

# Dichotic listening training, compensatory strategies and combined therapies on listening abilities of pupils with auditory processing disorders

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<b>Registration date</b> 17/10/2017	<b>Overall study status</b> Completed	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
<b>Last Edited</b> 17/10/2017	<b>Condition category</b> Ear, Nose and Throat	<input type="checkbox"/> Individual participant data <input type="checkbox"/> Record updated in last year

## Plain English summary of protocol

### Background and study aims

Auditory processing disorders (APD) are hearing problems where the brain is unable to process sounds in the normal way. They can affect people of all ages, but often start in childhood. The aim of this study is to assess the effect of a bottom-up approach (dichotic listening training), a top-down approach (compensatory strategies training), and a combination of both treatments (combined therapies) at improving the listening abilities (listening without background noise, listening ability in background noise and sound localisation ability) of pupils with APDs in Ibadan, Nigeria. The study will also determine the effect of gender and self-esteem on listening abilities in pupils with APDs. This study is conducted in Ibadan, Nigeria, at two selected schools located on the highway close to sources of environmental noise, and also through private practice in the residential areas of some of the participants.

### Who can participate?

Pupils aged 7 years 0 months through 11 years 11 months with auditory processing disorders in Ibadan, Nigeria

### What does the study involve?

Participants are randomly allocated into one of three treatment groups (dichotic listening training, compensatory strategies training, combined therapy) or a control group who receive no treatment. The participants then receive 10 weeks of their allocated training. Their listening ability without background noise, listening ability with background noise, and sound localisation ability are measured before and after the training.

### What are the possible benefits and risks of participating?

Possible benefits are improvement of listening abilities and reduction of the effects of APD on the participants. There are no known risks of participating in the study.

Where is the study run from?  
St Michaels Primary School (Nigeria)

When is the study starting and how long is it expected to run for?  
August 2013 to July 2015

Who is funding the study?  
University of Ibadan (Nigeria)

Who is the main contact?  
Dr Ayo Osisanya

## Contact information

**Type(s)**  
Public

**Contact name**  
Dr Ayo Osisanya

**Contact details**  
Audiology and Speech Pathology Unit  
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Ibadan  
Nigeria  
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## Additional identifiers

**Protocol serial number**  
Ad 13/479

## Study information

**Scientific Title**  
Effects of dichotic listening training, compensatory strategies and combined therapies in managing pupils with auditory processing disorders

### Study objectives

1. There is no significant main effect of treatments (dichotic listening training, compensatory strategies and combined therapies) on the listening abilities (listening ability without background noise, listening ability with background noise, and sound localization ability) of pupils with auditory processing disorders (participants)
2. There is no significant main effect of gender on the listening abilities of the participants
3. There is no significant main effect of self-esteem on the listening abilities of the participants
4. There is no significant interaction effect of treatments and gender on the listening abilities of the participants
5. There is no significant interaction effect of treatments and self-esteem on the listening abilities of the participants

6. There is no significant interaction effect of gender and self-esteem on the listening abilities of the participants

7. There is no significant interaction effect of treatments, gender and self-esteem on the listening abilities of the participants

### **Ethics approval required**

Old ethics approval format

### **Ethics approval(s)**

Ethics board: Department of Planning, Research and Statistics Division, Ministry of Health, Oyo State, Nigeria, 10/09/2017, ref: AD 13/479

### **Study design**

Multicentre randomised controlled trial

### **Primary study design**

Interventional

### **Study type(s)**

Treatment

### **Health condition(s) or problem(s) studied**

Auditory processing disorders

### **Interventions**

The design of the study was a randomised controlled trial of intervention, with a 4x2x2 factorial matrix. It is an interventional study that includes random allocation of subjects into any of the three intervention groups (Dichotic Listening Training, Compensatory Strategies, Combined Therapies) or the control group of no treatment, and random allocation of the interventions to the groups. The study is a multicentre study conducted in both the home and the school environment of the subjects, i.e. in the natural environment of the subjects.

The samples for this study were 80 pupils (male and female) attending primary schools in Ibadan, who were classified as having APD without any co-morbid conditions such as attention deficit hyperactivity disorder, or reading disability, and in the absence of Otitis media and hearing loss. The study made use of Multistage sampling technique and purposive sampling technique to select the participants for the study. At first, the sus-participants were screened out from the list of pupils with reported listening difficulties in selected schools in Ibadan. The selected schools were schools located on the highway, close to sources of environmental sounds. The selected schools were St. Michaels Primary School, Apata, Ibadan, and C&S New Eden Primary School, Mokola, Ibadan. Some sus-participants were also recruited on private interactions and independent practice. A total of 460 pupils were nominated at this stage. Thereafter, audiological tests were performed on these, in order to determine their hearing abilities.

First, otoscopy was performed on these individuals to determine the status of their outer ear, i.e. if the middle ear was filled with fluid that interfered with adequate listening. A total of 64 sus-participants were screened out at this stage, as such were found having impacted wax in their outer ear, which could affect their hearing perception. Secondly, the pure-tone audiometry was carried out on these individuals in order to determine their hearing levels, with 0-25 dB indicative of intact and adequate hearing. At this stage, 36 sus-participants were screened out as they presented with hearing levels higher than 25dB, indicative of a hearing loss. Out of the

remaining 360 sus-participants, 39 were left out of the screening exercise after they were tested on the Tympanometry, as their middle ear functioning was not intact and adequate, i.e. they had abnormal tympanometry with middle ear pressures greater than -200 daPa. The remaining 321 sus-participants were then administered the Children's Auditory Processing Performance Scale (CHAPPS), which was attended by their caregivers, in order to determine their listening behaviour at home, and corroborate with the results of the tests of auditory processing that were later administered. It was also asked the caregivers in the form if their child had a history of middle-ear infection as a child. 38 sus-participants were screened out at this stage (18 > -0.01 on CHAPPS, 20 with a history of middle ear infection).

Thirdly, because the diagnostic criteria selected by the researcher for a diagnosis of APD was an aberration of 2SD of at least one ear on at least two tests of auditory processing, and an aberration on at least one linguistic test, the sus-participants were exposed to the Tests for Auditory Processing in Children (SCAN-3:C), and the Random-Gap Detection Test Expanded (RGDT Expanded). A total of 42 (25 for SCAN-3:C, 17 for RGDT- Expanded) sus-participants were screened out at this stage, as they were not found to be aberrant with 2 SD in at least one ear on both tests and on the CHAPPS. The remaining 231 sus-participants were thereby diagnosed with an auditory processing disorder. Thereafter, the participants were assessed for intelligence and nonverbal intelligence on the Perceptual Reasoning sub-scale of the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV), to determine their general intelligence, and their level of intelligence, outside of the influence of language.

This followed Rosen (2003) specifications that nonverbal I.Q. should be considered when examining auditory and language abilities to partial out the effects of any underlying general cognitive deficit. Keller, Tillery and McFadden (2006) also laid claim that memory, along with verbal I.Q. has been implicated as an underlying factor in auditory processing deficits in children diagnosed with nonverbal learning disability and language impairment. 37 participants (23 FSIQ < 90, 14 PRI <90). Because the aim of the study was to remediate listening difficulties in children with a single profile of APD, and not with any comorbid disorder, the identified pupils with an APD were further screened for reading and attention problems. The Informal Graded Word Recognition Test (IGWRT) was administered on the sus-participants, and 41 of such were found to present with evidence of reading disorder, as their scores were less than 50% on each of the subtests of the test. The remaining 163 sus-participants were then screened for attention problems using the Canadian ADHD Resource Checklist (CADDRA), and 28 were found to present with comorbid attention problems. 135 pupils then became the pupils who qualified for the study, as they presented with a single profile of APD.

Thereafter, the participants had the Rosenberg Self-Esteem Scale administered on them. The scale classified the self-esteem of the participants as either high or low. Afterwards, the participants were asked to choose from a box containing small cuts of paper, with figures 1, 2, 3 or 4 written on each paper. Participants who chose 1 formed the participants for Dichotic Listening Training, participants who chose 2 formed the participants for Compensatory Strategies Training, participants who chose 3 formed the participants for Combined Therapies, and the participants who chose 4 formed the participants for the Control Group. There were 34 participants in the Dichotic Listening Training (23 males, 11 females), 34 participants in the Compensatory Strategies Training Group (23 males, 11 females), 34 participants in the Combined Therapy Group (19 males, 15 females), and 33 participants in the Control Group (20 males, 11 females). The self-esteem of the participants in each group was then analysed. In the Dichotic Group, there were 13 high (7 males, 6 females) and 21 low (16 males, 5 females) self-esteem classifications, 13 high (8 males, 5 females) and 21 low (15 males, 6 females) in the

Compensatory Strategies Training Group, 14 high (7 males, 7 females) and 20 low (12 males, 8 females) in the Combined Therapy Group, and 15 high (10 males, 5 females) and 18 low (12 males, 6 females) in the Control Group.

The participants in each group were then reduced to five each for gender and self-esteem classifications, i.e. 5 males with high self-esteem, 5 males with low self-esteem; 5 females with high self-esteem, 5 females with low self-esteem. This was made possible by having a cut-out of figures 1 through 5 and empty cut-outs for each group of the classifications of self-esteem. The participants were then asked to select from the cut-outs. Participants who selected the figures 1 through 5 became the final participants for the study.

The participants were exposed to 10 weeks training comprising eight weeks therapeutic sessions, one week of pre-test, and a week of post-test. The pre-test and post-test were done on measures of listening ability without background noise, listening ability with background noise, and sound localisation ability. The data gathered were tested on the seven null hypotheses formulated to guide the study, which were tested at 0.05 level of significance. The data were analysed with inferential statistics of multivariate analysis of co-variance (MANCOVA) – necessitated by the fact there were more than two dependent variables tested, and a post-hoc analysis of least significant difference (LSD).

### **Intervention Type**

Behavioural

### **Primary outcome(s)**

Listening ability (listening ability without background noise, listening ability with background noise, and sound localisation ability), measured using verbal information/response of the participants before and after each intervention

### **Key secondary outcome(s))**

Self-esteem, measured using the Rosenberg Self-Esteem Scale at baseline

### **Completion date**

31/07/2015

## **Eligibility**

### **Key inclusion criteria**

1. Pupils identified with listening difficulty without a hearing loss
2. Pupils presenting with auditory processing problems
3. Pupils with normal hearing abilities of between 0-25dB
4. Pupils with difficulty hearing in competing background noise or environmental noise
5. Pupils without glue ear
6. Pupils within the age range of 7 years 0 months - 11 years 11 months

### **Participant type(s)**

Patient

### **Healthy volunteers allowed**

No

### **Age group**

Child

**Lower age limit**

7 years

**Upper age limit**

11 years

**Sex**

All

**Key exclusion criteria**

1. Pupils with evidence of hearing loss, intellectual disability and attention deficit hyperactivity disorder
2. Pupils whose Full Scale Intelligence Quotient (FSIQ) scores on the Wechsler Intelligence Scale for Children (WISC IV) are lower than 90
3. Pupils whose scores on the Random Gap Detection Test (RGDT) are less than 20ms
4. Pupils whose scores are less than -0.01 on the Children's Auditory Processing Performance Scale (CHAPPS)
5. Pupils with reading disability

**Date of first enrolment**

22/01/2015

**Date of final enrolment**

15/05/2015

## **Locations**

**Countries of recruitment**

Nigeria

**Study participating centre**

**St Michaels Primary School**

Opposite Wema Bank, Apata

Ibadan

Nigeria

200005

## **Sponsor information**

**Organisation**

University of Ibadan

ROR

## Funder(s)

### Funder type

University/education

### Funder Name

University of Ibadan

### Alternative Name(s)

UI

### Funding Body Type

Government organisation

### Funding Body Subtype

Local government

### Location

Nigeria

## Results and Publications

### Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study are/will be available upon request from Mr Ajibola Ishola (ajibola\_ishola@yahoo.co.uk).

### IPD sharing plan summary

Available on request

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">Participant information sheet</a>	Participant information sheet	11/11/2025	11/11/2025	No	Yes