The Big Five personality traits as they correlate with subjective measures of hearing loss and self perception in newly identified adults, to predict hearing aid benefits

A'ja Danell Neal
Washington University School of Medicine in St. Louis

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The Big Five Personality Traits As They Correlate With Subjective Measures Of Hearing Loss And Self Perception in Newly Identified Adults, To Predict Hearing Aid Benefit

by

A’ja Danell Neal

A Capstone Project
Submitted in partial fulfillment of the
Requirements for the degree of:

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Approved by:
Mitchell Sommers, Ph.D and Steve Smith, Au.D.

This study makes use of the Big Five Inventory Personality Assessment to attempt to predict perceived hearing aid benefit, and compare with the Client Oriented Scale of Improvement. The end goal is to assess if identification of personality traits can be used as a counseling tool to promote hearing aid uptake and positive perceived benefit.
Acknowledgements

I would like to thank my primary advisor Mitchell Sommers, Ph.D, for providing the opportunity to complete this project. Special thanks to my second reader Steve Smith, Au.D, for facilitating the entire process and for his clinical insight and advice. Thank you to Michael Valente, Ph.D, for allowing access to the Audiologists at Washington University School of Medicine in my efforts to recruit participants. Thank you to all of Adult Audiology at Washington University School of Medicine for remembering to email me with recruitment opportunities. I could not have completed this study without you. Thank you to the Center for Hearing and Speech and Rebecca Frazier Au.D, for providing a second site to recruit from. David W. Penn, MBA, thank you so much for help with the statistical analysis and walking me through the process of interpretation. You have been my rock through this process and I do not know where I would be without you. Maureen Valente, Ph.D, William Clark, Ph.D, and the entire PACS staff, thank you for all of your support and encouragement throughout the years. To the best cohort a girl could ask for, Au.D Class of 2016, thank you ladies for the camaraderie and an amazing and strong three years. Lastly, thank you to my family. It has been a team effort and I am ever so grateful.
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Introduction

Hearing loss is an ever-growing concern among adults worldwide. This is especially true of the baby boomer population born between the years 1949-1969. In 2004, the Better Hearing Institute (BHI) published the incidence of hearing loss under the name “Marke Trak”. The incidence of hearing loss was determined to be: 1 in 14 generation Xers having some degree of hearing loss, 1 in 6 Baby Boomers having a hearing problem, and 3 in 10 of those who are 60+ years old suffer from a hearing loss. Efforts need to be made to urge adults to focus on hearing related issues, which will in turn change the culture surrounding hearing healthcare (Coleman, 2012). When most adults seek healthcare services it is not to address their hearing, and often hearing related issues are overlooked or take a backseat to other issues. In 2012 Robyn Cox, PhD. Stated (Coleman, 2012),

*People frequently notice hearing problems numerous years before they seek help,*
*and there is reason to think that the longer they wait, the more difficult is it to make up ground that gets lost.*

This statement rings true for various reasons as people with unaddressed hearing concerns tend to find ways to compensate for their loss of hearing, or retreat from what once was an inclusive lifestyle in order to avoid situations where the hearing loss highlights a communication disability.

A good many adults equate hearing loss solely with the aging process and although aging plays a role (as with most other biological/physiological processes), it is hardly the only cause. Environmental elements over time, and life experiences are just as great a contributor as aging alone. Hearing loss can occur due to aging but can be compounded by high levels of continuous noise exposure, music, sudden impulse noise, ototoxic medications, and trauma/head injury.
These environmental or experiential factors compound hearing hair cell and nerve-damage in this population. The effects of hair cell loss and nerve damage or atrophy are the measureable deficits for the population discussed, whereas the psychological and cognitive effects are where the waters become murky.

For adults with presumably normal psychological and cognitive abilities as they relate to age, and an essentially unremarkable hearing history relative to the environment and life experience (unremarkable referring to things patients forget to mention i.e. armed services, recreational gun use, numerous concerts attended, factory work before OSHA regulations took effect, farming and machinery, etc.) the use of hearing aids to help with hearing loss is a hit or miss idea. As stated by Kochkin (Avada and BHI on Baby Boomers, 2007), “Too many people cling to the old, stubborn belief that wearing a hearing aid won’t help fix their hearing problems, and we hope people, especially baby boomers, understand that hearing aids work better than ever and can dramatically improve the quality of their lives.”

Hearing loss is a disabling condition and a societal problem as it limits meaningful communication and social connectivity, resulting in negative effects of work, quality of life, and cognitive and emotional status (Agrawal, Platz, and Niparko, 2008). Audiologists and individuals with hearing loss alike, attest to this statement as they have seen or experienced its truths via direct or indirect measures. In a short article published in the Hearing Review (Avada and BHI on Baby Boomers, 2007), the BHI demonstrates that 93 percent of consumers with hearing loss devices report an improved quality of life and 85 percent are pleased with the benefit that their hearing devices provide. While this report exhibits a promising percentage, other research shows different results. A study on the rejection of hearing aids was completed by J. Franks and N. Beckmann in 1985, ranking results from a survey that listed reasons for non-use.
of hearing aids. Among the top 10 reasons were, “call attention to handicap, amplify noise, too loud, inconvenient to wear, and difficulty manipulating”. There is great importance in demonstrating contributing factors in both hearing aid uptake and rejection for hearing aid users, or those who may need to wear hearing aids as it may provide a bit of insight as to the “why” some users may do well with them and others may not.

When an Audiologist performs a comprehensive audiologic evaluation to determine the degree of hearing loss, or if there is a measurable hearing loss at all, he or she is able to objectively determine if components relative to that loss contribute to that hearing loss being aidable or unaidable, and to what degree approximately. Objectively unaidable results are clear. In 1990, Stelmachowicz noted that real ear measurements using a probe microphone yield valid, repeatable, and reliable results and are the preferred method for assessing real ear performance of hearing instruments (Pumford & Sinclair, 2001). Contrary to that, verified aidable results that are challenged by negative perceptual benefit, persists in being one of the most difficult conundrums for the experts to overcome. Where does the ambiguity lie? In a study by Franks and Beckmann (1985), a questionnaire was issued to individuals demonstrating a hearing loss of 30 dBHL+ pure-tone average at 500, 1000, and 3000 Hz. In providing numerous reasons for possible non-use of hearing aids, rated by Likert scale, the top five reasons for non-use were cost, draws attention to handicap, deceptive practices by dealers, amplification of noise, and inconvenient to wear (a Likert scale is a summative, psychometric scale that is used for various questionnaires for the purpose of research, Likert, 1932). Years later, Meister, Walger, Brehmer, Von Wedel, U., & Von Wedel, H., (2008) reports similar results; stigma associated with hearing loss, misjudging the degree of the loss, coping strategies, cost, false expectations, and personality
factors. Although hearing device technology has greatly advanced over time, the perception of what hearing aids represent, and how hearing aids function, has not.

Even though individuals may perceive negative aspects of hearing aids, many eventually try hearing aids. Some may reject hearing aid use and some may continue to use and report receiving benefit. Therefore other factors such as coping mechanisms and personality may be paramount in ultimately determining hearing aid uptake or rejection. The Environmental Docility hypothesis was first proposed by Lawton and Simon (1968). It states that there are particular psychological aspects among certain persons that contribute to a narrow range of adaptability as environmental demands increase. A study by Cox, Alexander, and Gray (1999) supports this hypothesis and reports that it is within reason to suspect that the coping style utilized will impact how effective the individual’s efforts will be in dealing with acquired hearing loss.

The need for validation in hearing aid fitting is of great importance. To date, objective measures such as comprehensive audiologic evaluations and real ear measures, or functional gain measures are followed by outcome measures. The outcome measures are usually subjective questionnaires that serve as a way to validate the objective measures by assigning a value to perceived benefit. Although this is the most reliable method of validation, the relationship between perceived disability and clinical impairment has a great weakness in the variance of disability that does not fall under what can be measured or accounted for in the clinic (Cox et al., 1999).

It was hypothesized that there may be a significant correlation between personality type and/or intrapersonal affective states and hearing aid uptake versus rejection (Cox, Alexander, and Gray, 2005; Helvik, Wennberg, Jacobson, and Hallberg, 2008). Preliminary data in Cox’s
research showed that self-report questionnaires are often predictable based on personality (2003); these data were later validated, with the strength of some correlations being weaker than others (Cox, Alexander, & Gray, 2007). Self report data from the Shortened Hearing Aid Performance Inventory for the Elderly (SHAPIE) demonstrated that higher scores for Neuroticism (a personality category) were correlated with reports of little benefit. On the contrary, results drawn from the Hearing Handicap Inventory for the Elderly (HHIE) showed a positive relationship with Neuroticism for difference benefit (difference being unaided and aided). The author notes that this correlation could be misleading if looked at beyond the realm of aided versus unaided scores. The Abbreviated Profile of Hearing Aid Benefit (APHAB) was used in this study as well. The data in the current study only makes use of the Client Oriented Scale of Improvement (COSI) for self report so as to avoid varying measurement scales and values that may in fact measure benefit differently and skew the results.

Before an analysis is completed or reviewed, it is important to understand the measures of personality and how they are derived. There are a few prominent models used to evaluate personality, but the one that tends to be utilized or referred to repeatedly, is the Five Factor Model. The Five Factor Model or “Big 5” (Srivastava, Goldberg, & McCrae (n.d.); Latzman and Masuda, 2013; Nathan, 1998), is a taxonomy of personality traits. The consensus is that these traits are generalizable and tend to stabilize in individuals around the third decade of life and remain firmly consistent thereafter. There has been debate over whether personality is acquired as a process of heritability, changes as a function of age, develops differently across gender, or is shaped by culture and environment (Five Factor Theory, McCrae and Costa-biological approach; Social Investment Theory, Roberts-interactionist approach). For purposes of this research, how personality is acquired or developed will not be evaluated. What is examined, is how an already

**Personality and the Big Five**

Personality is what makes a person who they are. It shapes the way they feel, how they think, and guides their behavior. It is a construct of characteristics that differ in makeup and expressivity across persons, but is also easily generalized as most everyone can be tied to one or more of the Big Five personality factors. The five factors are extraversion-introversion, openness, agreeableness, conscientiousness, and neuroticism. Brief descriptions are as follows:

1. **Extraversion**- assertiveness, friendliness, sociable, and outgoing
2. **Agreeableness**- cooperation, altruism, affable, and trusting
3. **Openness**- Imagination, intellect, emotionality, creative, and original
4. **Conscientiousness**- self-efficacy, dutifulness, systematic, and achievement oriented
5. **Neuroticism**- anxiety, depression, irritable, and temperamental

This paper explores the personality profile of adults who are new users of hearing aids. It seeks to answer the questions 1) Can personality profiles be of use in predicting perceived benefit in new hearing aid users, and 2) Is there variation in personality of hearing aid users across facilities; a) fee for service facility, b) not for profit facility.

**Methods**

Participants were patients identified with a hearing loss, non experienced users of hearing aids, and actual clinical patients, that were recruited from one of two audiology clinics. The first
clinic was associated with a school of medicine medical center where patients purchase their hearing aids out-of-pocket, and the second clinic was a not for profit clinic where the cost of hearing aids are subsidized by cash donations that fund a financial assistance program. With a small sample size, the recruitment of participants from polar opposite audiology sites (re: revenue) was the best way to provide a thorough representation of the population. Both sites utilized the bundling model where the fees for device and the services were combined or offset by donations of capital.

Participants

Inclusion criteria was such that each participant had to be between thirty-five to seventy-five years of age, have been diagnosed with an aidable hearing loss (unilateral or bilateral) excluding cochlear implants, be identified as a new user of hearing aids, and be autonomous with regard to treatment, care, and decision making (non-institutionalized). There were a total of 10 participants, of which 70 percent were female and 30 percent were male. The mean age was 65 years. There were 5 participants from the Center for Advanced Medicine (CAM), 1 from adult audiology at Central Institute for the Deaf (CID), and 4 from the Center for Hearing and Speech (CHS). All participants presented with varying degrees of sensorineural hearing loss from 250 Hz through 8000 Hz. Out of the 10 participants, 8 were identified as Caucasian and 2 were identified as Black or African American.

Procedure

Participants were recruited as they presented with hearing loss and made a routine visit to the clinic for a hearing aid evaluation or a hearing aid fitting. In each clinical setting, a licensed audiologist would invite patients who met the inclusion criteria to participate in the research.
The COSI was initiated for each patient that would be using hearing aids for the first time. In the COSI patients were instructed to try and select up to six categories from which he or she would like to see improvement with hearing aid use. From the six (if obtained), the patient was instructed to pick the two categories that are of the greatest importance to him/her. Each patient was given the opportunity to accept or decline learning/hearing about the research before accepting or declining whether to participate or not.

An explanation of the research and informed consent was obtained from all participants who decided to accept the invitation to take part in the study. Upon conclusion of a routine visit, the 44 item paper version of the BFI personality questionnaire was administered. This questionnaire made use of a Likert rating scale from 1-5, with 1 being “Disagree Strongly” and 5 being “Agree Strongly”. The administration of this item was initiated and completed before the participant had the opportunity to use the hearing aid(s).

Data collected from the BFI were transferred to electronic format for ease of scoring. All data were cross-checked by two sources upon being transferred (barring any identifying information) to guard against transfer error. At the 2-3 week post fit evaluation, participants completed the COSI, and perceived benefit data was then collected.

Subjectively weighted data obtained from the COSI were collected for “Degree of Change and Final Ability”. There are specifications on validity and reliability of the BFI in the literature as it is the most widely utilized and accepted format for profiling personality. The COSI is known by almost every audiologist who dispenses hearing aids in the US and is one of the most powerful tools in the audiologist’s clinical test battery (Taylor, 2009).

**Results**
Individual and group analyses were completed for this study and a various statistical methods were used to evaluate the data. Two regression analyses were completed to show the associations among variables; one multivariate and one group analysis (absolute yes or no). A linear correlation coefficient calculation between personality traits (grouped) and all other variables was also performed. In this study, outcomes with a probability greater than $P = 0.05$ were considered to be insignificant. Of the 10 participants, 4 scored high for agreeableness, 2 scored high for openness, 1 scored high for conscientiousness, 1 for extraversion, and 2 scored high for neuroticism. Figure 1 shows a graph of the personality trait percentages of the participants. Figure 2 shows the sum of the number of records for each Big Five trait and the corresponding outcomes.

Using a regression model to predict the relationship between the Big Five personality traits and outcome (perceived benefit), the correlation coefficient was .37 revealing an $r^2$ of .136 or roughly 14 percent of the variability in the outcome mean that could be explained by the model, leaving the other 86 percent unexplained (Figure 3). Although it yields a positive correlation, the data are scattered and not closely fitted to the regression line. The strength of the linear association between these variables is borderline weak/moderate. These data suggest that there may be a predictive relationship between participants who are highly characterized as extroverts, agreeable, conscientious, or open, and varying degrees of positive perceived benefit with hearing aid use. There may also be a relationship between participants who are highly neurotic or easily experience emotional distress, and a negative or non-existent perceived benefit from hearing aid use. A $P$-value of .29 indicates that these data are not statistically significant.

When considering an all or nothing response (perceived benefit or no perceived benefit) based on personality, outcome measures were grouped as follows; better and much better =
perceived benefit, and slightly better and below = no perceived benefit (this is inclusive of participants who never returned for a post fit evaluation). Note: Two of the three individuals lacking a post fit evaluation scored high for neuroticism and it cannot be said whether or not the no call/no show to assess outcome can be attributed to the personality trait. See Table 1 for linear correlation coefficients between personality trait category and multiple dependent variables.

Figure 4 depicts a regression model for an absolute yes or absolute no perceived benefit based on the Big Five personality traits. The correlation coefficient was .39 revealing an $r^2$ of .152 or approximately 15 percent of the outcome variability that was able to be explained by the model. Analysis yielded a $P$-value of .26 and is not statistically significant.

**Discussion**

Limitations of the study

The predominant limiting factor in this study was the sample size. An N of 10 was not nearly a large enough representation of the population especially when considering five different personality traits needing to be represented or accounted for. Additionally, post fit evaluation data (subjective validation measures) to assess perceived benefit was key in determining the relationship between personality and outcome. With three participants not completing the process, the strength of the results was affected.

Implications of the results

Although the results show a positive but weak relationship, it is fair to say that it is possible that it is a result of limited data and is worth looking into a bit further. Similar studies with a larger applicant pool, though very few have been performed, show positive relationships between high scores for extroversion, openness, and conscientiousness and positive hearing aid uptake. High
scorers for neuroticism were also shown to be linked to negative hearing aid uptake. Even in consideration of larger studies, for both positive and negative relationships, it has not been found that the correlations were consistently significant.

What can be determined from this study is that the linear regression correlation coefficients of both the scaled levels of outcome and the absolute yes or no levels of outcome are very close in value. It would be of great benefit to continue to use ranking in benefit to determine satisfaction outcome rather than an absolute yes or no since there is no significant difference in the values of the methods. It is also possible that perceived benefit can shift as a function of programming, different approaches to counseling and expectations, and with time, even when first considering the personality trait to help shape the process and aid in uptake. Although personality studies in other areas show human behavior and performance to be predictable, it can also be variable as some outcomes tend to yield results that were not expected.

Personality definitely plays a role in hearing aid uptake as most clinicians have seen in clinical practice. There are surely other less significant but compounded factors that also lend a hand in the determination of perceived benefit. With so many other possible variables, it is difficult to say whether or not to issue a personality questionnaire before prescribing a hearing aid could be considered a worthwhile added measure. The Appendix will show relevant data tables and figures, some which reveal a relationship and others which do not. Although these supporting data do not affirm nor deny causality of the relationships between personality and perceived benefit of hearing aid use established in this study, they are confounding variables nonetheless and should be taken into consideration when analyzing the datasets.
References


Figure 1. Participant personality trait percentages

Figure 2. Outcome vs. Traits
Figure 3. Regression analysis for Traits vs. Outcome

Figure 4. Regression analysis for Traits vs. Outcome (all or nothing model)
Appendix A

<table>
<thead>
<tr>
<th>Correlation Coefficient</th>
<th>Device</th>
<th>Gender</th>
<th>Race</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personality Traits</td>
<td>0.8007</td>
<td>0.4880</td>
<td>0.7986</td>
<td>0.5324</td>
</tr>
<tr>
<td>Age</td>
<td>0.3067</td>
<td>0.1917</td>
<td>0.3701</td>
<td>0.3912</td>
</tr>
</tbody>
</table>

Table 1. Linear correlation coefficients for personality traits category re: multiple variables

Informational Bar Graphs
Appendix A (Continued)

Unilateral/Bilateral vs. Outcome

<table>
<thead>
<tr>
<th>COSI Outcome</th>
<th>Bilateral</th>
<th>Unilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Better/CCLD</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Much Better</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>No PFE</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Slightly Better</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

Sum of Number of Records for each COSI Outcome broken down by Unilat/Bilat.

Race vs Unilateral/Bilateral

<table>
<thead>
<tr>
<th>Race</th>
<th>Bilateral</th>
<th>Unilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Caucasian</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Sum of Number of Records for each Race broken down by Unilat/Bilat.

Device vs Unilater/Bilateral

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Bilateral</th>
<th>Unilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTE</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>ITE</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Lyric</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Sum of Number of Records for each Device Type broken down by Unilat/Bilat.
Appendix A (Continued)

Device vs Race

Race vs. Site

Outcome vs Gender

Sum of Number of Records for each Race broken down by Device Type.

Sum of Number of Records for each Race broken down by Site.

Sum of Number of Records for each COSI Outcome broken down by Gender.
Figure 4. Regression model for traits vs, devices
Appendix B

COSI (Subjective Measure of Validation) National Acoustic Laboratories

The following documents may be freely downloaded and reproduced for use with individual patients. Commercialization of COSI™ is strictly prohibited unless agreement from NAL has been obtained.

- The COSI™ Questionnaire
Appendix C

How I am in general

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

<table>
<thead>
<tr>
<th>8 Agree strongly</th>
<th>7 Agree a lot</th>
<th>6 Agree a little</th>
<th>5 Neither agree nor disagree</th>
<th>4 Disagree a little</th>
<th>3 Disagree strongly</th>
</tr>
</thead>
</table>

I am someone who...

1. _____ Is talkative
2. _____ Tends to find fault with others
3. _____ Does a thorough job
4. _____ Is depressed, blue
5. _____ Is original, comes up with new ideas
6. _____ Is reserved
7. _____ Is helpful and unselfish with others
8. _____ Can be somewhat careless
9. _____ Is relaxed, handles stress well.
10. _____ Is curious about many different things
11. _____ Has a talent for energy
12. _____ Starts quarrels with others
13. _____ Is a reliable worker
14. _____ Can be tense
15. _____ Is ingenious, a deep thinker
16. _____ Generates a lot of enthusiasm
17. _____ Has a forgiving nature
18. _____ Tends to be disorganized
19. _____ Worry a lot
20. _____ Has an active imagination
21. _____ Tends to be quiet
22. _____ Is generally trusting
23. _____ Tends to be lazy
24. _____ Is emotionally stable, not easily upset
25. _____ Is inventive
26. _____ Has an assertive personality
27. _____ Can be cold and aloof
28. _____ Perserves until the task is finished
29. _____ Can be moody
30. _____ Values artistic, aesthetic experiences
31. _____ Is sometimes shy, inhibited
32. _____ Is considerate and kind to almost everyone
33. _____ Does things efficiently
34. _____ Remains calm in tense situations
35. _____ Prefers work that is routine
36. _____ Is outgoing, sociable
37. _____ Is sometimes rude to others
38. _____ Makes plans and follows through with them
39. _____ Gets nervous easily
40. _____ Likes to reflect, play with ideas
41. _____ Has few artistic interests
42. _____ Likes to cooperate with others
43. _____ Is easily distracted
44. _____ Is sophisticated in art, music, or literature

BFI (Personality Assessment) Oliver P. John- Director, Berkley Personality Lab

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