

## **Does Hearing Assistive Technology Provide Benefit to Nursing Home Residents with Dementia? A Pilot Study**

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### **Abstract**

#### **Rationale**

The goal of the study was to evaluate the benefits obtained when residents were trained and fitted with Hearing Assistive Technology (HAT).

#### **Methods**

A longitudinal time-series design was used to determine if nursing home residents with dementia would show improved cognitive function and quality of life when fitted with a HAT and trained on its use. Ten nursing home residents with a mean age of 86.5 years were fitted with a HAT (personal sound amplifier) and 7 were followed for 8 weeks. Each resident completed the Nursing Home Hearing Handicap Index (NHHI), and a certified nurse assistant completed the Staff NHHI. Mini Mental Status Evaluation (MMSE) results also were compared pre- and post-fitting with the HAT.

#### **Results**

No differences were found on the MMSE pre- to post-fitting. Self and Staff NHHI scores were similar. Three of the 10 people rejected the device and returned them immediately. Two individuals became interested in new hearing aids.

#### **Conclusion**

Developing communication strategies programs for groups or individuals in nursing homes might be helpful for staff and residents. Further research on using HATs in nursing homes to improve communication abilities of residents would be beneficial.

### **Introduction**

#### **Does Hearing Assistive Technology Provide Benefit to Nursing Home Residents with Dementia?**

It is well documented that elderly individuals living in nursing homes have some hearing impairment. Prevalence has been reported to be between 30-98% in the

institutionalized elderly (American Speech-Language-Hearing Association (ASHA), 1997; Garahan, Waller, Houghton, Tisdale, & Runge, 1992; Gutnick, Zillmer, & Philput, 1989; Kennedy-Malone, Fletcher, & Plank, 2004; Norwood-Chapman & Burchfield, 1999). The presence of a hearing loss can exacerbate feelings of isolation, loneliness, and depression and adversely affect the quality of life of nursing home residents. (Appollonio, Carabellese, Frattola, & Trabucchi, 1996; Walhagen, Pettengill, & Whiteside, 2006). An elderly nursing home resident with a hearing loss may have trouble understanding conversation, and this difficulty can lead to isolation and withdrawal from activities.

Although most nursing home residents have a hearing loss, hearing aid use is not common. Hearing aids in the nursing home are problematic, as they often are lost or broken (Cohen-Mansfield & Taylor, 2004b). Furthermore, residents often need assistance using a hearing aid. Other reasons may be financial considerations, inability to manipulate the controls, as well as cognitive status (ASHA 1997). Cohen-Mansfield and Taylor (2004a, 2004b) investigated the use of hearing aids and identification of hearing impairment in nursing home residents. In general, hearing aid use was inconsistent, and hearing impairment evaluated using questionnaires and chart reviews often was underestimated. Burnip and Erber (1997) reported that nurses underestimated the prevalence of hearing loss in nursing home residents. This was particularly true for those residents who had dementia.

Lin et al. (2011) investigated hearing impairment and cognitive function in a study covering an 11-year period and found that

those individuals living in the community who were diagnosed with dementia were more likely to have a hearing loss. That is, there was a positive association of hearing loss with dementia. Jupiter (2012) found that nursing home residents who had greater than a mild hearing loss had poorer scores on the Mini Mental Status Evaluation (MMSE; Folstein et al., 1975), indicating a positive relationship between hearing loss and dementia. Hearing impairment and its effect on the quality of life and dementia with nursing home residents was evaluated by Tsuruoka et al. (2001), and although they did not find a significant correlation between the Hasegawa Dementia Rating Scale (a scale of cognitive function), hearing level, and age, there was a trend of decreasing scores on the scale as hearing impairment increased.

The use of amplification may delay or postpone further cognitive decline. Ohta, Carlin, and Harmon (1981) and Weinstein and Amsel (1986) reported a positive relationship between hearing impairment and scores on the Mental Status Questionnaire (MSQ). Allen et al. (2003) evaluated the benefit of fitting individuals diagnosed with dementia with hearing aids. Overall results indicated that all of the individuals benefitted from amplification, although there was no improvement in cognitive function. Weinstein, Sirow, and Moser (2016) investigated if fitting hearing aids to elderly individuals in the community reduced social and emotional loneliness. They reported that loneliness scores, as measured by the DG Loneliness Scale, were significantly reduced after four weeks of hearing aid use. Their results indicated that hearing aids can improve social interaction and participation in activities. Although individuals in this study were living in the community, nursing home residents may improve their quality of life by engaging in everyday activities.

As the elderly in nursing homes face difficulties using hearing aids, other amplification devices are available and should be explored. One option is providing hearing assistive technology (HAT) to the residents. Hearing assistive technologies are inexpensive, easy to use, and may help the elderly who have a hearing impairment successfully participate in daily activities. Currently, the Minimum Data Set (MDS; Centers for Medicare and Medicaid Services, 2010) requires the use of a HAT device or hearing aid on intake to the nursing home; therefore, it is appropriate to evaluate the use of HATs within nursing home settings.

The purpose of this study was to evaluate if elderly nursing home residents with a hearing impairment and mild to moderate dementia benefit from using a HAT device.

## Methods

Institutional Review Board approval was obtained from St

John's University and Jewish Home Lifecare. All individuals were recruited from the long-term care population of Jewish Home Lifecare, which was a 514 bed skilled nursing care facility. The nursing home had a full-time house staff of physicians, as well as skilled nurses and attending physicians. They provided both short-term post-operative care and residential long-term care for older individuals who had Alzheimer's disease, as well as other health conditions.

An initial cohort of 24 individuals from a previous study (Jupiter, 2012) had indicated a desire to try amplification. A list of individuals was generated and reviewed with the staff. Individuals were excluded if they had hearing aids, scored less than 10 on the MMSE, or were considered too agitated by the nursing staff at the start of the investigation. The remaining individuals were approached by the investigator and shown the HAT, a SuperEar personal sound amplifier Model SE4000, and asked if they would agree to participate in the study. Written informed consent was obtained from each resident. All of the residents were told that they could keep the HAT. Of the initial group, 7 agreed to participate and 3 new residents known to the staff were recruited. There were 8 females and 2 males. Mean age was 86.5 years; mean number of years living in the nursing home was 2.4 years. Pure-tone audiograms were available for all of the residents and documented that each resident had at least a bilateral moderate sensorineural hearing loss. Right ear mean pure-tone average (PTA) was 61.6 dB HL and mean PTA for the left ear was 65.6 dB HL. All of the residents demonstrated mild-moderate dementia (scores of 12-24) on the MMSE (Folstein et al., 1975). The median MMSE score for the resident pre-fitting was 20 (range 12-24). The MMSE score pre-fitting was obtained from the patient's medical chart and had been administered within 6 months. The medical conditions of the residents included hypertension, embolism, debility, thrombosis, depression, kidney disease, diabetes, pancreatitis, and congestive heart failure. These are typical conditions for elderly nursing home residents and did not interfere with their use of the device.

Each individual was fitted with the HAT and trained to use it during an initial half-hour session. The resident and the certified nurse assistant (CNA) familiar with the resident completed the Nursing Home Hearing Handicap Index (NHHI) (Schow & Nerbonne, 1977). The NHHI was designed to evaluate the effects of a hearing loss on the everyday life of the resident. There were two versions, a resident version and a staff version.

A longitudinal time-series design was used to evaluate the effectiveness of using HAT with the residents. During the initial session, communication difficulties were discussed and the resident was given the HAT. All of the residents and

CNAs were English speakers and indicated that they communicated in English. Each resident and CNA was shown how to use the device by the investigator, and an introductory session was conducted. Each resident was shown the on/off switch, volume control switch, microphone movement, and how to hook the HAT to a waistband or wear around the neck with a lanyard. In addition, demonstrations regarding the benefits of amplification were conducted in the following manner: The HAT was turned on and off while the TV was on, conversation with the resident was conducted with the HAT turned on and then off, and conversation was held outside of the room with the device turned on and off. The demonstration ended with a discussion of activities where the use of the HAT would be beneficial such as Bingo, group discussions, and watching movies. Each resident was asked to demonstrate use of the device at the end of the initial training. Family members were not available for training or demonstration and were not frequent visitors to the nursing home. The resident's CNA was available during the training session and understood the use of the device.

At the completion of the session, the MMSE and NHHI were administered to each resident fitted with a HAT. The CNA familiar with the resident completed the NHHI Staff version. A Doctor of Audiology (Au.D.) student administered the post-fitting MMSE and NHHI to the residents and staff respectively. The investigator was responsible for training. Each visit lasted approximately 15-30 minutes.

A 30-minute session was considered by the staff to be the maximum amount of time that the residents would be able to concentrate. For the next 8 weeks, each resident was

visited by the investigator and an Au.D. student. The initial intent was to engage each resident in facilitative and repair communication strategies using the device; however, this was not possible due to the poor use of the HATs. Therefore, each visit consisted of a discussion encouraging use of the device, benefits of use, possible communication repair and facilitative strategies, and a repetition of the above demonstration of use of the HAT.

## Results

The median pre-fitting MMSE score was 18 (range 15-29) and the median post-fitting score was 20 (range 15-29), indicating similar scores from pre- to post-fitting. The median NHHI score was 65 for the residents and 62 for the staff, suggesting essentially no differences for both measures. Table 1 shows individual scores for each resident. In some cases, the resident scored higher on the NHHI and in other cases the nurse scored the resident as having more difficulties.

Three of the 10 residents returned the HAT immediately after being fitted. The remaining 7 residents remained in the study. Observation of the use of the device was noted on each visit by the investigator and Au.D. graduate student, and overall findings are as follows:

Two residents reported that the HAT was too bulky, they did not like the earphones, and they did not use the device after the initial visit, but they did not want to return it. After each session, they indicated they would use the device, but this was not verified by the CNA. One resident left the HAT on and the battery died, and one resident used the device for Bingo. Four of the 7 residents did not like the device, and

**Table 1. Staff and Self NHHI and MMSE Scores and Use of HAT for each Nursing Home Resident**

Resident	Staff NHHI Score	Self NHHI Score	Pre-Fitting MMSE	Post-Fitting MMSE	Use of HAT
1	60	66	15	15	Hearing Aid Ordered
2	42	56	16	17	Hearing Aid Ordered
3	34	40	18	19	Too Bulky
4	64	100	29	29	Too Bulky
5	100	64	18	20	Rejected
6	100	72	19	20	Rejected
7	52	68	22	24	Battery Died/Bingo Use

were not interested in any type of amplification. Two residents requested a new hearing aid. One resident, who was a previous hearing aid user, obtained a smaller HAT from his family and was waiting for a new hearing aid. Overall, the residents forgot that they had the device, did not remember how to use it, and had difficulty learning something new.

## Discussion

The purpose of the study was to determine if fitting of a HAT can improve the quality of life and cognitive function of nursing home residents with dementia. Overall MMSE scores did not change pre- to post-fitting of the HAT. This may have been due to the limited and poor HAT use by the residents.

There were several problems associated with using the device. Residents often forgot that they had the device. Most of the residents complained that the device was bulky, that they did not like wearing earphones, and thought it was too much trouble to use.

The NHHI scores indicated that residents were aware that they had difficulty hearing. The comparison with the staff and self-report NHHI questionnaires were inconsistent. In part, this difference can be attributed to factors other than hearing difficulties. Often residents who were not always cooperative in daily activities scored higher (more problems hearing) on the NHHI than those who were more compliant. For example, Resident 4 was a 98-year-old woman who had been a previous hearing aid user; she was a quiet woman who sat and read most of the time. This resident scored 100 on the Self NHHI version, whereas the nurse scored 64 for this woman. On the other hand, Resident 5 was a 91-year-old woman who scored 64 on the Self NHHI version, but the nurse scored 100 for this individual. Resident 5 was a difficult resident, with some personality issues and often was argumentative. Although overall use of the HAT was not successful, two of the residents did become interested in obtaining new hearing aids, and one resident was using an HAT purchased by his family. It is possible that HAT that is smaller, lighter, and could be tucked into a pocket or worn on a lanyard might be more acceptable to the residents.

Given the similar scores obtained from both the CNAs and the residents on the NHHI, it is apparent that the nurses in the current study were aware of the communication difficulties that the residents experienced. Gold, Lightfoot, and Chisolm (1996) evaluated a group of patients attending a Memory Disorders Clinic. They reported that patients with Alzheimer's disease were not able to provide reliable reports of the presence of a hearing impairment. In addition, results comparing the caregiver and patients scores on the HHIE-S

showed that caregiver scores were significantly poorer than the patient scores. In this study, the scores were more varied perhaps due to the fact that a CNA and not a family caregiver evaluated the patient. In addition, all of the participants were nursing home residents and their lifestyles tend to differ from elderly community-based individuals.

Although initially all of the nurses were interested and supportive of the use of the HAT with the residents, the nurses were not always available to reinforce or help the residents. Staff training about amplification use and the importance of hearing, especially in residents with dementia, is a critical need in nursing homes. Hearing loss does not necessarily cause reduced cognitive function, but the effects of decreased hearing sensitivity can lead to a poorer quality of life and increase the likelihood of cognitive decline.

Several of the nurses requested a HAT that would be available on the floor for staff and family members to use. Given that HATs are inexpensive and easy to use, it is suggested that nursing homes consider supplying several devices for use on each floor.

In addition, group or individual communication programs can be initiated for all of the residents in the nursing home. The goal of these programs is to improve speech recognition and communication ability. Programs can include auditory training, speech reading, education, counseling, and can help change the behavior of the resident during conversations or activities. Tye-Murray (2009) divided communication strategies into two categories: facilitation and repair. Facilitation teaches the individual to control the environment and use contextual and linguistic cues. Repair strategies provide the individual with specific activities that can be used to improve communication. The overall aim of a communication program is to provide the residents with techniques that will enable them to improve their ability to successfully communicate either with or without amplification. Although hearing impairment is highly prevalent in nursing homes, how residents can be helped to communicate and fully participate in activities has not been successfully addressed. Group sessions can address some of the issues associated with poor communication.


Reducing noise levels in nursing homes also will improve communication. Elderly individuals who have a hearing loss and some cognitive decline need speech to be at least 10-20 dB louder than the noise for speech communication in daily life (Nabelek & Nabelek, 1994). It has been reported that noise levels in nursing homes are often above the EPA recommended levels of 45 dB SPL during the daytime and 35 dB SPL at night (EPA, 1974). Lau and McPherson (2002) found that average noise levels at 500 Hz, 1000 Hz, 2000 Hz, and

4000 Hz were well above the recommended levels in nursing homes. Implementing noise reduction techniques in nursing homes such as using sound boards, decreasing levels of overhead paging, using carpeting, double paned windows, acoustically soft furnishings, reducing levels of the TV in common areas, and providing some quiet rooms for conversation could help residents living in nursing homes to communicate and improve their quality of life (Baccash et al., 2007; Lau & McPhearson, 2002).

It should be noted that all of the participants were eager to try the device, and it was expected that they would represent the most likely residents to be successful users. This prediction was not the case and indicated a limitation of the study related to the participants. Further research is needed on how to encourage both nursing home staff and residents to understand the value of using amplification.

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