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## **Effect of auditory training intervention on auditory perception problem of children with perceptual disorders in Nigeria**

**Patricia KWALZOOM LONGPOE**

Department of Special Education & Rehabilitation Sciences

University of Jos, Jos, Nigeria

Email: [atinuola70@gmail.com](mailto:atinuola70@gmail.com)

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### **Abstract**

**Introduction:** Perceptual disorders are a broad group of disturbances or dysfunctions of the central nervous system that interfere with the conscious mental recognition of sensory stimuli. Such conditions are caused by lesions of specific sites in the cerebral cortex that may result from any illness or trauma affecting the brain at any age or stage of development.

**Purpose:** The purpose of the study was to find and establish the effect of auditory training intervention on the auditory perception problems of children with perceptual disorders in Alheri Special School, Yangoji, Kwali Abuja, Nigeria.

**Methods:** This study adopted quasi-experimental design. Specifically, the Case Study Report is applied in this study, with two (2) children identified with perceptual disorders as participants for the study. Two set of instruments were adapted and validated.

**Results:** The results of the study revealed that auditory perception of child A and B at pre-test are significantly low, and an increase in the levels of auditory perception were recorded for the two children post-test. The findings also showed the extent of which auditory training improves auditory discrimination, awareness, figure-ground, memory and auditory blending of children with perceptual disorders.

**Conclusion:** The study concluded that children with perceptual disorders who have auditory perceptual disorders have improved in their auditory perception, and there is need for more auditory training therapy for children with perceptual disorders. The study recommended that teachers and professionals should develop a positive attitude towards auditory training therapy for children with perceptual disorders.

**Keywords:** *Perceptual Disorders, Auditory Perception, Auditory Training.*

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Corresponding address:

**Patricia KWALZOOM LONGPOE**

Department of Special Education and Rehabilitation Sciences

University of Jos

Jos, Nigeria

Email: [atinuola70@gmail.com](mailto:atinuola70@gmail.com)

## 1. Introduction

The rationale for effective intervention programmes is to identify the underlying causes of behaviours; the skills that the child needs to learn to replace the behaviour problems; strategies to help the child develop the skills; and ways to respond when behaviour problems occur. If a child is experiencing behaviour problems that interfere with educational and social life, it is necessary for the child to have valid and evidence based intervention packages to reduce, if not eliminate the problem (Jatau, Uzo & Lere, 2009; Kolo, 1984). Children with Auditory Perceptual Disorder (APD), as one of the beneficiaries of these services, are besieged with an array of auditory problems that warrant valid and effective intervention programmes.

The term perception (derived from the Latin *percipilo, percipio*), is the organisation, identification, and interpretation of sensory information in order to represent and understand the environment. All perception involves signals in the nervous system, which in turn result from physical or chemical stimulation of the sense organs. The Mosby's Medical Dictionary 9<sup>th</sup> Edition (2009) describes perceptual disorders as a broad group of disturbance or dysfunctions of the central nervous system that interfere with the conscious mental recognition of sensory stimuli. Such conditions are caused by lesions of specific sites in the cerebral cortex that may result from any illness or trauma affecting the brain at any age or stage of development. Psychology Dictionary (2016) includes children with perceptual disorders as a disorder of comprehension e.g.:

1. Not able to determine direction or size,
2. Confusion of foreground with background,
3. Not able to screen out irrelevant noises or visuals,
4. Visual distortion of body or picture
5. Problem with spatial unions, commonly referred to perceptual disorders.

The Individuals with Disabilities Education Acts (IDEA) (2004) sees perceptual disorders as a specific learning disability, meaning the person has a problem in interpreting and processing visual or auditory information. It can also mean that they have a problem perceiving objects in space. In addition, perceptual disorders include visual perception, auditory perception, tactile/ kinaesthetic perception, perseveration perception and figure-ground perception. There is considerable overlap of the condition along the perception, meaning that children with different

diagnoses may share many characteristics. The general characteristic traits of children with perceptual disorders in auditory perception range from a difficulty perceiving sound, inability to recognise sound to inability to differentiate similarities or differences amongst phonemes (American Speech-Language-Hearing Association, 2005).

Specifically, Auditory Perceptual Disorder (APD), is the ability to recognise or interpret what is heard, providing an important pathway for learning. Accumulating research shows that many poor readers have auditory linguistic and phonological difficulties (Williams, 1991, Liberman 1996). These children do not have a problem in hearing or in auditory acuity; rather they have a disability in auditory perception and an inability to recognise or interpret what is heard. Because abilities in auditory perception normally develop during the early years, many teachers mistakenly presume that all students have acquired these skills. Children with APD display the following signs or symptoms of delayed language development: problems in sequencing the sounds of words, inability to listen effectively, difficulty perceiving high frequency sounds, confusion when faced with similar sounds and poor speech comprehension, often asking "what", extremely poor comprehension in a noisy environment, high distractibility, short attention span, misunderstanding and poor memory for oral messages, inconsistent responses to the same auditory stimuli, inability to follow directions, difficulty in expressing desires, often blaming others for not understanding academic problems particularly in spelling, reading or comprehension, behaviour problems and social difficulties. Auditory Perceptual Disorders also include problems in auditory awareness, auditory discrimination, auditory figure-ground, auditory memory, and auditory blending (Ihenacho, 1986).

One of the intervention strategies to help children with APD, is auditory training. Auditory training therapy is an intervention for children who have problems processing what they hear. Auditory training therapy is part of an increasingly popular field of therapies known as "brain training". Auditory training therapy sometime called Auditory Integration Training (AIT) was developed by a French doctor, Guy Berard (1993), with the idea that auditory processing issues stem from over sensitivity or under sensitivity to sound (or certain sound frequencies), which can interfere with learning. Supporters of this

method say it helps children to discriminate and remember speech sounds (Brent, 2013). The premise of this program is that with guided practice, children can develop more efficient auditory processing and to learn to think about what they have learnt. It is designed to improved listening, accuracy and memory through games and exercises (Fry & Whetnail, 1954).

Auditory training is designed for children with auditory perceptual disorders, autism and Asperger's syndrome. It is also used to treat sensory processing issues, such as being over or under sensitive to sound (Anne, 2010). Auditory training also helps children who have trouble concentrating, such as those with Attention Deficit Hyperactivity Disorder (ADHD), and it's sometimes used to treat children with non-verbal learning disabilities.

The children identified with auditory perceptual disorder in Alheri special school Yangoji, Kwali-Abuja suffered from the following conditions (April, 2014):

1. Inability to listen effectively
2. Trouble in sequencing the sounds of words
3. Confusion when faced with similar sounds: e.g. "da" and "ba"
4. Inability to follow directions
5. Difficulty to perceiving high frequency sounds: "t", "p", "s"
6. Misunderstanding and poor memory of oral messages
7. Extremely poor comprehension in a noisy environment
8. Poor comprehension, often asking "what?"

It is against this background information that the researcher wished to study the effect of auditory training intervention on auditory perception problems of children with perceptual disorders in Alheri Special School, Yangoji, Kwali Abuja, Nigeria.

## 2. Statement of the problem

One of the problem areas that has not been given due attention in Nigerian educational system is children with perceptual disorders, they are children who because of their unique features cannot be adequately and satisfactory catered for in the regular and special classroom setting. Unfortunately, public/private schools in Nigeria are often over crowded and this affects children with auditory perception disorders immensely. A noisy environment and crowded classroom setting interfere with the auditory perception of children in these school settings. There is lack

of available perceptual intervention programmes to identify and screen children with perception difficulties in Nigeria.

Another area of concern is a lack of qualified personnel or professionals to use the intervention programmes to identify and screen children with perceptual disorders in Nigeria. Also, poor academic attainment amongst children with perceptual disorders is as result of improper identification and assessment of the individual and an inability to place them where their needs will be addressed adequately. This has raised concerns about auditory training on auditory perception for children with perceptual disorders (Rossy, 2014). Hence, the researcher is challenged in carrying out this study in providing answers to the questions raised and finding out the efficacy of auditory training on auditory perception for children with perceptual disorders in Nigeria.

## 3. Purpose of the study

The purpose of this study is to find out the effect of auditory training intervention on auditory perception problems of children with perceptual disorders in Alheri Special School, Yangoji, Kwali Abuja, Nigeria.

Specifically, this study intends to:

1. Establish the auditory perceptual levels of children with perceptual disorders before intervention
2. Establish the auditory perceptual levels of children with perceptual disorders after intervention
3. Establish the extent the auditory training improves auditory awareness of children with perceptual disorders
4. Establish the extent the auditory training improves auditory discrimination of children with perceptual disorders
5. Establish the extent the auditory training improves auditory figure-ground of children with perceptual disorders
6. Establish the extent the auditory training improves auditory memory of children with perceptual disorder
7. Establish the extent the auditory training improves auditory blending of children with perceptual disorders

## 4. Research questions

The following research questions were posed for investigation:

1. What is the level of auditory perception of children with perceptual disorders before intervention?

2. What is the level of auditory perception of children with perceptual disorders after intervention?
3. To what extent will auditory training improve auditory awareness of children with perceptual disorders?
4. To what extent will auditory training improve auditory discrimination of children with perceptual disorders?
5. To what extent will auditory training improve auditory figure-ground of children with perceptual disorders?
6. To what extent will auditory training improve auditory memory of children with perceptual disorders?
7. To what extent will auditory training improve auditory blending of children with perceptual disorders?

## 5. Methodology

### 5.1. Research Design

This study adopted quasi-experimental design. Specifically, the Case Study Report is applied in this study. This is the design based on an in-depth investigation of a single individual, group or event to explore the causes underlying principles (Porta, 2014). This type of quantitative research design can use single or multiple case studies, includes evidence from multiple sources and benefits from the prior development of theoretical propositions (Awotunde & Ugodulunwa, 2004).

### 5.2. Population and Sample

The population involved children with developmental disabilities: learning disabilities, autism spectrum disorders, down syndrome, cerebral palsy etc., that were identified with perceptual disorders in Alheri Special School, Yangoji Kwali, Abuja. The researcher used the two (2) children identified with perceptual disorders as participants for the study. The researchers described the characteristics of the two (2) participants for the study. The description included age of the participants, the diagnosis, the nature of the condition, the onset of the samples' condition, the history of medical condition, the social and behaviour problems, the existing management of the samples' as contained in their case files. The description of the participants is as follows:

#### Child A

The participant A, Male, aged 7 classified in Level 3. The child is from a poor rural setting, living in the suburb area of Kwali district, who was referred for a

psychological evaluation to determine his current perceptual status. The child's mother reported that she was 36 and his father was 45 at the time of his birth. The anecdotal record showed that the mother had a 9 months disturbed pregnancy. She had a prolonged labour but later had a normal delivery. The child did not cry immediately, was later diagnosed with jaundice and was treated at the General Hospital in Kwali Abuja. He has a long history of poor school performance. Despite extensive private tutoring and accommodations from his school, he has failed to succeed academically and in social and cognitive life. He experienced sleep difficulties as an infant, rarely sleeping for more than 3 to 4 hours at a time. His appetite was said to be poor. Developmental milestones were reported as within normal range for language, and gross motor development, but poor in cognitive and perceptual development. The report indicated that the child did not respond to conversation, had poor musical ability and had problems remembering details of what was read or heard.

#### Child B

The participant B, Female, aged 9 classified in Level 2. The anecdotal record showed that the mother had a 9 months undisturbed pregnancy, but had a prolonged labour which later led to a caesarean operation. The child did not cry at birth. After ten days of delivery, the mother noticed that the baby was not active and did not suckle well. She was also diagnosed with jaundice and was treated in General Hospital Kwali Abuja. The record showed that the child responded poorly to sound, struggled with oral communication and found it hard to follow spoken directions. The child's teacher reported that she has low motivation for school achievement because of her perceptual problems and also has problems in reading and classroom behaviour. She does not understand language and has poor abstract thinking. She is viewed as fearful and nervous with mood swings. She demonstrates a poor approach to planning, ignores mistakes, has a problem in following through, and is disorganised. She gets frustrated and depressed when she realises that she is having a problem with her school work.

### 5.3. Instruments for Data Collection

Two sets of instruments were used by the researcher for the collection of data in this study. This included the school records and Perceptual Diagnostic Test Instrument (PDTI). The school records showed the biodata and case histories of the participants while

the Perceptual Diagnostic Test Instrument (PDTI) was designed and validated with local content by Izuka John Ihenacho, Ph.D. for Special Education Department, University of Jos.

The instrument comprised of the following components: name, date of birth, age, date of observation, time of observation, date of observation, place of observation, situation, name of teacher, class, school and assessor. The instrument also consisted of five (5) major measurement traits and their characteristic traits. These included: Auditory perception (auditory awareness, auditory discrimination, auditory figure-ground, auditory memory and auditory blending). In practice, auditory awareness includes awareness of sounds in the classroom, cars outside, sounds of radio, music, background noise etc. Auditory discrimination is differentiating between the sounds of two different objects e.g. cries of animals etc. Auditory figure-ground is the location of different sounds. Auditory memory is recalling the sounds of objects, cries of animals etc. that have already been heard and auditory blending is the ability to imitate the sounds of objects, cries of animals and other sounds made in the environment.

Other items of the instrument include visual perception (visual closure, spatial relationship, visual discrimination, visual motor integration, and visual figure-ground); tactual/kinaesthetic (recognising objects with shapes and forms e.g. surface texture, recognising qualities e.g. hard, soft, and viscous and feeling pain, temperature and pressure); perseveration (shifting focus from one thing to another, and accomplishment of tasks within a given time frame); and figure-ground (recognition, relating to imageries, and recall).

The instrument used a scaling system for scoring students' behaviour observed in all the five (5) major areas. The scale is scored from -3-0-2-1 (0)010203. Evaluation of the conversation techniques is derived using a total raw score of 100. Auditory perception will be specifically useful for this study, by using the scaling system to measure the characteristic traits of the five (5) major areas of auditory perception.

#### **5.4. Procedure for Data Collection**

The researcher sought permission to conduct assessments and interventions from the principal of the school and the parents of the participants and to use the teachers or caregivers as research assistants. The consent letter was signed by the principal of the school and the parental letters of permission for the

participants were given out by the participants' teachers.

The researcher employed the services of the participants' teachers to be co-observers. The co-observers were graduates with a B.Ed. in Special Education. They were trained on how to identify, assess target behaviour of the participants and collect data at both the pre and post-test phases.

#### **5.5. Administration of Pre-test**

The pre-test of the target behaviour was determined by the use of perceptual diagnostic test instrument. The instrument was administered weekly to repeatedly rate the behaviour of the participants until the start of the intervention. The instrument analysis determined the auditory perceptual level of the participants, from the beginning to the end of the pre-test phase and this was observed in the classroom setting for the period of 10 to 15 minutes, three times a week for 2 weeks.

#### **5.6. Administration of the Intervention**

After the pre-test data was collected, the auditory perceptual therapy began for the period of 2 weeks on the participants by the researcher and teachers. This therapy continued for a period of 4 weeks. The researcher/special school teachers followed the procedures of the assessment and intervention. The researcher, with the help of the research assistants, adapted and improvised locally made materials following the items of the PDTI. Auditory awareness (awareness of sounds in the classroom, cars outside, sounds of radio, music, background noise etc.), auditory discrimination (differentiating between the sounds of two different objects e.g. cries of animals etc.), auditory figure-ground (location of different sounds), auditory memory (recalling the sounds of objects, cries of animals etc. already heard), and auditory blending (ability to imitate the sounds of objects, cries of animals and other sounds made in the environment).

#### **5.7. Administration of Post-test**

The post-test of the target behaviour was determined by the use of the perceptual diagnostic test instrument. The instrument was administered weekly to repeatedly rate the behaviour of the participants after the intervention. The instrument analysis determined the auditory perceptual level of the participants, from the beginning to the end of the post-test phase and this was observed in the classroom setting for the

period of 10 to 15 minutes, three times a week for 2 weeks.

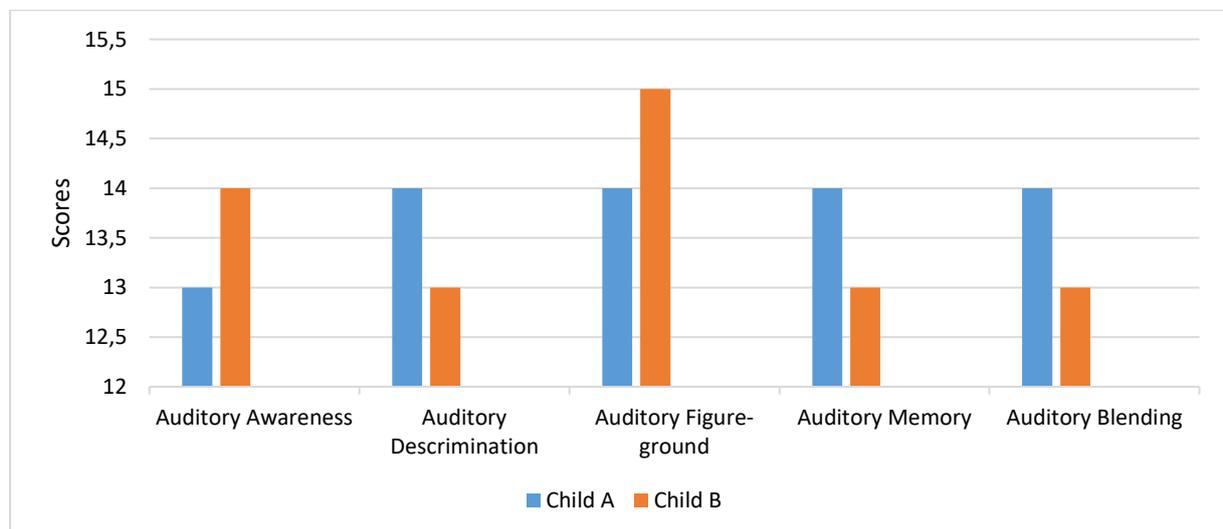
### 5.8. Method of Data Analysis

The method of data analysis used was descriptive in nature, and the two participants' data were analysed visually using graphs for changes in perceptual disorders. The descriptive statistics were used in this study to supplement the visual inspection of data analysis the Case Study Report design adopted. The results of the test for both pre-test and post-test groups were analysed against the two children.

## 6. Results

**Research Question 1:** What is the level of auditory perception of children with perceptual disorders before intervention?

After using perceptual diagnostic test instrument (frequency count) before intervention, the table shows the baseline total scores obtained for both child A and child B (pre-test). In auditory awareness, child A scored 13 while child B scored 14, for auditory discrimination, child A scored 14 while child B scored 13, for auditory figure-ground, child A scored 14 while child B scored 15, for auditory memory, child A scored 14 while child B scored 13, and auditory blending, child A scored 14 while child B scored 13. Finally, the table shows that auditory perception of child A and B at baseline (pre-test) is significantly low.

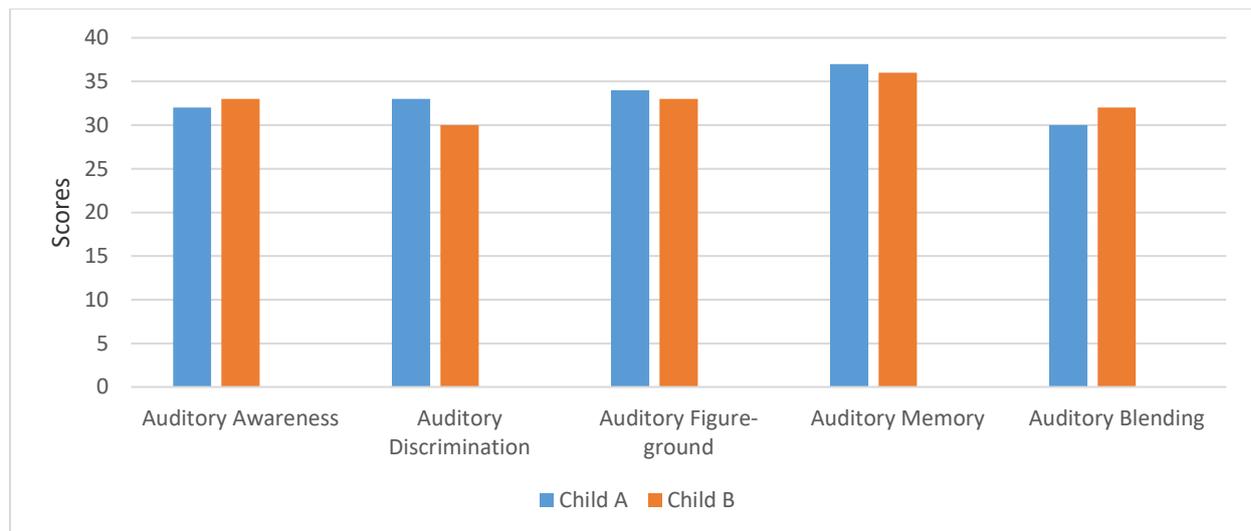


**Figure 1: Pre-test treatment for both child A and child B**

**Research Question 2:** What is the level of auditory perception of children with perceptual disorders after intervention?

After intervention, the table shows the scores obtained at post-test for both child A and child B. In auditory awareness, child A scored 32 while child B scored 33, for auditory discrimination, child A scored 33 while child B scored 30, for auditory

figure-ground, child A scored 34 while child B scored 33, for auditory memory, child A scored 37 while child B scored 36 and for auditory blending, child A scored 30 while child B scored 32. Finally, comparing the scores obtained at baseline (pre-test) treatment and intervention (post-test) shows that there is significant improvement in the five (5) major areas of auditory perception after intervention.

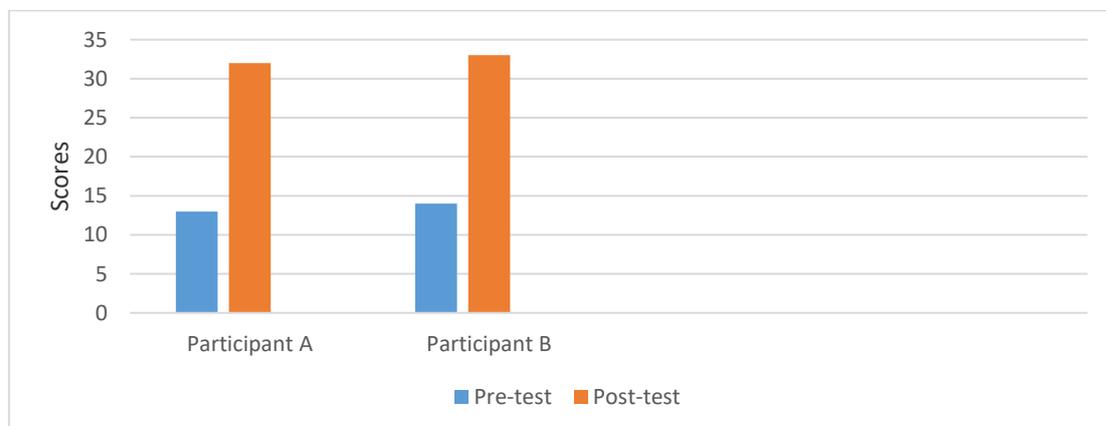


**Figure 2: Post-test treatment for child A and child B**

**Research Question 3:** To what extent will auditory training improve auditory awareness of children with perceptual disorders?

Figure 3 shows the scores obtained from auditory awareness before and after treatment. The table shows, specifically that child A was able to score 13 points at the baseline while at the post-test he was able to score 32 points. This means that child A has

improved by scoring an additional 19 points by the end of the treatment exercise. The table also shows that child B was able to score 14 points at the pre-test while at the post-test she was able to score 33 points. This means that child B has improved by also scoring an additional 19 point by the end of the treatment exercise.

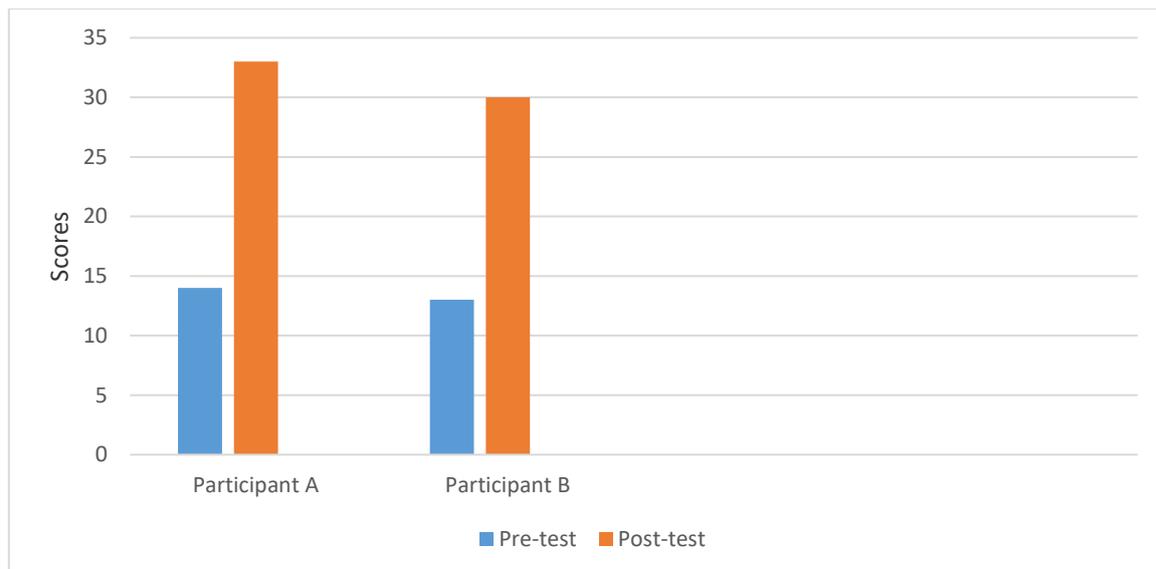


**Figure 3: Extent of Auditory Training on Auditory Awareness**

**Research Question 4:** To what extent will auditory training improve auditory discrimination of children with perceptual disorders?

Figure 4 shows the scores obtained from auditory discrimination before and after treatment. The table shows specifically that child A was able to score 14 points at the pre-test while at the post-test he was able

to score 33 points. This means that child A has improved by scoring additional 19 points by the end of the treatment exercise. The table also shows that child B was able to score 13 points at the pre-test while at the post-test she was able to score 30 points. This means that child B has improved by scoring 17 additional points by the end of the treatment exercise.

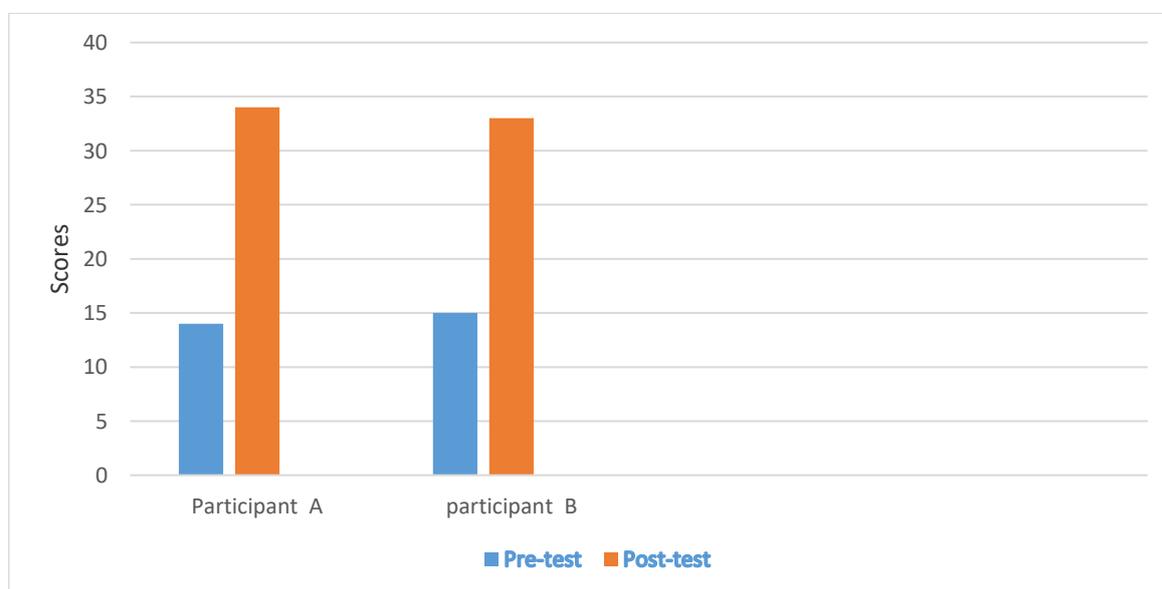


**Figure 4: Extent of Auditory Training on Auditory Discrimination**

**Research Question 5:** To what extent will auditory training improve auditory figure-ground of children with perceptual disorders?

Figure 5 shows the scores obtained from auditory figure-ground before and after treatment. The table shows specifically that child A was able to score 14 points at the pre-test while at the post-test he was able to score 34 points. This means that child A has

improved by scoring an additional 20 points by the end of the treatment exercise. The table also shows that child B was able to score 15 points at pre-test while at the post-test she was able to score 33 points. This means that child B has improved by scoring an additional 18 points by the end of the treatment exercise.



**Figure 5: Extent of Auditory Training on Auditory Figure Ground**

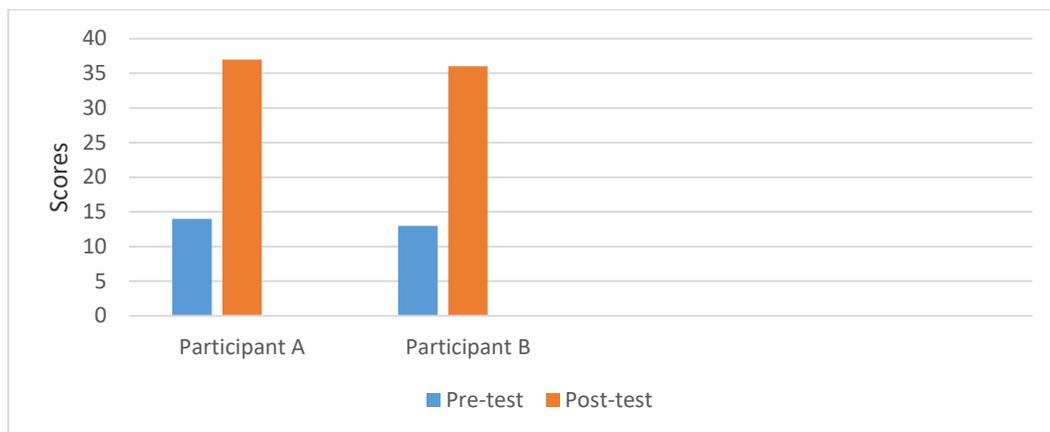
**Research Question 6:** To what extent will auditory training improve auditory memory of children with perceptual disorders?

Figure 6 shows the scores obtained from auditory memory before and after treatment. The table shows

specifically that child A was able to 14 point at the pre-test while at the post-test he was able to score 37 points. This means that child A has improved by scoring an additional 23 points by the end of the

treatment exercise. The table also shows that child B was able to score 13 points at the pre-test while at the post-test she was able to score 36 points. This means

that child B has improved by scoring an additional 23 points by the end of the treatment exercise.

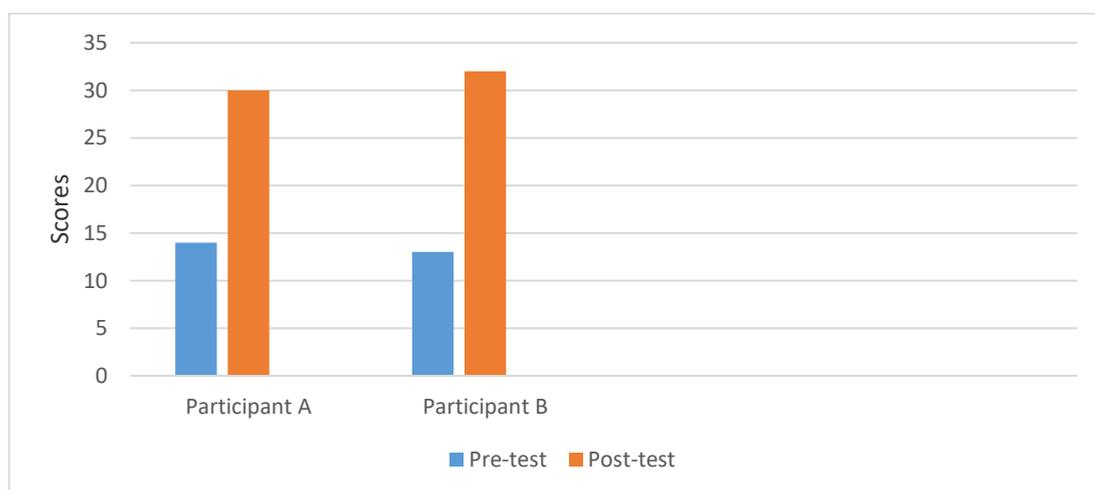


**Figure 6: Extent of Auditory Training on Auditory Figure Memory**

**Research Question 7:** To what extent will auditory training improve auditory blending of children with perceptual disorders?

Figure 7 shows the scores obtained from auditory blending before and after treatment. The table shows specifically that child A was able to score 14 points at the pre-test while at the post-test he was able to score 30 points. This means that child A has im-

proved by scoring an additional 16 points by the end of the treatment exercise. The table also shows that child B was able to score 13 points at the pre-test while at the post-test she was able to score 32. This means that child B has improved by scoring an additional 19 points by the end of the treatment exercise.



**Figure 7: Extent of Auditory Training on Auditory Figure Blending**

## 7. Discussion

The results of the finding from research question one on the level of auditory perception of children with perceptual disorders before intervention, revealed that the auditory perception of child A and B at pre-test is significantly low, and an increase in the levels of auditory perception were recorded for the two

children at post-test in research question two. A similar study by Gravel, Dunn, Lee and Ellis (2006) used a comprehensive test protocol and found no evidence of intrinsic differences in the peripheral auditory system of children with autism when compared to typically developing peers. They discussed the need to systematically investigate the auditory level of

children with developmental disabilities and how knowing basic peripheral function is crucial (Gravel, Dunn, Lee & Ellis, 2006; Tharpe, Bess, Sladen, Schissel, Couch & Schery, 2006). Knowing the status of the auditory perception is key to investigations of other levels of the auditory pathway in individuals and children. Additional research using assessment tools that assess higher level auditory perception abilities will allow investigation of auditory processing abilities of children with disabilities that go beyond the peripheral auditory system. Likewise as children with developmental disabilities is considered a spectrum disorder for diagnostic criteria, variability and a continuum of responses can be observed in the behavioural responses to auditory stimuli (Dunning, 2003).

The findings also revealed the extent of auditory training on auditory awareness of children with perceptual disorder that showed that child A and B had improved by scoring additional points at the end of the treatment exercise. The finding was consistent to the findings of the study carried out by Deshi on the effect of auditory training on speech and auditory awareness and enhancement of persons with auditory perception in Otana Special School, Jos, Nigeria (Deshi, 2014). The result revealed that auditory training alleviates speech problems of people with auditory perception problems.

More so, the results showed the extent to which auditory training improves auditory discrimination of children with perceptual disorders. The findings showed that child B improved in their points scored at the end of the treatment exercise. This was in tune with the findings of Arnold and Schwartz of which they suggested differences in auditory processing between the two subject groups that has not been found in dichotic listening research in children (Arnold & Schwartz, 1982). They found differences in dichotic speech discrimination between their samples of children with developmental disabilities and typically developing control groups. Arnold and Schwartz focused on children with language deficits, typical children and children with autism between 6 to 14 years of age.

Results of the study also revealed that for these two children with perceptual disorders, auditory training improves auditory figure-ground, auditory memory and blending. These results were in agreement with a past study on the investigation of the auditory processing abilities of children diagnosed with autism

(Egelhoff, 2011; Deborah, 2007). Parents of children with autism completed the screening questionnaire through an online survey. Overall differences in subject groups were impacted by significantly poorer performance in the left ear for the autism group during all conditions of dichotic word recognition. Individual variability within the children with autism was evident and resulted in three subjects with substantially greater deficits in auditory processing when compared to group performances for all tasks.

Our findings were also consistent with past research that had shown that child performance on dichotic word recognition does not approach adult patterns of performance until around the age of 12 and individual variability in maturation of the auditory system plays a role in observed performance (Hugdahl, Carlsson & Eichele, 2001). Dichotic listening involves auditory memory and temporal processing. These differences in performance between children and young adults may be due to underdevelopment of the auditory system in the younger age range and lack of maturation of the auditory pathways. Another longitudinal study, for example, found significant improvements in dichotic word recognition (auditory memory) performance in children can occur in as little as one year of additional auditory development (Lamm & Epstein, 1997).

## 8. Conclusion

The research study was designed to investigate the effects of auditory training on the auditory perception of children with perceptual disorders in Alheri Special School Yangoji, Kwali-Abuja. Generally, the two children with perceptual disorders improved their auditory perception. Based on the findings of this study, the researchers arrived at the following conclusions: 1) Children with perceptual disorders who have auditory perceptual disorders have improved in their auditory perception. 2) There is a need for more auditory training therapy for children with perceptual disorders and 3) that the schools, especially the special needs schools, should provide more valid screening materials in the schools as they serve as tools for enhancing auditory perception.

## 9. Recommendation

Based on the revelations of this study, the researcher deems it necessary to make the following recommendations as a way of improving auditory training on auditory perception for children with perceptual disorders: Teachers and professionals should devel-

op positive attitudes towards auditory training therapy for children with perceptual disorders. Also, governments at all levels should make adequate provision for identification and screening materials for special needs individuals in various schools and employ competent personnel to use them. The government should organise seminars and workshops on auditory perception intervention programmes for teachers of children with perceptual disorders. Lastly, the government should, as a matter of urgency, establish an early intervention programme in line with those in advanced countries of the world. This programme should include professionals, parents and caregivers. The programme should be designed to ensure the participation of interdisciplinary teams to tackle various problems emanating from perceptual and other related disorders.

### Conflict of interest

The author declares no conflict of interest.

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