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Development of a vocabulary-screening tool for children 3 to 7-years of age

Construção de um instrumento de triagem do vocabulário para crianças entre 3 e 7 anos

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ABSTRACT

Purpose: To develop a vocabulary screening tool for children from 3 to 7 years of age. **Methods**: Step one, development of the instrument, consisted of an integrative review of the National and International literature to verify instruments for vocabulary screening, and used the SciELO, LILACS, ERIC and PubMed databases. For step two, the items and user's manual were developed. A vocabulary-oriented instrument was developed: a database of words for children from 3 to 7 years old comprised 11 semantic categories and tapped expressive as well as receptive skills. The final step involved the creation of protocols for the instrument. **Results:** In the first step of the study, three international vocabulary screening instruments were identified. No national instrument was found. For the second step, a set of a total of 210 words were selected, including nouns, adjectives and verbs. During the third and final step, images, manual and answer protocols were developed. **Conclusion:** There was a scarcity of vocabulary screening instruments identified in international and national literature. Therefore, a vocabulary screening instrument for children between 3 and 7 years of age was developed.

Keywords: Screening tool; Protocols; Child language; Vocabulary test; Vocabulary

RESUMO

Objetivo: construir um instrumento de triagem do vocabulário para crianças entre 3 e 7 anos de idade. **Métodos:** a etapa 1, de construção do instrumento, consistiu em revisão da literatura nacional e internacional, para verificar os instrumentos utilizados para triagem do vocabulário, por meio de pesquisa nas bases de dados SciELO, LILACS, ERIC e PubMed. Na etapa 2, denominada formulação de itens e manual de uso, foi elaborado um instrumento direcionado para o vocabulário, com a criação de um banco de dados de palavras para crianças de 3 a 7 anos, de acordo com 11 categorias semânticas, em habilidades expressivas e receptivas. Por fim, a etapa 3 consistiu na criação das fichas de aplicação do instrumento. **Resultados:** na primeira etapa do estudo, foram identificados três instrumentos internacionais para triagem do vocabulário. Nenhum instrumento nacional foi encontrado. Quanto à segunda etapa, o banco de dados consistiu em um total de 210 palavras, dentre elas, substantivos, adjetivos e verbos. Na terceira etapa, foram criadas as imagens, manual e folhas de resposta. **Conclusão:** verificou-se escassez de instrumentos de triagem do vocabulário na literatura internacional e nacional. Portanto, foi construído um instrumento de triagem do vocabulário infantil para crianças entre 3 e 7 anos de idade.

Palavras-chave: Programas de rastreamento; Protocolos; Linguagem infantil; Testes de vocabulário; Vocabulário

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INTRODUCTION

Delays in language development are often overlooked. The "wait and see" approach[1] assumes that late speakers will catch up with their typical peers. However, the results of this approach have been unsatisfactory, with many children displaying persistent problems. Even those children who overcome the delay continue to display lower linguistic performance when compared to children without this history[2].

Difficulty in acquiring vocabulary is one of the main predictors of deficits in oral language development[3] and may result difficulties in: learning to read[4], in reading comprehension[5], and in regulation of emotion and behavior[6].

One of the world's most widely adopted means of early detection of health problems is screening. By definition, it is a procedure to identify individuals at risk for a given condition[7]. Given the importance of vocabulary, the screening of this skill enables the identification of children with difficulties or possible delays[8].

Early detection and intervention ensure the better child prognosis and improvement of skills required for the school functions[9]. However, the number of studies involving vocabulary screening remains scarce[8], and the late identification of children at risk results in adverse changes in language development.

In view of the importance of vocabulary and the need to for early detection of language difficulties, the objective of this research was to develop a vocabulary screening instrument and manual for assessment of children between 3 and 7 years of age.

METHODS

Ethical review

This research was approved by the Research Ethics Committee (REC) of the Federal University of Rio Grande do Norte - UFRN under opinion No. 2,548,341, following the resolution of the National Health Council - CNS 466/12 on Guidelines and Regulatory Standards Research Involving Human Subjects.

This study was based on the analysis of theoretical data and, therefore, the signing of the Informed Consent Form (ICF) was waived by the REC.

Research steps

This was a descriptive and qualitative study, and the following section reviews the background theory, examines the instrument's purposes, how items were selected and how it is intended to be used. The development of the instrument, named TRILHAR, occurred in three steps: 1) literature review; 2) development of the items and user's manual; 3) development of application forms.

Step 1: Literature review

Search strategy

An integrative literature review was conducted to verify the vocabulary screening instruments available nationally and internationally, through the Scientific Electronic Library Online (SciELO), Latin American and Caribbean Health Sciences Literature (LILACS), Education Resources Information Center (ERIC) and PubMed databases.

The searches in the SciELO and LILACS national databases were performed from the Health Sciences Descriptors (DeCS), using the following combinations: screening AND child language, AND vocabulary, screening AND vocabulary tests, screening tools AND child language, AND screening tools AND vocabulary, screening tools AND vocabulary tests, child language AND vocabulary, child language AND vocabulary test, vocabulary AND vocabulary test.

For the ERIC search, the following combinations of descriptors of the database itself were used: screening tests AND vocabulary, screening tests AND child language, screening tests AND vocabulary AND child language. Finally, for PubMed, descriptors of Medical Subject Headings (MeSH) were used: mass screening AND child language, mass screening AND vocabulary, mass screening AND language tests, language tests AND vocabulary.

Selection Criteria

Articles were considered according to the following inclusion criteria: articles that used fully available vocabulary screening instruments published in Portuguese or English between January 2014 and December 2018. Articles that did not address the subject in the title or abstract, that did not indicate the name of the instrument, duplicate listings of studies in the platforms and literature review were excluded.

The selection of the studies was made according to the reading of the title and abstract. Subsequently, the articles that met the criteria were read in full for the collection of information.

Data analysis

The analysis of the data collected in the articles was performed according to the protocol, including the following information: name of the instrument, nationality, age group, format and related studies, that is, studies that used the same instrument. Finally, this information was included in a table, analyzed and discussed according to the current literature (Table 1).

Step 2: Preparation of the items

Because the current screening instrument is to be used in educational environments, the researchers opted for the age group of 3 to 7 years as the target population. The choice to address children from the beginning of age of 3 was made due to applicability to early childhood education; also, we considered that entry into school occurs at age 4, however, some children

may start a little earlier, at age 3[10]. The maximum age of 7 years was selected because of its salience to initial literacy learning in elementary school, and is an age when vocabulary becomes important in relation to the development of phonological awareness[11] and reading comprehension[12].

Items for each age group were selected from two national instruments for evaluating expressive and receptive vocabulary: the Children's Language Test (ABFW)[13] and the Vocabulary Test by Figures USP (TVfUSP)[14], respectively. Thus, the selection of the receptive and expressive vocabulary sets, was performed according to the following inclusion criteria: has the minimum possible cultural variation from region to region; is easily represented graphically; and belongs one of the targeted semantic categories (furniture, toys, body parts, clothing and footwear, animals, means of transportation, food, places, professions, verbs or adjectives). At this time, no target number of words to be selected was stipulated, because it was only a selection of candidate words that might compose the eventual set used for screening. Item selection was based on two national evaluation tests in vocabulary, as well as on clinical judgment of words commonly used in the school environment for children in this age range, and which did not vary significantly by regional cultural variations. However, it is important to emphasize that, after the validation stage of the instrument, the words can be confirmed as appropriate, or not, for the age group, through analysis by judges of the area and through examination of the applicability of the words to children from different social and cultural contexts.

After the development of the initial word bank, ten words for each age group (Chart 1) were selected to compose the receptive vocabulary assessment and ten to compose the expressive vocabulary assessment. The division according to the expressive and receptive modalities was performed taking into consideration the original measures from which they were selected. Thus, the words belonging to the ABFW were selected for the expressive vocabulary and the words from TVfUSP for the receptive vocabulary, since items sets from both of these larger tests that have been studied within the Brazilian population. In addition, for expressive vocabulary, words from two to three syllables were selected for children up to 5 years old, while for children from 6 to 7 years old, words of greater syllable extension were used, taking into account that, at this age, articulatory development is largely completed. For receptive vocabulary, these word length criteria were not used, because word production is not required.

There are no Brazilian studies to support grouping words within the vocabulary set by difficulty for the target ages 3-7. Thus, researchers were required to rely on their experience in the areas of language and education. During this process, the researchers' took care to choose words with similar lexical representations in the different regions and cultural contexts of Brazil.

Step 3: Development of the application forms, the user manual and the answer sheet

Creation of the application form of the instrument in its paper version involved development of images corresponding to the selected words, and commissioning of a *designer* with experience in children's drawings. The figures were then inserted in the receptive and expressive vocabulary activity sheets of using *Adobe® Photoshop CC*.

The application forms for expressive vocabulary comprised one figure each, aiming at eliciting a naming response for a single stimulus at a time. The receptive vocabulary stimuli comprised four images, one of which was the target stimulus to be identified by the child, and the other three were distractors, which were composed of images already within the database. The selection of target words for receptive and expressive activities was random based on clinical judgment of which stimuli would be easy for a given age group.

The user manual and answer sheets were produced to guide the person using the screening tool. The guide contained topics such as teaching implications, skills evaluated, organization of evaluation materials, testing procedures, and analysis of results.

Table 1. Description of the protocols used on the reviewed literature

INSTRUMENT	NATIONALITY	AGE RANGE	FORMAT	RELATED STUDIES
Dynamic Indicators of Vocabulary Skills (DIVS)	United States	4-years-old	Direct screening	Marcotte, Parker, Furey, Hands[8] Marcotte, Clemens, Parker, Whitcomb[10]
Language Development Survey (LDS)	United States	2-years-old	Checklist with parents	Rescola, Nyame, Dias[11]
Receptive Vocabulary Screener Aplication (RVS)	United Kingdom	3;6- to 6-years-old	Direct screening via app	Schaefer, Bowyer-Crane, Herrmann, Fricke[12]

Chart 1. Selected words for each age range screening

	3-YEARS-OLD	4-YEARS-OLD	5-YEARS-OLD	6-YEARS-OLD	7-YEARS-OLD
Receptive vocabulary	Bitting, walking, refrigerator, pineapple, orange, house, apple, window, jumping, cow	Running, church, sleeping, airplane, ant, bike, shoe, crying, bread, television	Cutting, drum, kneading, garbageman, dress, whale, tea cup, slipper, licking, mountain	Driking, sandwich, hitting, toothbrush, combing, owl, giraffe, barking, firefighter, swing	Domino, calling, socks, pig, fishing, singing, brain, ambulance, cooker, fork
Expressive vocabulary	Duck, cake, stove, spoon, seesaw, school, smile, carrot, chicken, tap	Tshirt, horse, banana, table, car, doll, clown, bedroom, mouth, breaking	Jacket, monkey, popcorn, clock, bus, robot, doctor, bathroom, nose, sitting	Handbag, elephant, pastry, towel, rocket, ferris wheel, farmer, beach, belly button, swinging	Alligator, cheese, broom, helicopter, whistle, astronaut, castle, spider, digging, driving

RESULTS

Step 1

The initial database search resulted in a total of 1199 articles, and based on salience of the titles. 29 were selected for the analysis of the. Based on the abstracts, 13 studies were read in full, five were excluded due to redundant content and for were excluded because they did not meet the established inclusion criteria. The final sample consisted of four articles (Figure 1).

Of the four articles analyzed, the use of 3 international vocabulary screening instruments was identified, of which 1 was used in 2 articles, listed in Table 1. No nationally normed instruments were found for receptive and expressive vocabulary screening. The three selected instruments are described below.

Dynamic Indicators of Vocabulary Skills (DIVS)

The DIVS screens receptive and expressive vocabulary of preschool children. Its first subtest, *Picture Naming Fluency* (PNF), consists of 44 pictures that must be named in a one-minute time. In the second subtest, *Reverse Definition Fluency* (RDF), the tester provides definitions for 30 words, which the child must name. The overall score on the DIVS is the number of correctly named words in both subtests[8,15].

Language Development Survey (LDS)

The *Language Development* Survey is a scale to be completed by the person in charge, and consists of 300 words that characterize the spontaneous vocabulary of children at 24 months of age[16]. In the study in question, the European Portuguese version of the instrument was used[17].

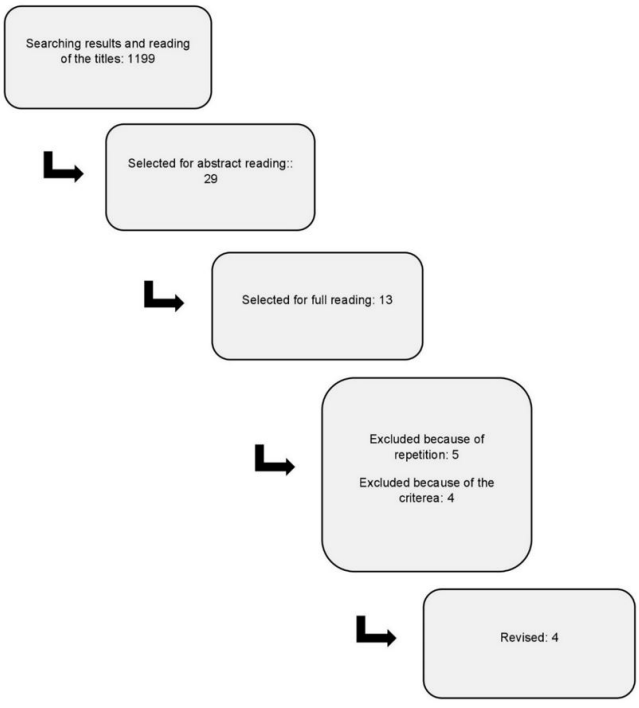

Figure 1. Flowgram of articles selection

Receptive Vocabulary Screener Application (SVR)

This instrument is an application for *tablet*, which aims to screen the receptive vocabulary of monolingual and bilingual children. Initially, a registration with the patient's data must be completed that includes name, date of birth and languages spoken. On each screen, the child hears a word and must choose the corresponding figure from four options. The instrument also has a digital mascot called *Meemo*, which guides the application process in the child's mother tongue. The score is automatically calculated and transferred to an Excel[18] spreadsheet.

Step 2

For the current screening measure, a word bank comprising a total of 210 items was obtained, with subgroups of words distributed among the ages, as shown in Table 2.

Step 3

From the word bank, 210 cards were prepared, comprising two test activities, 10 receptive vocabulary forms and 10 expressive vocabulary forms for each age. In the initial pilot phase, each child must respond to the activities only for their age, but in the validation phase the instrument will be applied in full, so that basic normative data for the screening instrument are obtained. For the receptive vocabulary task, the child will hear a word and will point to the corresponding picture among 4 options. One of the pictures is the target stimulus and the other three are distracting stimuli. For expressive vocabulary, the objective is to name individually presented visual stimuli without a time restriction. These procedures for vocabulary screening were chosen because of the simplicity of the tasks, their ease of application by the tester as well as their ease of comprehension by the child. Direct, individual screening was opted for, considering that, in different social conditions, the participation of parents in indirect screening may difficult the application of the test in the school environment and identification of any sign indicating language changes impossible, as well as it is not possible to analyze the real vocabulary performance of the child in a whole-group classroom setting.

The user manual was produced to instruct the evaluator in how to use the instrument. In the user manual, theoretical foundations of typical and atypical development of vocabulary and the importance of early identification can be found. Also lsited are the materials for the instrument (screening sheets of expressive and receptive vocabulary, a puppet and answer sheets), the assessment procedures, how to fill in the answer sheet, and data analysis procedures.

Screening should be carried out in a place with adequate acoustic and lighting conditions, with children between 3 and 7 years of age. The material includes a dog puppet which acts as a mascot to facilitate the interaction between tester and child and makes the procedure more comfortable for the child, creating a playful and interactive environment for the observation of qualitative interactions.

The answer sheet supports the recording and analysis of the child's performance. Correct responses are scored"1" and errors are scored "0", with a maximum total of 20 points. Although the

Table 2. Words bank for the selection of the activities for each age range

CATEGORIES	3-YEARS-OLD	4-YEARS-OLD	5-YEARS-OLD	6-YEARS-OLD	7-YEARS-OLD
Furniture	Spoon, window, tap, refrigerator, stove, cup	Bed, table, chair, sink, television, knife	Tea-cup, clock, comb, dish, pan	Mirror, towel, fan, toothbrush, computer	Couch, candle, car wheel, iron, telephone, broom, frying pan, fork
Toys	Seesaw	Doll, ball, airplane	Robot, drum	Swing, ferris wheel, piano, rollerblading	Arrow, whistle, domino
Body parts		Mouth, eyes, foot	Legs, nose, belly, tooth, ear	Knee, finger, shoulder, belly button	Heart, brain
Clothing and footwear		T-shit, shoe	Pants, slipper, dress, jacket	Hat, dress, handbag	Socks
Animals	Dog, cow, chicken, duck	Cat, fish, frog, bird, ant, rat, horse	Monkey, lion, bear, whale	Shark, elephant, snake, owl, giraffe	Whale, bee, pig, bunny, spider, alligator
Means of transport		Car, bike	Motocycle, airplane, train, bus	Truck, rocket, balloon	Ambulence, helicopter
Foods	Pineapple, carrot, orange, apple, cake	Banana, bread, icecream, eggs	Soda, strawberry, popcorn	Watermelon, sandwich, pastry	Cheese, pasta, onion, grape
Places	House, school	Bedroom, living room, church	Bathroom, mountain, park	Classroom, store, beach	Castle, river, waterfall
Professions		Teacher, clown	Doctor, dentist, garbageman	Farmer, firefighter, bricklayer	Mailman, cooker, astronaut
Verbs	Jumping, walking, biting, smiling	Eating, running, breaking, sleeping, crying	Combing, kneading, burning, licking, sitting, cutting	Beating, erasing, rocking, drawing, drinking, smelling, barking	Wet, digging, fishing, calling, writting, flying, singing, driving, dancing
Adjectives	Sad, happy, tall, big	Old, hot, sad, thin, angry	Small, sick, cold, pink, broken, sitted, open	Closed, angry, round, sunny, dirty, preagnant, curly	Strong, black, dark hair, prisoner, flowery, short, empty, bottom

objective is to screen vocabulary, it is also suggested qualitative aspects of language be observed, such as the presence of speech difficulties, difficulties in understanding the directions; and/or off-task behaviors such as inattention and restlessness.

Finally, after the application, a report will be generated for delivery to teachers and parents for referral, if needed. The Speech-Language professional should take measures according to the observed needs of each child.

DISCUSSION

The objective of this work was to develop an instrument to screen the receptive and expressive vocabulary for children between 3 and 7 years of age. The first stage, consisting of an integrative literature review, resulted in identification of three vocabulary screening instruments available in other countries.

The first, the *Dynamic Indicators of Vocabulary Skills,* was submitted to the validation process, presenting adequate reliability, construct validity and predictive validity values[15]. Performance on this screening predicts the development of receptive and expressive vocabulary, important for the acquisition of reading and academic success[19].

The second instrument, the *Language Development Survey*, is designed as a *checklist* and is translated into several languages. Its evidence of validity indicates the ability to differentiate children with delayed language development[20]. A possible limitation is of this screening tool is that the results can be influenced by the socioeconomic and educational level of the parents, compromising the reliability of the instrument[21]. Thus, for its application in Brazil, the cross-cultural adaptation and validation is needed.

Despite the lack of validation data, the *Receptive Vocabulary Screener Application*, presented adequate usability for screening of monolingual and bilingual children. This application can be used by health and education professionals[18]. Its use in a digital format (tablet) follows advances in technology, and most children are familiar with this type of device[22].

In relation to the national scenario, no vocabulary screening instruments were found. This data reinforces the need for the development and validation of national instruments in the area of Speech-Language therapy, since the number of studies dedicated to assessment tools is still small[23] are few commercially available speech-language tests[24].

In addition to demonstrating the scarcity of vocabulary screening instruments in the national scenario, the articles reviewed contributed a source of research for the possibilities of developing an assessment tool. Direct screening was chosen as a form of application, because the answers to an indirect screening by means of questionnaires and *checklist* can be influenced by the socioeconomic and educational conditions of the family in question[21]. Another factor is that, despite the potential that technological tools present optimization and motivation in the assessment of children, it is important to highlight that, in many Brazilian educational contexts, difficulty accessing technologies in the professional environment can be a barrier to screening.

This review highlighted the importance of monitoring the development of vocabulary, including the important relationship for the development of further skills, such as decoding and reading comprehension[19,25], as well as the ways of using the

instruments to develop the current screening tool. Receptive and expressive vocabulary skills were chosen to compose the instrument, because the limited understanding and production words is a main indicator of language development delays[19], a characteristic that can be observed in diagnoses, such as developmental language disorder (DLD)[26], autism spectrum disorder (ASD)[27] and language delay[28].

It is expected that this screening instrument will be able to differentiate the vocabulary of children who have changes in language development, specifically in vocabulary, enabling early identification and intervention, which will bring important benefits in child prognosis. The instrument presented here may be modified according to future validation steps, for adequacy of factors identified by testers, or observed in application studies with children, such as, for example, the spread of the age range and the use of appropriate words, according to linguistic variants of different regions.

In order to verify, however, whether the results of the instrument are reliable, validation studies will be necessary that examine: validity based on the test content; validity based on the response processes; evidence of validity based on internal consistency; reliability; equity and accuracy[29]. Thus, the first step in this research should verify evidence of validity based on the test content. These data would allow estimates of the extent to which items of the instrument are in consistent with the purpose of the construct, that is, if the selected items are representative for the identification of children with changes in vocabulary[30].

CONCLUSION

It was verified the absence of national vocabulary screening tools. Based on the literature review, an expressive and receptive vocabulary screening instrument was developed for children between 3 and 7 years of age.

This study can contribute to the scientific scenario, especially in the field of Educational Speech and Language Therapy, given the scarcity of screening instruments and the practical need to use this type of tool in health care units, schools and offices. The use of vocabulary screening tools in the school environment can bring benefits by identifying children at risk for language changes.

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