دمج العلاج السلوكي والمهني باستخدام نظام الكمبيوتر المرئي للحد من التحفيز الحسي أطفال اضطراب طيف التوحد

إعداد
أضواء علي الأحمري
أستاذ مساعد، قسم التربية الخاصة، كلية التربية، الملك خالد (أبها)

الملخص:
يعتبر التوحد أو اضطراب طيف التوحد (ASD) من الصحة العامة في البلدان النامية التي تحتاج إلى العلاج والإدارة في سن مبكرة، يتم التعامل مع أطفال ASD من خلال تعديل السلوك والعلاج المهني والتكامل الحسي، ويسعي هذا البحث إلى تقييم ما إذا كان العلاج بالتكامل الحسي مع تعديل السلوك والعلاج الوظيفي أكثر فاعلية، ويتم تقديم التكامل الحسي من خلال نموذج المعلومات خلال نموذج بمساعدة بالكمبيوتر، يمكن إدارة أنشطة التي تتضمن العرض الجانبي ، وإصدار بعض الضوضاء ، والرفرفة اليدوية وما إلى ذلك، ويضمن النموذج المعد أيضا على العلاج من خلال التكامل الحسي القائم على العلاج السلوكي والوظيفي، ويستخدم البحث الحالي تحليل الأداء الوظيفي الوصفي ، يتم إجراء التحليل الوصفي لنموذج على التجربة للطلاب في .STD–II / IV يتم إجراء التقييم للطالب مع تقييم أداء الطالب للأنشطة الأكاديمية، يتم جمع بيانات التحليل من طلاب المدارس الخاصة بالرياض في المملكة العربية السعودية ، ويستند البحث الحالي في جمع البيانات إلى إجراء الملاحظة للاختبار القبلي والبعدي في المجموعات، ويتم فحص أداء أطفال ASDفي المادة المحكية وهي الرياضيات و EVS ؛ وأظهر نتائج التحليل الإحصائي أنه من خلال أن التكامل الحسي والعلاج المهني مع النموذج المعد بمساعدة الكمبيوتر يؤثر على أداءً طلاب ASD بشكل إيجابي؛ كما أظهرت النتائج أنه من خلال النموذج التكامل الحسي بمساعدة الكمبيوتر مع تعديل السلوك يزيد من

الكلام والفهم لدى الأطفال ASD بشكل ملحوظ، وهذا يعني أن نموذج العلاج بالتكامل الحسي بمساعدة الكمبيوتر فعال في تعديل السلوك والعلاج المهني للطلاب المصابين ASD.

الكلمات المفتاحية: اضطراب طيف التوحد (ASD) ، علاج التكامل الحسي ، العلاج السلوكي ، العلاج الوظيفي

Integrating behavioural and occupational therapy using a computer visual system to reduce sensory stimulation in children with autism spectrum disorder

Adhwaa Ali Alahmari
Assistant Professor, Special Education Department, College of Education, King Khalid University (Abha)

Abstract

Autism or Autism Spectrum Disorder (ASD) is public health in developing countries those need to be treated and managed in early ages. The ASD children are managed with behavioural modification, occupational therapy and sensory integration. In this research evaluated the whether the integration of sensory integration with the behaviour and occupational therapy. The sensory integration is presented through the computer assisted information model. Through the computer-assisted model the stimming activities can be managed like lateral viewing, making some noises, hand flapping and so on. With descriptive functional performance analysis treatment can be managed with sensory integration based on behavioural and occupational therapy. The descriptive analysis is performed for the empirical-based research design model for the students in STD-II/IV. The examination is conducted for the children with the evaluation of student's performance for the academic activities. The data for analysis is collected from the special school students in Riyadh in Saudi Arabia. Through sensory integration therapy with behavioural and occupational therapy the observation is performed for the pre and post-testing in the groups. The statistical data analysis is performed through SPSS. The ASD children performance in subject wise are examined for mathematics and EVS. The statistical analysis

expressed that through sensory integration behaviour and occupational therapy with computer-assisted model provides significant performance in the ASD students' performance. Through computer-assisted sensory model integrated with behaviour and occupational model increases the speech and understanding of ASD children are significantly improved. It is evident that computer-assisted sensory integration therapy model is effective for the behavioural modification with occupational therapy for the students with ASD.

Keywords: Autism Spectrum Disorder (ASD), Sensory Integration Therapy, Behavioural Therapy, Occupational Therapy

1. Introduction

Education is considered as the greatest escalator for growth and development of all individuals. Without investing in education no country ever achieved speedy economic growth. Globally, the developing countries subjected to increase in number of children with disabilities due to lack of awareness. (Douglas, et al, 2021) The statistical profile published by the Ministry of Statistics and Programme Implementation (2016) (Grabowski, 2020) documents that 3.24% of the population in developing countries are disabled. Of the total, 69% are from rural areas. Males with disabilities (2.41%) are more than the females with disabilities (2.01%). According to the Census (2011), 20% of the individuals with disabilities are having disability in movement, 19% in seeing, 19 % in hearing and 8% in more than one category. (Salerno-Ferraro & Schuller, 2020) The report further revealed that 5% of the total population are in the age range 0-4 years, 7% in the age range 5-9 years. 61% of the children in the age range 5-19 years attend educational institutions. (Unwin, Powell & Jones, 2022)

At present, the Autism Spectrum Disorder (ASD) is classified into several subtypes based on the examination of condition severity those are grouped together. The specific class in the ASD are Autistic Disorder, Childhood Disintegrative Disorder, Asperger's Syndrome, pervasive Developmental Disorders-Not Otherwise Specified (PDD-NOS), Rett's Disorder and atypical autism. (Anderson, 2020) Previously, autism is identified as disability after 13 years only but

the early intervention increases the quality of life in large towns and cities. The performance of ASD increases with the provision of available therapies in the children with ASD. Most of the children with ASD continue to have less or very little access to the evaluation of sensory processing deficits. The ASD children access the therapies designed based on the neuro-development deficits to leads the normal life to the extent. (Haas, 2021) However, about 95% of children with ASD subjected to some extent of the dysfunction related to the sensory processing. Conventionally, only less schools identifies the sensory deficits in the children with autism. In developing countries sensory deficits is considered as the limited field through addressing the sensory needs of individual children with ASD only limited research has been conducted. Apart from the children with ASD the population subjected to the different disabilities those subjected to sensory intervention. (Asmus, 2022) The current rate developing countries subjected to difference in population for sensory deficits through the intervention sensory programs.

Senses are the gateways of knowledge. Sensory disability is impairment in one of the senses or more. Sensory disabilities include deaf and hard of hearing, low vision, blindness and deafblindness. Children born with severe to profound deafness are the ones who are born in a silent world and hence do not acquire language and spoken communication skills necessary for developing literacy for education. (Matsuda, Takenaga, Iwabuchi & Nakamura, 2022) This restricts the children's educational attainments and further aspirations. In order to overcome this, they need to build a strong foundation in the beginning years by use of good amplification devices so that sounds and the spoken language around them are interpreted by their brain. The delay in tackling hearing loss in children have far reaching effects causing burden to the family and the society. On the other hand, children with visual impairment are born in a world of darkness and hence needs tactile support for developing skills. (Seneheweera,& Edirisinghe,2022) Early identification and intervention with the support of braille helps them in tackling the void developed out of visual impairment. In addition to these two groups, some individuals may encounter multiple sensory impairments as in case of deaf-

blindness in which both deafness and blindness occur in the same individual. Literacy skills in such children may be a serious issue as reading requires and is enhanced by sight and hearing. Overcoming their challenges and creating a barrier free environment for education of Sensory is the prime responsibility of all concerned. (Yang, Li, Li, Xu, Shi, Wang, & Sun, 2021)

This paper concentrated on the examination of sensory integration therapy through computer-assisted model with the behavioural and occupational therapy. The analysis is based on the consideration of the students those are studying in std II/IV with the sensory dsyfucntion with ASD. The computer-assisted model is employed for the reduction of sensory stimming behavior. The statistical analysis is performed for the students to evaluate the sensory integration mode with computer-assisted model along with behavioural and occupational therapy. The statistical analysis stated that student performance is improved with the sensory integrated behavioural and occupational therapy. The present paper is organized as follows: the existing research on ASD based sensory activities are presented in section 2. The research methodology adopted are presented in section 3 with the statistical analysis is presented in section 4. The section 5 provides the overall discussion and conclusion is presented in section 6.

1.1 Importance and Objective of the Research

Special education allows the students with special education gains confidence based on the individual learning process. The special children need to achieve adequate personal development and growth to achieve proper educational support. In children with special disabilities subjected to emptional, physical, mental and developmental factors. The different impairments associated with the special needs are Autism Spectrum isorder, Traumatic Brain Injuiry, Developmental Delay, Speechand Language delay, Visual and hearning difficulties and other issues.

Therefore, it is necessary to develop a appropriate special education model for the learning process of children with spcial education need to fulfil the requirments those exposes the disability of individual. Therefore the special education is necessary to to

understand the own potential. The special education structure potential to overcome the issues in the children equation quality.

The aim of the present paper is to evaluate the contribution of computer-assisted technique in the students with the sensory dissifulties. The examination is conducted based on the examination of implementation of behavioural and occupational theraphy in the students with sensory difficulties.

1.2 Problem Statement

To meet the students requirement with the special education proper and well-maintained education system should be structured those need to be faster or slower in the students. To seek the attention of individual student with the special education the class need to be equipped effectively. The information provided by the tutor need to be identified by the students with special needs. The special education educators need to determine the individual education with adequate opportunities need to be provided. Tutors with special education shoud utilize the unique equipment and tools for the special needs. Through unique equaipment the understanding of the students are improved to derive the information. With the use of unique tool the tutor of special education can utilize the effective mechanism for the improving skills in special education. Therefore, the special education need to adapt adequate qualities for the hard-working, good sense, humor, for the proper training in the specialized children. The tutors of the special equacation need to understand the bheavioural pattern of the children with special needs. So, it is necessary to implement adequate tools and technique for the special education schools.

1.3 Research Hypothesis

The research Hypothesis analysis considered for the analysis are presented as follows:

1. The academic achievement of Sensory and OT are at different levels. Majority of the children in both groups displayed high level of achievement in EVS
2. There exists difference in the academic achievement of students with and without sensory disabilities studying in STD-II in EVS

3. The academic achievement of Sensory and OT are at different levels. Majority of the children in both groups displayed high level of achievement in Mathematics
4. There exists difference in the academic achievement of students with and without sensory disabilities studying in STD-II in Mathematics
5. There exists difference in the overall academic achievement of students with and without sensory disabilities studying in STD-II
6. The academic achievement of STD-IV Sensory and OT are at different levels. Majority of the children in both groups displayed moderate level of achievement in EVS.

2. Related Works

ASD children subjected to severe sensory processing issues those are observed in recent years. Recently, the examination expressed that children with ASD exhibits the sensory sensitivity behaviours in terms of covering the ears, unexpected noise, restricted foods, sensory seeking such as rocking, hand flapping and white noises and under-responsivity sensory activities such as react to pain. The research analysis subjected to links for both sensory and repetitive behaviours for the neuropathological mechanism for the sensory processing leads to atypical sensory processing for the long range underconnectivity related to cerebral cortex and lack of fiactional connectivity. With specific association between compulsive sameness individual behaviors evaluates the physiological research related to obsessive-Compulsive disorder (OCD) for the neurodevelopmental disorder to pathogenic and phenomenological simulations in the autism. (Asmus, 2022)

In Li, (2022). analysed the effectiveness of activity based learning (ABL) in primary schools in Chennai. Structural Education Model (SEM) was used to study the effectiveness and survey method was used for the study. The researcher randomly selected the primary schools with 36 classrooms 36 teachers and 828 students. The data analyzed and the results revealed that that ABL methodology enhance the learning capacity, students learn together and the classroom infrastructure was suitable for effective learning.

In Smees, Rinaldi, Simmons & Simner, (2022) observed in their study that school infrastructure profoundly influences learning significantly and inadequate structural facilities related to worse student achievement. It was also found that over half of the American schools have inadequate infrastructural facilities. The children of colour and lower income are more likely to attend such schools.

In de Belen, Bednarz, Sowmya, & Del Favero, (2020) conducted a research on elementary schools that operated from dilapidated buildings in Amritsar. The study revealed students of government elementary schools were studying in deplorable conditions and were deprived of basic amenities like toilets, benches, desks and even rooms. The schools did not have sufficient rooms to accommodate students of five classes' i.e. from Class I to V and classes were also held in the open dusty ground.

In Rhodus, et al,(2022) investigated the impact of activity-based teaching in primary mathematics classrooms. The researcher examined the implementation of instructional model for creating activities in activity-based learning. Purposive sampling technique and mixed method were used with 45 primary mathematics teachers trainees. The finding of the study was none of the students opined that they didnot learn enthusiastically under activity-based learning. All the teacher trainees prefer to use activity-based teaching methods in future.

In Mcgowan, McGregor & Leplatre,(2021) studied on activity-based instruction for motivating the children in mathematics learning. The data was gathered through lesson plan, student's reflections, observation, group work and by the classwork and analysed in qualitative manner. The finding of the study revealed that the activity-based instruction motivates students to learn different parts of the curriculum

In Riley, (2021) investigated the academic challenges of mainstream school teachers in implementing continuous comprehensive evaluation for students with disabilities. The survey method was followed for the study. The 200 teachers were purposely selected from Maharashtra for the study. Questionnaire and rating scale were used for the data collection. A difference was found in the academic

challenges faced by teachers in implementing different techniques of CCE for SWDs in mainstream schools with reference to training in disability". Teachers with disability training faced more challenges in implementing CCE techniques than their colleagues who had no disability training.

In Mueller, (2021) investigated a study on CCE in primary schools in Mizoram. The investigator adopted descriptive survey approach for the study. The checklist and interview schedule were used to collection the data of 75 teachers. Finding of the study revealed that majority of the teachers reported that there was lack of sufficient academic support facilities in the school. They also felt need of external monitoring and supervision from the higher official authority for the implementation of the recommended assessment practices.

3. Research Method

Research design is the conceptual blue print within which a research study is usually carried out and solve the research problem. It is a well-organised procedure utilized by researchers to carry out the study. Very often, researchers look at research design as a procedural plan that is adopted to answer the problem identified accurately. It suggests a variety of approaches used in solving the research problem. The design is relatively specific in nature. The collection of the design depends upon the statement of the problem.

A sample is a subset of the population that represent the entire group. The sample represents the population. To achieve representativeness, sampling procedures followed by the researchers are expected to follow certain standards and methodological principles. Probability sampling employs probability theory for selecting the sample. The key point behind all probability sampling is random selection. Sample is selected before the start of the research study. Probability sampling controls the sampling error. This type of sampling procedure is more laborious and bias free. Non-probability sampling is not based on the theory of probability. In this type, sample is selected before and during the process of research. Hence, researcher's bias cannot be controlled.

3.1 Samples

Based on the evaluation of sensory processing in the autism for principals, teachers, students with and without sensory disabilities and parents were included as the participants. A total 173 principals, 222 teachers practicing in Occupational therapy, 193 parents of behavioural therapy , 249 studying in STD-II/IV and 245 ADHD studying in STD II/IV were purposively selected and included. As the prime focus of the study was to evaluate the OT programme for its suitability to Sensory. It was essential to have the samples who had experience in dealing with Sensory under OT so that the data collected will be genuine. Hence, purposive sampling was followed.

3.2 Sampling procedure:

The data for analysis was collected from the Riyadh in Saudi Arabia. Based on the list of mainstream schools, researcher selected 173 OT practicing schools having students with sensory disabilities along with other students. The researcher visited all the 173 schools with the support of special educators working under IEDC scheme. The data of Sensory enrolled in OT schools were collected from the District Coordinators of IEDC scheme. The researcher shortlisted only those OT-practicing schools having Sensory. Researcher then collected the list of principals, teachers' students and parents who met the inclusion criteria, contacted them and briefed about the research work. After orienting them, the researcher obtained consent of participation from the identified 173 school principals, 222 OT teachers, 193 parents of Sensory, 249 Sensory.

3.3 Developmental Tools

The uniqueness of the present study was that the researchers did not use a single readymade tool for data collection. All the tools were developed by following proper procedures of tool development. A total of 06 tools were thus developed for carrying out the evaluation based on inputs. All these tools were developed in a phased and structured way which are mentioned below.

Phase I- Planning in general:

Stage 1- Brainstorming with field experts:

Stage 2- Consultation with master trainers of OT :

Stage 3- Consultation with principals:

Stage 4 - Consultation with teachers:
Stages 5 - Consultation with parents of Sensory:
Stage 6- Planning the framework for each tool for evaluation of input:
Stage 7 - Selection of areas and weightage allocation:
Stage 8- Selection of subareas and weightage allocation:
Stage 9 - Selection of units and number of items:
Stage 10 - Selection of tool formats based on the areas of evaluation
Stage 11 - Selection of item formats based on the tool formats
Stage 12 - Selection of language for tool development
The examination is based on the consideration of the following factors those are presented as follows:

1. Academic achievement of students with and without sensory disabilities studying in different classes on the selected subjects (EVS & Mathematics)based on researcher made tests.
    a. Academic achievement of students with and without sensory disabilities studying in STD-II in Environmental Science
    b. Academic achievement of students with and without sensory disabilities studying in STD -II in Mathematics
    c. Overall academic achievement of students with and without sensory disabilities studying in STD-II.
    d. Academic achievement of students with and without sensory disabilitiesstudying in STD-IV in EVS
    e. Comparison of academic achievement of students with and without sensory disabilities studying in STD-IV in Mathematics
    f. Overall academic achievement of students with and without sensory disabilities studying in STD-IV
2. Attendance of students with sensory disabilities served under OT
3. Level of awareness of parents of students with sensory disabilities about OT and their children's educational outcomes
4. Level of satisfaction of parents in educating their children with sensorydisabilities through OT

4. Experimental Analysis

Learning outcomes of children is an important criteria for deciding the success/failure of any educational programme that the schools are following as a part of imparting education to children. One of the commonly used means for measuring the learning outcomes is to assess the academic achievement of children. Academic achievement of children is very crucial because of the assumption that good academic record over years to a large extent predicts future success of children. The learning process takes place in various contexts. However, the focus of educators rest on learning that occurs in established instructional environments such as schools and classrooms where educators interact with students to help them achieve explicit knowledge and skills. The same holds true for children with sensory disabilities too. Keeping in mind these it was planned to carry out a comparison of the academic achievement of students with and without sensory disabilities studying in STD II & STD-IV. Two subjects were selected as a representative sample out of which one was Environmental Science and the other Mathematics.

In order to have a realistic picture of the Sensory's achievement in EVS, the present researcher evaluated the STD-II. Sensory & OT achievement in EVS on aresearcher made test. The range of scores selected for bringing out the levels of achievement is mentioned below. The percentage of students falling under each category is also mentioned in Table 1.

Table 1: Levels of academic achievement of Sensory & OT in EVS

Category with the range of score	Sensory		OT	
	Number	(%)	Number	(%)
Low (1-6)	0	0	2	1.53
Moderate (7-13)	30	21.28	30	22.90
High (14-20)	111	78.72	99	75.57
Total	**141**	**100**	**131**	**100**

From the above table, it can be seen that 78.72 % of the total

Sensory had high level of achievement; 21.28% had moderate level of achievement and none had low percentage of achievement in EVS. Similarly, 75.57 % of the total OT had high level of achievement; 22.90% had moderate level of achievement and 1.53% had low level of achievement in EVS.

Thus, the result obtained was ***"The academic achievement of Sensory and OT are at different levels. Majority of the children in both groups displayed high level of achievement in EVS".*** In order to compare whether there exists a significant difference between the groups, the null hypothesis framed was ***"There exists no significant difference in the academic achievement of students with and without sensory disabilities studying in STD-II in EVS".***

Considering the sample size and its distribution, *'z' test* was applied to see, whether there exists a significant difference or not between students with and without sensory disabilities. The calculated values of mean (x), known variances'' and 'z' value are shown in table 2.

Table 2: 'z' test analysis: Academic achievement in EVS of STD-II

Parameter	Groups	n	Mean (x)	Known Variance	'z' Cal. (2 tail)	'z' Crit. (2 tail)	Significance at 0.05 H o
Academic achievement in EVS	Sensory	141	15.42	9.14	0.5874	1.9599	Not Significant Retained
	OT	131	15.65	11.75			

The obtained mean and known variance of Sensory were 15.42 and 9.14. Similarly, the mean and known variance of OT SDs were 15.65 and 11.75. In order to find out whether the observed difference in mean value 15.42 of Sensory and 15.65 of OT is statistically significant or not, 'z' test was applied using SPSS. The obtained value of 'z' is 0.5874. The corresponding 'z' (critical) value is 1.9599. The obtained 'z' value (0.5874) is less than the 'z' critical value (1.9599). This suggests that the obtained 'z' value is not statistically significant. Hence the null hypothesis "***There exists no significant difference in the academic achievement of students with and without sensory disabilities studying in STD-II in EVS"*** was retained. This

means that the academic achievement of students with sensory disabilities is similar to that of students without sensory disabilities in EVS subject.

Mathematics skills are essential for all to perform in everyday situations. Day to day activities like purchasing, banking, maintaining time etc are all activities that ask for mathematical abilities such as understanding of number, size, space, order and time. If these abilities are not well developed, independent functioning is often more challenging. Although the focus in education and educational research has been on literacy more than on mathematics, children's early math skills have been found to predict their later math skills. Considering all these, it was decided to formulate an objective which in turn will help the present researcher to understand the academic achievement of the students with and without sensory disabilities in maths. Hence, the objective formulated was "to study the levels and compare the academic achievement of students with and without sensory disabilities studying in STD-II in Mathematics. Table 3 shows the levels of achievement.

Table 3: Levels of academic achievement of Sensory & OT in Maths of STD-II

Category with the range of score	Sensory		OT	
	Number	(%)	Number	(%)
Low (1-6)	4	2.8	2	1.5
Moderate (7-13)	65	46.1	59	45.0
High (14-20)	72	51.1	70	53.5
Total	**141**	**100**	**131**	**100**

From the above table, it can be seen that 51.1 % of the total Sensory had high level of achievement; 46.1% had moderate level of achievement and 2.8% had low percentage of achievement in Mathematics. Similarly, 45.0 % of the total OT had high level of achievement; 53.5% had moderate level of achievement and 1.5% had low level of achievement in Mathematics. Thus, the result obtained was ***"The academic achievement of Sensory and OT are at different levels. Majority of the children in both groups displayed high level of***

achievement in Mathematics.

In order to compare whether there exists a significant difference between the groups, the null hypothesis framed was ***"There exists no significant difference in the academic achievement of students with and without sensory disabilities studying in STD-II in Mathematics".*** Considering the sample size and its normal distribution, *'z' test* was applied to see, whether there exists a significant difference or not between students with and without sensory disabilities. The calculated values of mean (x), known variances'' and'z' value are shown in table 4.

Table 4: 'z' test analysis -Academic achievement in Maths of STD-II

Parameter	Groups	n	Mean (x)	Known Variance	'z' Cal. (2 tail)	'z' Crit. (2 tail)	Significanceat 0.05	Ho
Academic achievementin Math	Sensory	141	13.76	11.91	0.4269	1.9599	Not Significant	Retained
	OT	131	13.94	12.24				

The obtained mean and known variance of Sensory were 13.76 and 11.91. Similarly, the mean and known variance of OT were 13.94 and 12.24. In order to find out whether the observed difference in mean value 13.76 of Sensory and 13.94 of OT is statistically significant or not 'z' test was applied using SPSS. The obtained value of 'z' is 0.4269. The corresponding 'z' (critical) value is 1.9599. The obtained z value (0.4269) is less than the z critical value (1.9599). This suggests that the obtained'z' value is not statistically significant. Hence, the null hypothesis "***There exists no significant difference in the academic achievement of students with and without sensory disabilities studying in STD-II in Mathematics"*** was retained. This means that the academic achievement of students with sensory disabilities and students without sensory disabilities of STD-II is similar in Math subject through OT .

Overall academic achievement is the sum of the achievements of students in each subject selected for the study. Hence the objective formulated was "***to study the levels and compare the overall academic achievement of students with and without***

sensory disabilities studying in STD-II. **Table 5 shows the levels of overall achievement of the selected groups**

Table 5: Levels of overall academic achievement of Sensory & OT

Category with the range of score	Sensory		OT	
	Number	(%)	Number	(%)
Low (1-13)	1	0.7	0	0
Moderate (14-26)	40	28.4	40	30.5
High (27-40)	100	70.90	91	69.5
Total	**141**	**100**	**131**	**100**

From the above table, it can be seen that 70.90 % of the total Sensory had high level of achievement; 28.4% had moderate level of achievement and 0.7% had low percentage of achievement in Mathematics & EVS. Similarly, 69.5 % of the total OT had high level of achievement; 30.5% had moderate level of achievement and none had low percentage of achievement**.** Thus, the result obtained was ***"The overall academic achievement of Sensory and OT are at different levels. Majority of the children in both groups displayed high level of achievement".*** In order to compare whether there exists a significant difference in the overall achievement of the two groups selected for the study, the null hypothesis framed was **"*There exists no significant difference in the overall academic achievement of students with and without sensory disabilities studying in STD-II*".** Considering the sample size and its distribution, *'z' test* was applied. The calculated values of mean (x), known variances'' and 'z' value are shown in table 6.

Table 6: 'z' test analysis Overall academic achievement of STD-II

Parameter	Groups	n	Mean (x)	Known Variance	'z' Cal. (2 tail)	'z' Crit. (2 tail)	Significanceat 0.05	Ho
Overall Academic achievement	Sensory	141	29.18	28.41	0.6044	1.9599	Not Significant	Retained
	OT	131	29.59	34.18				

The obtained mean and known variance of Sensory were 29.18 and 28.41 similarly, the mean and known variance of OT were 29.59 and 34.18. In order to find out whether the observed difference in mean value 29.18 of Sensory and 29.59 of OT is

statistically significant or not 'z' test was applied using SPSS. The obtained value of 'z' is 0.6044. The corresponding 'z' (critical) value is 1.9599. The obtained z value (0.6044) is less than the z critical value (1.9599). This suggests that the obtained 'z' value is not statistically significant. Hence, the null hypothesis "***There exists no significant difference in the overall academic achievement of students with and without sensory disabilities studying in STD-II"*** was retained. This means that the overall academic achievement of students with sensory disabilities is similar to that of students without sensory disabilities studying in STD-II

Apart from the above, it was decided to compare the academic achievement of students with and without sensory disabilities studying in STD-IV. Two subjects were selected out of which one was Environmental Science and the other Mathematics**.** The range of scores selected for bringing out the levels of achievement is mentioned in the table given below. The percentage of students falling under each category is also mentioned in table 7.

Table 7: Levels of academic achievement of Sensory & OT in EVS of STD-IV

Category with the range of score	Sensory		OT	
	NO.	(%)	NO.	(%)
Low (1-6)	16	14.8	14	12.3
Moderate (7-13)	83	76.9	80	70.2
High (14-20)	9	8.3	20	17.5
Total	**108**	**100**	**114**	**100**

From the above table, it can be seen that 76.9 % of the total Sensory had moderate level of achievement; 14.8 % had low level of achievement and 8.3% had high level of achievement in EVS. Similarly, 70.2 % of the total OT had moderate level of achievement; 17.5% had high level of achievement and 12.3% had low percentage of achievement in EVS. Thus, the result obtained was ***"The academic achievement of STD-IV Sensory and OT are at different levels. Majority of the children in both groups displayed moderate level of achievement in EVS.*** **The**

null hypothesis framed in connection with this was "*There exists no significant difference in the academic achievement of students with and without sensory disabilities studying in STD-IV in EVS through OT in mainstream primary schools*". Considering the sample size and its distribution, *'z' test* was applied to see, whether there exists a significant difference or not between students with and without sensory disabilities. The calculated values of mean (x), known variances'' and 'z' value are shown in table 8.

Table 8: 'z' test analysis Academic achievement in EVS of STD-IV

Parameter	Groups	N	Mean(x)	Known Variance	'z' Cal. (2 tail)	'z' Crit. (2 tail)	Significanceat 0.05	Ho
Academic achievement in EVS	Sensory SwoSDs	108 114	9.65 10.59	8.47 9.36	2.367	1.9599	Significant	Rejected

The obtained mean and known variance of Sensory were 9.65 and 8.47 similarly, the mean and known variance of OT were 10.59 and 9.36 In order to find out whether the observed difference in mean value 9.65 of Sensory and 10.59 of OT is statistically significant or not 'z' test was applied using SPSS. The obtained value of 'z' is 2.367. The corresponding 'z' (critical) value is 1.9599. The obtained z value (2.367) was found greater than the z critical value (1.9599). This suggests that the obtained 'z' value is statistically significant. Hence the null hypothesis "*There exists no significant difference in the academic achievement of students with and without sensory disabilities studying in STD-IV in EVS"* was not retained and alternative hypothesis was retained. Thus, the result obtained was "***There exists a significant difference in the academic achievement of students with and without sensory disabilities studying in STD-IV in EVS".*** The mean of OT (10.59) is greater than the mean of Sensory (9.65). Therefore, it may be concluded that OT achieve significantly better than Sensory of STD-IV in EVS through OT .

In lines with mathematics, another objective was set to study the levels and compare the ***academic achievement of students***

with and without sensory disabilities studying in STD-IV in Mathematics. The range of scores selected for bringing out the levels of achievement is mentioned in the table given below. The percentage of students falling under each category is also mentioned in table 9.

Table 9: Level of academic achievement of Sensory & SwoSDs in Math of STD-IV

Category with the range of score	Sensory		OT	
	No.	(%)	No.	(%)
Low (1-6)	21	19.4	7	6.1
Moderate (7-13)	65	60.2	63	55.3
High (14-20)	22	20.4	44	38.6
Total	**108**	**100.0**	**114**	**100.0**

From the above table, it can be seen that 60.2 % of the total Sensory had moderate level of achievement; 20.4% had high level of achievement and 19.4% had low level of achievement in Maths. Similarly, 55.3% of the total OT had moderate level of achievement; 38.6% had high level of achievement and 6.1% had low percentage of achievement in Maths. Thus, the result obtained was ***"The academic achievement of STD-IV Sensory and OT are at different levels. Majority of the children in both groups displayed moderate level of achievement in Maths".*** The null hypothesis framed was **"*There exists no significant difference in the academic achievement of students with and without sensory disabilities studying in STD-IV in Maths through OT in mainstream primary schools*".** Considering the sample size and its distribution, *'z' test* was applied. The calculated values of mean (x), known variances'' and 'z' value are shown in table 10.

Table 10: 'z' test analysis: academic achievement in Maths of STD-IV

Parameter	Groups	N	Mean (x)	Known Variance	'z' Cal. (2 tail)	'z' Crit. (2 tail)	Significance at 0.05	Ho
Academic achievement in Math	Sensory	108	10.13	15.42	4.7584	1.9599	Significant	Reject
	OT	114	12.51	12.43				

The obtained mean and known variance of Sensory were 10.13 and 15.42. Similarly, the mean and known variance of OT were 12.51 and 12.43. In order to find out whether the observed difference in mean value 10.13 of Sensory and 12.51 of OT is statistically significant or not 'z' test was applied using SPSS. The obtained value of 'z' is 4.7584. The corresponding 'z' (critical) value is 1.9599. The obtained z value (4.7584) was found greater than the z critical value (1.9599). This suggests that the obtained 'z' value is statistically significant. Hence, the null hypothesis "***There exists no significant difference in the academic achievement of students with and without sensory disabilities studying in STD-IV in Mathematics"*** was not retained andalternative hypothesis was retained. Thus, the result obtained was "***There exists a significant difference in the academic achievement of students with and without sensory disabilities studying in STD-IV in Mathematics".*** This means that the academic achievement of students with sensory disabilities and students without sensory disabilities of STD-IV was not the same in Math subject. The mean of OT (12.51) is greater than the mean of Sensory (10.31). Therefore, it may be concluded that OT of STD-IV are significantly better than Sensory in Maths.

In order to study whether the combined scores obtained by both groups are significantly different or not, the objective framed was "***to study the levels and compare the overall academic achievement of students with and without sensory disabilities studying in STD-IV.***

Table 11: Levels of overall academic achievement of Sensory & OT of STD-IV

Category with the range of score	Sensory		OT	
	No.	(%)	No.	(%)
Low (1-13)	13	12	4	3.5
Moderate (14-26)	79	73.1	80	70.2
High (27-40)	16	14.8	30	26.3
Total	**108**	**100**	**114**	**100**

From the above table, it can be seen that 73.1 % of the total Sensory had moderate level of achievement; 12% had low level of achievement and 14.8% had high percentage of achievement in Mathematics & EVS. Similarly, 70.2 % of the total OT had moderate level of achievement; 26.3% had high level of achievement and 3.5% had low percentage of achievement**.** Thus, the result obtained was ***"The overall academic achievement of Sensory and OT are at different levels. Majority of the children in both groups displayed moderate level of achievement.*** The null hypothesis framed in connection with this was "*There exists no significant difference in the overall academic achievement of students with and without sensory disabilities studying in STD-IV*". Considering the sample size and its distribution, *'z' test* was applied to see, whether there exists a significant difference or not between students with and without sensory disabilities. The calculated values of mean (x), known variances'' and 'z' valueare shown in table 12.

Table 12: 'z' test analysis Overall achievement of Sensory & OT of STD-IV

Parameter	Groups	n	Mean (x)	Known Variance	'z' Cal. (2 tail)	'z' Crit. (2 tail)	Significanceat 0.05	Ho
Overall Academic achievement	Sensory	108	19.78	34.55	4.279	1.9599	Significant	Rejected
	OT	114	23.11	32.83				

The obtained mean and known variance of Sensory were 19.78 and 34.55. Similarly, the mean and known variance of OT were 23.11 and 32.83. In order to find out whether the observed

difference in mean value 19.78 of Sensory and 23.11 of OT is statistically significant or not, 'z' test was applied using SPSS. The obtained value of 'z' is 4.279. The corresponding 'z' (critical) value is 1.9599. The obtained z value (4.279) was found greater than the z critical value (1.9599). This suggests that the obtained 'z' value is statistically significant. Hence the null hypothesis "***There exists no significant difference in the overall academic achievement of students with and without sensory disabilities studying in STD-IV"*** was not retained and alternative hypothesis was retained. Thus, the result obtained was "***There exists a significant difference in the overall academic achievement of students with and without sensory disabilities studying in STD-IV".*** This means that the overall academic achievement of students with sensory disabilities and students without sensory disabilities of STD-IV are not the same. The mean of OT (23.11) is greater than the mean of Sensory (19.78). Therefore, it may be concluded that OT achieve significantly better than Sensory of STD-IV in subjects taught through OT .

Successful school programme begins by engaging the students making sure to come school regularly. In order to study success of OT and evaluation of OT it was necessary to undertake the attendance report. Hence, it was decided to study the attendance of students with sensory disabilities served under OT **.** The corresponding research question framed at the beginning of the study was ***"What is the average monthly attendance of students with disabilities served under OT ?"*** In order to arrive at the answer, first step taken was to find out how many students with sensory disabilities are enrolled for primary education. Out of total 286 Sensory, 192 males and 94 females Sensory were enrolled in STD-II of OT classroom. Now ever 3 males & 1 female students left, Similarly, 165 males and 81 females Sensory were enrolled in STD-IV. However, 4 males and 5 females left the STD-IV due to some reason. Similarly, exercise was done for the academic year 2018-19. Out of total 303 Sensory, 199 males and 104 females Sensory were enrolled

in STD-II, similarly 175 males and 89 females Sensory were enrolled in STD-IV. Out of these enrolments, 3 males and 1 female left the STD-II and 4 males, and 5 females leftthe STD-IV due to some reason. Remaining 196 males and 103 females of STD-II and172 males and 83 females of STD-IV continued in year 2018-19. The average monthly attendance of Sensory of STD-II for the first term of 2017-18 for June to Oct 2017 were 91%, 88%, 87%, 92% and 92%. Similarly, exercise was carried out for class-IV. The result obtained was "The average monthly attendance of Sensory of STD-IV for the first term were 91%, 88%, 91%, 92% and 83% present out of 106 running days. The average monthly attendance of term-II, session 2017-18. The average monthly attendance of Sensory of STD-II for the second term of 2017-18 for Nov 2017 to April 2018 were 91%, 91%, 91%, 90%, 91% and 92%. Similarly, exercise was carried out for class-IV. The average monthly attendance of Sensory of STD-IV. The result obtained was "The average monthly attendance of Sensory for the second term during the 2017-18 were 91%, 91%, 86%, 90%, 91% and 92% present out of 133 running days. The further the researcher reported the average monthly attendance of Sensory of term-I, session2018-19. The average monthly attendance of Sensory of STD- II for the first term of 2018-19 for June to Nov 2018 were 94%, 88%, 90%, 90%, 89% and 83%. Similarly, exercise was carried out for class-IV. The average monthly attendance of Sensory of STD-IV during first term of 2018-19. The result obtained was ***"The average monthly attendance of Sensory of STD-IV for the first term were 89%, 88%, 90%, 90%, 89% and 83% out of 117 running days".***

Parents play a crucial role in the mainstreaming of children with disabilities. They are the one who takes initiatives in educating CwDs and collaborate with institution and individual for meeting the needs of CwDs. Parents are counted as the first teachers for their children. Hence, understanding the educational practices followedfor their children in school is very essential to give out of school support. Hence, the present researcher

planned to study how for the parents of Sensory are aware of OT programme.

In order to study the levels of awareness of parents of students with sensory disabilities about OT , the research question framed at the beginning of the study was "***To what extent the parents are aware of (i) OT programme and (ii) educational outcomes of students with sensory disabilities in mainstream schools?"*** Table 13 depicts the same

Table 13: Awareness of parents about OT programme

Variable	Sample Size	Level of awareness about OT programme		
		Low	Moderate	High
Awareness about OT	193	5.70%	73.76%	21.24%

The study revealed that ***"5.70% of the total parents of Sensory had low, 73.76% moderate and the remaining 21.24% had high level of awareness about OT programme".*** *Since majority (73.76%) of them fall under moderate level of awareness"*

In order to study the levels of satisfaction of parents in educating their children with sensory disabilities through OT , the research question framed at the beginning of the study was "***To what extent the parents of students with sensory disabilities are satisfied with their children's education through OT ?".*** Rating scale was used for data collection. The scores, that the participants could obtain maximum and minimum were 1 and 100. Three different levels namely (i) low, (ii) moderate and (iii) high was decided and the range of scores selected for deciding the levels of satisfaction of parents is mentioned in table 14.

Table 14: Range selected for measuring the satisfaction of parents

Level of scoring	Satisfaction of parents				
	Readiness of school & Child	Active form of classes	Relationship with peers	Parent's relationship with teachers	Support services
Low	1 to 5	1 to 15	1 to 5	1 to 5	1 to 3
Moderate	6 to 10	16 to 30	6 to 10	6 to 10	4 to 7
High	11 to 15	31 to 45	11 to 15	11 to 15	8 to 10

Based on table 15, the level of satisfaction of parents was calculated and is depicted in table 16.

Table 15: Level of satisfaction of parents

Variable	Sample	Satisfaction of parents		
		Low	Moderate	High
Readiness of school & Child	193	3.11%	50.78%	46.11%
Active form of classes		0.52%	23.83%	75.65%
Relationship withpeers		0.52%	33.16%	66.32%
Parent's relationshipwith teachers		0.52%	22.80%	76.68%
Support Services		15.03%	27.46%	57.51%

From the table "***15, it is observed that out of 193 parents of Sensory were participated in the study, 3.11% of them reported that the satisfaction of parents in readiness of school and child was low; 50.78% reported moderate level and the remaining 46.11% parents reported high level of satisfaction".***

Parents satisfaction in active form of classes was also selected. Out of the total 193 parents participated in the study, 0.52% parents reported as low, 23.83% parents reported moderate satisfaction and 75.65% parents reported high level of satisfaction. In the same way, satisfaction of parents in relationship with peers was also studied. 0.52% parents of the total reported as low, 33.16% moderate and 66.32% parents reported as high level of satisfaction.

On parent's relationship with teachers 0.52% reported low, 22.80% moderate and 76.68% parents high. While studying the satisfaction of parents in support services, 15.03% reported low, 27.46% moderate and 57.51% parents reported high level of satisfaction. The graphical representation of the same is mentioned.

In order to study the overall level of satisfaction, the aggregate of score obtained by the parents on all the five parameters were calculated. The maximum and minimum scores calculated were based on the number of items and the scoring keys used for rating. The scores, that the participants could obtain maximum

and minimum were 1 and 100. For the present research, it was decided to study the overall satisfaction of parents under three different levels namely (i) low, (ii) moderate and (iii) high. The range of scores selected for deciding the levels is mentioned in table 16.

Table 16: Levels of satisfaction of parents and the range of scores

Parameter	Levels & Range of scores		
Overall satisfaction	Low	Moderate	High
	1 to 33	34 to 66	67 to 100

Based on table 16, the levels of satisfaction of parents in educating their Sensory through OT were calculated. Table 17 shows the result obtained

Table 17: Overall level of satisfaction of parents in educating their Sensory

Variable	Sample size	Level of awareness about OT programme		
		Low	Moderate	High
Level of satisfaction	193	0%	23.32%	76.68%

The study revealed that 23.32% of the parents had moderate level of satisfaction and the remaining 76.68% had high level of satisfaction in educating their Sensory. Thus, the result obtained was **"The overall satisfaction of parents in educating their Sensory in mainstream school through OT programme are at different level. Majority of them (76.68%) had high level of satisfaction in educating their Sensory".**

5. Discussion

It is observed that children with ASD those receive the sensory integration with the behavioural and occupational therapy exhibits improved performance and activity. Initially, the children with sensory integration dysfunction provides significant performance in empirical characteristics. The Sensory Integration (SI) therapy provides effective performance with reduction of sensory dysfunctions. Additionally, the ASD exhibits language, speech and understanding for the sensory integration therapy for the treatment.

Through standard comprehension standard language process expression sensory integration therapy is implemented for the representative population for the empirical support. The academic performance of the students also improved with the computer-assisted sensory activities for the motor gauges for the language system. With hypersensitivity analysis the SI based model provides the significant performance for the proprioceptive input-based squeeze machine. Additionally, with sensory integration therapy increases the children productivity with the behavioural modification and occupational therapy-based performance. The Special Educational Needs Partnership exhibits improved ASD performance with minimal intervention programs. Through the comparative analysis, the teaching intervention is evaluated for the intellectual, adaptive and educational functions to achieve an effective intervention.

5.1 Recommendations

Through the statistical analysis of the computer-assisted model for the special equation identifies the certains factors. The recommendations derived from the statistical analysis are stated as follows:

1. The computer-assisted technique is considered as the effective tool for the children with special needs.
2. The tutors can able to implement or utilize the computer-assisted tool for the teaching the special children.
3. The sensory issues with the children with special needs are minimized with the behavioral and occupational theraphy provided along with the computer-assisted model.

6. Conclusion

This research examined the contribution of sensory integration therapy in ASD children with behavioural and occupational therapy. With ASD based on analysis the academic performance of the children are improved for the academic performance for the inclusive and academic children. Through the long analysis and observation, statistical data were examined to derive student performance for academic achievement. The examination confirmed that with sensory integration therapy, the ASD children's effectiveness is increased through the integration of the behavioural and occupation therapy in

the children. This research concluded that sensory integration model is effective for the children with ASD along with occupational and behavioural therapy.

REFERENCES

- Anderson, A. (2020). *Therapeutic Trampolining for Children and Young People with Special Educational Needs: A Practical Guide to Supporting Emotional and Physical Wellbeing*. Routledge.
- Asmus, D. (2022). *The Use of Mindfulness Practices to Reduce Perceived Stress Levels in an Elementary Special Education Environment*. Wilmington University (Delaware).
- de Belen, R. A. J., Bednarz, T., Sowmya, A., & Del Favero, D. (2020). Computer vision in autism spectrum disorder research: a systematic review of published studies from 2009 to 2019. *Translational psychiatry*, *10*(1), 333.
- Douglas, P., Rice, C., Runswick-Cole, K., Easton, A., Gibson, M. F., Gruson-Wood, J., ... & Shields, R. (2021). Re-storying autism: A body becoming disability studies in education approach. *International Journal of Inclusive Education*, *25*(5), 605-622.
- Grabowski, A. (2020). *Virtual reality and virtual environments: a tool for improving occupational safety and health*. CRC Press.
- Haas, K. (2021). Stimming Expresses Empathy, not to be Masked or Persecuted: A Scoping Review and Case Study of the "Double-Empathy Problem" Solved by Recognizing the Autism Language.
- Li, D. (2022). Music Therapy in Mental Health and Emotional Diversion of Primary and Secondary School Students. *Occupational Therapy International*, *2022*.
- Matsuda, E., Takenaga, T., Iwabuchi, M., & Nakamura, K. (2022). Time Series Analyses of the Responses to Sensory Stimuli of Children with Severe and Multiple Disabilities. *Journal of Robotics and Mechatronics*, *34*(4), 726-738.

- Mcgowan, J. J., McGregor, I., & Leplatre, G. (2021). Evaluation of the use of real-time 3D graphics to augment therapeutic music sessions for young people on the autism spectrum. *ACM Transactions on Accessible Computing (TACCESS)*, *14*(1), 1-41.
- Mueller, V. T. (2021). Computer-Based Intervention Assistive Technology. *Encyclopedia of Autism Spectrum Disorders*, 1165-1168.
- Rhodus, E. K., Hunter, E. G., Rowles, G. D., Bardach, S. H., Parsons, K., Barber, J., ... & Jicha, G. A. (2022). Sensory processing abnormalities in community-dwelling older adults with cognitive impairment: A mixed methods study. *Gerontology and Geriatric Medicine*, *8*, 23337214211068290.
- Riley, M. L. (2021). *Labor of Last Resort: Mothers Navigating Special Education in a Context of Resource Scarcity* (Doctoral dissertation, University of Oregon).
- Salerno-Ferraro, A. C., & Schuller, R. A. (2020). Perspectives from the ASD community on police interactions: Challenges & recommendations. *Research in developmental disabilities*, *105*, 103732.
- Seneheweera, L., & Edirisinghe, V. (2022). Embedding Sustainability in Learning and Teaching: Communication Barriers to Learners with Special Needs. *The Wiley Handbook of Sustainability in Higher Education Learning and Teaching*, 397-419.
- Smees, R., Rinaldi, L. J., Simmons, D. R., & Simner, J. (2022). The Parent-completed Glasgow Sensory Questionnaire: Exploring Children's Sensory Sensitivities and Their Relationship to Well-being. *Journal of Child and Family Studies*, 1-18.
- Unwin, K. L., Powell, G., & Jones, C. R. (2022). The use of Multi-Sensory Environments with autistic children: Exploring the effect of having control of sensory changes. *Autism*, *26*(6), 1379-1394.

– Yang, S., Li, R., Li, H., Xu, K., Shi, Y., Wang, Q., ... & Sun, X. (2021). Exploring the use of brain-computer interfaces in stroke neurorehabilitation. *BioMed Research International*, *2021*.