Phonak
Quick Practice Guideline

The Phonak quick guide to the management of severe to profound hearing loss in adults

December 2020

Introduction

The consequences of severe to profound hearing loss dramatically changes the life experience and opportunities of those with the hearing loss and the people closest to them (Grenness et al. 2014).

Several studies have identified higher levels of social isolation, anxiety and depression among adults with severe to profound hearing loss, compared to their better-hearing peers (Hallam, Ashton, Sherbourne & Gailey, 2006; Grimby & Ringdah, 2016).
Young people are less likely to go to university or work full time compared to their hearing peers (Cameron et al., 2008).

Many will have tinnitus (Carlsson et al., 2014) and the majority will struggle with other attributes of ageing, declining vision, mobility, dexterity, cognition and general health.

Severe to profound hearing loss has been found to negatively affect quality of life, regardless of age or suddenness of onset (Carlsson et al., 2014) and to negatively impact activities of daily living (Gopinath et al., 2013; Turton & Smith, 2013).

This guide recognizes that the audiological management of mild to moderate hearing loss is sometimes insufficient to address the special needs of adults with severe to profound hearing loss. It will suggest a range of useful tools, available in multiple languages (where possible) and highlight those available from Phonak. There will be practical information about how to optimize the outcomes for adults with severe to profound hearing loss and their family/communication partners. The quick guide is based on a search of evidence in the scientific literature and when there is insufficient evidence available, on expert opinion.[1]

[1] The recommendations are from Turton, L. (editor), Souza, P., Thibodeau, L., Hickson, L., Gifford, R., Bird, J., Stropahl, M., Gailey, L., Fulton, B., Scarinci, N., Ekberg, K., Timmer, B. (2020). Guidelines for Best Practice in the Audiological Management of Adults with Severe and Profound Hearing Loss. Seminars in Hearing, 41(3), 141–245.

Does your client understand?

Before any specific audiological management, consider whether your client in particular, their family or communication partner, can understand you. Be sure to use appropriate language and terminology individualized to the client, for any information, advice and counselling. Failure to check the client's understanding is the single most common reason for clients' limited compliance with recommendations and the hearing care professionals' failure to offer appropriate interventions.

Assessment

People with severe to profound hearing loss should receive an individually tailored audiological assessment, which should include a comprehensive audiological examination including case history, otoscopy and behavioral and other auditory measures. The elements for the auditory assessment include, but are not limited to:

- Assessment of the need for additional evaluation and/or medical referral
- Assessment of candidacy for amplification and for other treatments (including tests of speech discrimination)

Table of suitable speech tests, ordered by increasing difficulty

Tests type	Tool	Reference
Sentences in quiet	BKB-A sentence lists	Bench, J., Kowal, A. & Bamford, J. (1979) The BKB (Bamford-Kowal-Bench) sentence lists for partially hearing children. *British Journal of Audiology* 13(3),108-112
	AzBio sentence lists multiple languages	Spahr, A., Dorman, M., Litvak, L., Van Wie, S., Gifford, R., Loizou, P., Loiselle, L. Oakes, T. & Cook, S.(2012) Development and Validation of the AzBio Sentence Lists. *Ear and Hearing* 33(1), 112-117
	CUNY sentence lists	Boothroyd, A., Hanin, L. & Hnath, T. (1985) A sentence test of speech perception: reliability, set equivalence, and short-term learning. *CUNY Academic Works.* Accessed online on November 2nd 2019, at https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=1443&context=gc_pubs
Words in quiet	AB word lists	Boothroyd, A. (1968) Developments in Speech Audiometry. *British Journal of Audiology* 7(3), 368-368
	CNC word lists multiple dialects	Peterson, G. & Lehiste, I. (1962) Revised CNC Lists for Auditory Tests. *Journal of Speech and Hearing Disorders* 27(1), 62
Sentences in noise	BKB-SIN sentences	Niquette, P., Arcaroli, J., Revit, L., Parkinson, A., Staller, S., Skinner, M. & Killion, M. (2003) Development of the BKB-SIN Test. Paper presented at the annual meeting of the *American Auditory Society*, Scottsdale, AZ
	HINT sentences multiple languages	Nilsson, M., Soli, S. & Sullivan, J. (1994) Development of the Hearing in Noise Test for the measurement of speech reception thresholds in quiet and in noise. *Journal of the Acoustical Society of America* 95(2), 1085-1099
	Matrix test multiple languages	Wagener, K.C., Brand, T., Kollmeier, B. (1999). Test at: https://www.hoertech.de/images/hoertech/pdf/mp/produkte/intma/Broschre_Internationale_Tests_2019_WEB_klein.pdf

Examine communication difficulties

It is important to examine the self-reported communication difficulties experienced by the client (for example, activity limitations and participation restrictions). This assessment should cover the client's hearing and communication needs at home, at work or in education, and in social situations. It is helpful to include the degree and type of support that can be expected from family and other significant communication partners (NICE Hearing loss in adults, 2018).

Table of useful tools for assessing communication needs, including family members

Test type	Tool	Reference
Expectation questionnaires	COAT Characteristic of Amplification Tool	Sandridge, S. & Newman, C. (2006) Improving the Efficiency and Accountability of the Hearing Aid Selection Process – Use of the COAT. *Audiology online* accessed on November 2nd 2019 at *https://www.audiologyonline.com/articles/improving-efficiency-and-accountability-hearing-995*
Needs analysis questionnaires	COSI Client-Orientated Scale of Improvement	Individualized, based on up to five user-nominated goals, categorized and with improvement subjectively rated. Dillon, H., James, A. & Ginis, J. (1997) Available at: https://www.nal.gov.au/products/downloadable-software/cosi-and-hauq/
	GHABP Glasgow Hearing Aid Benefit Profile (GHABP)	Gatehouse, S. (1999) Glasgow Hearing Aid Benefit Profile: Derivation and validation of client-centred outcome measures for hearing aid services. *Journal of the American Academy of Audiology* 10, 80-103.
	SSQ Speech, Spatial and Qualities of Hearing scale (SSQ-12)	Noble, W., Søgaard Jensen, N., Naylor, G., Bhullar, N. & Akeroyd, M. (2013) A short form of the Speech, Spatial and Qualities of Hearing scale suitable for clinical use: The SSQ12. *Int J Audiol* 52(6), 409-412.
Measures for communication partners	SOS-HEAR Significant Other Scale for Hearing Disability	Scarinci, N., Worrall, L., Hickson, L. (2009) Test at: https://shrs.uq.edu.au/communication-disability-centre
	FOCAS Family-Oriented Communication Assessment and Solutions	Crowhen, D. & Turnball, B. (2018) Test at: https://www.phonakpro.com/content/dam/phonakpro/gc_hq/en/resources/counseling_tools/documents/interactive_focas.pdf User Guide at: https://www.phonakpro.com/content/dam/phonakpro/gc_hq/en/resources/counseling_tools/documents/how_to_use_focas.pdf

Selecting hearing aids

When selecting hearing aid technology, some examples of special considerations are:

Compression

Clients with severe to profound hearing loss should be fitted with compression parameters which result in improved speech audibility and avoid distortion of usable speech cues. Output limiting should be appropriately set to avoid loudness discomfort or auditory damage due to over-amplification.

Table of useful information on compression speed in Phonak Naída™ hearing aids

Naída Phonak hearing aids slow compression	When required, slow compression can be selected in Phonak Target, when fitting Naída hearing aids, by using the proprietary fitting formula Adaptive Phonak Digital Contrast or Tonal. REM or the test box can be used to match to generic prescription targets.
Naída Phonak hearing aids fast compression	Fast compression is the default in Phonak Target, for Adaptive Phonak Digital (fast compression is always applied for the classification of speech in quiet), NAL-NL1/2 and all DSL formulas.

Programs

Clients with severe to profound hearing loss should be fitted with programs that maximize the available speech information. Careful attention should be paid to providing noise reduction, including appropriately fit directionality and a program that facilitates convenient use of a remote microphone.

Frequency lowering

Frequency lowering should be used in cases where the resulting improvements in high-frequency sound audibility result in better speech recognition than with traditional frequency-gain processing alone. After parameter adjustment, frequency lowering should be validated objectively and subjectively.

Table of useful tools for the verification of frequency lowering

Tool	Reference
Frequency lowering fitting assistants	https://web.ics.purdue.edu/~alexan14/fittingassistants.html
UWO Plurals Test	https://www.dslio.com/?page_id=314
Phoneme perception test Multiple languages	https://www.phonakpro.com/au/en/resources/fitting-and-tests/phoneme-perception-test/overview-phoneme.html

Prescriptions and verification

Hearing aids for clients with severe to profound hearing loss should be fitted using real ear measures and a validated prescriptive target as the starting point for adjustments. After adjustment, real ear responses should be re-measured to evaluate audibility. Hearing aid gain and maximum output should be constrained to prevent damaging sound levels.

Acclimatization

Maximizing audibility is a priority for clients with severe to profound hearing loss. Reducing the gain for a period of acclimatization is not recommended. Following a change in amplification, consider replacing multiple fine-tunings by a period of auditory training.

Table of useful tools for the verification of the hearing aid frequency response

Tool	Reference
BAA Guideline (2018)	British Society of Audiology's Practice Guidance on the verification of hearing devices using probe microphone measurements https://www.thebsa.org.uk/wp-content/uploads/2018/05/REMS-2018.pdf
Target Match Multiple languages	https://www.phonakpro.com/content/dam/phonakpro/gc_hq/en/resources/fitting_test/target_fitting_software/documents/Fitting_Guide_TargetMatch_Phonak_Target_6.1_210x297_EN_V1.00.pdf

Selecting remote microphones

Hearing aids and/or cochlear implants are the most commonly fitted technologies for adults with severe to profound hearing loss. However, such devices do not meet all communication needs and remote microphone technology can be used to improve performance, for example, when having conversations in noisy environments or when listening to a speaker at a distance.

Table of useful tools for prescribing and fitting remote microphones

Tool	Reference
FOCAS Family-Oriented Communication Assessment and Solutions	Crowhen, D. & Turnball, B. (2018) Test at www.phonakpro.com (see links above in table "Tools for assessing communication needs")
TELEGRAM Telephone, Employment, Legislation, Entertainment, Groups, Recreation, Alarms & Members of the family	Thibodeau, L. (2004). Test at: https://www.utdallas.edu/hhlab/resources-and-publications/clinical-tools/
The Roger™ Easy Guide Multiple languages	www.easyguide.phonakpro.com
ASHA guideline(2002) Verification of remote microphones	American Speech Language Hearing Association (2002). https://www.asha.org/policy/GL2002-00010.htm
Guidelines and standards	Thibodeau, L. & Wallace, S. (2014). Guidelines and Standards for Wireless Technology for Individuals with Hearing Loss, *Seminars in Hearing*, 35,159-167.

Refer for cochlear implant assessment

Globally the criteria for cochlear implants varies and uptake can be low for a variety of reasons. Hearing care professionals should understand the local requirements and create a simple process for requesting CI assessment.
Be comfortable in starting the conversation with clients.

Ensure your client's chances of achieving their maximum auditory potential by beginning the conversation about cochlear implant early in their audiological care. The conversation can start well before your client reaches criteria levels. Start the conversation by introducing the cochlear implant as a part of a continuum of care that starts with hearing aid use and ultimately progresses to cochlear implant candidacy.

Table of useful tools for starting the conversation about cochlear implants

Tool	Reference
BAA guideline "It's time to talk about cochlear implants."	*British Association of Audiologists: (BAA Guideline) It is time to talk about Cochlear Implants. https://www.baaudiology.org/files/8515/6267/2610/CI_BAA_Dickinson_FINAL_BAAtitle4.pdf*

Understand the benefits of bimodal fittings

A bimodal fitting is one with a hearing aid on one ear and a cochlear implant on the other. Aided acoustic hearing may not afford high levels of speech understanding alone, when combined with a cochlear implant, bimodal listeners demonstrate significantly higher speech understanding and sound quality than provided by the cochlear implant or a hearing aid alone.

Table of useful tools for bimodal fitting

Tool	Reference
Naída™ Link A Phonak hearing aid specifically designed for bimodal fitting.	Phonak Naída Link supports bimodal capabilities with a compatible AB sound processor
Guidelines for best practice: Part 2 Bimodal fitting	Guidelines for best practice in the audiological management of adults with severe to profound hearing loss Part 2: Bimodal fitting (in preparation).

Other implantable devices

For individuals with bilateral severe to profound sensorineural hearing loss, neither middle-ear implants nor bone-anchored implants are viable treatment options.

Rehabilitation

Psychosocial and communication rehabilitation

All clients with severe to profound hearing loss need rehabilitation to ensure they make best use of the information delivered by their hearing devices. This includes help in adjusting to life with severe to profound hearing loss. Where appropriate, the hearing care professional should help educate the client with self-management strategies, for example conversation repair strategies, lip-reading and manipulating their environment.

Training

Training is useful to develop effective communication strategies, behaviors and attitudes, including help on how to modify the communication behavior of communication partners in their lives.
All clients with severe to profound hearing loss will need to supplement their amplified hearing with lip-reading and other communication strategies. Communication training is a process designed to enhance the ability to interpret auditory experiences by maximizing the use of any residual hearing and by using other cues, for example visual ones to add further information to the listening situation.

Table of useful online tools for auditory training

Tool	Reference
HearingSuccess Comprehensive place for online auditory training resources to support the journey to better hearing	www.hearingsuccess.com

Contact with peers to provide support and to reduce isolation

If not managed well, the feelings of isolation, marginalization, and loneliness associated with severe to profound hearing loss can result in the client withdrawing from social contact, leading to adverse mental health consequences and increased risk of accelerated cognitive decline. The hearing care professional should always facilitate clients with severe to profound hearing loss to meet others, as peer support is the most effective and efficient way of averting these consequences.

Table of useful resources for peer support

Tool	Reference
Groups Your local association of people with hearing impairment or deafness	https://www.ifhoh.org/ International Federation of Hard of Hearing People http://www.hearingloss.org Hearing Loss Association of America http://www.betterhearingaustralia.org.au/ Better Hearing Australia (National) https://www.audicus.com/Hearing Loss Association of America database.
Hearing Like Me Online chat and blog	https://www.hearinglikeme.com/

Guidance in selecting and using appropriate assistive listening device solutions

The hearing care professional should maintain an up-to-date knowledge of the types of assistive listening solutions appropriate for each type of environment. This includes Roger, inductive loops, alerting devices, Bluetooth and Wi-Fi for acoustic information as well as text-based communication support systems (e.g. subtitles). The rapid and exciting developments using smartphones are especially interesting and highly accessible, with minimal or no cost.

Table of useful tools for assistive devices

Tool	Reference
The Roger Easy Guide Multiple languages	www.easyguide.phonakpro.com
Apps for smartphones from Phonak	https://www.phonak.com/com/en/support/apps.html
Online device database Assistive technologies	US ABLEDATA: database https://abledata.acl.gov EU EASTIN: database www.eastin.eu AU NED: database **https://ilcaustralia.org.au/** CA ORTC :Ontario Rehabilitation Technology Consortium (Canada)
Hearing Dogs Find your local service dog provider	US https://duodogs.org/contact/ CA: https://www.hearingdog.org/ UK : https://www.hearingdogs.org.uk/ NZ https://hearingdogs.org.nz/ AU https://hearingdogs.asn.au/

Tinnitus

Tinnitus management practices recommended in the literature are largely independent of degree of hearing loss and many are applicable with normal hearing. Here are a few recommendations that are specifically applicable to adults with severe to profound hearing loss.

- Otoscopic examination should exclude cerumen as a likely source of tinnitus from the constant wearing of earmolds.
- Address the hearing loss as the first step in tinnitus management.
- Treatment using tinnitus noise generators in hearing aids should be used with extreme care when severe to profound hearing loss is present. Avoid applying masking noise in speech programs due to restricted dynamic range (reduced range between audibility and loudness discomfort) and the critical importance of sparse speech cues.
- Set up a separate for-tinnitus-only hearing aid program and check that the output level of the noise is sufficient to be audible (but not a listener nearby).

Table of useful tools for assessing tinnitus

Tool	Reference
TFI Tinnitus Functional Index Multiple languages	Useful to find the domains of life that are affected by tinnitus (i.e. sleep) Henry, J.A., Stewart, B.J., Abrams, H.B., Newman, C.W., Griest, S., Martin, W.H., Myers, P.J., Searchfield, G. (2014) Tinnitus Functional Index – Development and Clinical Application. *Audiology Today* 26(6):40-48
THI Tinnitus Handicap Inventory Multiple languages	Newman, C.W., Jacobson, G.P., Spitzer, J.B. (1996) Development of the Tinnitus Handicap Inventory. *Arch Otolaryngology*; 122:143-148
TQ Tinnitus Questionnaire Multiple languages	Hallam, R.S., Jakes, S.C., Hinchcliffe, R. (1988) Cognitive variables in tinnitus annoyance. *Brit J Clin Psychol;* 27:213-222

Measuring outcomes & long-term management

After assessment and interventions for the management of hearing loss, follow-up sessions are important in addressing the following:

- Measurement of outcomes and assessing if treatment goals have been addressed
- Exploring alternative interventions and screening for onward referral for cochlear implants
- Ensuring appropriate ongoing care

The assessment of outcomes is a key part of evidence based clinical practice, to assess the effectiveness of interventions, to enhance and monitor individual care and to evaluate services. Currently, there is general agreement on the importance of measuring outcomes, but poor consensus about the most appropriate assessment tools and no questionnaires developed for those with severe to profound hearing loss.

Table of useful tools for assessing outcomes

Tool	Reference
COSI Client-Orientated Scale of Improvement	Individualized, based on up to five user nominated goals, categorized and with improvement subjectively rated. Dillon, H., James, A. & Ginis, J. (1997) Available at. https://www.nal.gov.au/products/downloadable-software/cosi-and-hauq/
TELEGRAM Telephone, Employment, Legislation, Entertainment, Groups, Recreation, Alarms & Members of the family	A graphical presentation of hearing needs that can be completed before and after any intervention and incorporates a broad range of situations. Thibodeau, L. (2004). Test at: https://www.utdallas.edu/hhlab/resources-and-publications/clinical-tools/

FOCAS Family-Oriented Communication Assessment and Solutions	Crowhen, D. & Turnball, B. (2018) Test available at www.phonakpro.com (see links above in table: "Tools for assessing communication needs")

Conclusion

The management of severe to profound hearing loss is an ongoing process of continued hearing device optimization, promotion of self-management strategies, provision of advice and support and onward referral where appropriate. To be effective in the management of severe to profound hearing loss in adults, hearing care professionals need to continually develop their skills, exchange ideas and share support among each other.

References

American Speech Language Hearing Association (2002). Guidelines for Fitting and Evaluation of FM Systems. *ASHA Desk Reference.* Retrieved from https://www.asha.org/policy/GL2002-00010.htm

Bench, J., Kowal, A. & Bamford, J. (1979). The BKB (Bamford-Kowal-Bench) sentence lists for partially hearing children. *British Journal of Audiology* 13(3):108-112

Boothroyd, A. (1968). Developments in Speech Audiometry. *British Journal of Audiology* 7(3):368-368

Boothroyd, A., Hanin, L. & Hnath, T. (1985). A sentence test of speech perception: reliability, set equivalence, and short-term learning. *CUNY Academic Works*. Accessed online on November 2nd 2019 at https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=1443&context=gc_pubs

British Society of Audiology (2018) Practice Guidance on the verification of hearing devices using probe microphone measurements. Available at http://www.thebsa.org.uk

British Association of Audiologists: (BAA Guideline) It is time to talk about Cochlear Implants. https://www.baaudiology.org/files/8515/6267/2610/CI_BAA_Dickinson_FINAL_BAAtitle4.pdf

Carlsson, P., Hjaldahl. J., Magnuson, A., Terneval, E., Eden, M., Skagerskarand, A., & Jonsson, R. (2014). Severe to profound hearing impairment: quality of life, psychosocial consequences and audiological rehabilitation. *Disability & Rehabilitation*, Early Online: 1-8

Crowhen, D. & Turnball, B. (2018). FOCAS: Family Oriented Communication Assessment and Solutions – A new holistic tool for performance hearing needs assessments. *Hearing Review*, November: 20-26. http://www.hearingreview.com/2018/10/focas-family-oriented-communication-assessment-solutions/

Dillon, H., James, A. & Ginis, J. (1997). Client Oriented Scale of Improvement (COSI) and its relationship to several other measures of benefit and satisfaction provided by hearing aids. *Journal of the American Academy of Audiology*. 8:27-43.

Gatehouse, S. (1999). Glasgow Hearing Aid Benefit Profile: Derivation and validation of client-centred outcome measures for hearing aid services. *Journal of the American Academy of Audiology*. 10:80-103.

Gopinath, B., Schneider, J., McMahon, C. M., Burlutsky, G., Leeder, S. R., & Mitchell, P. (2013). Dual sensory impairment in older adults increases the risk of mortality: a population-based study. *PloS one*, 8(3), e55054. DOI: 10.1371/journal.pone.0055054

Grenness, C., Hickson, L., Laplante-Levesque, A., Davidson, B. (2014). Patient-centred care – A review for rehabilitative audiologists. *International Journal of Audiology*, 53(S), 60-67.

Grimby, A., & Ringdah, A. (2000) Does Having a Job Improve the Quality of Life among Post-Lingually Deafened Swedish Adults with Severe-Profound Hearing Impairment?, *British Journal of Audiology,* 34:3, 187-195, DOI: 10.3109/03005364000000128

Hallam, R.S., Jakes, S.C., Hinchcliffe, R. (1988). Cognitive variables in tinnitus annoyance. *Brit J Clin Psychol*; 27, :213-22

Hallam, R., Ashton, P., Sherbourne, K., Gailey, L. (2006) Acquired profound hearing loss: Mental health and other characteristics of a large sample, *International Journal of Audiology* 45(12), 715-723, DOI: 10.1080/14992020600957335

Henry, J.A., Stewart, B.J., Abrams, H.B., Newman, C.W., Griest, S., Martin, W.H., Myers, P.J., Searchfield, G. (2014). Tinnitus Functional Index—Development and Clinical Application. *Audiology Today* 26(6), 40-48

Newman, C.W., Jacobson, G.P., Spitzer, J.B. (1996). Development of the Tinnitus Handicap Inventory. *Arch Otolaryngology* 122, 143-148

NICE Guideline: Hearing loss in adults: assessment and management (2018) www.nice.org.uk/guidance/ng98

Nilsson, M., Soli, S. & Sullivan, J. (1994). Development of the Hearing in Noise Test for the measurement of speech reception thresholds in quiet and in noise. Journal of the *Acoustical Society of America* 95(2), 1085-1099

Niquette, P., Arcaroli, J., Revit, L., Parkinson, A., Staller, S., Skinner, M. & Killion, M. (2003). Development of the BKB-SIN Test. Paper presented at the annual meeting of the *American Auditory Society*, Scottsdale, AZ

Noble, W., Søgaard Jensen, N., Naylor, G., Bhullar, N. & Akeroyd, M. (2013). A short form of the Speech, Spatial and Qualities of Hearing scale suitable for clinical use: The SSQ12. *International Journal of Audiology*. 52(6): 409-412.

Peterson, G. & Lehiste, I. (1962). Revised CNC Lists for Auditory Tests. *Journal of Speech and Hearing Disorders*. 27(1)62

Sandridge, S. & Newman, C. (2006) Improving the Efficiency and Accountability of the Hearing Aid Selection Process – Use of the COAT. *Audiology Online* accessed on November 2nd 2019 at https://www.audiologyonline.com/articles/improving-efficiency-and-accountability-hearing-995

Scarinci, N., Worrall, L., Hickson, L. (2009). The Effect of Hearing Impairment in Older People on the Spouse: Development and Psychometric Testing of the Significant Other Scale for Hearing Disability (SOS-HEAR). *International Journal of Audiology* 48(10), 671-683.

Schmitt, N., Winkler, A., Boretzki, M., Holube, I. (2016). A Phoneme Perception Test Method for High-Frequency Hearing Aid Fitting. Journal of the *American Academy of Audiology* 27(5), 367-379(13). https://doi.org/10.3766/jaaa.15037

Spahr, A., Dorman, M., Litvak, L., Van Wie, S., Gifford, R., Loizou, P., Loiselle, L. Oakes, T. & Cook, S. (2012). Development and Validation of the AzBio Sentence Lists. *Ear and Hearing*. 33(1), 112-117

Thibodeau, L. (2004). Maximizing communication via hearing assistance technology: Plotting beyond the audiogram! *Hearing Journal*, 57(11), 46-51.

Turton, L., & Smith, P. (2013). Prevalence & characteristics of severe and profound hearing loss in adults in a UK National Health Service clinic. *International Journal of Audiology,* 52(2), 92-97. https://doi.org/10.3109/14992027.2012.735376

Wagener, K.C., Brand T., Kollmeier B. (1999). Entwicklung und Evaluation eines Satztests für die deutsche Sprache Teil III: Evaluation des Oldenburger Satztests. *Z. Audiol.*, 38(3):86-95