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Perceptions about hearing aids from elderly non-users: a bicultural point of view (Italy and USA)

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Introduction

Many people all over the world will experience hearing difficulties as their bodies' age. However, some people with hearing loss will seek the help of hearing aids while other people will not. Although some elderly individuals may acknowledge a change in hearing with age, some elderly people report that they experience no communication problems, and are able to postpone or avoid the use of hearing aids for a very long time (Brooks, 1978; Kyle *et al.*, 1985). Preference for non-use of hearing aids among older adults who are candidates for amplification remains to be explained even though several studies have examined the contribution of consumer attitudes, behaviors, and life circumstances to this phenomenon (Garstecki & Erler, 1998). A study by Duijvestijn *et al.* (2003) in the Netherlands evaluated the factors influencing help-seeking behavior in 1419 hearing impaired subjects aged ≥55 years. The study revealed that fewer than half of the subjects diagnosed with hearing loss exceeding 30 dB had visited their general practitioner with complaints of hearing impairment. The authors concluded that help-seeking behavior of hearing-impaired elderly people is related to the social pressure exerted by significant others, to the degree of hearing disability, and to the willingness to try hearing aids. Hietanen *et al.* (2004) performed a 10 year longitudinal study in Finland about changes in the hearing ability of 80 year olds. The study revealed that hearing aids were not used by over 75% of the people who had a moderate hearing impairment. Hietanen *et al.* (2004) concluded that hearing deterioration in elderly people and their low level of use of hearing aids require closer attention in the healthcare system. In Germany, a study performed by Hesse (2004) on 331 subjects (≥60 years of age) demonstrated that the acceptance of hearing aids by the elderly is generally poor. The researcher recommended improvements in the regulation of hearing aid provision among the elderly in conjunction with an adequate audiological rehabilitation plan.

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Non-users of hearing aids

Kochkin (2005) reported that more than 22 million people in the United States have never tried hearing instruments as a solution to their hearing loss. According to a study conducted in the United States in 2004, there were 24.1 million individuals with a hearing loss who did not own a hearing aid device in contrast to 12.5 million individuals who owned hearing instruments and 11.1 million individuals who used their instruments (Kochkin, 2005). Information on the status of non-hearing aid use among the elderly in Italy was not formally published at the time of data collection of this study in 2005. According to Kochkin's study (2005) in the United States about 6 out of 10 hearing instrument owners and non-owners are male. The role of psychological factors in contributing to the decision of an individual to elect to opt out of device use remains to be proved. Kochkin (2005) stated that some of the reasons that hearing-impaired people delay the use hearing aids include: inadequate information, stigma, cosmetics, misdirected medical guidance, not realizing the importance of hearing, not believing that hearing aids work, failing to trust in the hearing professional, unrecognizing the value of hearing aids, and feeling that hearing aids are not affordable. Hearing loss and use of hearing aids are widely reported as unacceptably different from normal or stigmatizing. Perceptions of stigmatization most often result in denial of hearing problems and lack of adherence to professional recommendations to use hearing aids (Garstecki & Erler, 1998).

Prevalence of hearing loss

According to the American Speech-Language-Hearing Association (ASHA) (Castrogiovanni, 2006), clinical data to determine if hearing impairment rates are changing are not available since there are no ongoing, clinical, annual studies of hearing impairment in the United States (Lee *et al.*, 2004). Data collected from Federal surveys illustrate the following trend of prevalence for individuals aged three or older: 13.2 million (1971), 14.2 million (1977), 20.3 million (1991), and 24.2 million (1993) (Ries, 1994, Benson & Marano 1995). Kochkin (2005) estimated that 31.5 million Americans had hearing loss in 2004, with continued major increases in the baby boomer and elderly 75 plus age brackets. Italy's population of 57.7 million in 2000 was growing slowly, with deaths exceeding births. Italy has the lowest population growth rate (1.8% annually) and one of the highest percentages of elderly citizens in Europe. In 1999, Italy had a ratio of 125 people aged 65 or older to 100 people aged 14 years or younger, the highest ratio in the European Union. Italian senior citizens over 65 years of age currently represent 18% of the entire population. A key factor that impacts the future of the Italian healthcare services sector is the changing demographic profile of the population (Sistema Statistico Nazionale-Istituto Nazionale di Statistica, 2001). According to the Italian Sistema Statistico Nazionale-Istituto Nazionale di Statistica (2001), about 15.2 per thousand of Italians have hearing problems. The number of Italians that perceive difficulty hearing increases with age. In addition, there are more Italian men than women who report hearing problems (15.9 per thousand men against 14. 6 per thousand women). The difference in gender is greater among the elderly (65 to 74 years of age and ≥75 years of age). Among the older group (≥75 years of age), it was found that 113.9 per thousand of the men against 92.4 per thousand of the women have hearing loss. From a territorial point of view, the highest population of Italians who have hearing loss live in the Nord-Oriental region of Italy (19 per thousand) and the Central region of Italy (17.7 per thousand). Among the regions with a highest level of hearing loss prevalence, we find Umbria (24.2 per thousand) followed by Emilia Romagna (21.9 per thousand), Tuscany (21 per thousand) and Friuli Venezia Giulia (21 per thousand). Gatehouse (2003) stated that the service delivery and the modes of organization utilized to help people with hearing impairment differ from country to country and highly depend on the ways in which healthcare is structured, funded, and delivered. In addition, the training, the skills background, and the professional allegiance of the providers responsible for delivering services are also different depending on the country.

Healthcare structure and hearing aid policies in Italy

Martini *et al.* (2001) reported that Italy has a large aging population with a significant prevalence of hearing disability and with a great need for rehabilitative services. This situation has caused an impact in public health planning. According to Lapini *et al.* (2003), in 1978, Italy established its current national public healthcare service, Servizio Sanitario Nazionale (National Health Service), based on the principle of universal entitlement: the state would provide free and equal access to care (preventive care, medical care, and rehabilitation services) to all residents. However, free and universal health care coverage, in conjunction with an aging population, dramatically increased the use of medical services, thereby increasing healthcare costs. A process of gradual revision of the original approach took place early on, in an attempt to regulate demand for services and system of user co-payments was introduced gradually. Health reforms in the early nineties have brought changes to the National Health Service. The changes increased the functionality of the Italian Regions causing a reduction of the number of local health units converting these into Aziende Sanitarie Locali (Local Health Units), which were to be managed using private sector criteria. Changes were expected to lead gradually to better services, reduced bureaucracy, and more choice for the patients (Lapini *et al.*, 2003). Healthcare dissatisfaction and an increase in co-payments have created recourse to the private market for healthcare services. Private accredited institutions provide ambulatory, hospital treatment and/or diagnosis services financed by the National Health Service (Lapini *et al.*, 2003). The prescription and fees of hearing aids are regulated by the laws of the Ministero di Sanità (Department of Health) and by a document from 1999 (at the time of this study´s completion) called the Nomenclatore Tariffario delle Protesi (Schedule of Rules & Fees for Hearing Aids). The Nomenclatore Tariffario specifies who has the right to obtain hearing aids, what are the procedures to obtain hearing aids, what is the classification of the different types of hearing instruments, the criteria for a prescription of a hearing instrument, and the criteria for deductible fees toward the acquisition of hearing instruments. In Italy, as of the time of this study in 2005, analog basic or very basic digital behind-the-ear analog hearing aids were free of charge to Italian citizens. However, hearing aids with more than 3 manual controls/trimmers, digitally-programmable, digital, automatic with noise canceling features, directional microphones, all custom-made hearing aids, and accessories such as remote controls and frequency modulated (FM) systems had a deductible fee.

Healthcare structure and hearing aid policies in the United States

The United States healthcare market is driven by reimbursement policies. Health care costs in the United States are typically covered by managed care groups, private health insurance, Medicaid/Medicare (through the Health Care Finance Administration), state procurement agencies and the Department of Veteran Affairs (Bender & Hooper, 2003). The majority of individuals purchase their own health insurance to receive medical services. Every state has its own policies and rules. The majority of health insurance policies in the United States do not cover hearing aids. Hearing aid cost assistance from health insurance in the United States and especially for the elderly is still a much debated issue. In general, the actual cost of hearing aids in the United States is variable and depends on the type, model, and technology utilized. A survey study by Cox *et al.* (2003) using the International Outcome Inventory for Hearing Aids (IOI-HA) on 154 elderly subjects, revealed that 65% of the survey takers had paid the entire cost of their hearing aids. On the other hand, 26.5% of the survey participants said that hearing aids were partly paid and 8.5% said that hearing aids were completely paid by a third-party such as private insurance.

Hearing aid providers in Italy

Hearing aids in Italy are dispensed by a hearing aid technician or tecnico audioprotesista after the device has been prescribed by a medical doctor and authorized by the Local Health Unit (Azienda Sanitaria Locale). The primary professional who diagnoses hearing loss and prescribes hearing aids is the physician, and most likely an otolaryngologist or a medical audiologist. In addition to the hearing aid technician, there are also audiometric technicians who perform hearing evaluations. Audiometric technicians usually perform hearing tests for the otolaryngologist. After the hearing loss has been diagnosed by the otolaryngologist or by the medical audiologist, the prescription for hearing aids is given to the patient. The patient is then directed to visit the hearing aid technician to obtain the hearing aid(s) and to be evaluated. Audiometric and hearing Aid Technicians must obtain a three-year university diploma that will allow them to practice as audiometrists and as hearing aid dispensers. It is the responsibility of the hearing aid technician to choose the brand, model, and type of hearing aid based on the medical prescription. The hearing aid technician must also take the earmold impressions necessary to obtain the hearing aid(s), counsel the patient, and perform the hearing aid evaluation and the follow ups (Ambrosetti, 2002).

Hearing aid providers in the United States

According to ASHA (1997), the audiologist is the professional who determines the appropriateness and design of individual amplification systems. Hearing aid fitting is one component of a total audiologic, rehabilitation plan. The process of fitting hearing aids is composed of assessment, treatment planning, selection, verification, orientation, and validation. In the United States, there are also hearing aid specialists or dealers (non-audiologists) who have been licensed by their state to sale/dispense hearing aids to the public. Most hearing-impaired people who buy hearing aids expect to be fitted by a professional with expertise. In the United States, an audiologist must have at least a master's degree; however, many audiologists have doctorates too, such as an AuD or a Ph.D degree. Audiologists must be licensed by their state of residence to practice Audiology and dispense hearing aids. Audiologists as well as hearing aid specialists must attend seminars and other training events to obtain continuing education hours and to stay current in order to maintain their licenses. Nowadays advanced hearing aids require special computer software, accessories, and know-how; therefore experience and skill are fundamental to fit hearing aids properly.

Cultural differences

Cross-cultural research can shed light about possible cultural differences among elderly candidates for amplification who do not use hearing aids. Cross-cultural information can help us develop an appreciation for cultural sensitivity and understanding, acknowledge range of diversity in values and beliefs about hearing loss/hearing aids, and implement tools that address cultural needs for achieving hearing successful aid acceptance and use. At the same time, cross-cultural studies require re-thinking and revision of traditional research methods while designing new methods of inquiry (Sparks, 2002, p.1).

A cross-cultural study between Americans and Italians by Levin *et al.* (2002), evaluated the endowment effects and inclusion–exclusion differences in consideration set formation. The study's results were discussed in terms of marketing implications and cultural differences in emotional reactions to potential losses. Consumers from both cultures were asked to build up a basic cheese pizza by either adding components or scaling down from a fully loaded product. Endowment effects are defined when consumers place greater value on something they already possess than on something comparable that they do not possess. The authors wanted to examine which method would lead to a more complete and expensive purchase. There were two considerations: i) Consumers were allowed to create their own products by either building up starting with a basic product (basic cheese pizza) and adding desired components (toppings) with a fully loaded product; or ii) Consumers were allowed to scale down starting with a fully loaded product and removing undesired components (toppings). In addition, they wanted to know if there was a difference between the American consumers versus the Italian consumers. Their study revealed that consumers from both countries ended up with significantly more ingredients (toppings) at a higher cost in the scaling down condition. This effect was greater for Italians than Americans.

Levin *et al.* (2002, p. 337), had predicted as is the popular perception, Italians are more prone to emotional responses than Americans, and if the choice task of the study actually does tap into hedonic consumption processes, then the Italian and the American samples may indeed differ from each other on the study's task. The study revealed that the ingredient selection process was more affect-laden for Italians. In addition, Italian consumers felt more loss aversion than Americans. It is clear that more research is needed to evaluate the generality of differences in loss aversion and affect – based decision making in different cultures.

Richard Lewis' book When Cultures Collide (2000) provides a global guide to working and communicating across cultures. Lewis' book examines several countries around the world and classifies them within three categories: Linear-actives, Multi-actives, and Reactives (see Figure 1). The United States falls within the Linear-active category while Italy falls within the Multi-active category. Linear-active cultures prefer straightforward and direct discussion, sticking to facts and figures from reliable sources, and they are highly organized. Linear-actives partly conceal feelings, value privacy; dislike the "mañana" behavior and over-loquacity, are process oriented, and their status is gained through achievement. Multi-active cultures are impulsive people who attach great importance to feelings, relationships, and social interaction. They like animated communication, speaking and listening all at the same time, interruptions are frequent, and feel uncomfortable with silence or pauses. Multi-active cultures are dialogue oriented, oral communication driven more so than written, emotional and family-oriented, procrastination and flexibility is common, gregarious and inquisitive, diplomatic, compassionate and good at improvisation. Lewis' website www.crossculture.com also provides surveys that can help investigate your own cultural profile. Cross-cultural studies combined with scientific and market research has the potential to provide useful information on similarities and differences and modes of decision making across cultures.

According to Weber *et al.* (2000, p. 2), "the rapid globalization of manufacturing, commerce, and trade, for example, has increased the

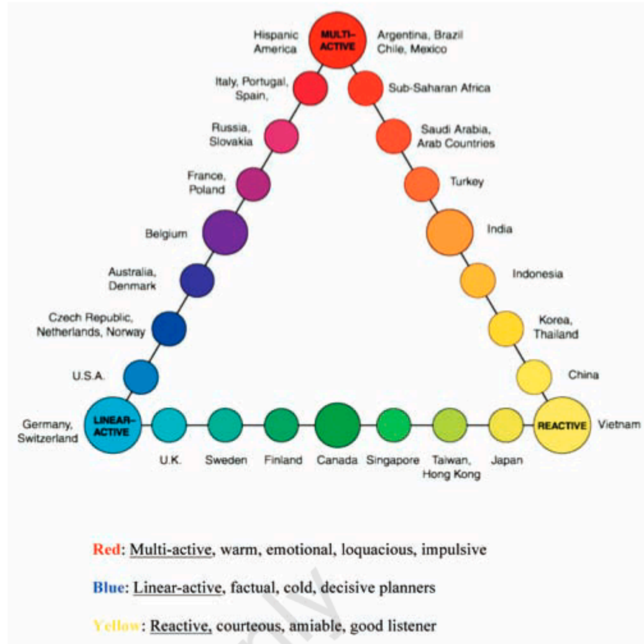

Figure 1. Lewis model of cultural classification. Taken from Richard Lewis Communications RLC at www.crossculture.com.

need for a knowledge base of reliable cross-national differences in perceptions, beliefs, or modes of information processing. Lewis (2000) has reported in his book and website that cultural attitudes with regard to science and technology vary in the general population of different cultures. He stated that future-oriented linear-active cultures such as the United States accept new technologies more readily while multi-active cultures such as Italy tend to prioritize people, not machines. Hearing aids fall within both categories because they help achieve technological communication for either culture. However, from a marketing perspective, the following questions could be raised: Should hearing aids be proposed differently to potential candidates based on cultural backgrounds? Should hearing professionals focus on technology features or communication factors during counseling? Does it matter to a specific culture? As technology changes, we also need to modify our counseling techniques to help potential hearing aid candidates understand the benefits of amplification. The knowledge of specific cultural traits could contribute positively to our approach to audiological counseling as long as it does not become a 'stereotyping' approach.

The purpose of this study, therefore, was to investigate the following:

1. What are the perceptions of elderly (≥60 yrs of age) subjects of Italian and US background (in all subject pools and between group pools) that complain of hearing loss but do not use hearing aids with regard to

- Benefit of hearing aids (Questions 1,8,& 14)
- Cosmetic/physical appearance of hearing aids (Questions 3,10,& 11)
- Cost/Value of hearing aids (Questions 5, 6, & 13)
- Social pressure about the use of hearing aids (Questions 2, 4, & 7).
- Who is the professional provider for hearing aid services? (Questions 9, 12, & 15)

2. Are there any differences in the responses to the surveys with regard to cultural background?

3. What are the future directions and considerations regarding an improvement of the survey questions, test-retest reliability and validity?

Methods

Instrumentation

The study was conducted through a survey approach (see surveys Appendix) and intended to be administered in a paper and pencil mode. A 15-item survey called 'Perceptions about Hearing Aids from Non-Users' (PHANU) was developed by Beatriz C. Alvarado and verified by two English (American) native speakers. The Italian version of the survey was translated by three Italian native speakers from Milan from the English survey version and from the Italian survey version back into English to crosscheck the accuracy of semantics and grammar. The PHANU survey items were divided in 6 categories: demographic information, general perceptions about the benefit of using hearing aids, perceptions about cost of hearing aids, perceptions about cosmetic appearance, perceptions about seeking help (who is the professional provider for such services?), and perceptions about social pressure. One hundred (100) surveys were given per each subject group in Italy and the United States (projected total=400 surveys). The final number of surveys that could be analyzed was 344 (92 surveys for each group in Italy and 80 surveys from each group in the United States). The surveys were conducted in major cities of each country. The surveys were distributed for a period of 3 months May 2005 through July 2005. An additional 3 months and an extra clinical site in the United States were required in order to obtain more responses.

Subjects & Procedures

The surveys were given randomly to all the subjects who voluntarily agreed to participate by signing the consent form and by meeting the subject criteria. The subjects were ≥60 years of age male or female Italian and American who reported difficulty hearing but had never used hearing aids. The subjects were possible candidates for amplification and were divided into two groups (clinical versus non clinical setting) within each country surveyed. The surveys distributed in non-clinical settings were mailed to a random list of elderly subjects provided by an association for the elderly or handed out randomly at an association for the elderly or church senior group. The US non-clinical surveys were distributed in Texas, New York, Minnesota, Illinois, California and Florida and the Italy Non-clinical surveys were distributed in Lombardy (Milan, Italy). Confidentiality was assured to all subjects. The subject's participation was recorded by group only. No names or individual identifying information was requested. With the exception of the researcher and assistants involved in running this study, nobody was allowed to see or discuss any of the individual responses. A brochure about hearing loss and hearing aid information was given to all subjects for participating in the survey.

The following audiologists in the United States administered the surveys and distributed them in the clinical settings: Lois Sutton, PhD (The Methodist Hospital Audiology Service, Houston, Texas), Mary Sue Harrison, AuD (Today's Hearing, private practice, Katy, Texas), and Helena Solodar, AuD (Audiological Consultants of Atlanta, private practice, Atlanta, Georgia). The surveys distributed in the clinical settings in Italy were administered by Medical Audiologist, Dott.ssa Elisabetta Vigliani (Ambulatorio Corso Italia, Milan), by Otolaryngologist/Medical Audiologist, Dott. Umberto Ambrosetti (Dipartimento di Neuroscienze e Organi dei Sensi, Ospedale Maggiore di Milano, Milan), and by Otolaryngologist/Medical Audiologist, Dott. Domenico Cuda, (U.O. di Otorinolaringoiatria, Azienda USL di Piacenza, Piacenza).

In the Italian and American clinical settings, the assigned investigator requested permission after the audiological assessment had been completed demonstrating candidacy for hearing aids. The subject had to report at that time that he/she experienced difficulty hearing but that he/she had never used amplification. The subject could or could not have been willing to pursue amplification at that time. However, the point was that the subject had not used hearing aids before. In the non-clinical subject pool, the investigator could only rely on the person's subjective report of having difficulty hearing but I don't use hearing aids because an objective audiological assessment was not available. However, the subject could have reported that he/she had a hearing test in the past or recently under demographic information. Hearing loss was defined to be any degree of loss that could be fitted with hearing aids and it could be from mild, mild-to-moderate, mild-to-severe, moderate, moderate-to-severe, or severe degree of hearing impairment. Profound hearing loss was not included in the criteria because of the limited likelihood of benefit from hearing aids.

Analysis

The surveys were analyzed using the Rasch Rating Scale Model (Rasch, 1960; 1980; Andrich, 1978; Wright and Masters, 1982). "This model can help us transform raw data from the human sciences into abstract, equal-interval scales. Equality of intervals is achieved through log transformations of raw data odds, and abstraction is accomplished through probabilistic equations. Unlike other probabilistic measurement models, the Rasch Model is the only one that provides the necessary objectivity for the construction of a scale that is separable from distribution of the attribute in the persons it measures" (Bond & Fox, 2001, p. 7).

Results

Rasch rating scale model

The 14 items out of 15 items that comprise the 'Perceptions about Hearing Aids from Non-Users' (PHANU) scale were analyzed using the Rasch rating scale model (Andrich, 1978; Wright and Masters, 1982). Item 12 was analyzed separately because Item 12 asked the subjects to choose from 4 different providers for hearing aid fitting services or to choose a not sure answer. Item 12 did not follow a Likert Scale or rating scale response. All other 14 questions on the survey were scored in a Likert Scale or rating scale mode. The rating scale model is an extension of the basic Rasch model (Rasch, 1960; 1980) to polytomous data, which estimates the probability that a person will choose a particular response category for an item as:

$$ln\left(\frac{P_{nik}}{P_{nik-1}}\right) = \beta_n - \delta_i - \tau_k,$$

where:
P_{nik} = the probability of person n responding in category k of item i
P_{nik-1} = the probability of person n responding in category $k - 1$ of item i
β_n = the measure of self-efficacy for person n
δ_i = the difficulty of item i
τ_k = the relative probability of responding in category k as opposed to category $k - 1$.

The Rasch rating scale model produces item calibrations and person measures by converting the raw scores obtained from the rating scale into measures that satisfy the conditions of order and additivity required by the interval scale. The item calibrations and person measures are estimated on a common linear scale, which defines a single latent variable. The unit of measurement on this scale is the 'logit' which is obtained by a simple logarithmic transformation of the odds of choosing a particular response category. When the data fits the model, the logit defines an equal-interval scale, which meets the conditions of order and additivity which allows for the use of parametric statistics investigations. The common frame of reference shared by persons and items facilitates comparisons between and within elements of these two groups. The Rasch rating scale model allows the researcher to establish a statistical framework that summarizes overall rating patterns in terms of group-level main effects for persons and items, and quantifies individual-level effects of the various elements within each group, thus providing diagnostic information about how each individual person and item are performing.

The Rasch rating scale model also allows for the assessment of the extent to which the data fit the model. When the data fits the model, item calibrations are independent of the sampling distribution of person measures, and person measures independent of the sampling distribution of the item calibrations, within standard error. The fit of the data to the model is evaluated by fit statistics, which are calculated for both persons and items. The Rasch model provides two indicators of misfit: infit and outfit. These fit statistics have the form of χ^2 statistics divided by their degrees of freedom. The infit is sensitive to unexpected behavior affecting responses to items near the person ability level and the outfit is outlier sensitive. Mean square fit statistics are defined such that the model-specified uniform value of randomness is 1.0. Person fit indicates the extent to which the person's performance is consistent with the way the items are used by the other respondents. Item fit indicates the extent to which the use of a particular item is consistent with the way the sample respondents have responded to the other items. For this study, values between 0.6 and 1.4 are considered acceptable (Linacre & Wright, 1994). Data were analyzed using the *Winsteps* (Linacre, 2005) computer program. For each person and item, the *Winsteps* computer program provides a measure estimate (in logits), a standard error (information concerning the precision of the measure), and fit statistics (information about how well the data fit the expectations of the measurement model). Reliability indices are also calculated for both persons and items.

Rating scale optimization

The analysis starts by investigating the performance of the 5-point rating scale. It is noticed that the 5 categories (1 through 5) do not function as expected. The category steps, which are the intersection points between any two category curves must increase in value, if each category is to be most probable over a certain logit interval. The category thresholds obtained for the 5-point rating scale (τ_1 = -.45, τ_2 = -.24, τ_3 = .31, τ_4 = .38) are very close to each other and suggest that the categories they border have very little chance of being most probable, i.e., of being selected over the other categories (Table 1 and Figure 2).

To rectify this problem categories 2 and 3 were collapsed into one category (Slightly/Moderately) and categories 4 and 5 were collapsed into one category (Quite a lot/Very much). Re-analysis of the data showed a marked improvement in the performance of the rating scale. Average measures and threshold values increased monotonically. Each category is most probable over a clearly defined interval. The middle category (Slightly/Moderately) in particular, was most probable over from -.65 logits to .65 logits, a well defined interval of over a logit (1.3-logits). Therefore, it can be concluded that the collapsed category rating scale was functioning adequately and all subsequent analyses could be based on the collapsed categories data (Table 2 and Figure 3).

Summary statistics

Items
- Mean of item difficulties = .00 logits (*SE* = .22)
- Item reliability = .99

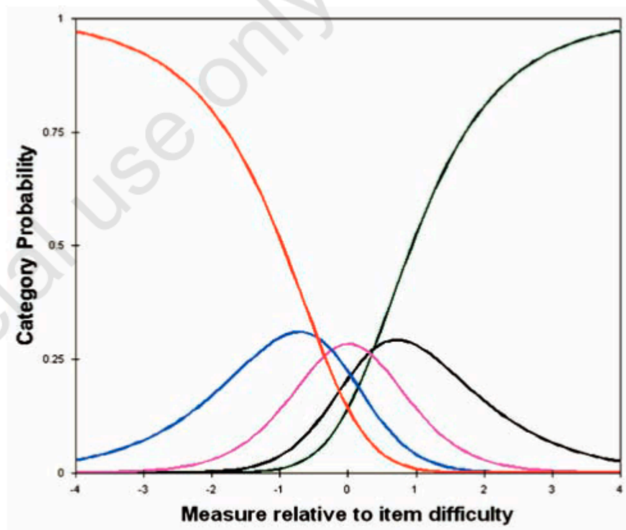

Figure 2. Category probability relative to item difficulty.

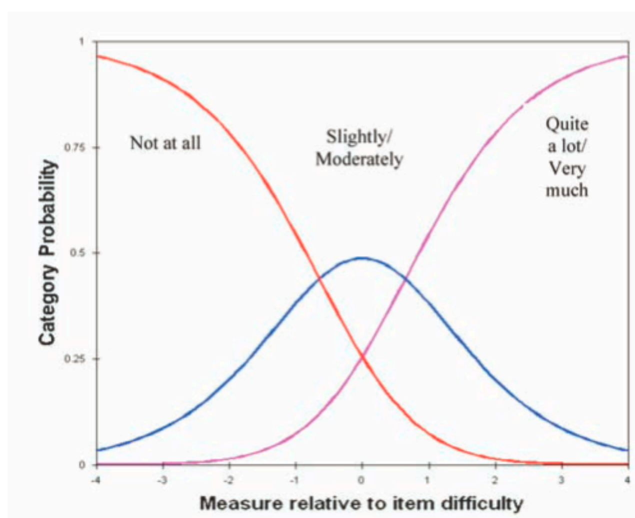

Figure 3. Category probability relative to item difficulty after collapsing two categories.

Table 1. Summary of category structure - initial rating scale.

Category	Observed Count	%	Observed Average	Infit Mean Square	Outfit Mean Square	Thresholds	SE
1	663	14	-0.23	1.12	1.15	-	-
2	862	18	-0.10	0.92	0.87	-0.45	0.05
3	1115	23	0.08	0.90	0.82	-0.24	0.03
4	1032	21	0.35	1.03	1.10	0.31	0.03
5	1144	24	0.65	0.96	0.98	0.38	0.04

Table 2. Summary of category structure - optimized rating scale.

Category	Observed Count	%	Observed Average	Infit Mean Square	Outfit Mean Square	Thresholds	SE
1 = Not at all	1120	23	-0.55	1.02	1.07	-	-
2 = Slightly/ Moderately/	1798	37	0.21	0.96	0.90	-0.65	0.04
3 = Quite a lot/ Very much	1884	39	1.19	0.99	0.99	0.65	0.03

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Persons
- Mean of Person Measures = .42 logits (*SE* = .05)
- Person Reliability = .67

Item – person maps

The *Winsteps* program produced a comprehensive snapshot of the findings in the form of person-item maps. Figures 4, 5, and 6 which are based on similar one produced by the *Winsteps*, provide a unified synopsis of the results obtained for persons and items. The map illustrates a continuum of person attitude and item difficulty constructed by the analysis. Persons and items are both calibrated on the same scale. The unit of measurement on this scale is the logit which is obtained by a simple logarithmic transformation of the probability of receiving a particular rating. If the data fit the model the logit defines an equal-interval scale, which serves as a common frame of reference for the analysis, thus facilitating comparisons within and between persons and items. The logit scale is displayed in the first column of the variable map. The second column of the map displays the distribution of person measures, which in this case represent estimates of person perceptions toward the use of hearing aids. Each square is equivalent to 5 respondents, and each dot represents less than 5 respondents. The distribution of person measures spans the length of 6.03 logits. Person measures are ordered with the highest values appearing at the top of the column, and the lowest values appearing at the bottom of the column. In this column, high person measures, which were obtained though the transformation of high raw score totals, represent persons with positive attitudes toward hearing aids. Low person measures, which were obtained through the transformation of low raw score totals, represent persons with negative attitudes toward hearing aids.

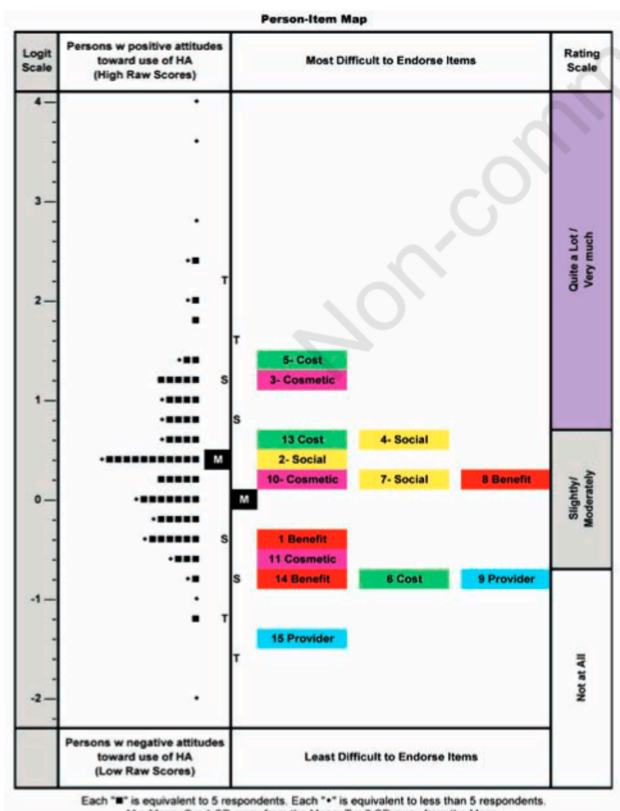

Figure 4. Item map of all subjects and positively/negatively phrased item difficulty.

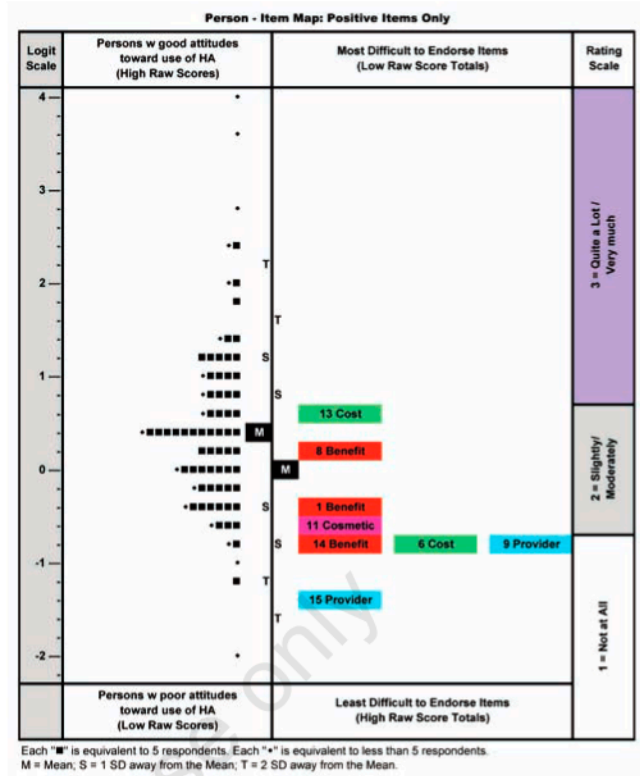

Figure 5. Item map of all subjects and positively phrased items only.

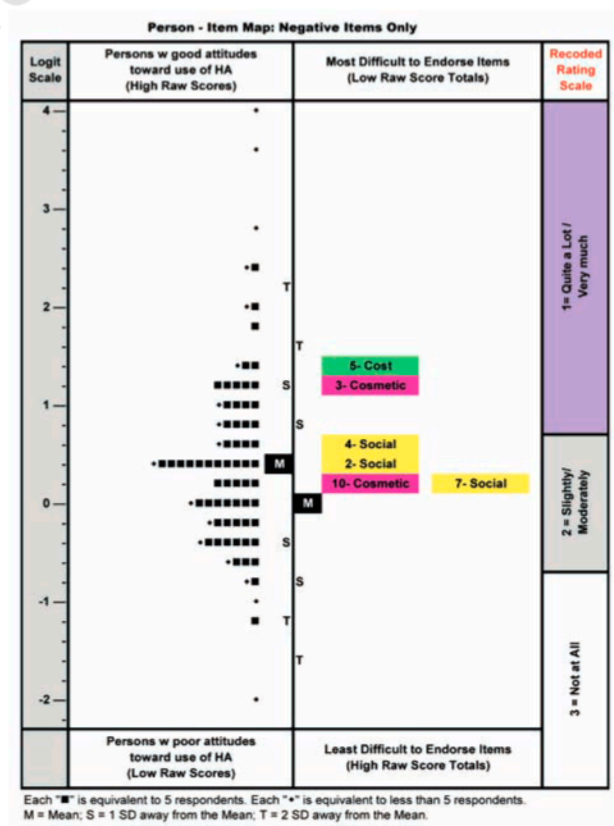

Figure 6. Item map of all subjects and negatively phrased items only.

The third column of the map lists the items in terms of their relative difficulties. Items appearing higher in the column were more difficult to endorse, while items appearing lower in the column were easier to endorse. Difficult to endorse items were rated with low raw score ratings. The low raw score totals accumulated by these items was transformed into high item difficulty measures that appear at the top of the item column. Easy to endorse items were rated with high raw score ratings. The high raw score totals gathered by these items was transformed into low item difficulty measures that appear at the bottom of the item column. The last column displays the three-point rating scale. The horizontal lines across the column indicate the threshold. The threshold is the point at which the likelihood of rating into the next highest category begins to exceed the likelihood of rating the next lowest rating. The distribution of item difficulty spans the length of almost three logits (2.94 logits), from a low of -1.47 logits to a high of 1.47 logits. The average item difficulty is .00 logits (SE = .22). The item reliability is a high .99, indicating that this 14-item instrument functions very well. Fit indices are all within the pre-established bounds of 0.6 to 1.4 suggesting that the data fit the model as expected (Table 3).

Differential item functioning analysis

US Clinical vs. US non-clinical

The item difficulty as perceived by the two different groups (US Clinical and US Non-clinical) was compared using the standardized difference t-test $\left(t = \frac{(meas_1 - meas_2)}{\sqrt{se_1^2 + se_2^2}}\right)$.

The difficulty of 10 of the 14 items remained stable across groups, i.e., both groups endorsed these 10 items at about the same level of difficulty (Table 4).

US Clinical vs. US non-clinical

Four of the 14 items showed significant difference between groups. These items are:

- Item 4 (Social) – Do you feel embarrassed because you may draw attention by using a hearing aid?
- Item 8 (Benefit) – In general, do you think that in most people in the United States have positive accepting perceptions about the use hearing aids?
- Item 13 (Cost) – Do you think that in the United States most people have access to affordable hearing aids?
- Item 14 (Benefit) – If you experience hearing difficulties, do you think that the use of a hearing aid can provide you with less stress and a better quality of life?

Item 4 (negatively phrased item)

US clinical respondents found this item easier to endorse (item difficulty = 0.17 logits) than US non-clinical respondents (item difficulty =0.88 logits). The clinical group could have received counseling about the benefits of using a hearing aid and is therefore less susceptible to the embarrassment factor than the non-clinical group. According to Kiessling (2003, p.20), two groups of older adult populations with hearing impairment who could benefit from audiological rehabilitation are those who seek intervention and those who do not. Kochkin (2005) reported that some people feel embarrassed because we live in a youth-oriented society where physical perfection is stressed as an ideal human attribute. Acceptance of the hearing loss and the willingness to try hearing aids with the support of significant others can alleviate the embarrassment factor of facing life with hearing aids.

For the US clinical group Item 4 had a total raw score of 168, which is higher than 156 the total raw score for the US non-clinical group. This means that the clinical group answered the question with mostly Not at all, which is coded with a 3 for the negatively phrased items. High total raw scores correspond to low item difficulty measures. The non-clinical group answered this question with mostly Quite a lot/Very much which is coded with a 1 for the negatively phrased items, hence the lower total raw score. Low total raw scores correspond to high item difficulty measures.

Item 8 (positively phrased item)

The US non-clinical respondents found this item easier to endorse (item difficulty = -0.43 logits) than US clinical respondents (item difficulty=0.14 logits). The US non-clinical group seems to be more positive about believing that most people in the US have positive perceptions about hearing aids. Because the US clinical group was already at the

Table 3. Item statistics.

		Item	Raw Score Total	Overall Measure (in logits)	Standard Error (SE)	Infit Mean Square	Outfit Mean Square
5	Cost	Cost an important factor in your decision to obtain HA	528	1.47	0.09	1.23	1.26
3	Cosm	Physical size/cosmetics of hearing is very important	576	1.11	0.08	1.19	1.21
13	Cost	Most people have access to affordable HA	651	0.60	0.08	1.09	1.16
4	Social	Embarrassment/draw attention by using a HA	654	0.59	0.08	0.98	0.95
2	Social	Pressure from family and friends to use HA	688	0.37	0.08	1.13	1.10
10	Cosm	Small HA even if ability to hear is compromised	701	0.29	0.08	1.15	1.14
7	Social	Worry about what other people might think	718	0.18	0.08	0.90	0.86
8	Benefit	Most people have accepting perceptions toward HA	727	0.12	0.08	0.85	0.87
1	Benefit	HA truly help you hear well	807	-0.41	0.08	0.86	0.99
11	Cosm	Cosmetic appearance not important	825	-0.54	0.08	1.09	1.14
6	Cost	Cost of HA worth it for best technology	851	-0.74	0.09	0.86	0.94
14	Benefit	Using a HA - less stress/better quality of life	855	-0.77	0.09	0.83	0.96
9	Prov	Consider obtaining a HA if healthcare provider recommends it	859	-0.80	0.09	0.87	0.86
15	Prov	Detailed explanation from your HA dispenser important	928	-1.47	0.11	0.86	0.70

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professional's office, this could imply that to some degree they had already accepted that there is a hearing problem. The US clinical group has received or is in the process of receiving counseling and their opinions about hearing aids may have taken a different perspective. The US clinical respondents are faced with making decisions about trying hearing aids and therefore may think that other people as a consensus may be reluctant to use them or have questionable opinions about them.

Item 13 (positively phrased item)

US clinical respondents found this item more difficult to endorse (item difficulty = 0.69 logits) than US non-clinical respondents (item difficulty =0.22 logits). The clinical group does not subscribe as readily to the opinion that most people have access to affordable hearing aids, as does the non-clinical group. The clinical group respondents are probably faced with the reality of paying for the hearing aid and are more aware of restrictive insurance policies than the non-clinical group respondents, who are perhaps only beginning to recognize that there is a problem. According to Kochkin (2005), some hearing-impaired people simply do not have enough income to afford today's advanced hearing aids. Hearing aid costs become more important to those subjects in the US clinical group than the US non-clinical group.

Item 14 (positively phrased item)

US clinical respondents found this item more difficult to endorse (item difficulty = -0.40 logits) than US non-clinical respondents (item difficulty= -0.93 logits). After a casual reading of this item, this may seem surprising. The clinical group, however, seems to have more realistic expectations about the benefits that a hearing aid can provide. "Less stress" and a "better quality of life" are still goals to be attained, even though hearing difficulties are being resolved. The non-clinical group, who is still very much bothered by hearing aid problems, may still be in the "if I can solve this problem, everything else will be better" phase, and hence endorses this item more readily.

Italy clinical vs. Italy non-clinical

The item difficulty as perceived by the two different groups (Italy Clinical and Italy Non-clinical) was compared using the standardized difference t-test $\left(t = \frac{(meas_1 - meas_2)}{\sqrt{se_1^2 + se_2^2}}\right)$.

The difficulty of 12 out of the 14 items remained stable across groups, i.e., both groups endorsed these 12 items at about the same level of difficulty (see Table 5).

Two of the 14 items, however, showed significant difference between groups. These items are:

- Item 3 (-Cosmetic) – Is the physical size and cosmetic aspect of a hearing aid a very important factor in your decision to obtain one?
- Item 14 (Benefit) – If you experience hearing difficulties, do you think that the use of a hearing aid can provide you with less stress and a better quality of life?

Item 3 (negatively phrased item)

Italy clinical respondents found this item easier to endorse (item difficulty= 0.89 logits) than Italy non-clinical respondents (item difficulty= 1.46 logits). The clinical group had more accepting perceptions about the cosmetic look reality of hearing aids than the Italy non-clinical group. The fact that the Italy clinical group was surveyed at a clinical setting that can lead us to believe that the subjects were already seeking help for

Table 4. Item measure comparison - US clinical vs. US non-clinical.

	Item	Meas US Clinical	SE US Clinical	Meas US Non-clinical	SE US Non-clinical	T-test
1 Benefit	HA truly help you hear well	-0.49	0.17	-0.32	0.18	-0.69
2- Social	Pressure from family and friends to use HA	0.36	0.16	0.34	0.17	0.09
3- Cosm	Physical size/cosmetics of hearing is very important	0.92	0.17	1.23	0.17	-1.29
4- Social	Embarrassment/draw attention by using a HA	0.17	0.16	0.88	0.17	**-3.04**
5- Cost	Cost an important factor in your decision to obtain HA	1.59	0.19	1.60	0.18	-0.04
6 Cost	Cost of HA worth it for best technology	-0.59	0.18	-0.84	0.21	0.90
7- Social	Worry about what other people might think	-0.02	0.16	0.37	0.17	-1.67
8 Benefit	Most people have accepting perceptions toward HA	0.14	0.16	-0.43	0.19	**2.30**
9 Provider	Consider obtaining a HA if healthcare provider recommends it	-0.79	0.18	-0.51	0.19	-1.07
10- Cosm	Small HA even if ability to hear is compromised	0.28	0.16	0.57	0.17	-1.24
11 Cosm	Cosmetic appearance not important	-0.56	0.18	-0.36	0.19	-0.76
13 Cost	Most people have access to affordable HA	0.69	0.16	0.22	0.17	**2.01**
14 Benefit	Using a HA - less stress/better quality of life	-0.40	0.17	-0.93	0.21	**1.96**
15 Provider	Detailed explanation from your HA dispenser important	-1.31	0.21	-1.82	0.29	1.42

their hearing problems and therefore had a more realistic expectation about the aesthetics of hearing aids. On the other hand, item 3 was more difficult to endorse for the Italy non-clinical group. The Italy non- clinical group subjects had poorer perceptions about hearing aids in the cosmetic aspect. This finding could be one of the reasons why these subjects have not obtained hearing aids yet or have not fully acknowledged their hearing difficulties to take the next step.

Item 14 (positively phrased item)

Italian non-clinical group respondents found this item easier to endorse (item difficulty = -1.20 logits) than Italian clinical respondents (item difficulty= -0.60 logits). The significance of this item mirrors that of the US non-clinical and US clinical groups' findings. The Italy clinical group seems to have fewer expectations about the overall benefit of hearing aids. Less stress and a better quality of life are still goals to be attained, even though hearing difficulties are being resolved. The Italy non-clinical group, who is still very much bothered by hearing aid problems, may still be in the if I can solve this problem, everything else will be better phase, and hence endorses this item more readily.

US Clinical vs. Italy Clinical

Let's now look at the significant item differences between the US clinical and the Italy clinical groups. The difficulty of 13 items out of 14 items remained stable across groups. One item showed a significant difference between groups (see Table 6).

The item is:

- Item 4 (Social) - Do you feel embarrassed because you may draw attention by using a hearing aid?

Item 4 (negatively phrased)

This item was easier to endorse for the US Clinical group (item difficulty= 1.7 logits) than for the Italy Clinical group (item difficulty= 0.73 logits). The Italian clinical group seems to be more concerned about how they will be perceived socially by others compared to the US clinical group. Communication is extremely important to Italians; they are very talkative and socially active people. However, aesthetics are also very important. Italians as a culture are known to be particular about aesthetics. To be seen by others using a hearing aid is a challenge and it could be stigmatizing to some people. The acceptance and perhaps more familiar social awareness about hearing aids by the US clinical group could make a difference in overcoming feelings of social embarrassment. An interpretation to this finding could be based on practicality and a more individualistic view of American society. Italians may feel more embarrassed because they are afraid to be rejected socially by family and peers. In Italy, it is good to draw attention to beautiful things but hearing aids may not be considered to be in that category. The Italian clinical group surveyed is not ready to take the step to obtain hearing aids because of fear of embarrassment.

US non- clinical vs. Italy non-clinical

The item difficulty as perceived by the two different groups (Clinical and Italy Non-clinical) was compared using the standardized difference t-test $\left(t = \frac{(meas_1 - meas_2)}{\sqrt{se_1^2 + se_2^2}}\right)$.

The difficulty of 12 out of the 14 items remained stable across groups (see Table 7).

Table 5. Item measure comparison - Italy clinical vs. Italy non-clinical.

	Item	Meas Italy Clinical	SE Italy Clinical	Meas Italy Non-clinical	SE Italy Non-clinical	T-test
1 Benefit	HA truly help you hear well	-0.20	0.16	-0.60	0.16	1.77
2- Social	Pressure from family and friends to use HA	0.47	0.16	0.33	0.15	0.64
3- Cosm	Physical size/cosmetics of hearing is very important	0.89	0.16	1.46	0.17	**-2.44**
4- Social	Embarrassment/draw attention by using a HA	0.73	0.16	0.60	0.15	0.59
5- Cost	Cost an important factor in your decision to obtain HA	1.61	0.18	1.19	0.16	1.74
6 Cost	Cost of HA worth it for best technology	-0.89	0.17	-0.68	0.16	-0.90
7- Social	Worry about what other people might think	0.37	0.16	0.04	0.15	1.51
8 Benefit	Most people have accepting perceptions toward HA	0.20	0.15	0.42	0.15	-1.04
9 Provider	Consider obtaining a HA if healthcare provider recommends it	-0.98	0.17	-0.86	0.16	-0.51
10- Cosm	Small HA even if ability to hear is compromised	0.17	0.15	0.20	0.15	-0.14
11 Cosm	Cosmetic appearance not important	-0.71	0.17	-0.50	0.15	-0.93
13 Cost	Most people have access to affordable HA	0.57	0.16	0.90	0.15	-1.51
14 Benefit	Using a HA - less stress/better quality of life	-0.60	0.16	-1.20	0.18	**2.49**
15 Provider	Detailed explanation from your HA dispenser important	-1.64	0.21	-1.30	0.18	-1.23

Table 6. Item measure comparison - US clinical vs. Italy clinical.

Item		Meas US Clinical	SE US Clinical	Meas Italy Clinical	SE Italy Clinical	T-test
1 Benefit	HA truly help you hear well	-0.49	0.17	-0.20	0.16	-1.24
2- Social	Pressure from family and friends to use HA	0.36	0.16	0.47	0.16	-0.49
3- Cosm	Physical size/cosmetics of hearing is very important	0.92	0.17	0.89	0.16	0.13
4- Social	Embarrassment/draw attention by using a HA	0.17	0.16	0.73	0.16	**-2.48**
5- Cost	Cost an important factor in your decision to obtain HA	1.59	0.19	1.61	0.18	-0.08
6 Cost	Cost of HA worth it for best technology	-0.59	0.18	-0.89	0.17	1.21
7- Social	Worry about what other people might think	-0.02	0.16	0.37	0.16	-1.72
8 Benefit	Most people have accepting perceptions toward HA	0.14	0.16	0.20	0.15	-0.27
9 Provider	Consider obtaining a HA if healthcare provider recommends it	-0.79	0.18	-0.98	0.17	0.77
10- Cosm	Small HA even if ability to hear is compromised	0.28	0.16	0.17	0.15	0.50
11 Cosm	Cosmetic appearance not important	-0.56	0.18	-0.71	0.17	0.61
13 Cost	Most people have access to affordable HA	0.69	0.16	0.57	0.16	0.53
14 Benefit	Using a HA - less stress/better quality of life	-0.40	0.17	-0.60	0.16	0.86
15 Provider	Detailed explanation from your HA dispenser important	-1.31	0.21	-1.64	0.21	1.11

Table 7. Item measure comparison - US non-clinical vs. Italy non-cinical.

Item		Meas US Non-clinical	SE US Non-clinical	Meas Italy Non-clinical	SE Italy Non-clinical	T-test
1 Benefit	HA truly help you hear well	-0.32	0.18	-0.60	0.16	1.16
2- Social	Pressure from family and friends to use HA	0.34	0.17	0.33	0.15	0.04
3- Cosm	Physical size/cosmetics of hearing is very important	1.23	0.17	1.46	0.17	-0.96
4- Social	Embarrassment/draw attention by using a HA	0.88	0.17	0.60	0.15	1.24
5- Cost	Cost an important factor in your decision to obtain HA	1.60	0.18	1.19	0.16	1.70
6 Cost	Cost of HA worth it for best technology	-0.84	0.21	-0.68	0.16	-0.61
7- Social	Worry about what other people might think	0.37	0.17	0.04	0.15	1.46
8 Benefit	Most people have accepting perceptions toward HA	-0.43	0.19	0.42	0.15	**-3.51**
9 Provider	Consider obtaining a HA if healthcare provider recommends it	-0.51	0.19	-0.86	0.16	1.41
10- Cosm	Small HA even if ability to hear is compromised	0.57	0.17	0.20	0.15	1.63
11 Cosm	Cosmetic appearance not important	-0.36	0.19	-0.50	0.15	0.58
13 Cost	Most people have access to affordable HA	0.22	0.17	0.90	0.15	**-3.00**
14 Benefit	Using a HA - less stress/better quality of life	-0.93	0.21	-1.20	0.18	0.98
15 Provider	Detailed explanation from your HA dispenser important	-1.82	0.29	-1.30	0.18	-1.52

US non-clinical vs Italy non-clinical

Two items showed a difference:

- Item 8 (Benefit) – Do you think that most people in the US/Italy have accepting perceptions toward hearing aids?
- Item 13 (Cost) – Do you think that most people in the USA/Italy have access to affordable hearing aids?

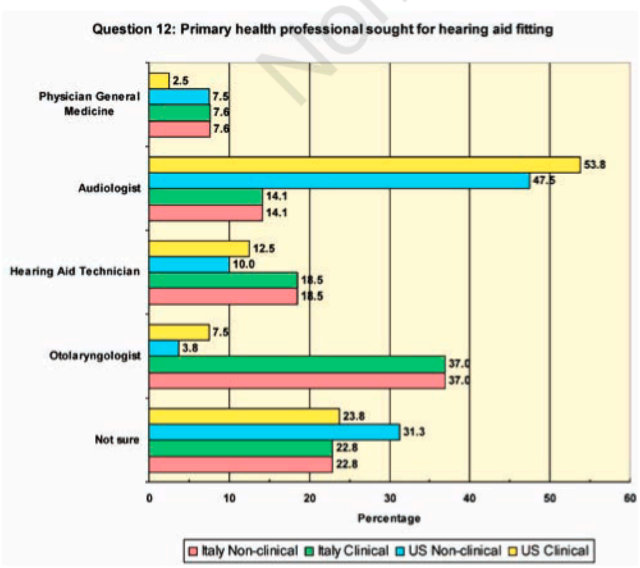
Item 8 (positively phrased item)

This item was easier to endorse by the US non-clinical group (item difficulty= -0.43 logits) than the than the Italy non-clinical group (item difficulty= .42 logits). The Italy non-clinical group does not seem to be as optimistic as the US non-clinical group with regard to a collective consensus on accepting perceptions toward hearing aids by the people in their native country. The more education and awareness of hearing aids by a cultural group, the more likely they are to have an optimistic view of the potential benefits of the technology.

Item 13 (positively phrased item)

This item was easier to endorse by the US non-clinical group (item difficulty= .22 logits) than the Italy non-clinical group (item difficulty= .90 logits). The US non-clinical group believes that most people in the United States have access to affordable hearing aids compared to the Italy non-clinical group regarding affordability of hearing aids in Italy. Differences in the healthcare structure in both countries can be indicative of this trend. As mentioned earlier, the Italian healthcare system provides Italian citizens and residents with free basic analog and economy digital hearing aids as needed and regulated by the Nomenclatore Tariffario. Advanced hearing aid technology requires a deductible payment from the potential hearing aid candidate. Therefore, acquiring advanced hearing aid digital technology has a price for the enduser and this maybe viewed as an undesired expense. In the United States, healthcare is primarily private pay and citizens and residents with hearing loss know that obtaining a hearing aid will cost something. People in the United States are more used to and expect to pay for health related services including hearing aids.

The differences discussed above were noted between the US non-clinical and Italy non-clinical groups in each country. It must be kept in mind that the subjects may or may not know all the details about how much a hearing aid costs. They may know from family, friends, or public information. The results cannot be generalized by country but they can only be attributed to the subject samples surveyed.



Bar Graph 1. Item 12 responses per group and country.

Item 12 analysis

Item 12: Who is the primary health professional that you would seek in order to be fitted with hearing aids in the United States/Italy?(see Bar Graph 1).

Item 12 of the survey was analyzed separately because the answers requested a 'provider' for hearing aid services; therefore, the answers did not follow a Rating Scale coding. The subjects had to select among the following: General Medicine Physician, Audiologist, Hearing Aid Technician, Otolaryngologist, and Not sure. The survey results showed 'Audiologist' as the predominant answer among the subjects of the US clinical group and US non-clinical group. Otolaryngologist was the predominant answer among the subjects of Italy clinical group and Italy non-clinical group (see Bar graph #1). Secondary to the predominant answers, the Not sure category was the most utilized in all groups.

According to Traynor (1998), in the United States, audiologists display the best overall credentials both clinically and professionally, audiologists are the best qualified to provide hearing aids and the most cost-effective. On the other hand, Kochkin (1992, p. 13) stated that although one can argue that the available information is not sufficient to conclusively prove that audiologists are the superior dispensing group, there is little data to suggest that the hearing aid dealer or the otolaryngologist is superior, or even equal to the audiologist.

Audiologist was the predominant answer in both US non clinical and clinical groups. The US clinical surveys were distributed by Audiology clinics in the United States and even though the US non-clinical surveys were not distributed by Audiology clinics, the survey required the subject to sign a consent form which specified that the study was carried out by an Audiology doctoral student. It is not possible to know if those factors could have influenced the subjects' decision to choose Audiologist over other categories. It will be important to diversify the settings of distribution in future survey studies in order to observe if this triggers different responses for item 12.

It is surprising that the Italian subjects selected Otolaryngologist over the Hearing Aid Technician category because in Italy the hearing aid technician fits and dispenses the hearing aid(s). Perhaps, both Italian subject groups perceive the otolaryngologist as the 'first stop' hearing aid prescriber or gate keeper to obtain hearing aids. One could wonder if there could be a certain bias effect in the survey study with regard to question 12 for the Italy clinical setting. The clinical survey sites in Italy were three separate hospital settings each directed by two otolaryngologists and one by a medical audiologist. Although I would have expected a variety of answers to question 12 from the Italy non-clinical group, surprisingly this group's survey responses parallel that of the Italy clinical group. This finding could indicate that the structure of the healthcare in Italy points to the otolaryngologist as the primary professional to refer to in order to obtain hearing aids. This finding requires more investigation and a larger survey sample to validate its interpretation.

A study carried out by Garstecki & Erler (1998), examined the attitudes and behaviors regarding the acquisition of hearing aids of elderly subjects (≥65 years of age). They reported that hearing aids were recommended to the subjects by different professionals such as audiologists, otologists, and hearing aid specialists. The researchers stated that "it is not known if adherence or nonadherence to hearing aid use might be linked more to one particular type of hearing care professional and it may be instructive to determine whether or not follow-through behavior could be different for advice given by dispensing audiologists and hearing aid specialists versus non-dispensing otologists" (p.533)

Person Measure Comparison

The analysis tested the following hypothesis:

H_0: $\mu_{\text{US Clinical}} = \mu_{\text{US Non-clinical}} = \mu_{\textit{Italy Clinical}} = \mu_{\text{Italy Non-clinical}}$

H_1: At least one mean differs from the others.

The statistical hypotheses were evaluated via a one-way ANOVA test and a Tukey's post hoc test.

Results and Discussion

The Levene test for homogeneity of variance showed that the variances of the four groups (Table 8) can be considered as not being significantly diferent (P>.05). The one way ANOVA test found a significant difference between the average person measures of the four groups, F (3, 340)=12.59, P>.001 (Table 9). To precisely locate the difference between average person measures, a Tukey's post hoc test was performed (Table 10). The average person measure for the US Clinical group (M=0.43, SD=0.83) is significantly lower than that of the US Non-clinical group (M=0.90, SD=0.96), P>.01. The average person measure for the US Non-clinical group (M=0.90, SD=0.96) is significantly higher than that of the Italy Non-clinical group (M=0.19, SD=0.70), P>.001, and also than that of the Italy Clinical group (M = 0.27, SD=0.84), P>.001. No statistically significant difference was found between any other pair of average person measures.

Overall, subjects in the US clinical and non-clinical groups had more accepting perceptions about hearing aids than the Italian clinical and non-clinical groups. The results indicate that the US non-clinical group had the highest average person measures compared to all the other groups (see bar graph #2). This can be interpreted as the US non-clinical group being the subject group with the highest positive perceptions about hearing aids.

Kricos *et al.* (1991) evaluated 100 adults (55-92 yrs old) in the United States with no prior hearing aid use. The researchers used a 48 item questionnaire evaluating: cosmetics, acoustics, communication benefits, comfort, cost, ease of use, and upkeep attitudes toward hearing aid use. The subjects were all volunteers from senior associations and church groups. Their findings revealed that older adults in the sample tested appeared to have very positive attitudes toward hearing aids with 87% having medium to high expectations for hearing aid use. In some ways, Kricos *et al.* findings parallel the findings of the US groups in this study. The surveys were not the same but it is interesting that the questions that they used and this study's questions had a similar content. The researchers concluded "the generally positive attitude expressed by respondents was particularly surprising since 39% of the sample who reported knowing a hearing aid user indicated that the individual was dissatisfied with its performance. Perhaps the respondents recognize that, despite troublesome factors there are a number of potential benefits from the use of hearing aids" (Kricos *et al.*, p.132).

The goal of cross-cultural surveys in research is to identify differences in response patterns between populations. From a theoretical perspective, revealed differences in the survey's items can provide insights of true scientific value. From a methodological perspective, cross-cultural surveys can pose challenges that may render direct comparisons between cultural populations difficult. When a survey such as PHANU is developed, an accurate translation of the survey items from one language to another should be obtained carefully. PHANU underwent back-to-back translations from English to Italian and vice-versa to ensure that items were conveying the same concepts and information. The risk of having a poor language translation can result in measurement bias that can threaten the validity of the findings as illustrated previously by Hernvig & Olsen's study (2006).

The application of the Rasch analysis on the PHANU survey items revealed interesting interactions within and between the US and the IT clinical and non-clinical groups. The US clinical and non-clinical groups revealed significant differences in opinion about hearing aids for questions regarding social pressure, cost, and benefit. The IT clinical and non-clinical groups revealed significant differences in opinion for cosmetic and benefit survey questions. The US and IT clinical groups revealed significant differences in opinion about hearing aids with regard to social pressure aspects. The US and IT non-clinical groups revealed significant differences in opinion about hearing aids with regard to benefit and cost. Audiologists were considered the healthcare hearing aid provider according to both US groups while otolaryngologists were the preferred healthcare hearing aid provider according to both IT groups. The US non-clinical group had the most positive opinions about hearing aids.

The Rasch rating scale analysis provided valuable information about

Table 8. Variances.

Test of Homogeneity of Variances

measure

Levene Statistic	df1	df2	Sig.
1.257	3	340	.289

Table 9. ANOVA Between and within groups.

ANOVA

measure

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	25.349	3	8.450	12.159	.000
Within Groups	236.274	340	.695		
Total	261.623	343			

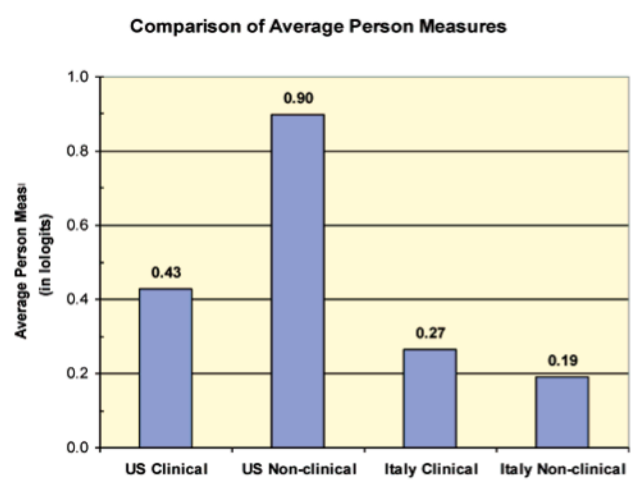
Table 10. Multiple comparisons Tukey test.

Multiple Comparisons

Dependent Variable: measure
Tukey HSD

(I) country	(J) country	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
US Clinical	US Non-clinical	-.46917*	.13181	.002	-.8095	-.1289
	Italy Clinical	.16345	.12744	.575	-.1556	.4925
	Italy Non-clinical	.23961	.12744	.238	-.0894	.5686
US Non-clinical	US Clinical	.46917*	.13181	.002	.1289	.8095
	Italy Clinical	.63262*	.12744	.000	.3036	.9616
	Italy Non-clinical	.70877*	.12744	.000	.3798	1.0378
Italy Clinical	US Clinical	-.16345	.12744	.575	-.4925	.1556
	US Non-clinical	-.63262*	.12744	.000	-.9616	-.3036
	Italy Non-clinical	.07615	.12291	.926	-.2412	.3935
Italy Non-clinical	US Clinical	-.23961	.12744	.238	-.5686	.0894
	US Non-clinical	-.70877*	.12744	.000	-1.0378	-.3798
	Italy Clinical	-.07615	.12291	.926	-.3935	.2412

*. The mean difference is significant at the .05 level.



Bar Graph 2. Comparison of average person measures.

the difficulty of the survey questions, the endorsability of the questions, and the attitude of the subjects with regard to hearing aids. The Person Item Map of all the subjects revealed that item 5 (Cost) and item 3 (Cosmetic) were the questions most difficult to endorse and item 15 (Provider) was the easiest to endorse by all subject groups. Overall, PHANU's reliability was high (item= .99 and person reliability= .67) which demonstrates consistency within and between all subject pool responses. PHANU also demonstrated good validity. The subject responses are well distributed across the continuum of possible responses but future utilization of the survey will provide stronger validation.

Conclusions

One of the limitations of this survey study relates to its sample size. It is not possible to report that all US and IT people with the same characteristics as the subjects in this study have parallel opinions on perceptions about hearing aids as a 'cultural' consensus. The subject sample size must be very large in order to be able to observe trends or to correlate cultural traits. In order to assess if cultural traits correlate with opinions about hearing aids regarding cosmetics, benefit and social pressure aspects; questions that evaluate emotions, beauty, social behavior traits could be included in a revised version of PHANU. Questions about cost of hearing aids and about who is the provider of hearing aid services depend greatly on the structure of healthcare in each country; therefore, it is unlikely that cultural traits can reveal much information. However, I suggest that PHANU be given in a variety of clinical settings such as hearing aid technician offices, otolaryngologists'offices, medical audiologists' offices in Italy and hearing aid specialists/dealers' offices, audiologists' offices, and otolaryngologist-s'offices in the United States. Responses could shed some light into the opinions of new subjects about who is perceived to be the primary hearing aid healthcare provider.

Another possible limitation of this study has to do with how some of the PHANU survey questions were constructed. It would be much easier to score questions that were all positively phrased or negatively phrased in order to avoid recoding during the analysis. This type of writing can also benefit the subject's response time while filling out the questionnaire. However, it is also good to maintain a balance between positively and negatively phrased questions in a survey to maintain randomness across items. According to Rumsey (2003), surveys should avoid the use of leading questions. Leading questions are questions that are worded in such a way that you know what the researcher wants you to answer.

Test-retest reliability is an index of score consistency over a short time period (usually a few weeks) and indicates how much the individual's normative score is likely to change on near-term retesting. Score change can be caused by day to day fluctuation in performance or the individual recollection of the earlier administration. A test-retest coefficient is a statistical measure that is obtained by administering the same test twice, with a certain amount of time between administrations, and then correlating the two score sets. The most important concern in retesting is whether the individual's retest scores may be inflated by the practice effect. The practice effect depends on the content of the survey questions in this case, and the length of time or interval for retesting. Due to the experimental design of this survey, it was not possible to obtain test-retest reliability indexes of score consistency. The surveys were given only once to each subject to obtain the participant's first impression. This information will be collected as PHANU's questions continue to be evaluated with larger subject samples during future studies.

Overall, the PHANU survey appears to be a promising tool that could be utilized to provide our profession with important data that can be of great interest to clinicians, researchers, industry, and healthcare policymakers. Future directions should implement recommendations on sample size, cultural trait questions, gender/age/setting variations, and re-wording of the questions to simplify its analysis.

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