

Systematic Review

Revisão Sistemática

Léia Gonçalves Gurgel¹
 Deisi Cristina Gollo Marques Vidor²
 Maria Cristina Rodrigues Azevedo Joly³
 Caroline Tozzi Reppold⁴

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Correspondence address:

Léia Gonçalves Gurgel
 Rua Sarmento Leite, 245, Sala 117,
 anexo II, Porto Alegre (RS), Brasil,
 CEP: 90050-170.
 E-mail: leiagg@yahoo.com.br

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Risk factors for proper oral language development in children: a systematic literature review

Fatores de risco para o desenvolvimento adequado da linguagem oral em crianças: uma revisão sistemática da literatura

ABSTRACT

Purpose: To conduct a systematic review of literature production related to risk factors for proper oral language development in children. **Methods:** We used the terms “child language,” “risk factors,” and “randomized controlled trial” in MEDLINE (accessed via PubMed), Lilacs, SciELO, and The Cochrane Library from January 1980 to February 2014. Randomized controlled trials involving the study of some risk factors related to child language were included. Works with individuals who were not from the age group 0–12 years and presented no reliable definition of risk factors were excluded. The research findings were classified according to their theme and categorized methodological aspects. **Results:** We observed the lack of a standardized list of risk factors for language available for health professionals. The main risk factor mentioned was family dynamics, followed by interaction with parents, immediate social environment, and encouragement given to the child in the first years of life. It was also observed that organic hazards such as brain injury, persistent otitis media, and cardiac surgery, besides the type of food and parental counseling, may be related to language disorders. **Conclusion:** More randomized controlled trials involving the evaluation of risk factors for child language and the creation of further studies involving children above 6 years of age and males are needed.

RESUMO

Objetivo: Este artigo tem como objetivo realizar uma revisão sistemática da produção bibliográfica relacionada aos fatores de risco para o desenvolvimento adequado da linguagem oral em crianças. **Estratégia de pesquisa:** Utilizaram-se os termos “*child language*”, “*risk factors*” e “*randomized controlled trial*” nas bases de dados MEDLINE (acessado via PubMed), LILACS, Biblioteca Cochrane e SciELO, durante o período de janeiro de 1980 a fevereiro de 2014. **Critérios de seleção:** Foram incluídos ensaios controlados randomizados que envolvessem o estudo de algum fator de risco relacionado à linguagem de crianças. Foram excluídos trabalhos com indivíduos que não tivessem entre 0 e 12 anos e apresentassem definição não confiável de fator de risco. **Análise dos dados:** Os achados da pesquisa foram classificados de acordo com o tema investigado e os aspectos metodológicos categorizados. **Resultados:** Observou-se a inexistência de algum tipo de lista padronizada de fatores de risco para a linguagem disponível aos profissionais da saúde. O principal fator de risco apontado foi a dinâmica familiar, seguido da interação com os pais, o ambiente social imediato e o estímulo dado à criança nos primeiros anos de vida. Observou-se também que os riscos orgânicos, como lesão cerebral, otite média persistente e cirurgia cardíaca, além do tipo de alimentação e aconselhamento parental, podem estar relacionados aos transtornos de linguagem. **Conclusão:** São necessários mais ensaios clínicos controlados randomizados envolvendo a verificação dos fatores de risco para a linguagem em crianças e a criação de mais estudos envolvendo crianças acima dos 6 anos de idade e do sexo masculino.

Study carried out at the Graduate Program in Health Sciences, Universidade Federal de Ciências da Saúde de Porto Alegre – UFCSPA – Porto Alegre (RS), Brazil.

(1)Graduate Program in Health Sciences, Universidade Federal de Ciências da Saúde de Porto Alegre – UFCSPA – Porto Alegre (RS), Brazil.

(2)Pontifícia Universidade Católica do Rio Grande do Sul – PUC-RS; Departamento de Fonoaudiologia, Universidade Federal de Ciências da Saúde de Porto Alegre – UFCSPA – Porto Alegre (RS), Brasil.

(3)Universidade de São Paulo – USP – São Paulo (SP); Graduate Program in Psychology, Universidade de Brasília – UnB – Brasília (DF), Brazil.

(4)Universidade Federal do Rio Grande do Sul – UFRGS; Psychology Department, Universidade Federal de Ciências da Saúde de Porto Alegre – UFCSPA – Porto Alegre (RS), Brazil.

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INTRODUCTION

Language is developed based on genetics and verbal stimulations that are created in the environment in which the subject is inserted⁽¹⁾. Language development is an evolutionary and complex process that specially involves cognition⁽²⁾. The child also has his/her development affected by nutrition, stimulation, education, and environment where that child and his/her family lives⁽³⁻⁵⁾. Language difficulties refer to changes in the developmental process of verbal and/or written expression and reception. Majority of complaints reported in the pediatric, neurology, and speech therapy practice involve some kind of delay in language acquisition or learning difficulties and different risks for cognitive development^(3,6).

Several factors may be involved with language disorders such as poor or impaired social relationships, lack of linguistic opportunities in the environment, mental handicap, autism, genetic and chromosomal syndromes, motor or sensorial deficits, and Attention Deficit and Hyperactivity Disorder - ADHD⁽⁷⁾. Specific delays in language development should be identified early, because these disorders may interfere in the child's social and educational development. ⁽⁸⁾ Language disorders in children are also associated, in literature, with psychosocial impairment such as low self-esteem, social isolation and anxiety. Language disorders are one of the most frequent developmental disorders, affecting 3–15% of the children. They may be classified as delay, dissociation, or deviation⁽³⁾.

There are some crucial periods in language development, when adverse factors have higher impact⁽⁹⁾. Thus, assessment of risk factors, together with detailed observation of the child's speech, may provide a useful guide for the early identification of children who may someday develop any kind of language disorder⁽¹⁰⁾. In this context, risk refers to personal, environmental, or social circumstances that increase the possibility of a person to have some impairment^(6,11).

Hence, it is important to emphasize that frequently health professionals, such as pediatricians, nurses, speech therapists and psychologists, and educators, are responsible for identifying children that may be at risk for disorders in language development and for reporting them to a more detailed evaluation. However, especially in Brazil, there is still a lack of training for professionals and of validated instruments that can be used in the evaluation and detection of such disorders⁽¹²⁾. Among the main methods used by primary attention professionals to identify them is the comparison with other children of same age and information about the parents' concern about their child's development⁽¹⁰⁾.

OBJECTIVES

With the aim of searching information that may help to provide instruments for health and education professionals, this study tried to systematically analyze in literature randomized controlled trials that approach the risk factors for children's appropriate language development.

RESEARCH STRATEGIES

The following electronic databases were investigated (from January 1980 to February 2014): MEDLINE (accessed via PubMed), Lilacs, The Cochrane Library, and SciELO. The keywords used were "child language," "risk factors," and "randomized controlled trial" and their related terms. Words related to outcomes to increase sensibility of this research were not included. There was no risk factor restriction for language.

SELECTION CRITERIA

Randomized controlled trials that studied some kind of risk factor related to children's language were included. Randomized controlled trials were chosen in this study because they represented the most reliable available scientific evidence. In order that systematic reviews became effective, they should include only high-quality randomized controlled studies⁽¹³⁾. Exclusion criteria were as follows: investigations that included subjects who were not between 0 and 12 years, presentation of a nonreliable definition of what was deemed as risk factor, and presentation of a methodological design that is different from what was proposed in the objective of this study.

DATA ANALYSIS

The investigators assessed titles and abstracts of all articles identified in the search strategy. All abstracts that did not provide enough information as to their inclusion and exclusion criteria were chosen for evaluation of the complete text. In the whole text phase, two independent reviewers assessed the articles and performed their selections according to eligibility criteria. Two independent reviewers collected data concerning methodological characteristics, interventions, and outcomes of studies using standardized forms. In all study stages, discordances got into agreement in a consensus. The main information concerned risk factors related to children's oral language development.

RESULTS

The initial research found 1,367 abstracts, from which 9 studies satisfied the inclusion criteria and were considered as potentially relevant for a later detailed analysis. Figure 1 presents the selection diagram of studies in all stages. Articles that were not accepted for this review had the following factors as reasons for their exclusions: they analyzed mainly other aspects (such as risk factor related only to general development), they were literature reviews or were not randomized controlled trials. After choosing the articles, two independent evaluators proceeded to the analysis and extraction of information, which were entered in spreadsheets previously formatted for this objective.

In total, nine studies that satisfied all inclusion criteria were found. Risk factors found in the included studies were the following: family dynamics, interaction with parents, immediate

social environment, encouragement given to the child in the first years of life, brain injury, persistent otitis media, heart surgery, type of diet, obesity, type of food, and parental counseling about language. Age of kids varied from 0 (newborns) to 12 years. The main characteristics of the included studies are given in Table 1, such as authors, year of publication, published journal and impact factor (which is the main risk factor mentioned in the study), sampling number, age, and gender of participants.

There are only a few randomized controlled trials available in literature that discuss about risk factors for children's

language development. Two studies^(14,15) verified the effect of children's immediate social environment, family dynamics, and aspects of parents' history as potential risk factors for their language development. One of the studies⁽¹⁴⁾ highlighted that early pediatric care represents a significant opportunity of improving children's development. This study emphasizes that poverty is related to difficulties in children's development and in their chances to get education. This happens because the verbal interactions between parents and children are important for the proper development of children's oral language

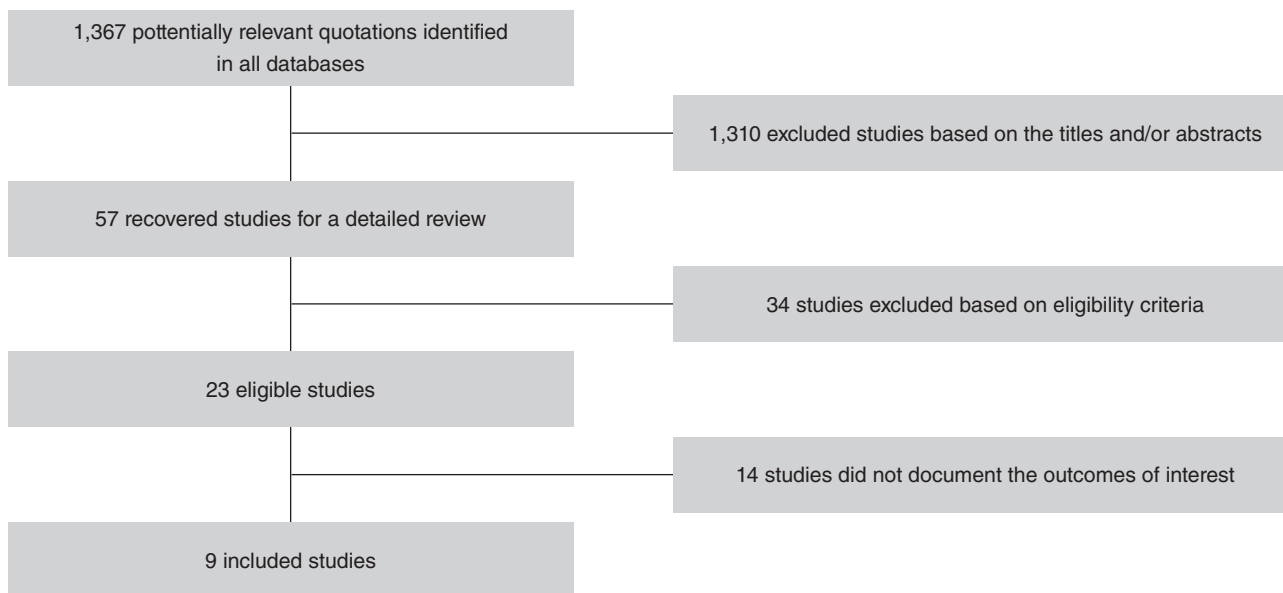


Figure 1. Diagram of the process of article selection

Table 1. Characteristics of the included studies

Authors and year	Original language	Journal (impact factor)	Main risk factor described	n	Sample sex
Mendelsohn et al., 2011 ⁽¹⁴⁾	English	Archives of Pediatrics & Adolescent Medicine (5,184)	Family and environment	410 families (different ages)	Between 45.3 and 54% (F)
Nair et al., 2003 ⁽¹⁵⁾	English	Child Abuse & Neglect (ni)	Family and environment	265 mothers (27.5 years old in average) and no children	Mothers: 265 (F); 0 (M) Children: ni
Lowell et al., 2011 ⁽¹⁶⁾	English	Child Development (ni)	Family and environment	157 (6–36 months)	Between 57.7 and 54.4% (F); between 42.3 and 45.6% (M)
Landry et al., 2008 ⁽¹⁷⁾	English	Developmental Psychology (ni)	Family and environment	264 NB (28 months)	167 (F) and 97 (M)
Luu et al., 2009 ⁽¹⁸⁾	English	Pediatrics (5,930)	Prematurity	375 children (12 years old)	37.75 (F) and 62.25% (M)
Paradise et al., 2003 ⁽¹⁹⁾	English	The Pediatric Infectious Disease Journal (3,486)	Otitis	429 children (2 months old)	ni
Bellinger et al., 1997 ⁽²⁰⁾	English	Journal Of Developmental and Behavioral Pediatrics (2,578)	Heart surgery	171 children (2 years and a half)	23.5 (F) and 76.5% (M)
Rask-Nissilä et al., 2000 ⁽²¹⁾	English	Journal of the American Medical Association (29,273)	Diet	1,062 (7 months to 5 years)	ni
About e Akhter, 2011 ⁽²²⁾	English	Pediatrics (5,930)	Diet	302 (8–20 months)	Between 50 and 57% (F)

Caption: n = sample number; F = female; M = male; ni = no information; NB = newborns

and reading, which tend to be reduced when families have low socioeconomic level.

The methodology used⁽¹⁴⁾ interactions between parents and children of 410 families, who were assessed through the use of StimQ-Infant questionnaire⁽²³⁾, which is characterized as a structured interview to evaluate the interactions between parents and children and children's development in the first years of childhood. In this study, a diary was also used in which mothers wrote their reading activities to their children at home. Families were divided into two groups. The first, besides illustrational didactic material, received support and orientations of an expert on verbal interactions in a ludic context, with shared readings, and daily routines. The second received only illustrational didactic material. The first group achieved higher scores in the StimQ-Infant questionnaire and had more reading activities at home. However, there was, in both groups, an increase in the interaction between parents and children; therefore, we can see the importance of counseling parents through the illustrational didactic material and of consultations to health professionals.

The other study⁽¹⁵⁾ evaluated the relationship between environmental risks and early intervention about parenting attitudes. Children whose mothers had recent or previous substance abuse were included in this study. In this study, 161 mothers and their sons were evaluated for 18 months. The intervention group received weekly visits in the first 6 months and, between 6 and 18 months, once every 2 weeks. Language was evaluated through the Receptive-Expressive Emergent Language Scale (REEL)⁽²⁴⁾. Ten risk factors for development and language were assessed: maternal depression, domestic violence, size of family, nondomestic violence, imprisonment, absence of boyfriend or husband, negative events of life, psychological status and psychiatric problems, lack of housing, and mother that used drugs. It was found that women with more than five risk factors had more frequently abusive and negligent behaviors, putting their children at higher risks for their general and language development.

Other two studies^(16,17) also evaluated the risk factors related to the child's social environment, suggesting some strategies to minimize them. One of the studies⁽¹⁶⁾ used the Child First, a home intervention program developed for investigating the negative effects of exposure to cumulative psychosocial risks in children's emotional and cognitive development. They documented the efficiency of an intervention based on the interaction between parents and children and psychotherapy. At the 12th follow-up month, children had some improvements in the socioemotional functioning and in language development. Language was evaluated through the Infant/Toddler Developmental Assessment⁽²⁵⁾. Authors emphasize parents' mental health, abuse, and negligence as main risk factors for child's language development. They state that cumulative environmental risk is strongly associated with the incidence increase of behavioral, socioemotional, and language issues.

Another study⁽¹⁶⁾ analyzed the right moment for the intervention on maternal and child social behaviors and on communication skills for children with biological risk. It used the Playing and Learning Strategies (PALS II) — the toddler-preschool phase — a children intervention program whose

focus is on maternal behavior and child's needs. Intervention during childhood through games and learning strategies shows strong changes in the affective-emotional maternal behaviors and on child's development. Language of children included in this study was assessed with the following tests: The Peabody Picture Vocabulary Test, Third Edition (PPVT-III)⁽²⁶⁾ (English and Spanish versions)⁽²⁷⁾ and Preschool Language Scale, Third Edition⁽²⁸⁾, which assesses synthetic and semantic skills. Authors mention prematurity, abuse, living in orphanage, maternal depression, low socioeconomic level, and quality of verbal encouragement as risk factors for language. The study reveals that generally children with special needs have less responsive parents and perform inappropriate interactions, therefore their situation gets worsened due to the presence of these other risk factors. Studies presented until here are in agreement with general literature, which states that as earlier and appropriate the family relations are and child's social interaction, more benefits will be achieved at short term, considering language and learning development. More specifically, maternal speech has been pointed out as a highlight to make the development of children's language easier^(29,30).

Other studies emphasized children's individual organic hazards as influences on the development of language. It is the case of a study⁽³¹⁾ that intended to compare cognitive, language, behavioral, and educational aspects of premature children with a control group of children born at term. They evaluated the impact of neonatal brain injury and environmental risks in the intellectual function before children turned 12 years old. A total of 375 children born from 1989 to 1992 with intraventricular hemorrhage and 111 children from a control group were assessed. Psychometric and neurological tests were applied and interviews about educational needs were taken. In the Wechsler Intelligence Scale for Children, the premature cohort achieved 6–14 points less in the scores when compared to the control group, even after adjustment of the sociodemographic factors. In the Clinical Evaluation of Language Fundamentals test (linguistic skills test), 22–24% of premature children were in an abnormal range, whereas controls presented from 2 to 4%, showing a result lower than expected.

Several other tests were also applied that complement children's global and language evaluations, such as the PPVT⁽³¹⁾, Comprehensive Test of Phonological Processing (CTOPP)⁽³²⁾, Test of Word Reading Efficiency (TOWRE)⁽³²⁾, and Gray Silent Reading Test (GSRT)⁽³³⁾. Premature children with and without brain injury required more school services, more support at reading, writing, and mathematics, as well as they had more behavioral issues. Premature children, especially those with severe brain injury, showed severe deficits in their neuropsychological profiles, translated into an increase of using the school support services at 12 years of age. Indeed, literature states that premature children may someday present problems of general language⁽³⁴⁾ and fluency⁽³⁵⁾. Although some studies mentioned that it seems that 2-year-old premature children may not present considerable damage in their language performance, only gestational age is not enough to damage this development. Family risks can produce interference in the language, and possibility of risks regarding the future cannot be discarded⁽³⁶⁾.

Also considering the organic hazards, a study tried to verify⁽¹⁹⁾ if the immediate insertion of ventilation tubes in children with persistent otitis media would minimize the development of subsequent deficiencies. A total of 429 three-year-old children were randomized and divided into two groups, where in the second group the ventilation tube was put 9 months later. Children were evaluated through the following tests: McCarthy Scales of Children's Abilities⁽³⁷⁾, PPVT-R⁽³¹⁾, Form M Number of Different Words (NDW)⁽³⁸⁾, Percentage of Consonants Correct: Revised (PCC-R)⁽³⁹⁾, and Child Behavior Checklist (CBCL)⁽⁴⁰⁾. No significant differences between the treatment groups concerning speaking, language, cognition, or psychosocial development were found.

In the first 3 years of life, the immediate insertion, or not, of ventilation tubes had no influence on the results of development evaluation instruments, regardless the otitis being continuous or not, uni- or bilateral, with or without light-to-moderate hearing loss. The first years of life are considered the most important for the development of hearing and language skills, because in this period the maturation of the nervous system with higher brain increases and new neuronal connections are formed⁽⁴¹⁾. The objective of inserting ventilation tubes is restoring normal hearing levels and avoiding development problems⁽⁴²⁾. The functional effect of lack of tube use included deficiencies in speaking, language, and cognitive development, even though this effect has not yet been explained in literature.

Another study⁽²⁰⁾ observed the development of children that had a transposal surgery of great arteries. It included 171 children who had presented total circulatory arrest or extra-body circulation, with low predominant flow. They were evaluated through the CBCL for ages 2–3 years⁽⁴³⁾, Minnesota Child Development Inventory⁽⁴⁴⁾, and MacArthur Communicative Development Inventory/ Words and Sentences⁽⁴⁵⁾. Parents answered questionnaires when children were 2 and a half years old. It was seen that children with circulatory arrest, especially those with deficiency in the ventricular septum, manifested poorer expressive language and behavioral issues. Use of circulatory arrest to protect vital organs during heart surgery may be therefore, according to this study⁽²⁰⁾, a risk for the appropriate development of motor and language skills.

Another study⁽²¹⁾ showed that diet and kind of food are also risk factors for language. Parents were counseled to keep children's diets with reduced amounts of saturated fat and cholesterol. The effect of such practice on neurodevelopment during the first 5 years of life was analyzed. A group of 496 five-year-old children were randomly distributed to receive individual guidance from a professional. The aim was to reduce ingestion of fat from 30 to 35%. Children were analyzed through the extended 5-year neurological testing for children⁽⁴⁶⁾. The relative risk for children to achieve results below that expected for their ages in the speaking and language tests, motor functioning, perception, and motor-visual skills was of 0.95. The study showed that counseling about children's diet during the first 5 years of life is related to their proper development.

Another study⁽²²⁾ considered bad nourishment as a risk factor for the proper development of language. Authors stated that intervention in children's feeding, through guidance to mothers, improved their development in language and nutritional aspects. This randomized trial was carried out with 302 children aged 8–20 months and their mothers in Bangladesh. Mothers from the control group received 12 informational sessions about health and nutrition. An intervention group received more six sessions. A second intervention group received, together with the sessions, fortified powder food with vitamins and minerals. Children had their receptive and expressive linguistic competences evaluated through 11 items from the Bayley Scales, such as repetition of words, pronunciation of words and sentences, acknowledgment, and nomination of objects. Children received scores according to the number of words that were repeated, comprehended, or spoken. It was concluded that children from the intervention group had better performances in the linguistic competences compared to the controls. In addition, the study provided evidence for political planners regarding the importance of complementary food, stimulation of children, and orientation to mothers.

As to the standardized instruments that were used in the nine included articles in this research, as specific tests of language parameter evaluation, the following were included: PPVT-III (English⁽²⁶⁾ and Spanish⁽²⁷⁾ versions); Preschool Language Scale, Third Edition⁽²⁸⁾; Wechsler Intelligence Scale for Children⁽⁴⁷⁾; CTOPP⁽³²⁾; TOWRE⁽³²⁾; GSRT⁽³³⁾; PCC-R⁽³⁹⁾; MacArthur Communicative Development Inventory/ Words and Sentences⁽⁴⁵⁾; REEL⁽²⁴⁾; and NDW⁽³⁸⁾.

Some of the investigations in this review⁽¹⁴⁻¹⁷⁾ involved the participation of subjects in intervention programs to reduce risk factors. Generally, these programs had as their aim to change parents' behavior, and they were effective in reducing complications through the development of children that had risk factors related to language. Even though literature^(10,48,49) states that male gender is a risk factor for the development of language changes, the studies included in this review have, at least most of them, samples with female children.

The main risk factor declared in studies with the randomized controlled trials in this review was family dynamics. They are followed by interaction with parents, immediate social environment, and encouragement given to children in the first years of life. Also, follow-up with experts counseling about child's development tend to reduce the effects of risk factors. With lower frequency in the studies, there were also organic hazards such as brain injury, persistent otitis media, and heart surgery. Finally, diet, kind of food, and parental counseling on this subject were considered risk factors. Studies included in this review are in agreement with literature⁽¹⁰⁾, and the most significant identified risk factors were being male, having hearing issues, and reactive temper. The persistent and sociable temper and good maternal mental health were found to be the protection factors for language development. The risk and protection factors, together with observations of child's speaking and marks of child language development, are confirmed as important guides for primary health professionals who aim at early identifying children with difficulties.

It is worth mentioning that professionals generally use comparison with children of the same ages, parents' complaints, and lists of the main marks in child's development as methods of alteration diagnosis⁽¹¹⁾. A list of language development risk factors available for health professionals has not been developed or validated yet. This happens because biological, social, psychological, and individual factors have a complex relation with other factors such as family history, socioeconomic status, prenatal information, health conditions, birth order, number of siblings, oral habits, and other individual varieties.

As a limitation of this review, several relevant studies may not have been included due to the design restriction imposed in this review. More randomized controlled trials including the male sex and a more detailed verification of the protection factors for acquiring and developing language in children should be performed to provide instruments for health and education professionals, so that they can find these difficulties earlier.

CONCLUSION

In this review, there was the inexistence of a standardized list including risk factors for language available for health professionals. Professionals that are directly in contact with the child end up presenting difficulties in diagnosing and using other techniques, such as comparison with other children, as a parameter to diagnose changes involving children language aspects. Despite the inexistence of lists described in literature, the main risk factor found in this review was family dynamics, followed by interaction with parents, parental counseling, immediate social environment, and encouragement given to the child in the first years of life. Organic hazards such as brain injury and persistent otitis media, besides nourishment, were also mentioned. More randomized controlled trials involving the verification of risk factors for children's language are suggested given the importance of such subject, and the creation of studies including children above 6 years of age and males are also recommended to prove the effect of the sex variable for child's language development.

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