The search for validity evidence in the development of instruments in speech therapy: a systematic review

A busca de evidências de validade no desenvolvimento de instrumentos em Fonoaudiologia: revisão sistemática

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ABSTRACT

Purpose: To identify in the literature the use of psychometry in Speech Therapy, besides the processes used in the search for validity evidence for the instruments in that field. **Research strategy:** The databases investigated were MEDLINE (accessed via PubMed), LILACS, Scopus, and SciELO. The descriptors used were "Validation studies," "Validity of tests," "Speech, Language and Hearing Sciences," and "Valid" (followed by a truncation element) in Portuguese, English, and Spanish. **Selection criteria:** The review included studies that performed some type of validation of tests in Speech Therapy. The survey found 296 papers, 48 of which were included. Most studies were published by international journals in Speech Therapy and with broad-age-group samples. **Results:** The main area assessed by the instruments was language (20 studies), followed by audiology (13 studies). The year with the highest number of publications was 2014 and the main type of search for validity evidence was based on the internal structure. **Conclusion:** The principles of search for validity evidence are still scarcely used for instruments in Speech Therapy. However, most studies were developed in recent years, which shows the current trend for focusing on the need for enhancing the instruments.

Keywords: Speech, language and hearing sciences; Psychometrics; Validation studies; Validity of tests; Evaluation

RESUMO

Objetivo: Identificar, na literatura, o uso da Psicometria na área da Fonoaudiologia e os processos utilizados para a busca de evidências de validade dos instrumentos da área. **Estratégia de pesquisa:** As bases pesquisadas foram MEDLINE (acessado via PubMed), LILACS, Scopus e SciELO. Os descritores foram "*Validation studies*", "*Validity of tests*", "*Speech, Language and Hearing Sciences*" e "*Valid*" (seguido de elemento de truncagem), em português, inglês e espanhol. **Critérios de seleção:** Foram incluídos os estudos que realizavam algum tipo de validação de testes referentes a áreas da Fonoaudiologia. A survey encontrou 296 artigos e destes, apenas 48 foram incluídos. A maioria dos estudos foi publicada por periódicos internacionais, da área da Fonoaudiologia e com amostra de ampla faixa etária. **Resultados:** A principal área avaliada pelos instrumentos foi linguagem (20 estudos), seguida por audiologia (13 estudos). O ano de maior publicação foi 2014 e o principal tipo de busca de evidências de validade foi com base na estrutura interna. **Conclusão:** O uso dos princípios de busca de evidências de validade de instrumentos da área fonoaudiológica ainda é escasso. Porém, observa-se que a maior parte dos estudos foi desenvolvida nos últimos anos, demonstrando tendência atual para atenção à necessidade de aprimoramento dos instrumentos.

Descritores: Fonoaudiologia; Psicometria; Estudos de validação; Validade dos testes; Avaliação

INTRODUCTION

Speech therapists have noticed an increasingly broader professional field and growing complexity in the competencies required by the work market. They must be able to deal with the most complex technology as well as with elementary actions geared towards preventing diseases and promoting public health[1]. The evaluation in speech therapy practice guides therapeutic processes and is closely related to patient rehabilitation and to preventing future harm. It is known that speech therapy is a very broad field. However, it overall requires the use of instruments and techniques that may or may not be structured. These techniques may vary according to the needs of the patient being evaluated and to the professional carrying out such evaluation. A structured evaluation includes objective and specific protocols such as actual scales and tests, while the non-structured evaluation deals with the issues brought up by the patient and companions[2].

The use of evaluation instruments for speech therapy in Brazil is recommended by resolution no. 14 of the Federal Speech Therapy Council, which ensures their use to diagnose and treat human communication disorders. Such evaluation instruments are the protocols, tests, equipment, software, and other resources. Thus, the use of instruments that evaluate aspects such as oral and written language, voice, hearing and balance, orofacial function, and deglutition is guaranteed for the speech therapy practice.

In this context, the evaluation means more than applying the actual instruments, but, when they have to be used, their quality must to be assured. To that end, it is important to take psychometric principles into account when seeking to validate these instruments. Over the years, psychology has dedicated to studying standardized criteria to build and seek evidence of validity of tests. For instance, resolution 25/2001 of the Brazilian Federal Psychology Council regulates the creation, commercialization, and use of psychological tests and is based on materials such as the "Standards for Educational and Psychological Testing," by the American Educational Research Association, American Psychological Association, and National Council on Measurement in Education[3]; "Guidelines for Educational and Psychological Testing," by the Canadian Psychological Association[4]; and "ITC Guidelines on Test Use" and "ITC Guidelines on Adapting Tests," by the International Test Commission (ITC)[5,6].

Speech therapy, on the other hand, has no specific guidelines to create and apply tests, but can use the framework of psychology as basis while adapting the norms to its specific professional realities. These guidelines[7] aim to establish criteria that aid professionals in using and analyzing the quality and overall characteristics of these instruments.

In particular, the guidelines provided by the International Test Commission indicate that the patient's needs must be carefully analyzed during the evaluation to ensure the effective usefulness of applying such instrument, besides determining its upsides and downsides compared to other evaluation methods. These guidelines also guide professionals to verify whether the instrument has up-to-date and relevant information, if it is technically appropriate, its base psychometric studies, its convenient application, the specific groups to which it is designed, besides the resources needed, application norms, and test limitations.

Regarding the search for evidence of instrument validity, according to the American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, in the manual titled Standards for Educational and Psychological Testing[3], four types of validity evidence must be found in the instruments: evidence based on the content (considers data on the instrument's content, investigating the set of items through analysis by experts), evidence based on external variables (correlations between the instrument and other external variables), evidence based on the internal structure (correlation between items through factorial analyses), and evidence based on the response process (mental processes involved in each task and item).

There are still few formal and objective evaluation instruments in speech therapy practice. Of those, a small number are verified for validity evidence[8]. In oral language evaluation, for instance, besides few instruments being available, most target the evaluation of receptive vocabulary and several have no validity study. In addition, few randomized controlled studies are available on the subject[9].

Speech therapy practice, hence, assumes interdisciplinary work given the constant need for teamwork in order to complement and ensure the adequacy of the diagnosis process[2]. In this sense, the theory on the search for validity evidence is organized by psychology and speech therapy can embrace this knowledge to build higher quality instruments.

PURPOSE

The present review aimed to verify studies in the literature that somehow validate clinical evaluation instruments in speech therapy so as to determine the state of the art in the subject.

RESEARCH STRATEGY

The follow electronic databases were searched: MEDLINE (accessed via PubMed), LILACS, Scopus, and SciELO. The search strings used were "Validation studies," "Validity of tests," "Speech, Language and Hearing Sciences," and "Valid" (followed by a truncation element) in Portuguese, English or Spanish as required by the databases.

SELECTION CRITERIA

The review included studies that performed some type of validation of tests in speech therapy (voice, hearing, language,

oral motor skills, and dysphagia). Studies that did not clearly show the participation of speech therapy or the validation process used, i.e., theoretical studies, were excluded.

DATA ANALYSIS

The titles and abstracts of all papers identified through the search strategy were analyzed by the researchers. All abstracts that did not provide enough information regarding the inclusion and exclusion criteria were selected for full-text reading. In this stage, two independent blinded reviewers evaluated and selected the full papers according to the eligibility criteria. Two independent reviewers used standardized forms to collect data concerning the studies' methodology characteristics, interventions, and outcomes. In all stages, disagreements were settled through consensus. The main piece of data collected dealt with the types of searches for validity evidence in the studies targeting speech therapy.

RESULTS

The initial search identified 296 studies. Of those, 79 were chosen for full-text reading. After a detailed analysis, 48 met the inclusion criteria and were considered relevant to the sample in this review (Chart 1).

The papers that did not seek validity evidence of instruments, that did not deal with speech therapy, that were written in languages other than English, Portuguese, or Spanish, or that did not describe the data of the instruments employed well enough were excluded from the review. The flowchart for the selection process in this review can be seen in Figure 1.

The selection found that 2014 had the largest number (n=11) of papers published (22.92%), followed by seven papers in 2013 (14.58%) and five in 2007 (10.42%). In 2010, 2011, and 2012, 12 papers were published (n=4 in each year), corresponding to 25% of the sample. Three studies were published in 2008 and the others, in 1999, 2001, 2003, 2006, 2009, and 2015. The first study found that aimed to validate a speech therapy instrument was published in 1999. 35 (72.92%) studies were published in English. The others (n=13) were published in Portuguese (27.08%).

Thirty four (70.83%) studies were published in speech therapy journals. The other journals dealt with human development, neurology, language neurobiology, otorhinolaryngology, psychology, and public health. The 48 studies included in the present review were published in 28 different journals, 21 (75%) of which international journals (31 papers) and seven (25%), Brazilian journals (17 papers). The higher number of papers published in international journals may be because Brazilian journals are not indexed in the databases researched, such as MEDLINE and Scopus.

When the journals are considered individually, the largest number of papers (n=8) was published in the Brazilian

journal CoDAS, followed by the International Journal of Pediatric Otorhinolaryngology (n=4), Journal of the American Academy of Audiology (n=3), Journal of Speech, Language and Hearing Research (n=3), Ear and Hearing (n=2), Audiology – Communication Research (n=2), Language, Speech, and Hearing Services in School (n=2), Pró-Fono (n=2), and Research in Developmental Disabilities (n=2). Only one paper was published in each of the other journals. The impact factor considered concerned 2013 and 2014 and five (17.86%) journals had no data on these years. The others (n=23) has an impact factor ranging from 0.352 to 3.309, with an average of 1.592 and standard deviation of 0.867.

In the WebQualis strata evaluation in the CAPES (Coordination for the Improvement of Higher Education Personnel) portal, the journals were analyzed preferably regarding the topic "interdisciplinary" and, in case this evaluation topic was not available, area 21 was chosen, which includes physical education, physiotherapy, speech therapy, and occupational therapy. Seven journals (25%) had no WebQualis evaluation, while 14 (50%) had an evaluation in the "interdisciplinary" topic, six of which classified as B1, four as B2, three as A2, and one as A1. Of the seven journals evaluated in physical education, three were classified as A2, two as A1, one as B1, and one as B4. In the overall distribution, the highest stratum was A1 and the lowest, B4.

The speech therapy areas that had the most instruments validated were language with 20 studies (41.67%) (Box 2) and audiology with 13 studies (27.09%) (Box 3). The areas of voice, dysphagia, and orofacial motor skills had, respectively, seven (14.58%), four (8.33%), and three (6.25%) studies published on instrument validation (Box 4). Only one validation study considered two areas: audiology and language. It is worth pointing out that, among the instruments considered in the studies, only the one in orofacial motor skills was computerized.

Seventeen (35.42%) studies included exclusively children, five (10.42%) dealt only with adults, and one (2.08%) included only elderly persons. Three studies (6.25%) only presented the instruments and one contained only evaluators. The 22 remaining papers (45.83%) contained diversified samples such as guardians, patients, family members, and subjects with a specific clinical outcome, not always taking their ages into account or, most times, maintaining very heterogeneous groups in the samples.

The instruments mentioned in the studies and the types of validation used included mainly validation based on internal structure (n=25; 52.08%), validation based on the content and on external criteria (n=18 each; 37.5%), and validation based on the response process (n=16; 33.33%). Validations based in standardization, adaptation, and item response theory were identified in four (8.33%), three (6.25%), and two (4.17%) studies, respectively. Reliability and translation were found in only one study (2.08%) each.

Chart 1. References used in the systematic review

1.	Alvarenga KF, Araújo ES, Melo TM, Martinez MAN, Bevilacqua MC. Questionnaire for monitoring auditory and language development in the first year. CoDAS. 2013;25(1):16-21.[10]
2.	Arehart KH, Kates JM, Anderson MC, Moats P. Determining perceived sound quality in a simulated hearing aid using the international speech test signal. Ear Hear. 2011;32(4):533-5.[11]
3.	Bloom RL, Pick LH, Borod JC, Rorie KD, Andelman F, Obler LK et al. Psychometric aspects of verbal pragmatic ratings. Brain Lang. 1999;68(3):553-65.[12]
4.	Boominathan P, Samuel J, Arunachalam R, Nagarajan R, Mahalingam S. Multi parametric voice assessment: sri ramachandra university protocol. Indian J Otolaryngol Head Neck Surg. 2014;66(1):246-51.[13]
5.	Brown DK, Cameron S, Martin JS, Watson C, Dillon H. The North American Listening in Spatialized Noise-Sentences test (NA LiSN-S): normative data and test-retest reliability studies for adolescents and young adults. J Am Acad Audiol. 2010;21(10):629-41.[14]
6.	Cardoso MH, Henderson S, Capellini SA. Tradução e adaptação cultural brasileira do Detailed Assessment of Speed of Handwriting: equivalência conceitual e semântica. Audiol Commun Res. 2014;19(4):321-6.[15]
7.	Costa VBS, Harsányi E, Martins-Reis VO, Kummer A. Tradução e adaptação transcultural para o português brasileiro do teste Children's Communication Checklist-2. CoDAS. 2013;25(2):115-9.[16]
8.	Edmonds LA, Donovan NJ. Research applications for an Object and Action Naming Battery to assess naming skills in adult Spanish-English bilingual speakers. Behav Res Methods. 2014;46(2):456-71.[17]
9.	Felício CM, Folha GA, Gaido AS, Dantas MMM, Azevedo-Marques PM. Protocolo de Avaliação Miofuncional Orofacial com Escores Informatizado: usabilidade e validade. CoDAS. 2014;26(4):322-7.[18]
10.	Ferrite S, Santana VS, Marshall SW. Validity of self-reported hearing loss in adults: performance of three single questions. Rev Saúde Pública. 2011;45(5):824-30.[19]
11.	Fonseca RP, Parente MAMP, Côté H, Ska B, Joanette Y. Apresentando um instrumento de avaliação da comunicação à Fonoaudiologia Brasileira: Bateria MAC. Pro Fono. 2008;20(4):285-91.[20]
12.	Gasparin M, Menegotto IH, Cunha CS. Propriedades psicométricas do questionário internacional: aparelho de amplificação sonora individual. Braz J Otorhinolaryngol. 2010;76(1):85-90.[21]
13.	Gray S. Diagnostic accuracy and test-retest reliability of nonword repetition and digit span tasks administered to preschool children with specific language impairment. J Commun Disord. 2003;36(2):129-51.[22]
14.	Greenslade KJ, Plante E, Vance R. The Diagnostic Accuracy and Construct Validity of the Structured Photographic Expressive Language Test-Preschool: Second Edition. Lang Speech Hear Serv Sch. 2009;40(2):150-60.[23]
15.	Gutiérrez-Clellen VF, Simon-Cereijido G. The discriminant accuracy of a grammatical measure with Latino English-speaking children. J Speech Lang Hear Res. 2007;50(4):968-81.[24]
16.	Haley KL, Roth H, Grindstaff E, Jacks A. Computer-mediated assessment of intelligibility in aphasia and apraxia of speech. Aphasiology. 2011;25(12):1600-20.[25]
17.	Holt RF, Lalonde K. Assessing toddlers' speech-sound discrimination. Int J Pediatr Otorhinolaryngol. 2012;76(5):680-92.[26]
18.	Kaneoka AS, Langmore SE, Krisciunas GP, Field K, Scheel R, McNally E, Walsh MJ, O'Dea MB, Cabral H. The Boston residue and clearance scale: preliminary reliability and validity testing. Folia Phoniatr Logop. 2013;65(6):312-7.[27]
19.	Kida ASB, Chiari BM, Ávila CRB. Escalas de avaliação da leitura e da escrita: evidências preliminares de confiabilidade. Pro Fono. 2010;22(4):509-14.[28]
20.	Kim J, Oh BM, Kim JY, Lee GJ, Lee SA, Han TR. Validation of the videofluoroscopic dysphagia scale in various etiologies. Dysphagia. 2014;29(4):438-43.[29]
21.	Kosky C, Boothroyd A. Validation of an on-line implementation of the Imitative test of Speech Pattern Contrast perception (IMSPAC). J Am Acad Audiol. 2003;14(2):72-83.[30]
22.	Lamarche A, Westerlund J, Verduyckt I, Ternström S. The Swedish version of the Voice Handicap Index adapted for singers. Logoped Phoniatr Vocol. 2010;35(3):129-37.[31]
23.	Lu X, Wong LLN, Wong AMY, Xi X. Development of a Mandarin Expressive and Receptive Vocabulary Test for children using cochlear implants. Res Dev Disabil. 2013;34(10):3526-35.[32]
24.	Machado FP, Lerner R, Novaes BCAC, Palladino RRR, Cunha MC. Questionário de indicadores clínicos de risco para o desenvolvimento infantil: avaliação da sensibilidade para transtornos do espectro do autismo. Audiol Commun Res. 2014;19(4):345-51.[33]

Chart 1. References used in the systematic review (cont.)

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25.	Magalhães JHV, Pernambuco LA, Souza LBR, Ferreira MAF, Lima KC. Tradução e adaptação transcultural do Northwestern Dysphagia Patient Check Sheet para o português brasileiro. CoDAS. 2013;25(4):369-74.[34]
26.	Mahalingam S, Boominathan P, Subramaniyan B. Voice disorder outcome profile (V-DOP)-translation and validation in Tamil language. J Voice. 2014;28(6):841.e21-32.[35]
27.	Marian V, Blumenfeld HK, Kaushanskaya M. The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing Language Profiles in Bilinguals and Multilinguals. J Speech Lang Hear Res. 2007;50(4):940-67.[36]
28.	Martinelli RLC, Marchesan IQ, Rodrigues AC, Berretin-Felix G. Protocolo de avaliação do frênulo da língua em bebês. Rev CEFAC. 2012;14(1):138-45.[37]
29.	Milman LH, Holland A, Kaszniak AW, D'Agostino J, Garrett M, Rapcsak S. Initial validity and reliability of the SCCAN: using tailored testing to assess adult cognition and communication. J Speech Lang Hear Res. 2008;51(1):49-69.[38]
30.	Mitra IH, Krishnan G. Adaptation and validation of stroke-aphasia quality of life (SAQOL-39) scale to Hindi. Ann Indian Acad Neurol. 2015;18(1):29-32.[39]
31.	Moreti F, Zambon F, Oliveira G, Behlau M. Equivalência cultural da versão Brasileira da Voice Symptom Scale: VoiSS. J Soc Bras Fonoaudiol. 2011;23(4):398-400.[40]
32.	Mukari SZ, Keith RW, Tharpe AM, Johnson CD. Development and standardization of single and double dichotic digit tests in the Malay language. Int J Audiol. 2006;45(6):344-52.[41]
33.	Nanjundeswaran C, Jacobson BH, Gartner-Schmidt J, Verdolini Abbott K. Vocal Fatigue Index (VFI): development and validation. J Voice. 2015;29(4):433-40.[42]
34.	Neves MB, Borsel JV, Pereira MMB, Paradela EMP. Cross-cultural adaptation of the Western Aphasia Battery - Revised screening test to Brazilian Portuguese: a preliminary study. CoDAS. 2014;26(1):38-45.[43]
35.	Ng KY, To CK, McLeod S. Validation of the Intelligibility in Context Scale as a screening instrument for preschoolers in Hong Kong. Clin Linguist Phon. 2014;28(5):316-28.[44]
36.	Padovani AR, Moraes DP, Mangili LD, Andrade CRF. Protocolo fonoaudiológico de avaliação do risco para disfagia (PARD). Rev Soc Bras Fonoaudiol. 2007;12(3):199-205.[45]
37.	Pankratz ME, Plante E, Vance R, Insalaco DM. The diagnostic and predictive validity of the Renfrew Bus Story. Lang Speech Hear Serv Sch. 2007;38(4):390-9.[46]
38.	Paulinelli BR, Gama ACC, Behlau M. Validação do questionário de performance vocal no Brasil. Rev Soc Bras Fonoaudiol. 2012;17(1):85-91.[47]
39.	Rossarolla C, Menon MU, Scochi CGS, Fujinaga CI. Validade discriminatória do instrumento de avaliação da prontidão para início da alimentação oral de bebês prematuros. Rev Soc Bras Fonoaudiol. 2009;14(1):106-14.[48]
40.	Thal D, Desjardin JL, Eisenberg LS. Validity of the MacArthur-Bates Communicative Development Inventories for measuring language abilities in children with cochlear implants. Am J Speech Lang Pathol. 2007;16(1):54-64.[49]
41.	Thomas-Stonell N, Oddson B, Robertson B, Rosenbaum P. Validation of the Focus on the Outcomes of Communication under Six outcome measure. Dev Med Child Neurol. 2013;55(6):546-52.[50]
42.	Vaillancourt V, Laroche C, Giguère C, Soli SD. Establishment of age-specific normative data for the canadian French version of the hearing in noise test for children. Ear Hear. 2008;29(3):453-66.[51]
43.	Wang L, Sun X, Liang W, Chen J, Zheng W. Validation of the Mandarin version of the LittlEARS® Auditory Questionnaire. Int J Pediatr Otorhinolaryngol. 2013;77(8):1350-4.[52]
44.	Whitehill TL. Nasalance measures in Cantonese-speaking women. Cleft Palate Craniofac J. 2001;38(2):119-25.[53]
45.	Williamson I, Sheridan C, Galker E, Lous J. A video-based performance in noise test for measuring audio-visual disability in young school children: test development, with validation by trained teachers, parents and audiometry as relative standards for disability. Int J Pediatr Otorhinolaryngol. 1999;49(2):127-33.[54]
46.	Williams-Sanchez V, McArdle RA, Wilson RH, Kidd GR, Watson CS, Bourne AL. Validation of a screening test of auditory function using the telephone. J Am Acad Audiol. 2014;25(10):937-51.[55]
47.	Wong AM, Leung C, Siu EK, Lam CC. Validating the language domain subtest in a developmental assessment scale for preschool children. Res Dev Disabil. 2012;33(5):1633-41.[56]
48.	Zhu S, Wong LL, Chen F. Development and validation of a new Mandarin tone identification test. Int J Pediatr Otorhinolaryngol. 2014;78(12):2174-82.[57]
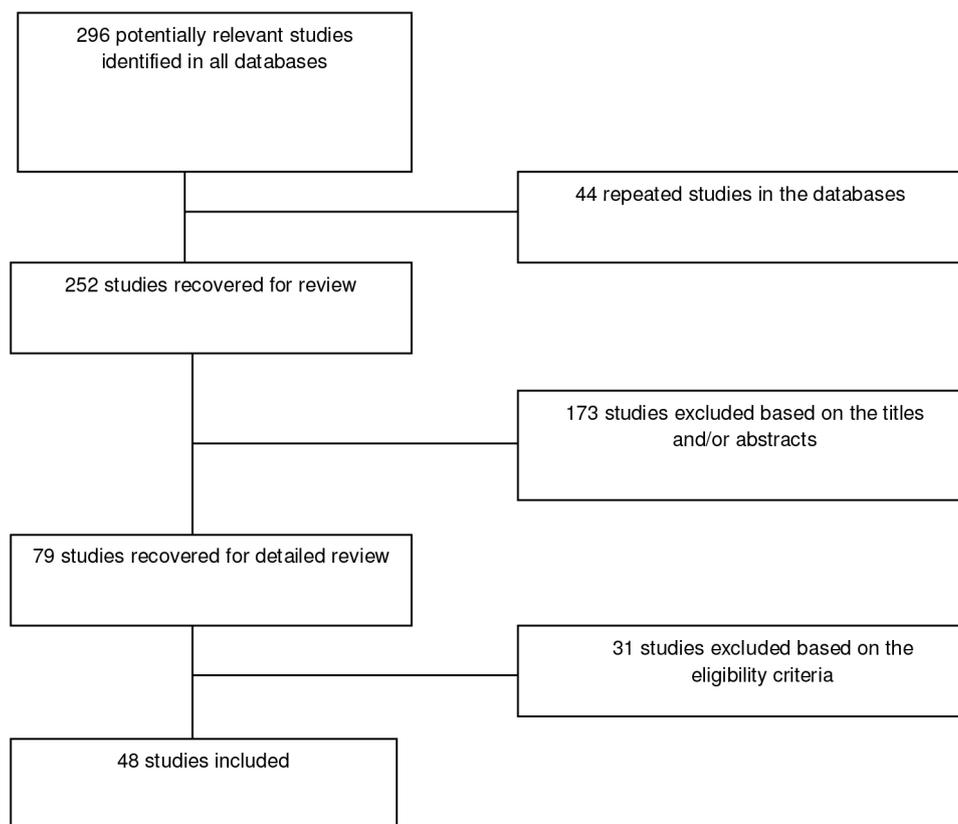
Figure 1. Study selection process

Chart 2. Characteristics of the studies included in the area of language

Authors and year	Journal	Instrument validated	Sample used	Validation study based on
Bloom RL, Pick LH, Borod JC, Rorie KD, Andelman F, Obler LK et al. (1999)[12]	Brain Lang.	Verbal pragmatic rating scale	81 subjects with or without left- or right-hemisphere brain lesion	Internal structure
Cardoso MH, Henderson S, Capellini SA. (2014)[15]	Audiol Commun Res.	Detailed Assessment of Speed of Handwriting	32 students	Internal structure, content, and adaptation
Costa VBS, Harsányi E, Martins-Reis VO, Kummer A. (2013)[16]	CoDAS	Children's Communication Checklist-2	20 guardians or caregivers of autistic individuals	Content, translation, and adaptation
Kida ASB, Chiari BM, De Ávila CRB. (2010)[28]	Pro Fono	EL (*escala de leitura – reading scale*) and EE (*escala de escrita – writing scale*)	100 students from 8 to 11 years old	Internal structure
Edmonds LA, Donovan NJ. (2014)[17]	Behav Res Methods.	An Object and Action Naming Battery	Spanish-English bilingual adults	External criteria, internal structure, and item response theory
Fonseca RP, Parente MAMP, Côté H, Ska B, Joanette Y. (2008)[20]	Pro Fono	MAC battery	Instrument presentation	Instrument presentation
Gray. (2003)[22]	J Commun Disord.	Word-repetition task	22 preschool children	Response process and external criteria
Greenslade KJ, Plante E, Vance R. (2009)[23]	Lang Speech Hear Serv Sch.	Structured Photographic Expressive Language Test-Preschool	54 children with typical development and 42 with specific language disorder	External criteria, internal structure, and response process
Gutiérrez-Clellen VF, Simon-Cereijido G. (2007)[24]	J Speech Lang Hear Res.	Test of English Morphosyntax	59 children with typical development and 52 with language deficit	Internal structure

Quadro 2. Características dos estudos incluídos da área de linguagem (cont.)

Authors and year	Journal	Instrument validated	Sample used	Validation study based on
Lu X, Wong LLN, Wong AMY, Xi X. (2013)[32]	Res Dev Disabil.	Mandarin Expressive and Receptive Vocabulary Test	1- to 3-year-old children with cochlear implant	Content, external criteria, and response process
Machado FP, Lerner R, Novaes BCAC, Palladino RRR, Cunha MC. (2014)[33]	Audiol Commun Res.	IRDI – questionnaire for parents	72 subjects, family members of children	Internal structure
Marian V, Blumenfeld HK, Kaushanskaya M. (2007)[36]	J Speech Lang Hear Res.	Language Experience and Proficiency (LEAP-Q)	52 multilingual adults and 50 Spanish-English bilingual adults	External criteria and internal structure
Milman LH, Holland A, Kaszniak AW, D'Agostino J, Garrett M, Rapcsak S. (2008)[38]	J Speech Lang Hear Res.	The Scales of Cognitive and Communicative Ability for Neurorehabilitation	40 neurologically healthy subjects and 51 with left- or right-hemisphere pathologies or Alzheimer's	Response process and internal structure
Mitra IH, Krishnan G. (2015)[39]	Ann Indian Acad Neurol.	Stroke-Aphasia Quality of Life-39 (SAQOL-39)	84 subjects with aphasia	Content and internal structure
Neves MB, Borsel JV, Pereira MMB, Paradela EMP. (2014)[43]	CoDAS	Western Aphasia Battery	30 subjects between 18 and 89 years old	Content and adaptation
Ng KY, To CK, McLeod S. (2014)[44]	Clin Linguist Phon.	The Intelligibility in Context Scale (ICS)	72 preschool children with no speech or hearing disorder	content, internal structure, and response process
Pankratz ME, Plante E, Vance R, Insalaco DM. (2007)[46]	Lang Speech Hear Serv Sch.	American version of The Renfrew Bus Story	64 children with and without specific language disorder	Internal structure, external criteria, and response process
Thal D, Desjardin JL, Eisenberg LS. (2007)[49]	Am J Speech Lang Pathol.	MacArthur-Bates Communicative Development Inventories (CDI)	24 children with cochlear implant and their mothers	External criteria
Thomas-Stonell N, Oddson B, Robertson B, Rosenbaum P. (2013)[50]	Dev Med Child Neurol.	Outcomes of Communication Under Six (FOCUS)	Family members of children up to 4 years old	External criteria and response process
Wong AM, Leung C, Siu EK, Lam CC. (2012)[56]	Res Dev Disabil.	Language subtest in the Developmental assessment scale for preschoolers	3- to 6-year-old children	Item response theory

Chart 3. Characteristics of the studies included in the area of audiology

Authors and year	Journal	Instrument validated	Sample used	Validation study based on
Alvarenga KF, Araújo ES, Melo TM, Martinez MAN, Bevilacqua MC. (2013)[10]	CoDAS	Questionnaire to monitor hearing and language development in the first year of life	Families of 304 children between 0 and 1 year old	Internal structure
Arehart KH, Kates JM, Anderson MC, Moats P. (2011)[11]	Ear Hear.	International Speech Test Signal (ISTS)	19 typical adults and 15 with hearing deficiency	External criteria
Brown DK, Cameron S, Martin JS, Watson C, Dillon H. (2010)[14]	J Am Acad Audiol.	The Listening in Spatialized Noise-Sentences test	120 subjects with normal hearing	Response process and normalization
Ferrite S, Santana VS, Marshall SW. (2011)[19]	Rev Saúde Pública	Three questions to assess self-reported hearing loss	188 subjects between 30 and 65 years old.	Response process
Gasparin M, Menegotto IH, Cunha CS. (2010)[21]	Braz J Otorhinolaryngol.	International Questionnaire – Individual Sound Amplification Device (ISAD)	53 ISAD users	Internal structure

Chart 3. Characteristics of the studies included in the area of audiology (cont.)

Authors and year	Journal	Instrument validated	Sample used	Validation study based on
Haley KL, Roth H, Grindstaff E, Jacks A. (2011)[25]	Aphasiology	Monosyllabic intelligibility test	23 aphasic and 20 healthy subjects	Content and internal structure
Holt RF, Lalonde K. (2012)[26]	Int J Pediatr Otorhinolaryngol.	Toddlers' Speech-Sound Discrimination	2- to 3-year-old children	External variables, response process
Kosky C, Boothroyd A. (2003)[30]	J Am Acad Audiol.	Imitative Test of Speech Pattern Contrast Perception (IMSPAC)	6 children with neurosensorial hearing loss	Content and response process
Mukari SZ, Keith RW, Tharpe AM, Johnson CD. (2006)[41]	Int J Audiol.	Single and double dichotic digit tests in Malay language	120 children between 6 and 11 years old with normal hearing and academic performance	External criteria and normalization
Vaillancourt V, Laroche C, Giguère C, Soli SD. (2008)[51]	Ear Hear.	A Canadian French version of the Hearing in Noise Test (HINT)	70 native French	External criteria, internal structure, and normalization
Wang L, Sun X, Liang W, Chen J, Zheng W. (2013)[52]	Int J Pediatr Otorhinolaryngol.	Mandarin version of the LittlEARS Auditory	157 Mandarin-speaking parents of children below 24 months old with normal hearing	Content, internal structure, external criteria, and response process
Williamson I, Sheridan C, Galker E, Lous J. (1999)[54]	Int J Pediatr Otorhinolaryngol.	The performance-in-noise (P.I.N.) test	Children between 4 and 8 years old (227 English and 182 Danish)	External criteria and internal structure
Williams-Sanchez V, McArdle RA, Wilson RH, Kidd GR, Watson CS, Bourne AL. (2014)[55]	J Am Acad Audiol.	US National Hearing Test (NHT)	693 subjects	Internal structure
Zhu S, Wong LL, Chen F. (2014)[57]	Int J Pediatr Otorhinolaryngol.	Mandarin tone identification test (MTIT)	50 subjects with normal hearing and age around 7 years old	Content and internal structure

Chart 4. Characteristics of the studies included in the area of voice, dysphagia, and orofacial motor skills

Authors and year	Journal	Instrument validated	Sample used	Area	Validation study based on
Felício CM, Folha GA, Gaido AS, Dantas MMM, Azevedo-Marques PM. (2014)[18]	CoDAS	Computerized protocol of orofacial myofunctional evaluation	No sample, three assessors	Orofacial motor skills	Content
Kaneoka AS, Langmore SE, Krisciunas GP, Field K, Scheel R, McNally E, Walsh MJ, O'Dea MB, Cabral H. (2013)[27]	Folia Phoniatr Logop.	Boston Residue and Clearance Scale (BRACS)	63 subjects	Dysphagia	Response process, internal structure, and external criteria
Kim J, Oh BM, Kim JY, Lee GJ, Lee SA, Han TR. (2014)[29]	Dysphagia	Videofluoroscopic dysphagia scale (VDS)	Medical records of 1995 dysphagic patients subjected to videofluoroscopy	Dysphagia	External criteria

Chart 4. Characteristics of the studies included in the area of voice, dysphagia, and orofacial motor skills (cont.)

Authors and year	Journal	Instrument validated	Sample used	Area	Validation study based on
Lamarche A, Westerlund J, Verduyckt I, Ternström S. (2010)[31]	Logoped Phoniatr Vocol.	Swedish version of the Voice Handicap Index adapted for singers	126 singers with and without vocal disorders	Voice	Internal structure, response process, and content
Magalhães JHV, Pernambuco LA, Souza LBR, Ferreira MAF, Lima KC. (2013)[34]	CoDAS	Northwestern Dysphagia Patient Check Sheet	35 volunteers between 62 and 92 years old with no dementia or dysphagia complaint	Dysphagia	Content
Mahalingam S, Boominathan P, Subramaniyan B. (2014)[35]	J Voice	The voice disorder outcome profile (V-DOP)	95 subjects	Voice	Content validity and internal structure
Boominathan P, Samuel J, Arunachalam R, Nagarajan R, Mahalingam S. (2014)[13]	Indian J Otolaryngol Head Neck Surg.	Comprehensive voice assessment protocol	200 subjects with voice issues	Voice	External criteria and internal structure
Martinelli RLC, Marchesan IQ, Rodrigues AC, Berretin-Felix G. (2012)[37]	Rev CEFAC	Protocol to evaluate the lingual frenulum in babies	10 babies	Orofacial motor skills	Content
Moreti F, Zambon F, Oliveira G, Behlau M. (2011)[40]	J Soc Bras Fonoaudiol.	Voice Symptom Scale (VoiSS)	15 subjects with voice complaints	Voice	Content
Nanjundeswaran C, Jacobson BH, Gartner-Schmidt J, Verdolini Abbott K. (2015)[42]	J Voice	Vocal Fatigue Index (VFI)	105 subjects with voice disorders and 70 healthy ones	Voice	Content and internal structure
Padovani AR, Moraes DP, Mangili LD, Andrade CRF. (2007)[45]	CoDAS	Dysphagia Risk Assessment Protocol (*Protocolo de Avaliação do Risco para Disfagia* - PARD)	Instrument presentation	Dysphagia	Instrument presentation
Paulinelli BR, Gama ACC, Behlau M. (2012)[47]	Rev Soc Bras Fonoaudiol.	Vocal Performance Questionnaire	160 subjects with voice complaints and 165 without	Voice	Content, external criteria, and internal structure
Rossarolla C, Menon MU, Scochi CGS, Fujinaga CI. (2009)[48]	Rev Soc Bras Fonoaudiol.	Instrument to assess the readiness of newborns to begin oral feeding proposed by Fujinaga	19 preterm babies	Orofacial motor skills	Response process
Whitehill TL. (2001)[53]	Cleft Palate Craniofac J.	Stimulus materials for nasalance measurement in Cantonese speakers	141 women with normal resonance	Voice	Response process and normalization

DISCUSSION

The results showed that few studies in speech therapy seek validity evidence. When they are carried out, they present data mainly towards the instruments' internal structure aiming to show whether they actually assess the proposed constructs or characteristics, besides observing the structure of the correlations between the items. These results are usually obtained through factorial analyses or internal consistency analyses[58].

Although studies with all sorts of searches for validity evidence were found in the present review, none presented results of all types together (based on the internal structure, on

the response process, on external criteria, and on the content), which shows the need for more detailed studies, in special since Brazil is responsible for 1% of the worldwide scientific literature[1,59].

The present review also found adaptation and normalization studies. Well-executed adaptations that go beyond simply translating the instrument are important so that there are instruments truly adapted to the Brazilian population and that meet the actual needs of the subjects evaluated, thus providing reliable parameters to propose interventions. In the area of voice, for example, the instruments must evaluate specific groups of subjects such as dysphonic persons[60]. Protocols in English are commonly translated into the Brazilian reality, however, the validation process means more than translation, suggesting the reading of the document established by the Scientific Advisory Committee of the Medical Outcomes Trust (SAC).

Language is commonly evaluated through standardized tests, which include the analysis of components such as phonology, morphology, syntax, and semantic organization. Nevertheless, it is worth pointing out that the tests not always evaluate all components as a whole and, overall, are not sensitive to variations in speech, pragmatics, syntax, or semantics[61]. The use of incomplete or unreliable evaluation instruments leads to a poor prognostic and difficulty in outlining rehabilitation therapeutic processes[9].

In the areas of dysphagia and orofacial motor skills, since the dimensions evaluated are mostly physical attributes, the search for content evidence was the most common in these studies. The literature shows that some orofacial motor skills protocols are more global and, when needed, more specific protocols must be used, such as for temporomandibular disorders and cleft lip and palate[62]. However, further studies are still needed that seek validity evidence for these protocols.

Creating and validating instruments are issues that also permeate the training of speech therapists since, when the professional graduates, he or she must be able to work in several areas and to perform full evaluations while employing all techniques and instruments available. In this sense, the role of the higher education institutions and undergraduate courses must be take up a strategic position so that the professional, by the end of the course, is as capable and critical as possible for the labor market. Among these abilities is the search for constant training[1]. In a study that included newly graduated professionals, the authors concluded that they were satisfied with their education and secure to work in the field. According to these professionals, language was the area in which they were the most well prepared and they reported intending to work in private offices and clinics. As continued training, they report graduate courses as their greatest interest[1].

Moreover, during the early education of speech therapists, it must be highlighted that the work in healthcare requires specific technical knowledge to that profession and original education, but that is also linked to other areas of knowledge,

including the ability to take social and cultural diversity into account[2]. That comprises the skill of researching and seeking validity evidence of psychology, for example.

Evaluation stands out in this context since it lays basis for effective interventions and proper referrals. In Brazil, few instruments are available in speech therapy, while in the United States, for instance, the professionals have a broad range of tests, such as in the area of language[8]. The authors of that study mention that over 100 tests are described in the Directory of Speech-Language Pathology Assessment Instruments by the American Speech-Language-Hearing Association, which confirms the statements in the present review. Nonetheless, they report that researches have been increasingly carried out in order to adapt and validate instruments, thus enhancing the Brazilian outlook. Hence, more reliable clinical practice and research will be possible, besides better planning of interventions and public policies in the area.

CONCLUSION

In the footsteps of psychology, precursor of studies with standardized criteria to design and seek validity evidence in instruments, the creation of speech therapy instruments must be systematized in order to enhance the clinical practice and research. The principles of search for validity evidence are still scarcely used for instruments in Speech Therapy. However, most studies were developed in recent years, which shows the current trend of focusing on the need for enhancing the instruments and on the advances in this field.

REFERENCES

1 Silva DG, Sampaio TM, Bianchini EM. Percepções do fonoaudiólogo recém-formado quanto a sua formação, intenção profissional e atualização de conhecimentos. Rev Soc Bras Fonoaudiol. 2010;15(1):47-53. http://dx.doi.org/10.1590/S1516-80342010000100010

2. Goulart BN, Chiari BM. Avaliação clínica fonoaudiológica, integralidade e humanização: perspectivas gerais e contribuições para reflexão. Rev Soc Bras Fonoaudiol. 2007;12(4):335-340. http://dx.doi.org/10.1590/S1516-80342007000400014

3. American Educational Research Association; American Psychological Association; National Council on Measurement in Education. Standards for educational and psychological testing. New York: American Educational Research Association; 1999.

4. Canadian Psychological Association. Guidelines for educational and psychological testing. Ottawa: Canadian Psychological Association; 1987.

5. International Test Comission – ITC. ITC guidelines on test use. 2013 [citado 14 jul 2015]. Disponível em: http://www.intestcom.org/files/guideline_test_use.pdf

6. International Test Comission – ITC. ITC guidelines on adapting tests. 2005 [citado 14 jul 2015]. Disponível em: http://www.intestcom.org/

files/guideline_test_adaptation.pdf

7. Noronha APP, Freitas FA, Ottati F. Parâmetros psicométricos de testes psicológicos de inteligência. Inter Psicol. 2002;6(2):195-201.

8. Giusti E, Befi-Lopes DM. Tradução e adaptação transcultural de instrumentos estrangeiros para o Português Brasileiro (PB). Pro Fono. 2008;20(3):207-10. http://dx.doi.org/10.1590/S0104-56872008000300012

9. Gurgel LG, Plentz RDM, Joly MCRA, Reppold CT. Instrumentos de avaliação da compreensão de linguagem oral em crianças e adolescentes: uma revisão sistemática da literatura. Rev NeuroPsicol Latinoam. 2010;2(1):1-10.

10. Alvarenga KF, Araújo ES, Melo TM, Martinez MAN, Bevilacqua MC. Questionnaire for monitoring auditory and language development in the first year. CoDAS. 2013;25(1):16-21. http://dx.doi.org/10.1590/S2317-17822013000100004

11. Arehart KH, Kates JM, Anderson MC, Moats P. Determining perceived sound quality in a simulated hearing aid using the international speech test signal. Ear Hear. 2011;32(4):533-5. http://dx.doi.org/10.1097/AUD.0b013e31820c81cb

12. Bloom RL, Pick LH, Borod JC, Rorie KD, Andelman F, Obler LK et al. Psychometric aspects of verbal pragmatic ratings. Brain Lang. 1999;68(3):553-65. http://dx.doi.org/10.1006/brln.1999.2128

13. Boominathan P, Samuel J, Arunachalam R, Nagarajan R, Mahalingam S. Multi parametric voice assessment: sri ramachandra university protocol. Indian J Otolaryngol Head Neck Surg. 2014;66(1):246-51. http://dx.doi.org/10.1007/s12070-011-0460-y

14. Brown DK, Cameron S, Martin JS, Watson C, Dillon H. The North American Listening in Spatialized Noise-Sentences test (NA LiSN-S): normative data and test-retest reliability studies for adolescents and young adults. J Am Acad Audiol. 2010;21(10):629-41. http://dx.doi.org/10.3766/jaaa.21.10.3

15. Cardoso MH, Henderson S, Capellini SA. Tradução e adaptação cultural brasileira do Detailed Assessment of Speed of Handwriting: equivalência conceitual e semântica. Audiol Commun Res. 2014;19(4):321-6. http://dx.doi.org/10.1590/S2317-64312014000400001447

16. Costa VB, Harsányi E, Martins-Reis VO, Kummer A. Tradução e adaptação transcultural para o português brasileiro do teste Children's Communication Checklist-2. CoDAS. 2013;25(2):115-9. http://dx.doi.org/10.1590/S2317-17822013000200005

17. Edmonds LA, Donovan NJ. Research applications for an Object and Action Naming Battery to assess naming skills in adult Spanish-English bilingual speakers. Behav Res Methods. 2014;46(2):456-71. http://dx.doi.org/10.3758/s13428-013-0381-7

18. Felício CM, Folha GA, Gaido AS, Dantas MM, Azevedo-Marques PM. Protocolo de Avaliação Miofuncional Orofacial com Escores Informatizado: usabilidade e validade. CoDAS. 2014;26(4):322-7. http://dx.doi.org/10.1590/2317-1782/201420140021

19. Ferrite S, Santana VS, Marshall SW. Validade da perda auditiva auto-referida em adultos: desempenho de três perguntas únicas. Rev Saúde Pública. 2011;45(5):824-30. English. http://dx.doi.org/10.1590/S0034-89102011005000050

20. Fonseca RP, Parente MA, Côté H, Ska B, Joanette Y. Apresentando um instrumento de avaliação da comunicação à fonoaudiologia brasileira: bateria MAC. Pro Fono. 2008;20(4):285-91. http://dx.doi.org/10.1590/S0104-56872008000400014

21. Gasparin M, Menegotto IH, Cunha CS. Propriedades psicométricas do questionário internacional: aparelho de amplificação sonora individual. Braz J Otorhinolayngol. 2010;76(1):85-90. http://dx.doi.org/10.1590/S1808-86942010000100014

22. Gray S. Diagnostic accuracy and test-retest reliability of nonword repetition and digit span tasks administered to preschool children with specific language impairment. J Commun Disord. 2003;36(2):129-51. http://dx.doi.org/10.1016/S0021-9924(03)00003-0

23. Greenslade KJ, Plante E, Vance R. The diagnostic accuracy and construct validity of the structured photographic expressive language test-preschool: Second Edition. Lang Speech Hear Serv Sch. 2009;40(2):150-60. http://dx.doi.org/10.1044/0161-1461(2008/07-0049)

24. Gutiérrez-Clellen VF, Simon-Cereijido G. The discriminant accuracy of a grammatical measure with Latino English-speaking children. J Speech Lang Hear Res. 2007;50(4):968-81. http://dx.doi.org/10.1044/1092-4388(2007/068)

25. Haley KL, Roth H, Grindstaff E, Jacks A. Computer-mediated assessment of intelligibility in aphasia and apraxia of speech. Aphasiology. 2011;25(12):1600-20. http://dx.doi.org/10.1080/02687038.2011.628379

26. Holt RF, Lalonde K. Assessing toddlers' speech-sound discrimination. Int J Pediatr Otorhinolaryngol. 2012;76(5):680-92. http://dx.doi.org/10.1016/j.ijporl.2012.02.020

27. Kaneoka AS, Langmore SE, Krisciunas GP, Field K, Scheel R, McNally E et al. The Boston residue and clearance scale: preliminary reliability and validity testing. Folia Phoniatr Logop. 2013;65(6):312-7. http://dx.doi.org/10.1159/000365006

28. Kida AS, Chiari BM, Ávila CR. Escalas de avaliação da leitura e da escrita: evidências preliminares de confiabilidade. Pro Fono. 2010;22(4):509-14. http://dx.doi.org/10.1590/S0104-56872010000400025

29. Kim J, Oh BM, Kim JY, Lee GJ, Lee SA, Han TR. Validation of the videofluoroscopic dysphagia scale in various etiologies. Dysphagia. 2014;29(4):438-43. http://dx.doi.org/10.1007/s00455-014-9524-y

30. Kosky C, Boothroyd A. Validation of an on-line implementation of the Imitative test of Speech Pattern Contrast perception (IMSPAC). J Am Acad Audiol. 2003;14(2):72-83. http://dx.doi.org/10.3766/jaaa.14.2.3

31. Lamarche A, Westerlund J, Verduyckt I, Ternström S. The Swedish version of the Voice Handicap Index adapted for singers. Logoped Phoniatr Vocol. 2010;35(3):129-37. http://dx.doi.org/10.3109/14015430903352592

32. Lu X, Wong LL, Wong AM, Xi X. Development of a Mandarin expressive and receptive vocabulary test for children using cochlear implants. Res Dev Disabil. 2013;34(10):3526-35. http://dx.doi.org/10.1016/j.ridd.2013.07.010

33. Machado FP, Lerner R, Novaes BC, Palladino RR, Cunha MC. Questionário de indicadores clínicos de risco para o desenvolvimento

infantil: avaliação da sensibilidade para transtornos do espectro do autismo. Audiol Commun Res. 2014;19(4):345-51. http://dx.doi.org/10.1590/S2317-64312014000300001392

34. Magalhães Junior HV, Pernambuco LA, Souza LB, Ferreira MA, Lima KC. Tradução e adaptação transcultural do Northwestern Dysphagia Patient Check Sheet para o português brasileiro. CoDAS. 2013;25(4):369-74. http://dx.doi.org/10.1590/S2317-17822013000400012

35. Mahalingam S, Boominathan P, Subramaniyan B. Voice disorder outcome profile (V-DOP)-translation and validation in Tamil language. J Voice. 2014;28(6):841.e21-32. http://dx.doi.org/10.1016/j.jvoice.2014.04.006

36. Marian V, Blumenfeld HK, Kaushanskaya M. The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing Language Profiles in Bilinguals and Multilinguals. J Speech Lang Hear Res. 2007;50(4):940-67. http://dx.doi.org/10.1044/1092-4388(2007/067)

37. Martinelli RL, Marchesan IQ, Rodrigues AC, Berretin-Felix G. Protocolo de avaliação do frênulo da língua em bebês. Rev CEFAC. 2012;14(1):138-145. http://dx.doi.org/10.1590/S1516-18462012000100016

38. Milman LH, Holland A, Kaszniak AW, D'Agostino J, Garrett M, Rapcsak S. Initial validity and reliability of the SCCAN: using tailored testing to assess adult cognition and communication. J Speech Lang Hear Res. 2008;51(1):49-69. http://dx.doi.org/10.1044/1092-4388(2008/004)

39. Mitra IH, Krishnan G. Adaptation and validation of stroke-aphasia quality of life (SAQOL-39) scale to Hindi. Ann Indian Acad Neurol. 2015;18(1):29-32. http://dx.doi.org/10.4103/0972-2327.144276

40. Moreti F, Zambon F, Oliveira G, Behlau M. Equivalência cultural da versão Brasileira da Voice Symptom Scale: VoiSS. J Soc Bras Fonoaudiol. 2011;23(4):398-400. http://dx.doi.org/10.1590/S2179-64912011000400018

41. Mukari SZ, Keith RW, Tharpe AM, Johnson CD. Development and standardization of single and double dichotic digit tests in the Malay language. Int J Audiol. 2006;45(6):344-52. http://dx.doi.org/10.1080/14992020600582174

42. Nanjundeswaran C, Jacobson BH, Gartner-Schmidt J, Verdolini Abbott K. Vocal Fatigue Index (VFI): development and validation. J Voice 2015;29(4):433-40. http://dx.doi.org/10.1016/j.jvoice.2014.09.012

43. Neves MB, Borsel JV, Pereira MM, Paradela EM. Cross-cultural adaptation of the Western Aphasia Battery - Revised screening test to Brazilian Portuguese: a preliminary study. CoDAS. 2014;26(1):38-45. http://dx.doi.org/10.1590/S2317-17822014000100006

44. Ng KY, To CK, McLeod S. Validation of the Intelligibility in Context Scale as a screening tool for preschoolers in Hong Kong. Clin Linguist Phon. 2014;28(5):316-28. http://dx.doi.org/10.3109/02699206.2013.865789.

45. Padovani AR, Moraes DP, Mangili LD, Andrade CR. Protocolo fonoaudiológico de avaliação do risco para disfagia (PARD). Rev Soc Bras Fonoaudiol. 2007;12(3):199-205. http://dx.doi.org/10.1590/S1516-80342007000300007

46. Pankratz ME, Plante E, Vance R, Insalaco DM. The diagnostic and predictive validity of the Renfrew Bus Story. Lang Speech Hear Serv Sch. 2007;38(4):390-9. http://dx.doi.org/10.1044/0161-1461(2007/040)

47. Paulinelli BR, Gama AC, Behlau M. Validação do questionário de performance vocal no Brasil. Rev Soc Bras Fonoaudiol. 2012;17(1):85-91. http://dx.doi.org/10.1590/S1516-80342012000100016

48. Rossarolla C, Menon MU, Scochi CG, Fujinaga CI. Validade discriminatória do instrumento de avaliação da prontidão para início da alimentação oral de bebês prematuros. Rev Soc Bras Fonoaudiol. 2009;14(1):106-14. http://dx.doi.org/10.1590/S1516-80342009000100017

49. Thal D, Desjardin JL, Eisenberg LS. Validity of the MacArthur-Bates Communicative Development Inventories for measuring language abilities in children with cochlear implants. Am J Speech Lang Pathol. 2007;16(1):54-64. http://dx.doi.org/10.1044/1058-0360(2007/007)

50. Thomas-Stonell N, Oddson B, Robertson B, Rosenbaum P. Validation of the Focus on the Outcomes of Communication under Six outcome measure. Dev Med Child Neurol. 2013;55(6):546-52. http://dx.doi.org/10.1111/dmcn.12123

51. Vaillancourt V, Laroche C, Giguère C, Soli SD. Establishment of age-specific normative data for the canadian French version of the hearing in noise test for children. Ear Hear. 2008;29(3):453-66. http://dx.doi.org/10.1097/01.aud.0000310792.55221.0c

52. Wang L, Sun X, Liang W, Chen J, Zheng W. Validation of the Mandarin version of the LittlEARS® Auditory Questionnaire. Int J Pediatr Otorhinolaryngol 2013;77(8):1350-4. http://dx.doi.org/10.1016/j.ijporl.2013.05.033

53. Whitehill TL. Nasalance measures in Cantonese-speaking women. Cleft Palate Craniofac J. 2001;38(2):119-25. http://dx.doi.org/10.1597/1545-1569(2001)038<0119:NMICSW>2.0.CO;2

54. Williamson I, Sheridan C, Galker E, Lous J. A video-based performance in noise test for measuring audio-visual disability in young school children: test development, with validation by trained teachers, parents and audiometry as relative standards for disability. Int J Pediatr Otorhinolaryngol 1999;49(2):127-33. http://dx.doi.org/10.1016/S0165-5876(99)00110-X

55. Williams-Sanchez V, McArdle RA, Wilson RH, Kidd GR, Watson CS, Bourne AL. Validation of a screening test of auditory function using the telephone. J Am Acad Audiol 2014;25(10):937-51. http://dx.doi.org/10.3766/jaaa.25.10.3

56. Wong AM, Leung C, Siu EK, Lam CC. Validating the language domain subtest in a developmental assessment scale for preschool children. Res Dev Disabil. 2012;33(5):1633-41. http://dx.doi.org/10.1016/j.ridd.2012.03.002

57. Zhu S, Wong LL, Chen F. Development and validation of a new Mandarin tone identification test. Int J Pediatr Otorhinolaryngol. 2014;78(12):2174-82. http://dx.doi.org/10.1016/j.ijporl.2014.10.004

58. Primi R, Muniz M, Nunes CHSS. Definições contemporâneas de validade de testes psicológicos. In: Hutz CS (Org.). Avanços e polêmicas em avaliação psicológica. São Paulo: Casa do Psicólogo;

2009. p. 243- 65.

59. Behlau M, Gasparini G. Education of speech-language pathologists and audiologist in Brazil. Folia Phoniatr Logop. 2006;58(1):14-22. http://dx.doi.org/10.1159/000088994

60. Behlau M, Oliveira G, Santos LM, Ricarte A. Validação no Brasil de protocolos de auto-avaliação do impacto de uma disfonia. Pro Fono. 2009;21(4):326-32. http://dx.doi.org/10.1590/S0104-56872009000400011

61. Morrow CE, Vogel AL, Anthony JC, Ofir AY, Dausa AT, Bandstra ES. Expressive and receptive language functioning in preschool children with prenatal cocaine exposure. J Pediatr Psychol. 2004;29(7):543-54. http://dx.doi.org/10.1093/jpepsy/jsh056

62. Genaro KF, Berretin-Felix G, Rehder MI, Marchesan IQ. Avaliação miofuncional orofacial - Protocolo MBGR. Rev CEFAC. 2009;11(2):237-55. http://dx.doi.org/10.1590/S1516-18462009000200009