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AN ABSTRACT OF THE THESIS OF Mary Engel for the Master of Science in Audiology presented May 5, 1990.

Title: The Duration of Tinnitus in an Aging Population.

APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

James Maurer, Chairman

Maria Montserrat-Hopple

Berit Ingerd-Hopple

The purpose of the present study was to determine whether the perceived severity of chronic tinnitus in a geriatric population increased, decreased, or remained constant with the passage of time. A questionnaire was designed to ascertain the subjects' perceived severity at time of onset and the perceived severity of their current tinnitus. The subjects were asked to rate their past and present tinnitus severity according to how much it bothered them. They were also asked questions pertaining to noise exposure history, hearing aid use, and tinnitus sound parameters for purposes of comparison with other groups

previously studied.

Seventy-eight hearing-impaired adults with current tinnitus symptoms participated in the study. The subjects ranged in age from 65 to 83 years, with a mean age of 69.3 years. Thirty-two of the subjects (41%) were current users of amplification. Previous excessive noise exposure was cited by 65 subjects (83%). Noise exposure duration for these subjects ranged from two to forty-five years, with a mean of 11.4 years. Subjects were contacted by telephone and asked to respond verbally to the ordered series of questions pertaining to their tinnitus. The number of responses was recorded for each possible answer. The data were analyzed by utilizing a percentage format and bar graphs to demonstrate relationships between data.

Results of this study indicated a decrease in perceived severity of mild tinnitus from time of onset to the present condition. Seventy-nine of the subjects reported that their present mild tinnitus was not as annoying, compared with perceived severity at time of onset. Current mild tinnitus symptoms were not a problem for 90% of the subjects. Ten subjects (11%) who reported no current symptoms were not included in the balance of the study.

THE DURATION OF TINNITUS IN AN AGING POPULATION

by

MARY ENGEL

A thesis submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE
in
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1990

TO THE OFFICE OF GRADUATE STUDIES:

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CHAPTER I

INTRODUCTION AND STATEMENT OF PURPOSE

INTRODUCTION

Tinnitus is a Latin word for "ringing" and has been defined as "...the sensation of sound not brought about by simultaneously applied mechano-acoustic or electrical signals" or as the "...conscious experience of a sound that originates in the head" (Coles, 1987; Penner, 1986; Webster, 1981).

Individuals with tinnitus variously describe it as ringing, hissing, buzzing, clicking, popping, pulsing, roaring, rushing, or with other similar adjectives (Meikle, 1984). Those with tinnitus may state that the sound originates in one or both ears, or somewhere within the head (Chung, 1984). They may describe a periodic change in the loudness or quality of the tinnitus. The tinnitus may be described as continuous, intermittent, or a combination of these, and may be either an isolated sound or a combination of sounds (Meikle, 1984). Those with tinnitus are male or female, hail from all socio-economic groupings, and range from pediatric through geriatric age groups (Chung, 1984 and Nodar, 1984). Tinnitus is not restricted to humans, and has been noted in lower animals as well (Zurek, 1981).

There are two major categories to be discussed, objective and subjective tinnitus. Objective tinnitus consists of sound(s) emitted by the ear which can be directly monitored by other individuals. These sounds may or may not be apparent to the subject and are generally "pulsing" or "clicking" in nature (Coles, 1987). Subjective tinnitus consists of sound(s) emitted by the ear which cannot be monitored by other individuals and are only apparent to the subject (Coles, 1987). Subjective tinnitus has been classified both quantitatively and qualitatively. Vernon (1976), for example, recommended mild, moderate, and severe categories relating to individual tinnitus severity. Jakes (1986) found that scales employing adjectives reflecting severity of tinnitus were the most useful. Generally, all categories relate tinnitus to its perceived loudness, the degree of individual discomfort, or the extent to which it may interfere with the lifestyle of the individual. Mild tinnitus, according to House (1984), is rarely annoying and barely noticeable. In its severe state, tinnitus interferes with sleeping patterns, thought processes, speech communication, and other factors according to Vernon (1976).

The 1984 National Study of Hearing (NSH), conducted in the United Kingdom, sent out a postal questionnaire to a random sample of 522 individuals. Of those respondents, 39% claimed to have experienced tinnitus. Within this

percentage, however, are those individuals with occasional tinnitus episodes of short duration (less than five minutes). These individuals are not likely to seek medical counsel or consider tinnitus to be a problem. A followup sampling was done by the NSH of 1,804 individuals claiming to have experienced tinnitus. After excluding those with tinnitus duration of less than five minutes, the figures approach a more valid incidence range of 15.5-18.6 in the general population (Coles, 1984).

The United States Department of Health, Education, and Welfare published a report in 1968 which surveyed 6,672 persons 18-79 years of age. The report cited a 32.4% incidence of tinnitus in this population, but does not exclude respondents with short duration tinnitus.

Hawthorne (1987) stated that tinnitus is very likely to become a chronic condition several weeks after onset. As with other chronic conditions, it would be reasonable to assume that the degree of annoyance with the tinnitus would increase with the passage of time. Meikle (1984) reported a slight tendency of individuals (age 0-80 years) with tinnitus longer than five years to give higher severity ratings than those who had tinnitus for periods of two years or less. It also has been shown that the tinnitus persistence over time appears to be the most objectionable quality to the majority of those complaining of tinnitus (Jakes, 1985).

Chung (1984) found that the prevalence of tinnitus

increased in direct relation to the presence of hearing loss and increased chronological age. It could be surmised from results of the study that an elderly hearing-impaired population would rate their current tinnitus as more severe than at the time of tinnitus onset.

The question of whether the perceived severity of chronic tinnitus in the elderly remains constant with the passage of time has not been specifically addressed in the literature cited. According to Maurer (1979), the majority of individuals who seek audiological services are elderly. The clinical audiologist, with a large proportion of elderly hearing-impaired clients, will be faced with a large proportion of clients reporting tinnitus. If it can be shown that the perceived severity of chronic tinnitus in the elderly remains constant or possibly decreases with the passage of time, the audiologist can offer reassurance that the condition is not likely to become worse. This information can lead to important considerations in determining the direction of patient rehabilitation by the audiologist.

STATEMENT OF PURPOSE

The purpose of this study was to determine whether the perceived severity of chronic tinnitus in a geriatric population remained constant with the passage of time.

The primary research question addressed by this study was:

Does the perceived severity of tinnitus increase, decrease, or remain the same between the time of onset and the present condition in an elderly population?

CHAPTER II

HISTORY OF THE PROBLEM

Tinnitus has been documented back to at least 800 BC (Stephens, 1987). The first written accounts of medical intervention were Egyptian, occurring within the Mesopotamian Era. Three different tinnitus qualities were identified: singing, whispering, and speaking. These have been loosely categorized, respectively, as ringing, hissing, and possibly auditory hallucinations. The Assyrians in 700 BC identified the etiology of tinnitus as "If when the hand of a ghost seizes a man, his ears ring..." (Stephens, 1984). Another suspected causative factor was described as a "wind rushing about the head" (Stephens, 1987).

Tinnitus treatment throughout history has taken some strange and potentially hazardous courses. Descriptions advise the use of leeches, bloodletting, electrical stimulation, massage, eustachian tube catheterization, and boring holes in the mastoid bone (Stephens, 1987). Other concoctions recommended for treatment include: earthworms boiled in goose grease, woodlice, ox gall, foxes fat, boar semen, asses dung, woman's milk, foam from horse's mouth, cockroaches ground in rose oil, opium, frankincense, myrrh, turpentine, and cedar sap. Some treatments were even

specific for tinnitus in the right or left ear (Stephens, 1984).

ETIOLOGY

Although the cause of tinnitus is not known in the majority of cases, it has been found to be associated with nearly every organic disruption of the peripheral and central auditory systems. Possible lesion sites have been identified as involving the external ear canal, middle ear and/or eustachian tube, inner ear, and neural pathways (Baloh, 1984).

External Ear Canal

Tinnitus apparently induced by disruption of normal external ear canal function appears to be primarily mechanical in nature. Cerumen in contact with the tympanic membrane may lead to sounds generated by friction, while complete canal blockage may inadvertently amplify existing tinnitus via the occlusion effect. Head/ear trauma and external otitis can contribute to tinnitus generation through associated edema of the external ear canal (Wilson, 1987).

Middle Ear/Eustachian Tube

Stephens (1987) indicates that mechanical or electrical dysfunction appears to be the primary disruptor in middle ear generated tinnitus. Otosclerosis, spontaneous noise from middle ear musculature, head/ear trauma, nearby carotid wall

elasticity, jaw movement, middle ear effusion, eustachian tube dysfunction (either through electrical or mechanical lesions), and tumors have been implicated as possible tinnitus generators through their disruption of normal middle ear functions (Stephens, 1987).

Inner Ear

The cochlea is a complex organ which functions through a combination of mechanical, chemical, and electrical processes. Inner ear disturbances such as presbycusis, noise induced hearing loss, acoustic trauma (either acute or chronic), vascular insufficiencies, head/ear trauma, Meniere's Syndrome, viral disturbances, tumors, and spontaneous cochlear nerve fiber activity have been linked with tinnitus symptoms (Wilson, 1987). Since the majority of those with tinnitus also have sensorineural hearing loss, it would appear that inner ear disturbance is the primary causative agent in the majority of cases (Baloh, 1984).

Neural Pathways

tinnitus generated beyond the inner ear periphery is thought to be due to electrical disturbance in neural transmission, although this may be influenced by mechanical or chemical causes (Wilson, 1987). This may involve the auditory nerve, brainstem, or cortex, according to Baloh (1984). Tumors, head trauma, neurologic diseases (e.g., Multiple Sclerosis) or other dysfunctions have been

associated with tinnitus symptoms. These conditions, either through their actions in compression or destruction of the insulating myelin sheath, contribute to the phenomenon of "cross talk" between neural fibers. This "cross talk" sends errant sound signals to the inner ear or auditory cortex, which is perceived as tinnitus (Wilson, 1987).

DIAGNOSIS AND TREATMENT

According to Vernon (1976), it is a frequent clinical observation that tinnitus may be experienced by individuals who demonstrate no associated organic pathology. But due to the wide variety of potential sites of lesions associated with tinnitus, he recommended that all individuals with tinnitus symptoms receive a complete medical examination and audiological assessment. Obviously, if a condition can be identified as treatable (e.g., change in medication or use of noise protection), the tinnitus symptoms may be eliminated with its treatment. As tinnitus may be the first symptom of an underlying life-threatening condition, medical evaluation is imperative.

For those individuals (95%) who are considered medically intractable, there appears to be no universally accepted protocol for treatment according to Vernon (1976). Methods which have been tried include surgical treatment and use of external stimulation, drug therapy, hearing aids and maskers, and psychological approaches.

External Stimulation and Surgery

Tinnitus treatment, as summarized by Vernon (1976), has been attempted through surgical cochlear destruction, ultrasound, acupuncture, and transdermal electrical stimulation. Although some success was reported with the use of transdermal electrical stimulation, its clinical application was not found to be practical (Vernon, 1985).

Drug Therapy

As summarized by Goodey (1987), tinnitus treatment with chemical agents has been largely unsuccessful due to noxious side effects or the short-lived nature of the apparent remission. Drugs which have been tried include heparin, nicotinic acid, reserpine, vitamin A, dimethylsulfoxide (DMSO), and local anesthetic injection into the cochlea, tympanic membrane, or middle ear cavity. There has been some discussion of the placebo effect with regard to drug therapies. One such study found a 40% incidence of false positive response after saline solution injections (Duckert, 1984).

Hearing Aids and Masking Devices

Hearing aids and masking devices have been shown to interfere with the perception of tinnitus by way of acoustic stimulation. Vernon (1976) once suggested that hearing aids provide only limited useful amplification above 3000 Hz., so those with a high frequency hearing loss are not good

candidates for this treatment. Subsequent studies on amplification and tinnitus have repudiated this early opinion. Coles (1985), for example, reported that the majority of hearing aid users do obtain significant relief from tinnitus, at least as long as the instrument is used.

According to Vernon (1976), the rationale behind the choice of a tinnitus masker in treatment is that the patient is afforded some element of control over the symptoms. Besides the actual interference effect, the quality of masker sound is more acceptable than the tinnitus. According to Jakes (1985), however, the majority of individuals with tinnitus object to the persistence of the enigma, not to the quality of sound. Coles (1985) noted that approximately 25% of those seeking tinnitus treatment refused to try treatment with a masker. Although maskers have been reported to be up to 70% effective during initial tinnitus treatment, subsequent followup of those accepting masking treatment showed poor patient compliance.

Psychological Approaches

It has been theorized that the problem of tinnitus does not lie with the patient's symptoms, but rather in the patient's reaction to the symptoms. Masking has been called a "cover-up" that does not relieve the underlying hostility toward the presence of the condition (Sweetow,

1985). It also has been suggested that the success rate of hearing aids and maskers in dealing with tinnitus can be directly attributed to the psychological benefits received through the support and information processes derived from counseling (Coles, 1985).

Psychological treatments of tinnitus have also focused on hypnosis, biofeedback, cognitive therapy, and behavior management (Sweetow, 1985). According to Baloh (1984), these approaches would appear to be singularly most useful in cases where depression or chronic anxiety can be identified. A curious paradox is that Gerber (1985) noted from tinnitus patient results on the Minnesota Multiphasic Personality Inventory (MMPI) that "...severity of tinnitus was not perceptibly linked to locus of control, life satisfaction, or the occurrence of stressful life events."

A combination of prosthetics and counseling has been recommended by Coles (1985). The goal of such therapy is not to eliminate the tinnitus, but to decrease the frequency of awareness and provide some locus of control (Jakes, 1985). It is a tailored program for the individual to address a particular set of diverse complaints.

RISK FACTORS

There are a number of factors which have been found to constitute high risk for tinnitus development. Members of groups with the following attributes would show higher

percentages of severe forms due to the increase in exacerbating factors and/or general prevalence in their populations.

Age

Tinnitus prevalence increases with the chronological age of the individual. Chung (1984) reported on the tinnitus incidence in 31,504 noise-exposed male workers. For those workers less than 19 years of age, 3.1% reported tinnitus, while the incidence jumped to 20% for those over 70 years of age. Coles (1984) cited a 12.1% incidence of tinnitus for those under 40 years of age and a 20.8% incidence for those over 60 years of age in a general population sample of 1,804 individuals. Data on prevalence of tinnitus with increasing age must be viewed carefully, as increased age also tends to run concurrently with an increase in other possible causal factors, particularly hearing loss (Chung, 1984). For example, data obtained from over 2,000 normal hearing children (grades 5-12) show a tinnitus prevalence of 15%, which coincides with figures given for the general population (Nodar, 1984).

Gender

According to Chung (1984), there appears to be no relation of tinnitus incidence with respect to gender. Of 2,081 noise-exposed male workers, 6.6% reported tinnitus, while 5.6% of the 93 female noise-exposed workers reported

tinnitus. It has been noted, however, that females tend to report tinnitus symptoms more readily than males (Coles, 1984). This increase was thought to be possibly balanced by the greater percentage of males with other high-risk factors.

Noise Exposure

Noise exposure is very frequently a presumed cause of tinnitus (Wilson, 1987). Coles (1984) reported that in a general population survey of 2,162 persons claiming tinnitus, 20.8% of those over 60 years of age reported noise exposure and 14.4% did not. Of those individuals with tinnitus under 40 years of age, 12.1% reported noise exposure and 5.8% did not. In another study of 1,806 tinnitus clinic patients, 66% reported previous noise exposure (Meikle, 1984). It is felt that because of its association with hearing loss, noise exposure is indirectly related to tinnitus prevalence (Chung, 1984).

Stress

There is some dispute as to whether stress constitutes a host factor for tinnitus development or aggravation. Gerber (1985) reported on a study of 45 male patients with tinnitus who completed the Minnesota Multiphasic Personality Inventory (MMPI). Only 13% had typical psychosomatic or hysterical profiles on the MMPI, and their mean tinnitus severity scores did not deviate significantly from the other subjects. This suggested that those with tinnitus have no

increase in related psychosomatic complaints or indications of undue stress. House (1984) claimed that stress has an intricate relationship with tinnitus, and can be considered a stress-related disorder. No findings are given to support this claim, however. It has been suggested that the presence of tinnitus itself constitutes a stressor for the individual, which leads to increased awareness of its symptoms (Coles, 1984).

Biochemical

According to Meikle (1984), in a study of 1,806 tinnitus clinic patients, 74% claimed regular caffeine (coffee) ingestion, 50% had documented allergies which affected the upper respiratory tract, 40% were hypertensive, 26% smoked tobacco, and "less than 2%" had arthritic conditions. Baloh (1984) states that hypertension and arthritis may be indirectly linked to an increase in tinnitus due to common treatments involving ototoxic agents. Chung (1984) believes that smoking may be indirectly related due to its association with hearing loss.

Hearing Loss

Prevalence of tinnitus appeared to increase in direct relation to the presence of hearing loss, and was identified as the single most important risk factor by Chung (1984). In his study of 2,081 male noise-exposed workers with tinnitus, 4% demonstrated 0 dB HL at 4 KHz., while approximately 22%

demonstrated 90 dB HL at 4 KHz..

In a study of 56 hearing-impaired public school children, Nodar (1984) found that 55% claimed tinnitus. Graham (1984) reported that 49% of 158 hearing-impaired children claimed tinnitus, and noted that the degree of hearing loss and/or hearing aid use did not seem to be directly related to tinnitus prevalence. Abelson (1985) stated that in the presence of normal hearing, tinnitus could be considered idiopathic. However, no data was cited to support this claim.

TINNITUS SOUND PARAMETERS

There are several sound parameters which should be discussed with respect to tinnitus prevalence: location of sound, type of sound, constancy, loudness, and perceived severity. Discussion of these parameters will provide a probable profile for an individual experiencing tinnitus.

Location of Sound

Graham (1984) reported on tinnitus laterality patterns in 158 hearing-impaired school age children. In 30 children with unilateral tinnitus and unilateral amplification, tinnitus was reported to occur in the aided ear by 73% (22 children). In 27 children with unilateral tinnitus and asymmetric hearing, tinnitus was reported in the better hearing ear by 81% (22 children). But in 17 children who reported tinnitus in their aided ear and had asymmetric

hearing, 15 had both the tinnitus and the hearing aid in their better hearing ear. He concluded that hearing aid use and degree of hearing loss did not exhibit a pattern of laterality for tinnitus. Nodar (1984) also found no pattern of laterality for tinnitus in 56 hearing-impaired children with tinnitus. Meikle (1984) in the study of 1,806 tinnitus clinic patients, found that 55% of her subjects claimed bilateral "in the ear" noises, with 11% stating that the sound originated "in the head". Chung (1984) studied 2,081 male noise-exposed workers and reported a significant correlation between the poorer hearing ear and tinnitus. No other pattern of laterality emerged in the right versus left ears for the tinnitus. Of those workers with unilateral tinnitus, 0.8% reported tinnitus in the left ear and 0.9% reported tinnitus in the right ear.

Type of Sound

Nodar (1984) studied over 2,000 children (grades 5-12). Of the 15% who claimed tinnitus, 52% reported hearing a "ringing" sound. Meikle (1984), in a study of 1,806 tinnitus clinic patients, reported that the majority (453 patients) claimed they heard a "ringing" sound, followed by "hissing" (152 patients), and "roaring" (67 patients). She also noted that "ringing" was associated with greater perceived severity than "hissing", but there was no correlation between the pitch of the "ringing" and perceived severity. When these subjects were asked to match the pitch

of their tinnitus with a pure tone stimulus, 68% identified frequencies above 3000 Hz.. Jakes (1985) reported that of 110 neuro-otology clinic patients presenting with a primary complaint of tinnitus, only 34% indicated objection to the type of sound.

Constancy

The foregoing study by Meikle also reported that of 1,806 patients, 55% claimed a constant sound, 24% claimed an intermittent sound, while 17% claimed a combination. She also found little or no correlation between the constancy and the perceived severity of the tinnitus by the subjects. According to Jakes (1985), the tinnitus persistence over time appears to be the single most important factor in determining severity. In his study of 110 neuro-otology patients, 84% objected most strongly to the persistence of the tinnitus.

Loudness

In a study by Jakes (1985) of 110 patients complaining of tinnitus, 46% objected to the loudness of the sound. Hulshof (1986) compared the estimated tinnitus loudness of 27 subjects with a normal contralateral ear to 76 subjects with contralateral recruitment. Of the 27 subjects, 78% identified their tinnitus loudness at 10 dB SL or less, with a mean loudness of 8.9 dB SL. Eighty-two percent of the 76 subject group identified their tinnitus loudness at 10 dB SL or less, with a mean loudness of 6.2 dB SL. Meikle (1984),

in a study of 1,806 tinnitus clinic patients, reported tinnitus loudness matches for 522 of her subjects. Of the 522 subjects, 51% identified their tinnitus loudness at 0-3 dB SL, and 28% identified 4-6 dB SL loudness. She also noted that there was no correlation between the loudness of the tinnitus at the tinnitus frequency and the perceived severity of the tinnitus by the subjects.

Perceived Severity

Jakes (1986) stated that the data obtained on tinnitus severity would be expected to vary depending upon the type of measurement employed, and whether or not the data base population contained an inherent bias toward a higher incidence. According to Meikle (1984), patients seeking relief in a tinnitus clinic setting understandably would have more severe tinnitus than those in the general population. However, biased data is still useful in determining the probable degree of severity at which the individual is driven to seek medical intervention.

The National Study of Hearing (NSH), as reported by Coles (1984), indicated that of 2,162 persons in the general population claiming tinnitus, only 4% reported moderate annoyance and 1% reported severe annoyance. "Interference with sleep" accounted for 5% of the total group of subjects, and the effect on "ability to lead a normal life" affected 0.5%. The study by Meikle (1984) of 1,806 tinnitus clinic

patients reported 35% perceived their tinnitus as moderate-severe, 34% as moderate, 22% as severe, 8% as mild-moderate, and 2% as mild. Fifty-three percent of the subjects claimed difficulties in sleeping due to their tinnitus. In this study, perceived severity was positively correlated with sleep interference. Jakes (1986) noted in his study of 82 neuro-otology patients that the frequency of tinnitus awareness correlated significantly with the degree of severity. It has been suggested by House (1984) that perhaps "interference with sleep", which has been widely used as a criterion for degree of perceived severity, is more reflective of the psychological (rather than physiological) state of the complainant. Identical parameters of tinnitus may be perceived by one individual as intolerable and by another as hardly noticeable. Coles (1984) continues further in this argument by dismissing the high 5.6% of severe tinnitus in the United States as being a possibly less stoic population than those in the United Kingdom.

An elderly population (by virtue of their age) would likely have longer durations of tinnitus than younger individuals. According to studies reviewed earlier, older adults are at greater risk for tinnitus development due to the predominance of hearing loss, past occupations with hazardous noise levels, vascular problems, and other conditions associated with the aging process. As tinnitus persistence over time appears to be the most objectionable

attribute, those individuals with long-term tinnitus would be expected to demonstrate increased perceived severity. The present study was designed to test this assertion.

CHAPTER III

METHODS

SUBJECTS

Subjects consisted of 78 hearing-impaired adults of age 65 or older. All subjects had sought an audiologic evaluation for their hearing impairment and had identified current experience with tinnitus on a routine history form (Appendix A). The subjects ranged in age from 65 to 83 years, with a mean age of 69.3 years. Thirty-two of the subjects (41%) were current users of amplification. Experiences with excessive noise exposure (military, occupational, recreational) were cited by 65 subjects (83%). Noise duration ranged from reported exposures of two to forty-five years, with a mean of 11.4 years. None of the subjects with reported noise exposure had ever used ear protection devices.

PROCEDURES

Subjects were contacted by telephone and asked to respond to an ordered series of questions pertaining to their tinnitus (Appendix B). Each subject received the questions verbally in the given order and was allowed unlimited response time prior to receiving the next question.

If a subject did not understand what was requested from a particular question, it was repeated in the exact same manner until a response was obtained. Subjects were not allowed to skip questions (with the exception of those pertaining to hearing aid use or indicating an absence of tinnitus), and questions were not paraphrased at any time.

Each subject was randomly assigned a number for purposes of anonymity during data collection, and no other identifying information was used. Responses to questions were recorded on separate answer sheets for each subject.

QUESTIONNAIRE

A questionnaire for this study was developed to determine past and present tinnitus severity (Appendix B). Some questions were devised to elicit subject responses for purposes of comparison with other groups of subjects previously studied (Chung, 1984; Coles, 1984; Meikle, 1985). Questions regarding previous noise exposure were included to ascertain the percentage of this population with another risk factor besides hearing loss and age.

ANALYSIS OF DATA

The number of responses for each answer was given as a straight percentage of the total number of respondents. Questions 9 and 11 required variable answers, so the range and mean of the responses could be recorded. Bar graphs were

used to demonstrate the following relationships: a) degree of perceived tinnitus severity at onset and number of years duration; b) change in perceived severity of tinnitus at onset and number of years duration; and c) degree of perceived current stress from tinnitus and number of years duration.

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

Seventy-eight elderly hearing-impaired subjects with perceived tinnitus participated in the present study, and the following question was asked:

Does the perceived severity of tinnitus increase, decrease, or remain the same between the time of onset and the present condition in an elderly population?

Perceived severity appeared to decrease, with 79% of the 78 subjects reporting that their tinnitus is not as bothersome currently, as compared with perceived severity status at onset. The subjects reported on severity of their tinnitus at time of onset as 95% (N=74) with mild symptoms, 5% (N=4) with moderate symptoms, and 0% (N=0) with severe tinnitus. The majority of subjects (79%, N=62) reported that their tinnitus "doesn't bother me as much" currently (as compared with tinnitus severity at onset), 21% (N=16) reported "about the same", and 0% (N=0) claimed their tinnitus was "worse now" than at time of onset (Table I).

Current perceived tinnitus severity reported by these subjects showed 95% (N=74) with mild symptoms, 5% (N=4) with

TABLE I

RESULTS

Question/Answers	Number of Respondents	Percent
1. Do you <u>now</u> have tinnitus (ear noises)?	88	100
Yes	78	89
No	10	11
2. What does it sound like?	78	100
Ringing	43	55
Buzzing	13	17
Hissing	7	9
Roaring	8	10
Clicking/popping	2	3
Pulsing/heartbeat	5	6
3. How severe is it?	78	100
Mild- Doesn't bother me too much	74	95
Moderate- Really bothers me sometimes	4	5
Severe- Terrible, keeps me awake at night	0	0
4. Is it...?	78	100
Continuous- Goes all the time	13	17
Intermittent- Comes and goes	65	83
5. Does it sometimes change...?	78	100
In loudness	7	9
In pitch	2	3
Does not change	69	88
6. Do you wear a hearing aid?	78	100
Yes	32	41
No	46	59
7. Does wearing your hearing aid seem to relieve or decrease your tinnitus (ear noises)?	32	100
Yes	12	38
No	2	6
Sometimes	18	56

TABLE I

Questions/Answers	RESULTS (continued)	Number of Respondents	Percent
8. Have you ever been exposed to loud noise?		78	100
On the job		41	53
During military service		16	21
Other (hunting, chain saws, etc.)		8	10
No		13	17
9. How long were you exposed to noise?		65	100
Range: 2-45 years Mean: 11.4 years			
10. Did/do you use any kind of ear protection from noise?		65	100
Yes		0	0
No		65	100
11. When did the tinnitus (ear noises) start?		78	100
Range: 2-50 years Mean: 8.6 years			
12. How severe was it when it began?		78	100
Mild- Didn't bother me too much		74	95
Moderate- Really bothered me sometimes		4	5
Severe- Terrible; kept me awake at night		0	0
13. Has it changed since it started?		78	100
Doesn't bother me as much now		62	79
About the same		16	21
Worse now		0	0
14. Overall, how would you rank your tinnitus in terms of producing stress?		78	100
Doesn't bother me		70	90
Somewhat disturbing		8	10
Fairly annoying		0	0
Quite bothersome		0	0
Can't stand it		0	0

moderate symptoms, and 0% (N=0) with severe tinnitus ratings. The subjects overall described their tinnitus in terms of degree of stress with 90% (N=70) stating the tinnitus "doesn't bother me", 10% (N=8) claiming it is "somewhat disturbing", and 0% (N=0) claimed "fairly annoying", "quite bothersome", and "can't stand it" (Table I).

The 78 subjects included in this study reported the duration of tinnitus to be two to fifty years (mean 8.6 years). Perceived tinnitus severity at onset was identified as mild by 33 subjects with a two to eight year duration, 39 subjects with a nine to fifteen year duration, and one subject each for the 37-43 and 44-50 year durations. The four subjects who reported moderate perceived severity at onset had durations of two to eight years (Figure 1).

A perceived decrease in tinnitus severity since onset was reported by 22 subjects with two to eight year durations, 38 subjects with nine to fifteen year durations, and one subject each for the 37-43 and 44-50 year durations. Of those subjects who reported no change in perceived tinnitus severity since onset, 15 had a duration of two to eight years, and one had a nine to fifteen year duration (Figure 2). Perceived current stress from tinnitus was identified as not bothersome by 29 subjects with two to eight year durations, 39 subjects with nine to fifteen year durations, and one subject each for the 37-43 and 44-50 year durations. All subjects who reported that their current

Figure 1. A graphic representation of the number of subjects reporting each degree of perceived tinnitus severity at onset and the number of years duration.

Figure 2. A graphic representation of the number of subjects reporting on change in perceived severity of tinnitus since onset and the number of years duration.

Figure 3. A graphic representation of the number of subjects reporting each degree of perceived current stress from tinnitus and the number of years duration.

tinnitus was "somewhat disturbing" (N=8) had durations of two to eight years (Figure 3).

Hearing aid use for the subjects was found to be 41% (N=32). Of those subjects, 38% (N=12) stated that amplification use definitely reduced symptoms, 56% (N=18) reported occasional relief/reduction in tinnitus symptoms during hearing aid use, and 6% (N=2) reported no effect of the hearing aid on their tinnitus (Table I).

The primary current tinnitus sound was identified by these subjects as "ringing" (55%, N=43), followed by "buzzing" (17%, N=13), "roaring" (10%, N=8), "hissing" (9%, N=7), "pulsing/heartbeat" (6%, N=5), and "clicking/popping" with 3% (N=2) of the total. Tinnitus constancy for these subjects was 83% (N=65) with intermittent symptoms and 17% (N=13) with continuous tinnitus. The majority of subjects (88%, N=69) did not experience fluctuations in the sound parameters, although 9% (N=7) reported periodic changes in the loudness and 3% (N=2) reported periodic changes in the pitch of their tinnitus (Table I).

DISCUSSION

The results of this study support the hypothesis that perceived severity of tinnitus decreased from time of onset. Seventy-nine percent of the 78 subjects responded that they were less bothered by their tinnitus currently than they were at its onset. Although the same subjects reported mild

and moderate severity of their tinnitus for past and present, the majority still perceived a decrease in symptoms over time. This conclusion did not appear to be weighted by those subjects using hearing aids (allegedly enjoying the previously discussed therapeutic advantages), as only 41% used hearing aids. Further support for this conclusion is obtained from the fact that 10 individuals, contacted at the outset (who were not included in the balance of this study), reported that they had experienced tinnitus previously, but exhibited no current symptoms. Of the total number of subjects contacted, approximately 11% experienced remission of tinnitus.

The majority of subjects in this study reported a mild "ringing" sound, which agrees with data given by Meikle (1984) for type of sound, and Coles (1984) for predominant degree of severity. These data did not coincide with respect to constancy, as the majority of subjects reported intermittent tinnitus symptoms. The majority of patients in the study by Meikle (1984) claimed constant tinnitus. Although the subjects in the present study exhibited many high-risk attributes for tinnitus development (i.e., advanced age, noise exposure, hearing loss), and in fact did develop tinnitus, the majority reported their symptoms have decreased (or ceased) with the passage of time.

It should be noted, however, that these results can be considered reliable only for groups of subjects with mild

tinnitus symptoms. None of the subjects with moderate tinnitus reported a decrease in symptoms from onset to present. Since all those who reported moderate tinnitus had durations of two to eight years, it is possible that they might perceive a change in symptoms when more years have passed. Another problem that appeared in gathering data on tinnitus duration was the tendency of the subjects to choose the years five and ten as their response. It became evident that the subjects were generally unable to recall the exact date of tinnitus onset due to its gradual introduction into their lives. It may also be said that, compared with other health-related concerns facing the elderly, tinnitus might not be considered a problem of any magnitude. While it is true that there is no known cure for tinnitus (Shulman, 1984), it appears from this study that individuals with mild tinnitus experience less annoyance and more acceptance of the condition as time goes by.

The information obtained for the current study is important in determining the direction of rehabilitation/counseling programs for individuals with tinnitus. As previously stated, the tinnitus persistence over time appears to be the most objectionable quality to the majority of those complaining of tinnitus, and in fact is the single most important factor in determining severity (Jakes, 1985). Hence, those individuals with tinnitus of longer duration are more likely to seek medical and audiological counsel

regarding their condition.

It has been shown in the treatment section of this paper that, other than hearing aid and/or masker use, there is very little "treatment" available for the individual who complains of tinnitus. This leaves the practitioner with the task of counseling the individual and offering reassurance. Like other long-term psychological processes, such as grief reaction, it may be of little comfort to the patient to hear "This will get better, just give it time", but we all know that it does "get better". This study provides information on which to base the above claim, and better further goals in counseling the patient with tinnitus.

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

The purpose of the present study was to determine whether the perceived severity of chronic tinnitus in a geriatric population increased, decreased, or remained constant with the passage of time. A questionnaire was designed to ascertain the subjects' perceived severity at time of onset and the perceived severity of their current tinnitus. The subjects were asked to rate their past and present tinnitus severity according to how much it bothered them. They were also asked questions pertaining to noise exposure history, hearing aid use, and tinnitus sound parameters for purposes of comparison with other groups previously studied.

Seventy-eight hearing-impaired adults with current tinnitus symptoms participated in the study. The subjects ranged in age from 65 to 83 years, with a mean age of 69.3 years. Thirty-two of the subjects (41%) were current users of amplification. Previous excessive noise exposure was cited by 65 subjects (83%). Noise exposure duration for these subjects ranged from two to forty-five years, with

a mean of 11.4 years. Subjects were contacted by telephone and asked to respond verbally to the ordered series of questions pertaining to their tinnitus. The number of responses was recorded for each possible answer. The data were analyzed by utilizing a percentage format and bar graphs to demonstrate relationships between data.

Results of this study indicated a decrease in perceived severity of mild tinnitus from time of onset to the present condition. Seventy-nine percent of the subjects reported that their present mild tinnitus was not as annoying, compared with perceived severity at time of onset. Current mild tinnitus symptoms were not a problem for 90% of the subjects. Ten subjects (11%) who reported no current symptoms were not included in the balance of the study.

IMPLICATIONS

The findings in the present study suggest areas that would be enhanced by further research. A longitudinal study of perceived tinnitus severity would provide more accurate information on the onset and course of symptoms rather than relying on the subjects' recall. Also suggested for possible future research is an examination of the characteristics of tinnitus associated with spontaneous remission. Such information would prove useful in determining a probable profile for an individual to experience remission of symptoms, and enhance our understanding of risk factors

associated with this phenomenon.

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APPENDIX A

HEARING HISTORY FORM

APPENDIX A

HEARING HISTORY FORM

IDENTIFICATION:

NAME: _____ BIRTHDATE: _____ AGE: _____
 ADDRESS: _____ SEX: _____
 COUNTY: _____ TELEPHONE: _____
 OCCUPATION: _____ REFERRED BY: _____
 COMPLAINT, PROGRESSION, PRESENT STATUS: _____

HEARING LOSS HISTORY:

FAMILIAL: (Immediate family) _____

DIFFICULTY IN: Groups ☐ Phone ☐ Noise ☐ Individual ☐

Other: _____

PREVIOUS HEARING TEST: (Date) _____

LAST NOISE EXPOSURE: Work ☐ Military ☐ Hobby ☐ Other ☐

Comments: _____

MEDICAL HISTORY:

PHYSICIAN CONSULTED: _____ MEDICAL SPECIALTY: _____

TREATMENT AND DATE: _____

TINNITUS: R ☐ L ☐ DRAINAGE: R ☐ L ☐ AURAL PAIN: R ☐ L ☐

DIZZINESS: _____ NAUSEA: _____ HEADACHE: _____

HEAD TRAUMA WITH UNCONCIOUSNESS: _____

OTHER: _____

(Kidney disease, high blood pressure, allergies, medication, etc.)

HEARING AID EXPERIENCE:

AID: (Type) _____ (Ear) _____ (Years worn) _____

(Manufacturer, model or serial number) _____

MOLD: (Type) _____ BATTERY: _____

ADJUSTMENT TO AID: (Satisfaction) _____ (Hours worn/daily) _____

FORMAL TRAINING: (Auditory training) _____ (Speech reading) _____

COMMENTS: _____

Audiologist: _____ Date: _____

APPENDIX B

QUESTIONNAIRE

APPENDIX B

QUESTIONNAIRE

1. Do you now have tinnitus (ear noises)?
Yes, No
2. What does it sound like?
Ringing Roaring
Buzzing Clicking/popping
Hissing Pulsing/heartbeat
3. How severe is it?
Mild- Doesn't bother me too much
Moderate- Really bothers me sometimes
Severe- Terrible, keeps me awake at night
4. Is it...?
Continuous- Goes all the time
Intermittent- Comes and goes
5. Does it sometimes change...?
In loudness
In pitch
Does not change
6. Do you wear a hearing aid?
Yes, No
7. Does wearing your hearing aid seem to relieve or decrease your tinnitus (ear noises)?
Yes
No
Sometimes
8. Have you ever been exposed to loud noise?
On the job
During military service
Other (hunting, chain saws, etc.)
No
9. How long were you exposed to noise?
10. Did/do you use any kind of ear protection from noise?
Yes, No
11. When did the tinnitus (ear noises) start?

12. How severe was it when it began?
Mild- Didn't bother me too much
Moderate- Really bothered me sometimes
Severe- Terrible, kept me awake at night
13. Has it changed since it started?
Doesn't bother me as much now
About the same
Worse now
14. Overall, how would you rank your tinnitus in terms of producing stress?
Doesn't bother me
Somewhat disturbing
Fairly annoying
Quite bothersome
Can't stand it