SAJOT

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Occupational Therapy in the Snoezelen® Room: Teachers' and Therapists' Knowledge and Perceptions of the Changes in Children's Behaviour and Performance.

ABSTRACT

Introduction: The Snoezelen® room, a multisensory environment (MSE), is often used in conjunction with sensory integrative techniques. Therefore, it may be of support in school-based occupational therapy intervention. Research has documented positive changes in children's performance in the MSE. However, research to suggest that changes could be carried over to external environments is limited. This study aimed to investigate the knowledge and perception of teachers and therapists regarding changes in children's behaviour and performance after therapy in the Snoezelen® room.

Methodology: A descriptive quantitative cross-sectional survey design by purpose sampling was used. Teachers and therapists working with children who received occupational therapy intervention in the Snoezelen® room participated.

Results: Strong positive, significant correlations were found between the total impact of the Snoezelen® room and the children's level of arousal, as well as their behaviour and scholastic performance. After therapy in the Snoezelen® room, improvement of level of arousal was ranked as the biggest change, which appeared to be 'just right' for hours upon returning to the classroom.

Conclusion: Children's arousal levels changed due to sensory input, which carried over to the external environment. Due to this, most teachers and therapists perceive that the Snoezelen® room positively changed behaviour and scholastic performance.

INTRODUCTION

The Snoezelen® room is specifically designed to allow exploration of the quantity, nature, intensity, and arrangement of sensory stimuli[1]. Individuals are encouraged to explore the equipment in the environment to stimulate the senses of vision, hearing, smell, and touch, as well as proprioceptive and vestibular sensation[2]. The multisensory environment (MSE) such as Snoezelen® arose as the next logical development of sensory approaches and has become a relatively well-known benefit for therapeutic interventions that use a sensory integrative frame of reference. Research has been done on positive change in performance within the MSE; however, little research has been done on the transfer of these changes into other environments, such as the school or classroom[3]. It is important to explore the transfer of knowledge, skills, and behaviour from the MSE to the classroom environment to validate the benefit of having an MSE within school environments. The aim of this study was to investigate

the knowledge and perception of teachers and therapists about the change in child behaviour and performance, after occupational therapy in the Snoezelen® room, as a treatment modality in a specialised school environment. The broad areas of level of arousal, behaviour, and scholastic performance were explored to better achieve this aim[4].

LITERATURE REVIEW

Occupational therapists assist children to achieve maximum participation in daily activities, or occupations[5]. Jean Ayres was an occupational therapist and neuropsychologist who spent her career learning and determining how to treat children with behavioural and learning difficulties[6]. Learning disabilities are "unexpected, significant difficulties in academic achievement and related areas of learning and behaviour"[7(p3)]. Ayres emphasised that children with learning difficulties may also experience neurological dysfunction with respect to their ability to process sensory information[8]. To address these difficulties Ayres Sensory Integration® (ASI) theory was developed in 1972. ASI is "the neurological process that organizes sensation from one's own body and from the environment and makes it possible to use the body effectively within the environment"[9(p1)]. The ASI theory describes how the nervous system receives sensory (sound, taste, touch, sight, vestibular, and proprioceptive) input and adjusts it to allow for an appropriate adaptive behavioural outcome[4,6]. Adaptive responses are seen as successful interactions with the environment in response to an environmental input, which is a building block for successful participation in occupations[6]. These building blocks of function are targeted through sensory integration therapy (SIT), to improve a child's overall participation in occupations. Neuroplasticity, which refers to the ability of the nervous system to adapt in response to sensory stimulation, can be strongly associated with SIT[10]. Young children respond well to SIT because there is still opportunity for neuroplasticity and recent evidence suggests that this process is of highest maturation in the first 8 years of life[11]. As children grow, the less changeable the brain becomes. This highlights the benefit of making use of SIT in school-based occupational therapy intervention, to meet therapy aims when children are younger, and their brains can still adapt due to neuroplasticity[8]. Combining the theory behind sensory integration and neuroplasticity, it has become evident that providing a child with enhanced personalised sensation in the context of everyday activities or altering their environment would allow a child to succeed[11].

The concept of the multisensory environment (MSE) was introduced in 1987 by two scientists, Hulsegge and Verheul, in the Netherlands, with their original purpose being relaxation and leisure exploration for people with profound intellectual disabilities[12,13]. Snoezelen®, a specific type of MSE, was later trademarked and introduced in the form of a specially designed room to encourage exploration of the quantity, nature, and intensity of sensory stimuli. Equipment

that is often present can include white-coloured equipment, seating and walls that are soft and padded, mirror balls, bubble tubes, coloured lights, a projector, lava lamps, music, and colour-changing fibre-optic cables, all of which can be controlled by the individual to meet their sensory needs[14,15]. Individuals are invited to engage with the equipment of their choice, and according to their needs, to stimulate senses of vision, hearing, smell, touch, proprioceptive, and vestibular sensation[2]. The safe and relaxing environment reduces the notion of external emotional or physical pressure that might be experienced in other demanding environments[2]. The Snoezelen® room is windowless to reduce stimuli from the external environment. This creates a room that is more inviting for an individual who experiences sensory overload, such as a child who might be overwhelmed in a busy classroom or playground environment[16].

The sensory rich nature of a typical school environment can be overwhelming for certain children[17]. This could explain why some children have difficulties regulating themselves, keeping attention, engaging in social scenarios, participating in scholastic activities, and most importantly learning new skills[18]. Therefore, children with sensory integration challenges are at risk of experiencing difficulties participating in their education occupation[17]. According to Ayres, sensory integration challenges can negatively impact higher-order cognitive functions, such as executive functions, that allow for successful learning and academics, as well as the level of arousal needed for emotional regulation and self-regulation[6]. Therefore, the educational progress of a child with learning disabilities can be affected by their reduced ability to self-regulate their emotional and behavioural responses in a school setting[19]. Dunn's model of sensory processing describes neurological thresholds and how different thresholds affect self-regulation[20,21]. Self-regulation refers to the ability of a person to manage their own thresholds or level of arousal, using strategies. For example, a child who is often on the go and presents with a high level of activity is likely to have a high threshold for vestibular, or movement, input. Thus, this child would have a high level of arousal. This may lead the child to be disruptive to others or to themselves. Occupational therapists help children, and their caregivers, understand their thresholds and how to use sensory strategies to increase their engagement and learning[20]. Ultimately, children learn to recognise, change, and maintain their level of arousal, using sensory strategies, to increase their participation in the classroom. Research shows that Snoezelen® can influence one's level of arousal, particularly related to changing levels of relaxation, emotion, and well-being by providing the correct amount of sensory input[22]. Acquiring self-regulation skills in the early years sets the foundation for positive classroom behaviour and academic performance later. Furthermore, for children with learning disabilities, academic skills such as reading, writing, and mathematics can be impacted[4]. These difficulties may be compounded by comorbid sensory and arousal difficulties, thus other skills such as cognitive skills become difficult for these children.

According to the fourth edition of the occupational therapy practice framework, specific mental functions, or cognitive functions, include executive functioning skills, as well as attention, memory, perception, and thought[23]. Executive functioning skills refer to the cognitive skills that work together to help children solve intricate problem-solving tasks[24]. These difficulties may result in additional effort needed to achieve the same outcomes as peers and thus children with learning disabilities can also present with anxiety and behavioural changes that can further impact their participation in the classroom. Various research studies document the positive outcomes of the multisensory environment such as behavioural enhancement, reduced levels of pain, a balance of heart rate, calming effects, and increased motivation and attention[14,25,26]. In 2008, Botts et al.[2] conducted a study to delve into these effects, however, only two studies that included children were found[2]. Chan et al.[27] found an increase in children's positive emotions after intervention in the Snoezelen® room; however, no change in aggression or adaptive behaviours was found[27]. In their research, Shapiro et al. [28] found that a child's behaviour seemed to be more adaptive in the Snoezelen® room compared to a playroom[28]. In a study completed in 2011 by Stephenson and Carter[25], teachers' perceptions of the use of the MSE in schools were explored. This study was carried out as there is a gap in research on the outcomes of the Snoezelen® room especially with respect to children and schools[25]. Many teachers agreed that the MSE allows children to receive an opportunity to focus on specific tasks, while being free of distraction. Many educational professionals agreed that MSEs can improve behaviour, leading to better learning opportunities within the controlled environment[29]. However, not many teachers suggested the notion of these skills being carried over from the MSE to the classroom environment or other environments like the home, which is a vital component to explore if MSEs are to become significant in contributing to education[25]. This depicts the research gap surrounding the carryover of improvements from the Snoezelen® room to other environments. A recent study by Graham[30] in 2019, explored the use of sensory rooms for students with disabilities[30,31]. The study determined that an improvement in children's focus was most reported by teachers. Furthermore, 57.5% of teachers reported improved following of instructions, 38.8% found students were better on task, 55% observed fewer negative behaviours, and 27.5% found that students had higher levels of motivation following the use of the MSE[30]. This suggests that the improvements noted within the MSE may be associated with improved classroom functioning. However, more research is required to build on these findings and determine which specific skill improvement is carried over from the MSE to the classroom. This will clarify the benefit of having a MSE in a school environment to positively impact children's learning experiences, particularly children with disabilities[31].

METHODOLOGY

Research Design

A descriptive, quantitative, cross-sectional survey design was used to address the aim of this study.

Population/sampling

There are two special education primary schools in Johannesburg with a functional Snoezelen® room on their campus, so the availability of participants was limited. Therefore, this study made use of purposive nonprobability sampling, as the sample of individuals was specifically chosen based on predetermined criteria[32]. The inclusion criteria required participants to be staff in special education primary schools who are teachers or therapists by profession and who work with children who have received occupational therapy intervention in the Snoezelen® room. The G*Power Version 3.1.9.4 statistics software was used to determine the sample size according to the aim of the study and the specificity of the sample. It was determined that enough relevant data was collected once a minimum of 30 participants had completed the survey. This reduced response rate falls within the 10% margin of error accepted for small samples.

Research setting

This study was conducted online. However, the research was based on information participants gained through working in special education schools, specifically those with Snoezelen® rooms on campus.

Research instrument

This research instrument was an author-developed survey created using current available literature. The four-part survey included Section A, that sought to obtain demographic data through multiple choice questions. This included personal demographic data such as age, gender, profession, and years of experience, as well as questions regarding the participant's existing knowledge about the Snoezelen® room. Sections B, C, and D were developed from literature on school-based occupational therapy and current knowledge on the benefits of the MSE related to SIT. These followed the same set of questions that included a four-point Likert scale, from very little effect to very effective, to measure the impact of the Snoezelen® room in improving a child's performance with respect to their 'level of arousal' (Section B), 'behaviour' (Section C) and 'scholastic performance' (Section D). Three-point Likert scales were used to measure changes in child performance following intervention in the Snoezelen® room (Becomes worse, Stays the same, Improves) as well as the duration (Minutes, Hours, Days) and frequency (Never, Sometimes, Always) of these changes. The outcomes that fell

into each category were explored to determine the changes that were observed after intervention in the Snoezelen® room. Comment sections were included to enhance the richness of the data and allow participants to explain their answers. Concluding questions were asked to discover gender-based differences, as well as the participants' view on whether it is beneficial to have a Snoezelen® room on school campuses. An expert panel of occupational therapists conducted a content validity check on the survey, prior to distribution to participants. This included having six occupational therapists who have specialties in paediatric and sensory integrative practice, answer questions related to the relevance, clarity, simplicity, and ambiguity of the survey. According to Polit and Beck (2006), when there are six or more experts, the minimum requirements for excellent content validity of an instrument are I-CVIs of 0.78 or higher and an S-CVI of 0.80 or higher[33]. The I-CVIs for this study ranged from 0.83 to 1 and the S-CVI value was 0.98. Therefore, the survey had acceptable content validity and no changes were required prior to distribution.

Data Collection

Data collection commenced once the University's ethical clearance processes were followed and approval from the Gauteng Department of Education was obtained. The headperson or appointed representative of each school with a Snoezelen® room on their campus was contacted and an information sheet and a consent form were sent by email to each school representative. Following retrieval of these signed documents, the survey link was shared by email to the school representatives, who forwarded the link to each teacher and therapist employed at their school. Participants accessed the survey through the online REDcap platform. This allowed participants to maintain anonymity. Online informed consent was obtained from all participants. Surveys that were completed within a month were compiled and analysed using Microsoft Excel and later using SPSS 21 software. Data were collated, cleaned, and coded for descriptive analysis.

Means and standard deviations, as well as data normality, were used to provide descriptive statistics of the participant demographics, as well as their knowledge and perception of the use of the Snoezelen® room. Pearson's correlation coefficients were used for data analysis. Point-biserial correlations were run to make inferences about the association between components of knowledge, perception, and demographic information. The statistical significance of these correlations was also evaluated with the level of statistical significance established at $p = 0.01$. Furthermore, 95% confidence intervals were calculated. Data were organised and summarised into graphs and summary tables showing samples, percentages, means, correlation coefficients, and p-values to be more easily understood.

Ethics

Ethical clearance was obtained from the Human Research Ethics Committee (Medical) of the University of X (HREC-M) (Certificate Number M210947). Approval was obtained from the Gauteng Department of Education. Informed consent was obtained from schools and individuals participating in this study. Participants were required to declare that they understood the research process and to provide voluntary consent to participate.

RESULTS

Demographic of participants

A total of 30 participants responded to the study and gave their consent. Referring to Table I, the participants comprised of 100% females (n = 30) whose ages ranged from 27 to 61 years, the mean age being 42.27. Most of the participants (60%) had known about the Snoezelen® room for 6-10 years, while 36.7% had known about the Snoezelen® room for only 1-5 years and 3.3% for more than 10 years. Most participants taught or gave therapy to more than one grade, between Grade R to Grade 7.

Table I: Demographic statistics of participants

	N = 30	%
Gender		
Female	30	100
Profession		
Teacher	13	43.3
Psychologist	2	6.7
Occupational Therapist	4	13.3
Speech and Language Therapist	5	16.7
Remedial Therapist	6	20.0
Years participants have been teaching or giving therapy		
1-5 years	3	10.0
6-10 years	4	13.3
More than 10 years	22	73.3
Years participants have known about Snoezelen®		
1- 5 years	11	36.7
6-10 years	18	60.0
More than 10 years	1	3.3
Years participants have taught or given therapy to children who receive therapy in Snoezelen®		
Less than 1 year	3	10.0
1- 5 years	13	43.3
6-10 years	13	43.3
More than 10 years	1	3.3
Grades participants teach or give therapy to		
Grade R	6	20.0
Grade 1	11	36.7

Grade 2	14	46.7
Grade 3	14	46.7
Grade 4	12	40.0
Grade 5	8	26.7
Grade 6	6	20.0
Grade 7	6	20.0

Participants were asked about their perception of the benefits of the Snoezelen® room, as well as the diagnoses, age, and gender of the children who may benefit from the room.

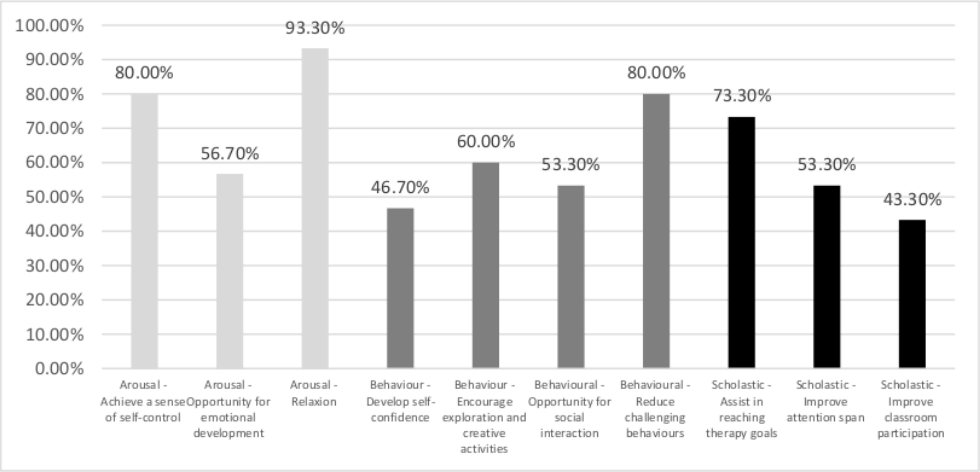

Figure 1: Benefits of the Snoezelen® room

Figure 1 indicates the percentages of participants who selected various benefits of occupational therapy intervention within the Snoezelen® room, based on pre-existing knowledge of the subject. Relaxation was the highest benefit reported (93.3%) while improving classroom participation was reported to be the least beneficial (43.3%).

Table II: Identified benefits of occupational therapy in the Snoezelen® room.

	Count	%
Benefits for Level of Arousal	25	80.60
Benefits for Scholastic Performance	18	58
Benefits for Behaviour	20	65

In Table II, it is evident that most of the participants (80.6%) identified Snoezelen® as the most beneficial to improve a child's level of arousal, based on their existing knowledge. Furthermore, the least number of participants (58%) identified Snoezelen® as beneficial for improving scholastic performance.

Table III: Participants knowledge of diagnosis suitable for intervention in the Snoezelen® room

	N = 30 n	%
ADHD	28	93.3
Cerebral Palsy	14	46.7
ASD	24	80
Down Syndrome	13	43.3
Dyslexia	20	66.7
Learning difficulties	24	80
Sensory integration difficulties	27	90
Emotional difficulties	28	93.3
Speech related difficulties	17	56.7
Other	4	13.3

Based on their previous knowledge, the participants report on the diagnoses they believe are suitable to receive occupational therapy intervention in the Snoezelen® room (Table III). Emotional difficulties (93.3%), ADHD (93.3%) and sensory integration difficulties (90%) were selected as most suitable. Cerebral Palsy (46.7%) and Down syndrome (43.3%) were selected as the least suitable.

Table IV: Participants knowledge of age groups suitable for intervention in the Snoezelen® room

	N = 30 n	%
0 – 12 months	5	16.7
13 months – 6 years	18	60
7 – 12 years	30	100
13 – 18 years	18	60
19 – 25 years	13	43.3
26 years and older	13	43.3

In Table IV, the age group that was selected as the most suitable for intervention in the Snoezelen® room was 7 to 12 years, as 100% of the participants selected this age group. 60% of the participants selected age groups from 13 months to 6 years and 13 to 18 years. The age group of 0 to 12 months were selected as least suitable (16.7%).

Perceptions of the impact of the Snoezelen® room

The results of this section are presented according to the number of participants who answered the questions. The percentages do not reflect 100% since some participants did not answer all questions.

Most of the participants (86.7%) reported that there are no differences in gender with respect to the changes observed after the occupational therapy intervention in the Snoezelen® room.

Twenty-nine participants affirmed that they believe it is beneficial for schools to have a Snoezelen® room on their campus.

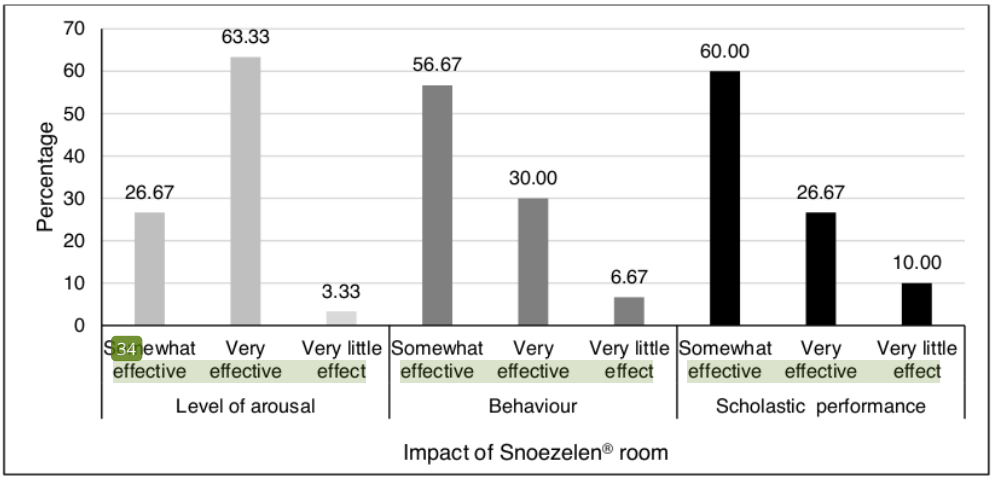

Figure 2: Participants perception of the impact of the Snoezelen® room on level of arousal, behaviour, and scholastic performance (n=28)

As can be seen in Figure 2, the total impact of occupational therapy in the Snoezelen® room was perceived to be significantly better for improving a child's level of arousal (Chi squared 38.78, p =0.001) with 63% of the participants indicating 'very effective'. A higher percentage of participants reported that it was 'somewhat effective' for both behaviour (57%) and scholastic performance (60%).

The level of change, as well as frequency and duration of change in level of arousal, behaviour, and scholastic appointment is shown in Table V.

Table V: Participants perception of the level, duration, and frequency of change in arousal, behaviour, and scholastic performance following occupational therapy intervention in the Snoezelen® room.

	Level of change			Frequency of change			Duration of change		
	n (%)								
	Just right	**Fast**	**Slow**	**Some-times**	**Always**	**Never**	**Hours**	**Days**	**Minutes**
Arousal	28 (93.33)	1 (3.33)		24 (80.00)	4 (13.33)		20 (66.67)	6 (20.00)	1 (3.33)
	Improves	**Stays the same**	**Become worse**	**Some-times**	**Always**	**Never**	**Hours**	**Days**	**Minutes**
Behaviour (mean)	(52.12)	(30.30)	(6.67)	(49.70)	(18.73)	(3.33)	(43.94)	(15.67)	(7.58)
Classroom disturbance	20 (66.67)	5 (16.67)	1 (3.33)	19 (63.33)	5 (16.67)		17 (56.67)	2 (6.67)	2 (6.67)
Impatience	18 (60.00)	8 (26.67)		16 (53.33)	6 (20.00)		13 (43.33)	1 (3.33)	6 (20.00)
Disrespect-defiance (mood changes)	14 (46.67)	10 (33.33)	1 (3.33)	17 (56.67)	4 (13.33)		12 (40.00)	4 (13.33)	5 (16.67)
External blame	11 (36.67)	13 (43.33)		15 (50.00)	5 (16.67)		11 (36.67)	6 (20.00)	2 (6.67)

Achievement anxiety (meltdowns)	20 (66.67)	4 (13.33)		11 (36.67)	7 (23.33)		15 (50.00)	2 (6.67)	1 (3.33)
External reliance (needs assistance)	13 (43.33)	11 (36.67)		14 (46.67)	7 (23.33)		14 (46.67)	3 (10.00)	4 (13.33)
Comprehension (cooperative, engaging)	11 (36.67)	14 (46.67)		12 (40.00)	9 (30.00)		15 (50.00)	5 (16.67)	1 (3.33)
Inattentive- withdrawn	20 (66.67)	5 (16.67)		17 (56.67)	4 (13.33)		17 (56.67)		3 (10.00)
Irrelevant responsive-ness	17 (56.67)	8 (26.67)		14 (46.67)	5 (16.67)	1 (3.33)	13 (43.33)	4 (13.33)	2 (6.67)
Creative initiative (self-confidence)	16 (53.33)	9 (30.00)		14 (46.67)	6 (20.00)	1 (3.33)	9 (30.00)	8 (26.67)	2 (6.67)
Need closeness to teacher	12 (40.00)	13 (43.33)		15 (50.00)	4 (13.33)	1 (3.33)	9 (30.00)	2 (6.67)	7 (23.33)
	Improves	**Stays the same**	**Become worse**	**Some-times**	**Always**	**Never**	**Hours**	**Days**	**Minutes**
Scholastic achievement (mean)	(61.11)	(22.22)		(52.22)	(13.33)	(3.33)	(28.33)	(21.67)	(11.67)
Academic	16 (53.33)	9 (30.00)		14 (46.67)	6 (20.00)	1 (3.33)	8 (26.67)	7 (23.33)	5 (16.67)
Cognitive skills	19 (63.33)	6 (20.00)		16 (53.33)	3 (10.00)		9 (30.00)	6 (20.00)	2 (6.67)
Executive functioning skills	20 (66.67)	5 (16.67)		17 (56.67)	3 (10.00)				
p-value	0.001	0.001		0.009	0.566		0.003	0.574	0.101

Level of Change

The change in level of arousal was perceived by a significantly higher percentage (93%) of participants (Chi squared 13.52, p =0.001) to improve after occupational therapy in the Snoezelen® room, followed by scholastic achievement (61%) and lastly behaviour (52%), indicating that overall performance in the external environment improves. A significantly higher percentage of participants felt that behaviour (30%) and scholastic achievement (22%) remained the same (Chi squared 20.98, p =0.001) compared to the percentage of participants who thought that of level of arousal (3%). Only behaviour was seen to deteriorate by 6% of participants. At least two thirds of the participants perceived certain aspects of behaviour to improve after occupational therapy in the Snoezelen® room and these were classroom disturbance, impatience or impulsivity, achievement anxiety (meltdowns) and inattentive withdrawal. Similar results were seen of cognitive and executive functioning skills under scholastic achievement.

Frequency of change

The frequency in change of level of arousal was perceived by a high percentage of participants (80%) to change sometimes, with 13% of participants reporting change always occurs. Regarding the frequency of change in behaviour after occupational therapy in the Snoezelen® room, 49.70% of the participants noted change sometimes and 18.73% noted change always.

Scholastic achievement was observed to change sometimes by 52.22% of the participants and always by 13.33% of the participants. Only 3.33% of the participants noted that scholastic performance never changes after occupational therapy in the Snoezelen® room. Some aspects of behaviour were perceived by more than half of the participants to change, sometimes, after intervention, and these included classroom disturbance, impatience, external blame, inattentive-withdrawal, and need for closeness to the teacher, as well as cognitive and executive functioning skills under scholastic performance. Lower percentages of participants reported that changes always occur.

Duration of Change

Most of the participants (66.67%) reported the level of arousal of children to change for hours after the occupational therapy intervention in the Snoezelen® room. The change in level of arousal was observed for days by 20% of the participants and for minutes by only 3% of the participants. Similarly, 43.94% of the participants noted change in behaviour for hours, 15.67% noted change for days, and 7.58% for minutes. Regarding scholastic achievement, 28.33% of participants noted a change for hours, 21.67% for days and 16.67% for minutes. The highest reported changes observed were for hours, which included level of arousal and behavioural aspects such as classroom disturbance, achievement anxiety, comprehension and inattentive-withdrawal.

Level of change and grade

The association between the grade and the total level of change was determined by point biserial correlations in Table VI. 'Total change in arousal, behaviour, scholastic' displayed a weak positive correlation with Grade 1 ($r(29) = 0.274$, $p = 0.150$) and Grade 2 ($r(29) = 0.266$, $p = 0.162$), however these were not statistically significant. Therefore, the change due to occupational therapy in the Snoezelen® room was not strongly associated with any particular grade.

Table VI: Correlations of impact scores

Variable 1	Variable 2	Statistic			
		Correlation	Count	Lower C.I.	Upper C.I.
Behaviour Impact	Level of Arousal Impact	0.60	27	0.28	0.80
	Behaviour Impact	1.00	28		
	Scholastic Impact	0.70	28	0.44	0.85
	Total Impact	0.90	28	0.80	0.95
Level of Arousal Impact	Level of Arousal Impact	1.00	28		
	Behaviour Impact	0.60	27	0.28	0.80
	Scholastic Impact	0.48	28	0.14	0.73
	Total Impact	0.82	28	0.65	0.91
Scholastic Impact	Level of Arousal Impact	0.48	28	0.14	0.73
	Behaviour Impact	0.70	28	0.44	0.85
	Scholastic Impact	1.00	29		
	Total Impact	0.86	29	0.73	0.93

Estimation is based on Fisher's l-to-Z transformation
** Correlation is significant at the 0.01 level (2-tailed)

Table VI shows the correlations between the total impact of occupational therapy in the Snoezelen® room on level of arousal, behaviour, and scholastic performance of a child, as well as the impact in these areas individually. It was found that 'total impact' exhibited strong positive correlations with 'level of arousal impact' $r(28) = 0.821$, $p < 0.001$, 'scholastic impact' $r(29) = 0.863$, $p < 0.001$ and 'behaviour impact' $r(28) = 0.901$, $p < 0.001$. A strong positive correlation was observed between 'behaviour impact' and 'scholastic impact' $r(28) = 0.698$, $p < 0.001$. Moderately strong positive relationships were observed between 'behaviour impact' and 'level of arousal impact' $r(27) = 0.597$, $p = 0.001$ and 'level of arousal impact' and 'scholastic impact' $r(28) = 0.483$, $p < 0.001$. All these scores were statistically significant.

DISCUSSION

Much research has been done on positive changes in child performance within the MSE. However, little research has been done on the transfer of these changes to other environments, such as the school environment[3]. This study aimed to review the perceptions of teachers and therapists about the use of MSE by identifying changes in the level of arousal, behaviour, and scholastic performance of children that they have observed within the classroom, therapy, or general school environment, after occupational therapy in the Snoezelen® room. For this study, it is assumed that occupational therapy sessions in the Snoezelen® room would follow a SIT approach as this reference frame coincides with the sensory rich nature of MSE. This study confirmed that teachers and therapists do observe changes in children's performance in other environments after occupational therapy in the Snoezelen® room. Strong positive and significant correlations were found between the total impact of the Snoezelen® room and the level of arousal of the children, as well as their behaviour and their scholastic performance, suggesting that changes in these areas are perceived by teachers and therapists as related. Of the total 30 female participants, the majority (60%) had known about the Snoezelen® room and taught or given therapy to children who receive intervention in the Snoezelen® room for around 6 to 10 years, indicating that they have had some prior exposure to the concept. This also highlights the fact that Snoezelen® is a relatively new concept in school environments, where the literature shows a large increase in the use of MSEs for children with learning disabilities in the past 15 years[12,22]. Furthermore, participants had a diverse range of professional backgrounds and extensive experience working with children, as 73% of participants had been doing so for more than 10 years. Their years of experience may have contributed to their knowledge and perceptions of the Snoezelen® room. Teachers' and therapists' diverse professional backgrounds, extensive experience, and understanding of suitable age groups and diagnoses align with the evidence commonly found in MSE research.

In a study by Graham[30] in 2019, it was determined that students with special needs who attended schools with an MSE on campus showed better improvements in academic performance and behavioural performance compared to their peers at schools without an MSE on campus[30]. Interestingly, 96.7% of the participants in this study affirmed that they believe it is beneficial for schools to have a Snoezelen® room on their campus; however, 'improving classroom participation' was their least reported benefit of intervention in the Snoezelen® room. In fact, the highest reported category of benefits of the Snoezelen® room was the improvement of the level of arousal, followed by behaviour, and lastly, scholastic performance. This indicates that a substantial majority of teachers and therapists perceive that occupational therapy in the Snoezelen® room has a positive impact on arousal levels of children.

Interestingly, participants found that the Snoezelen® room is most suitable for children diagnosed with ADHD, emotional difficulties, and sensory integration difficulties rather than diagnoses that are typically known to impact school performance, such as dyslexia or learning disabilities. Children with the former three diagnoses are all at risk of having trouble with regulation. There is existing evidence that Snoezelen® can affect one's level of arousal, particularly related to changing levels of relaxation, emotion, and well-being through the provision of the correct amount of sensory input[22]. Ultimately, through being in a controlled sensory environment, children learn to monitor, maintain, or change their state of arousal to increase participation and performance in the classroom, in other words, learn to self-regulate[20,34]. This study found that the children were observed to have a 'just right' level of arousal for hours upon returning to the classroom after the occupational therapy intervention in the Snoezelen® room[34]. Although all children naturally have changes in their level of alertness throughout the day, children with sensory integration difficulties find it more challenging to remain alert and focused consistently throughout the school day[35]. The lack of ability to self-regulate or maintain one's level of arousal has been shown to impact a child's participation in the classroom. In 2004, research by Raver[36] highlighted the fact that self-regulation in early development is as important as learning to read[36]. In fact, children who have better developed regulation skills show increased performance in academic activities such as maths and literacy[37]. Additionally, Post, Boyer, and Brett[38] define self-regulation as a learning tool that is highly predictive of academic success[38]. Similarly, in this study, a positive correlation was found between Snoezelen's® impact on a child's level of arousal and its impact on a child's scholastic performance. This suggests that changes in scholastic performance and arousal are perceived by teachers and therapists as related. This evidence highlights two contributions to this growing body of research. First, the positive correlations suggest that as a child's level of arousal improves, so would their scholastic performance improve. Second, the sensory input a child receives through occupational therapy intervention in the MSE has a positive impact on improving the level of arousal of a child, which is then transferred to an external environment such as the classroom. Therefore, occupational therapy in the Snoezelen® room improves a child's scholastic performance through improving their level of arousal. Most participants (61%) reported that the overall scholastic performance of children improved after the occupational therapy intervention in the Snoezelen® room for hours upon return to the classroom. Most participants (80%) observed that this change occurs sometimes. At least two thirds of the participants reported that cognitive skills such as attention and following instructions, and executive functioning skills such as problem solving and pace had improved in an external environment following the intervention in the Snoezelen® room, while only half of the participants noted improvement in academic skills such as reading and

handwriting[39,40]. However, the frequency of these changes was not explicit. This combination of evidence indicates that a child's ability to maintain their level of arousal is essential for their academic success, specifically their cognitive and executive functioning skills. This also shows that the participants had relatively good prior knowledge of the Snoezelen® room.

Researchers reason that the development of self-regulation skills is vital for younger children, as this lays the foundation for early childhood education and intersects with all aspects of behaviour and performance output[20,37]. Children who can self-regulate are more likely to stay focused, take turns, and follow instructions, and are less likely to show impulsivity or aggressive behaviour[37]. In this study, more than half the participants (52%) reported that the overall behaviour of children improved after the occupational therapy intervention in the Snoezelen® room upon returning to the classroom. Participants perceived changes in children's behaviour to occur sometimes and last for hours. This indicates that most teachers and therapists believe that occupational therapy in the Snoezelen® room has a positive impact on children's behaviour upon returning to the classroom. Examples of behaviour that at least two-thirds of participants reported to improve included classroom disturbance, impulsivity, achievement anxiety, and inattention or withdrawal[41]. Although changes in these behaviours were most often only observed sometimes. One recent study by Graham[30] in 2019, explored the use of sensory rooms for students with disabilities[30,31]. The study determined that teachers reported the highest improvement in the focus of the children. Furthermore, 57.5% of teachers reported improved follow-up of instructions, 38.8% found that students were better on task, 55% observed fewer negative behaviours, and 27.5% found that students had higher levels of motivation after the use of the MSE[30]. Evidence, from both Graham's study and this study, suggests that MSEs contribute to improving behaviour, according to the perceptions of teachers and therapists of children in external environments. A strong positive correlation was found between the impact of Snoezelen® in improving the level of arousal and its impact in improving behaviour. Similarly, to the above-mentioned findings, this suggests that occupational therapy in the Snoezelen® room contributes to improving a child's behaviour in the classroom through improving their level of arousal. However, this study also found a strong positive correlation between Snoezelen's® impact on behaviour and its impact on scholastic performance. Thus, in agreement with Ashburner et al.[19], acquiring self-regulation skills in early years lays the foundation for positive classroom behaviour, and thus academic performance later.

On the topic of targeting these areas of development 'in the early years', it is beneficial to mention the relevance of neuroplasticity and early intervention in relation to school performance. Young children respond well to SIT because there is still an opportunity for neuroplasticity. This alludes to the fact that brain function is not permanent and can be

changed. As children grow, the neuroplasticity decreases. Recent evidence suggests that changes in brain structure due to neuroplasticity have been observed from three to five months of age, with the process at highest maturation in the first 8 years of life[11]. In this study, the most common grades that teachers and therapists interacted with were Grade 2 and Grade 3, among Grade R to Grade 7. There was a weak positive correlation between Snoezelen's® total impact on a child's level of arousal, behaviour and scholastic performance and Grade 1, as well as Grade 2. However, this was not statistically significant. Making use of SIT in school-based occupational therapy intervention has been shown to be beneficial, as these aims can be more easily met in younger children whose brains can still adapt due to neuroplasticity[8]. Thus, with early intervention, specifically related to SIT, being a popular topic among research, it may be beneficial to continue to use the Snoezelen® room specifically for children in Grade 1 and Grade 2. However, more importantly, it poses questions for future studies on the impact of occupational therapy in the Snoezelen® room, for children under school age (6 years old), as well as how this type of intervention can impact their schooling performance if it were introduced earlier in development[42].

Based on the findings of this study, it could be foreseen that having a Snoezelen® room on school campuses would be beneficial for some pertinent reasons. Since strong positive and significant correlations were found between the total impact of the Snoezelen® room and the level of arousal of children, as well as their behaviour and their scholastic performance, it is evident that each component should not be targeted in isolation from the others, to achieve therapy or school-based aims. Importantly, a child's ability to self-regulate and maintain their level of arousal has been shown to be fundamental. Subsequently, the question around 96.7% of participants affirming that it is beneficial for schools to have a Snoezelen® room on their campus, despite, 'improving classroom participation' being their least reported benefit of the Snoezelen® room, can be clarified. Consistent with extensive research surrounding self-regulation of children, acquiring self-regulation skills in the early years lays the foundation for positive classroom behaviour and academic performance later [19]. Specifically, in relation to the findings of this study, the self-regulation skills a child develops through SIT occupational therapy in the Snoezelen® room. Therefore, participants essentially alluded to the results of this study that it is beneficial to have a Snoezelen® room on school campuses not necessarily to directly enhance scholastic performance, but to improve it and children's classroom behaviour, through improving their level of arousal. Furthermore, by having a Snoezelen® room on school campuses, school-based occupational therapy aims can be more readily met in sensory controlled, non-distracting environments. Additionally aims can be more readily met in schools for younger children whose brains can still adapt due to neuroplasticity [8].

Limitations of the study

This study had a narrow sample size. Due to this sample size, the generalisation of these findings to other settings and the larger context of South Africa should be done with caution. It is not known if the research survey reached the whole potential population and only 30 responses were used. This could be due to participants having received the survey, but not completing it. These factors may have caused a non-response bias which could have skewed the results. Additionally, survey pilot testing was not completed.

This study presented generalised findings of the impact of the Snoezelen® room on children in Grade R to Grade 7. However, many participants reported that the selected questions were difficult to answer confidently as the information may be applied differently to different children, and different children may respond differently to therapy in the Snoezelen® room. Additionally, the information gathered through participants' perceptions is subjective. Therefore, it is recommended that further research be carried out to explore the impact of the Snoezelen® room, where findings can be more child-specific and based on age, diagnosis, or additional demographic information and changes can be objectively measured.

CONCLUSION

The diverse professional background of teachers and therapists, extensive experience, and understanding of suitable age groups and diagnoses align with the principles and recommendations commonly found in MSE research. In this study, the impact of occupational therapy using a SIT approach in the Snoezelen® room is highlighted. Since strong positive and significant correlations were found between the total impact of the Snoezelen® room and the level of arousal of children, as well as their behaviour and their scholastic performance, it is evident that each component should not be targeted in isolation from the others, to achieve maximum therapy or school-based aims. Importantly, a child's ability to self-regulate and maintain their level of arousal has been shown to be fundamental. Although all areas were shown to improve in an external environment after occupational therapy intervention in the Snoezelen® room, a substantial majority of teachers and therapists perceived that occupational therapy in the Snoezelen® room has a positive impact on improving child behaviour and scholastic performance, through improving their level of arousal. Consistent with extensive research on self-regulation in children, the acquisition of self-regulation skills in the early years lays the foundation for positive classroom behaviour and academic performance later.

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Conflict of interests

The authors have no conflict of interest to declare.

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Author contributions

X completed the study towards a postgraduate degree and was responsible for drafting the manuscript. X supervised the study and edited the manuscript.

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