Effectiveness of Auditory Training Programs for Older Adults with Hearing Loss

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Introduction

In recent years complex auditory training programs (ATPs) have begun to emerge. A main purpose of these programs is to assist individuals with hearing impairment make better use of their hearing aids. In 2008, a systematic review was completed to determine the effectiveness of auditory training programs1. At that point in time, Sweetow & Palmer (2008) determined that there was "very little evidence for the effectiveness of individual auditory training" (p. 501). However, much new research has been completed since 2008 and many new ATPs have been created.

Question

The present systematic review will investigate if ATPs are effective in improving communication in older adults with hearing impairment. In order to draw conclusions about the development of effectiveness in ATPs since 2005, the procedure that Sweetow and Palmer (2005) utilized will be followed. The older adult population is the focus of this review because the majority of people with a hearing impairment are older adults and research has shown that older adult's perceptual listening experiences are different from those of young adults2,3.

Search Terms

Hearing Loss	**Hearing aids, Auditory processing, High frequency, Presbycusis, Age-related hearing loss, Hearing impairment, Sensorineural hearing loss, Sensorineural hearing impairment**

Inclusion / Exclusion Criteria

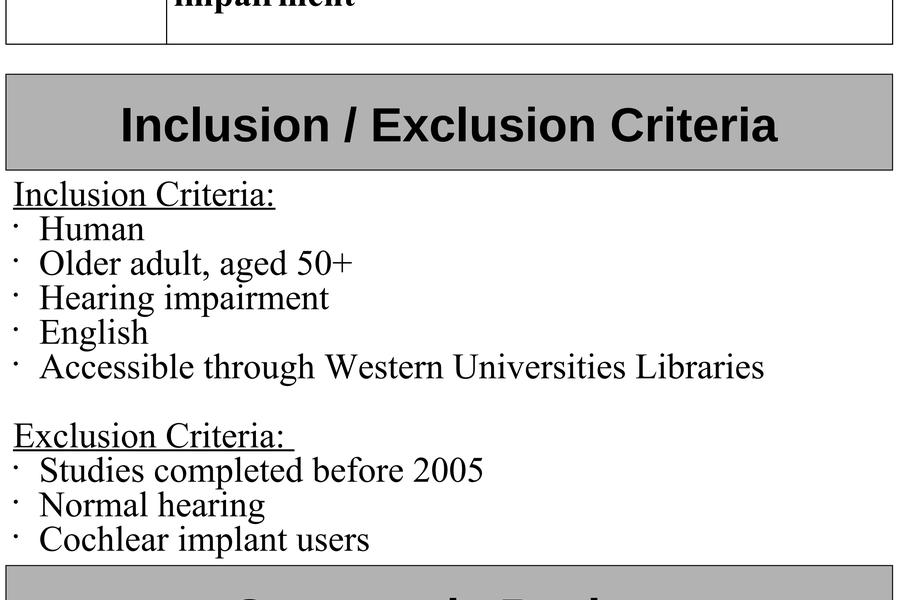
Inclusion Criteria:
- Human
- Older adult, aged 50+
- Hearing impairment
- English
- Accessible through Western Universities Libraries

Exclusion Criteria:
- Studies completed before 2005
- Normal hearing
- Cochlear implant users

Systematic Review

A systematic literature was conducted. Three databases were searched; Scopus, PubMed, and CINAHL.

Results:



Results

#	Reference	Design	Intervention	Outcome	Results	Comments
1	Megale, Iorio, & Schochat (2010)	Randomized control trial	An ATP focusing on temporal processing abilities, binaural integration, and dichotic speech perception.	Speech in noise, dichotic digits, and abbreviated profile of hearing aid benefit.	Significant improvement in auditory processing abilities over the group that did not receive auditory training.	New bilateral hearing aid users. n= 42
2	Humes et al. (2009)	Non-randomized intervention study	A word-based ATP, focusing on single words that frequently occur in the English language.	Central Institute for the Deaf everyday sentences.	Significant improvements in both groups following completion of the training program.	2 groups; young adults with normal hearing and older adults with hearing loss. n= 36
3	Santos et al. (2014)	Non-randomized intervention study	An ATP focusing on temporal processing abilities, dichotic hearing, and frequency and intensity discrimination.	Electrophysiological, behavioral and subjective outcomes.	Significant improvements on all the behavioural tests utilized. Some significant improvement on the subjective and electrophysiological tests utilized.	Did not utilize a standardized auditory training program. n=7
4	Burk and Humes (2008)	Non-randomized intervention study	A word-based ATP.	Open set word recognition, closed set word identification, novel words spoken by familiar and unfamiliar talkers, and sentence recognition.	Significant improvement in word intelligibility after the ATP but no significant improvement in novel word identification and sentence recognition.	n=8
5	De Miranda, Gil, & Martinelli-Iorio (2008)	Randomized control trial	An ATP focusing on memory, attention, background figure, and binaural integration.	Recognition of phrases in noise, speech recognition index test, speech test with white noise, and hearing handicap inventory for the elderly.	Significant behavioural and subjective improvement in the group that received the ATP.	Bilateral hearing aid users for at least 3 months. n=13 Inclusion criteria: speech recognition score of 72% or higher.
6	Anderson et al. (2013)	Randomized control trial	'Brain Fitness' an auditory based cognitive training program.	Auditory brainstem response to the speech syllable [da] in noise and quiet, speech in noise perception, memory, and speed of processing.	The experimental group had increased neural timing and demonstrated improvements in memory, speed of processing and speech in noise abilities.	n= 67 Screened for cognitive impairment.
7	Lavie et al. (2013)	Randomized control trial	An ATP consisting of free conversation.	Dichotic listening test for monosyllabic words.	Outcomes were slightly better in the group that received the ATP.	Bilateral hearing aid use. n=36 Screened for cognitive impairment.
8	Olson et al. (2013)	Randomized control trail	The DVD version of the Listening and Communication Enhancement (LACE).	Speech in noise, compressed speech, synthetic sentence identification, IOI-hearing aid, IOI-intervention, and SSQ.	Improvements in all participants regardless of if they were new or experienced hearing aid users but new users reported more benefit than experienced users.	Bilateral hearing aid use. n=29 Three groups; new hearing aid with training, experienced hearing aid with training, and control (new hearing aid and no training).

ATPs have begun increasingly more convenient for patients6 as they can now be done at home and on multiple devices. This convenience has allowed for more studies to be completed with more participants, and with increasing compliance. However, similar to Sweetow & Palmer (2005) findings, the studies in this review are not consistent in the ATP studied, the outcome measures utilized1, or hearing aid use. While most of these studies did find statistically significant results, these inconsistencies make it impossible to infer stronger conclusions about the effectiveness of ATPs in older adults with hearing impairment.

This systematic review revealed many promising findings. Temporal processing abilities did seem to improve and they improved more than matched younger adults5,3. This suggests that ATPs may be combating the negative effect of aging on audition. There were also improvements in self assessment of auditory handicap4,7,10, which could lead to improvements in communication confidence. Data that examines the electrophysiological changes in participants after completing an ATP is a promising direction for future research. Although Santos et al. (2014) did find auditory brainstem response changes following completion of an ATP, there were inconsistencies in the changes and the sample size was quite small.

There are several plausible confounding factors that future studies need to take into account. First, cognition could be playing a role in the outcomes of the results and not all studies took cognitive effects into account. Second, future research needs to determine if these effects are long-term in nature. Although previous studies have documented long-term change3, none of these studies focused on older adults. Finally, all the studies ensured that participants adhered to the program. While this is necessary for an experimental study it is not consistent with the realities of usage among clients. A study which investigates the effectiveness of ATPs with real-world usage is necessary before audiologists can begin to recommend these programs with confidence.

References

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