. (2017). Let's get moving!: Eight ways to teach information literacy using kinesthetic activities. *Pennsylvania Libraries: Research & Practice*, 5(1), 26-34. <https://doi.org/10.5195/palrap.2017.141>

Choy, L. T. (2014). The strengths and weaknesses of research methodology: Comparison and complimentary between qualitative and quantitative approaches. *IOSR journal of humanities and social science*, 19(4), 99-104.

Cohen, L. and Manion, L. (1989) *Research Methods in Education*. 3rd .. edn. London: Routledge

Clark, A., and Moss, P. (2011). *Listening to young children: The mosaic approach* (Second edition.). London: National Children's Bureau.

Collier, D. (1993). The comparative method. *Political Science: The State of Discipline II*, Ada W. Finifter, ed., American Political Science Association.

Cooper, P. and Olsen, J. (2001) Dealing with disruptive students in the classroom. Routledge.

Crandall, E, (2022) "The Importance and Implementation of Kinesthetic Learning in the English Classroom" Senior Honors Theses. 1250.
<https://digitalcommons.liberty.edu/honors/1250>

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. BMC medical research methodology, 11, 100.
<https://doi.org/10.1186/1471-2288-11-100>

Denzin and Lincoln (1994) Educational Research: An Introduction. New York: Longman

Dynia, J.M., Walton, K.M., Sagester, G.M., Schmidt, E.K. and Tanner, K.J. (2022). Addressing Sensory Needs for Children With Autism Spectrum Disorder in the Classroom. Intervention in School and Clinic, 58(4),
<https://journals.sagepub.com/doi/abs/10.1177/10534512221093786>

ESTYN (2017) [Redacted] [Online] Available at:
<https://www.estyn.gov.wales/system/files/2020-08/Ysgol%2520Gymraeg%2520Dewi%2520Sant%2520en.pdf> (Accessed 7 May 2024)

George, T (2023) *What Is Participant Observation? Definitions & Examples* [Online] Available at: <https://www.scribbr.co.uk/research-methods/participant-observations/#:~:text=Participant%20observation%20is%20a%20research,and%20practices%20of%20the%20participants>. (Accessed 5 May2024)

Flipping et al (2020)

Grafstrom, A. and Schelin, L. (2014). How to Select Representative Samples. Scandinavian Journal of Statistics, [online] 41(2), pp.277–290. Available at: <https://www.jstor.org/stable/24586652>

Gregory, G., & Kaufeldt, M. (2015). The motivated brain: Improving student attention, engagement, and perseverance. ASCD.

Hills, A. P., King, N. A., & Armstrong, T. P. (2007). The contribution of physical activity and sedentary behaviours to the growth and development of children and adolescents: implications for overweight and obesity. *Sports medicine*, 37, 533-545.

Horwood, J. (2009). *Sensory circuits: A sensory motor skills programme for children*. Nottingham: LDA.

Jones, E.K., Hanley, M. and Riby, D.M. (2020). Distraction, distress and diversity: Exploring the impact of sensory processing differences on learning and school life for pupils with autism spectrum disorders. *Research in Autism Spectrum Disorders*, [online] 72(72), p.101515.
<https://www.sciencedirect.com/science/article/pii/S1750946720300052>

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14-26.

Korstjens, I., & Moser, A. (2018). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *The European journal of general practice*, 24(1), 120–124. <https://doi.org/10.1080/13814788.2017.1375092>

Krauss, S. E., Kornbluh, M., & Zeldin, S. (2017). Community predictors of school engagement: The role of families and youth-adult partnership in Malaysia. *Children and Youth Services Review*.

Marks, H. M. (2000). Student engagement in instructional activity: Patterns in the elementary, middle, and high school years. *American educational research journal*, 37(1), 153-184.

Mcdowell, I. and Maclean, L. (1998) Blending qualitative and quantitative study methods in health services research, *Health Informatics Journal* No.4, pp.15-22.

Mcloed, S., (2024) Case Study Research Method In Psychology [Online] Available at: <https://www.simplypsychology.org/case-study.html> (Accessed: 11 March 2024)

My Local School (2023) [Redacted] [Online] Available at: <https://mylocalschool.gov.wales/School/6692371?lang=en> (Accessed 7 May 2024)

Neuman, W. L. (2006) Social Research Methods: Qualitative and Quantitative Approaches 6th Edition, Pearson International Edition, USA.

OT Toolbook (ND) BRAIN BREAKS [Online] Available at: <https://www.theotttoolbox.com/brain-breaks/#:~:text=These%20activities%20might%20include%20Yoga,a%20great%20tool%20in%20learning.> (Accessed 7 May 2024)

Ouellet, B., Carreau, E., Dion, V., Rouat, A., Tremblay, E. and Voisin, J.I.A. (2018). Efficacy of Sensory Interventions on School Participation of Children With Sensory Disorders: A Systematic Review. American Journal of Lifestyle Medicine, 15(1), p.155982761878427. Available at: <https://pubmed.ncbi.nlm.nih.gov/33447172/> (Accessed 7 May 2024)

Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. Health services research, 34(5 Pt 2), 1189.

PE Blog (2023) BARRIERS TO PARTICIPATION IN PE FOR CHILDREN WITH SEND [Online] Available at: <https://blog.peoffice.co.uk/barriers-participation-pe-children-with-send/#:~:text=There%20are%20many%20barriers%20that,injury%2C%20and%20lack%20of%20support.> (Accessed: 07 May 2024)

Peiris, C. L., O'Donoghue, G., Rippon, L., Meyers, D., Hahne, A., De Noronha, M., ... & Hanson, L. C. (2021). Classroom movement breaks reduce sedentary behavior and increase concentration, alertness and enjoyment during university classes: a mixed-methods feasibility study. International Journal of Environmental Research and Public Health, 18(11), 5589.

PISA (2018) *Insights and Interpretations*. [online] OECD. Available at: <https://www.oecd.org/pisa/PISA%202018%20Insights%20and%20Interpretations%20FINAL%20PDF.pdf>.

Schlechty, P. C. (2002). Working on the Work: An Action Plan for Teachers, Principals, and Superintendents. The Jossey-Bass Education Series. Jossey-Bass, 989 Market Street, San Francisco, CA 94103-1741.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*, 22(2), 63-75.

Sprinz, D.F. and Wolinsky-Nahmias, Y. (2004). *Models, Numbers, and Cases: Methods for Studying International Relations*. [online] Google Books. University of Michigan Press. Available at:

<https://books.google.co.uk/books?hl=en&lr=&id=o0iOOrN3DQIC&oi=fnd&pg=PA19&dq=strengths+and+limitations+of+case+study+research+&ots=t6JhFFxdIL&sig=prixEmCTp6Xxr4bmLA5ISDsbOLY#v=onepage&q=strengths%20and%20limitations%20of%20case%20study%20research&f=false>

Stipek, D. and Byler, P. (2004). The early childhood classroom observation measure. *Early Childhood Research Quarterly*, 19(3), pp.375–397. doi:<https://doi.org/10.1016/j.ecresq.2004.07.007>.

Streefkerk, R. (2023) Qualitative vs Quantitative Research. Examples and Methods [Online] Available at: <https://www.scribbr.co.uk/research-methods/quantitative-qualitative-research/> (Accessed: 2 April 2024)

Swedberg, R. (2020). Exploratory research. *The production of knowledge: Enhancing progress in social science*, 2(1), 17-41.

Velez, A. M. (2008). Evaluating research methods: Assumptions, strengths, and weaknesses of three educational research paradigms. *Academic Exchange Extra*, 9, 1-9.

Westwood, P. (2015) *Commonsense methods for children with special educational needs*. London: Routledge.

Wilson, C., Janes, G., & Williams, J. (2022). Identity, positionality and reflexivity: relevance and application to research paramedics. *British paramedic journal*, 7(2), 43–49. <https://doi.org/10.29045/14784726.2022.09.7.2.43v>

Yin, R. K. (2002). *Case study research: Design and methods*. Thousand Oaks, CA: SAGE Publications.

2307703

ECAD7004