EFFECT OF AGING ON LOUDNESS SCALING

Thesis Submitted for Partial Fulfillment of the Master Degree in Audiology

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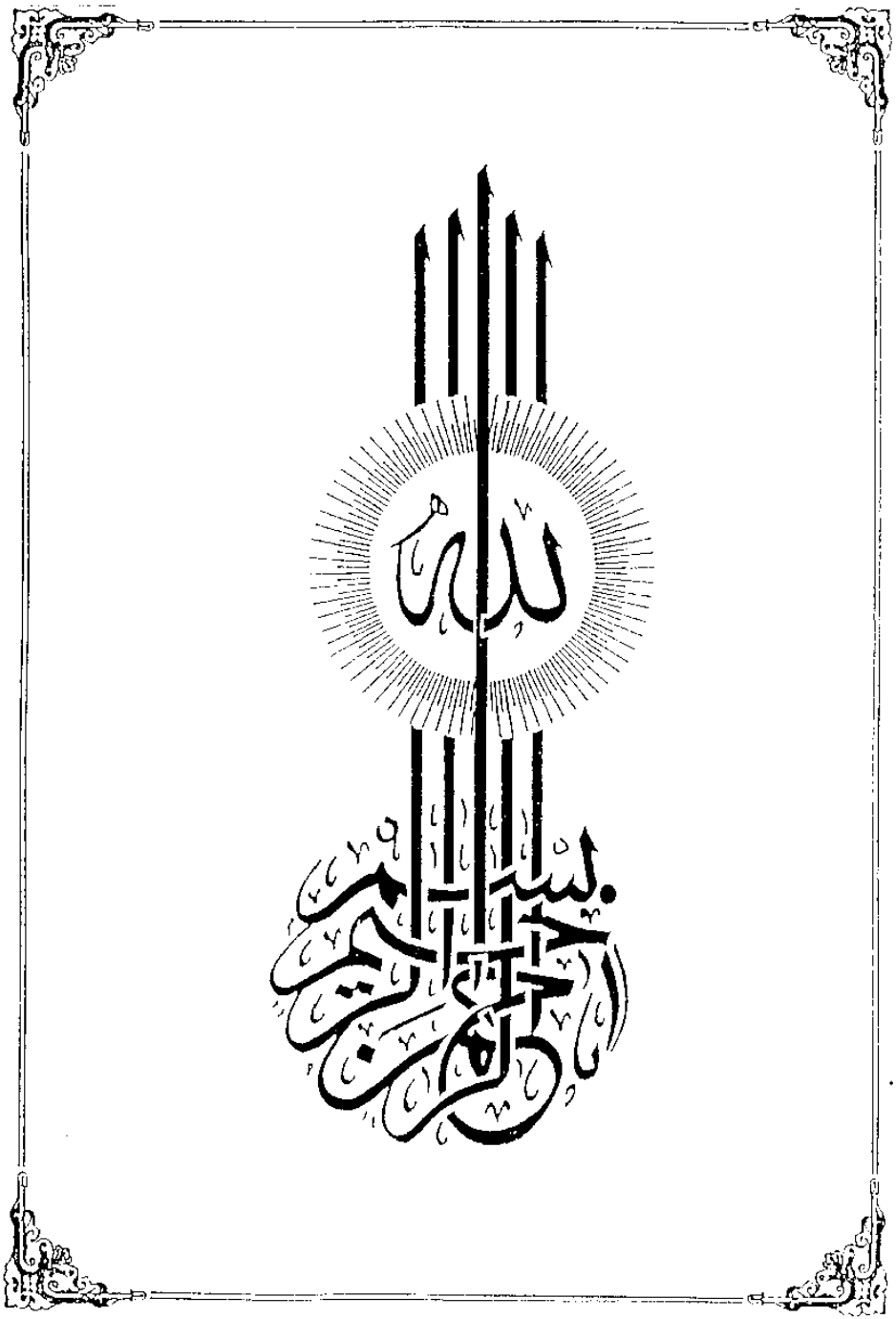

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DEDICATION

To my family

INTRODUCTION AND RATIONALE

Loudness is the perceptual correlate of intensity and is a product of the response or output of the entire auditory system ***(Fink, 1995)***. From a clinical point of view, measurement of sound intensity is much easier than quantification of loudness. It is obvious that, under the usual circumstances, loudness grows with intensity. However, this is not a linear growth. Many factors such as frequency, wave complexity, duration of sound and background noise affect this relationship ***(Guilick et al., 1989)***.

Abnormal growth of loudness is observed in some cases of hearing loss. A cochlear insult is usually associated with some degree of recruitment. On the other hand, decruitment is encountered in case of retrocochlear lesions. Therefore, measurement of loudness perception may be used as a tool which would help in localization of lesion along the auditory pathway ***(Evans, 1975)***.

Loudness scaling seemed to be an attractive method in adjustment and proper selection of hearing aids. Loudness growth scaling was first used in adjustment of hearing aids by ***Pascoe (1978)***. Since

then, many trials have been conducted in an attempt to further evaluate the role of loudness scaling in hearing aid fitting. The Wurzburg Hearing Field (WHF) is a procedure for loudness scaling that measures the individual's categorized loudness sensation ranging from "very soft" (hearing threshold) up to "very loud" (uncomfortable level) ***(Moser, 1995)***. The sensation of loudness is displayed separately for each frequency as a function of intensity ***(Kammermeier, 1996)***.

Elderly people are susceptible to many pathological changes that may involve any part of the entire auditory system ***(Schuknecht, 1964)***. Due to these changes, a difference in loudness perception would be expected and would vary according to the nature and the site of lesion in the auditory pathway. In spite that loudness scaling has been extensively studied in the adult population, researches dealing with loudness perception in elderly subjects were relatively scarce.

In a previous study ***(Hassan et al., 1997)***, loudness scaling using the WHF technique was standardized on a group of normal-hearing Egyptian adult subjects. The present research is designed to address the issues related to loudness perception in the elderly.

AIMS OF THE WORK

1. To study the effect of age on loudness scaling measures.

2. To compare the test results with those of adults.

PRESBYACUSIS

DEFINITION:

The term presbyacusis refers to hearing loss associated with the aging process (from Greek:presbys=old, akouein=hearing). It is the most common type of hearing loss and develops gradually with age. The decline in hearing acuity is particularly pronounced during the decade from 70 to 80 years of age. At 70 years of age, most subjects have no or only minor hearing problems, but at the age of 80, difficulties in hearing are common *(Jonsson et al., 1998)*.

THEORIES OF PRESBYACUSIS:

In their recent report, the ***Committee on Hearing, Bioacoustics and Biomechanics (CHABA) (1988)*** defined presbyacusis as the sum of hearing losses that results from several varieties of physiological degeneration including insults due to noise exposure, insults due to exposure to ototoxic agents, and insults due to medical disorders as well as medical treatments.

Pure presbyacusis is the hearing loss which remains when the cumulative effects of multiple pathological processes throughout the individual life have been excluded ***(Rosenhall et al., 1993).***

Lowell and Paparella (1977) summarized possible aetiological factors causing presbyacusis as genetic (intrinsic factors) and non-genetic (extrinsic factors) i.e., noise exposure, concussion, ototoxic medications, inflammatory, metabolic and others.

I. Noise exposure:

Exposure to excessive noise causes degeneration of the hair cells in the lower basal turn of the cochlea which is distinct from deterioration due to pure presbyacusis. However, it is difficult to separate the patterns typically attributed to age . The extent to which hearing loss in older persons is attributed to noise, rather than age, cannot be predicted from audiogram at this time. There is, however, support for the observation that age and noise exposure can have a synergistic effect ***(CHABA, 1988)***.