DEVELOPMENT OF AN AUDIOLOGIC BATTERY FOR ASSESSMENT OF BENEFIT FROM AMPLIFICATION

Thesis Submitted for the Partial Fulfillment of the M.D. Degree

in

Audiology

617.89
W.A

by:

Wafaa Abdel Hai El Kholi

53739

Supervised by:

Prof. Dr. Salah Soliman

Professor of Audiology,
Audiology Unit - ORL Dept.,
Ain Shams University

Prof. Dr. Nasser Kotby

Prof. & Head of Phoniatrics
Unit, Head of ORL Dept.,
Ain Shams University

Prof. Dr. Nadia Kamal

Prof. & Head of Audiology Unit,
ORL Department,
Ain Shams University

Dr. Iman El Danasoury

Lecturer of Audiology,
ORL Department
Ain Shams University

Faculty of Medicine
Ain Shams University

1997

Central Library - Ain Shams University

Central Library - Ain Shams University

بسم الله الرحمن الرحيم

Central Library - Ain Shams University

"جامعة عين شمس"
الكليـــة:

صفحـــة العنـــــوان

أســـــم الطالـــــب : .....
الدرجـــة العلميـــــة : .....
القسم التابع لـــــــه : .....
أســـم الكليـــــــة : .....
الجامعـــــــــــة : .....
سنـــة التخـــــــرج : .....
سنـــة المنـــــــح : .....

شـــــروط عامـــــه

يوضع شعـــار الجامعـــة علـــى الغـــلاف الخارجـــى.

Central Library - Ain Shams University

Central Library - Ain Shams University

" جامعة عين شمس"
الكليـــة:

رسالـــة ماجســـتير / دكتـــوراه

أسم الطـــالب:.....
عنوان الرسالة:.....

أســم الدرجـــة : (ماجستيـــر / دكتـــوراه)

لجنـــة الإشـــرا ف

١- الاسم/ ..... ٢- الوظيفة/.....
١- الاسم/ ..... ٢- الوظيفة/.....
١- الاسم/ ..... ٢- الوظيفة/.....

تاريخ البحـــث : / / ١٩

الدراســـات العليـــا

ختـــم الإجـــازة : أجيزت الرسالـــة بتـاريخ /
/ ١٩٩

موافقة مجلس الكلية
/ / ١٩٩

موافقة مجلس الجامعة
/ / ١٩٩

Central Library - Ain Shams University

Central Library - Ain Shams University

"جامعة عين شمس"

الكليـــة:

شكـــــــر

اشكـــــر الســـــادة الأســـــاتذة الـــذين قامـوا بالأشـــــراف

وهـــم :

١) .....

٢) .....

٣) .....

٤) .....

ثـم الأشخـــاص الذيـــن تعـــاونوا معـــى فـى البحـــث

وهـــم :

١) .....

٢) .....

٣) .....

وكـــذلك الهيئـات الأتيـــة :

١) .....

٢) .....

٣) .....

Central Library - Ain Shams University

Central Library - Ain Shams University

Table of Contents

	Page
- Acknowlegement	
- List of tables	
- List of figures	
- Introduction and Rationale	1
- Aims of the Work	4
- Review of Literature	5
Acoustics of Speech	**5**
Physiologic Basis for Speech Coding	**25**
Evaluation of Hearing Aid Benefit	**34**
Speech Perception Tests	**51**
Speech Perception Test Results in Cochlear Implant and Hearing Aid Users	**68**
- Material and Methods	82
- Results	101
- Discussion	141
- Conclusions	158
- Recommendations	159
- Summary	160
- References	163
- Appendix	200
- Arabic Summary	

Central Library - Ain Shams University

Central Library - Ain Shams University

ACKNOWLEDGEMENT

I am greatly endebted to *Prof. Dr. Salah Soliman*, Professor of Audiology, Ain Shams University, who, in addition to his wholehearted assistance and supervision, has provided me with a great deal of support, encouragement, and knowledge. His vast experience truely enriched this work.

I wish to extend my thanks to *Prof. Dr. Nasser Kotby,* Professor of Phoniatrics - Head of Otolaryngology Dept., Ain Shams University for his constructive criticism and valuable advice. His help and concern are greatly appreciated.

I would like to express my deep gratitude and appreciation to *Prof. Dr. Nadia Kamal*, Prof. & Head of Audiology Unit, Ain Shams University for her kind guidance, valuable remarks and great help.

Special thanks are due to *Dr. Iman Sadek*, Lecturer of Audiology, Ain Shams University for her careful supervision, meticulous revision, and above all, her friendship.

I truely appreciate the help given to me by *Prof. Dr. Hussein Mansour*, Professor of Animal Production, Ain Shams University in conducting the statistical analysis of this work.

Lastly, I would like to thank all members of the Audiology Unit, Otolaryngology Dept., especially *Dr. Nagwa Hazzaa* and *Dr. Amani Shalaby*, for their continuous advice, encouragement and cooperation.

Central Library - Ain Shams University

Central Library - Ain Shams University

LIST OF TABLES

Page

Table (1): Viseme groups for English consonants determined by various researchers 21

Table (2): Viseme groups for English vowels as determined by two separate studies 23

Table (3): Standard test batteries 55

Table (4): A comparison between some different "units" for testing speech perception 57

Table (5): The Arabic speech perception tests 85

Table (6): Number of items, number of choices and chance levels for the Arabic speech perception tests 86

Table (7): Classification of patients according to the regularity of hearing aid use 102

Table (8) : Breakdown of the hearing aid users group according to the etiology of hearing loss 103

Table (9): Unaided pure-tone thresholds in the hearing aid users group 104

Table (10): Aided thresholds in the hearing aid users group .. 105

Table (11): Speech perception test results in the hearing aid users group 106

Table (12): Speech perception tests arranged in order of difficulty and number of patients showing extreme scores 108

Table (13): ANOVA table showing the effect of variables on the Question/Statement test scores 110

Table (14): ANOVA table showing the effect of variables on the Noise/Voice test scores 110

Table (15): ANOVA table showing the effect of variables on the Accent test scores 111

Central Library - Ain Shams University

Table (16): ANOVA table showing the effect of variables on the Spondee: Same/Different test scores 111
Table (17): ANOVA table showing the effect of variables on the Four-Choice Spondee test scores 112
Table (18): ANOVA table showing the effect of variables on the Initial Consonant test scores 113
Table (19): ANOVA table showing the effect of variables on the Final Consonant test scores 113
Table (20): ANOVA table showing the effect of variables on the Vowel test scores 114
Table (21): ANOVA table showing the effect of variables on the Modified Initial Consonant test scores 114
Table (22): ANOVA table showing the effect of variables on the Modified Final Consonant test scores 115
Table (23): ANOVA table showing the effect of variables on the Modified Vowel test scores 115
Table (24): ANOVA table showing the effect of variables on the Consonant Recognition test scores 116
Table (25): ANOVA table showing the effect of variables on the Monosyllabic (word) test scores 116
Table (26): ANOVA table showing the effect of variables on the Monosyllabic (phoneme) test scores 117
Table (27): ANOVA table showing the effect of variables on the Spondee Recognition test scores 117
Table (28): ANOVA table showing the effect of variables on the Everyday Sentences test scores 118
Table (29): ANOVA table showing the effect of variables on the High Context Sentences test scores 118
Table (30): ANOVA table showing the effect of variables on the Consonant Recognition (visual enhancement) test scores 119

Central Library - Ain Shams University