

Revision articles

Influence of risk factors on language development and contributions of early stimulation: an integrative literature review

Influência de fatores de risco sobre o desenvolvimento da linguagem e contribuições da estimulação precoce: revisão integrativa da literatura

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Conflict of interest: non-existent

Received on: November 08, 2016
Accepted on: January 11, 2017

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ABSTRACT

This study aimed to identify evidence in the literature regarding the influence of risk factors on child language development and point out the contributions of early stimulation. In this integrative literature review, the databases Lilacs, PubMed and SciELO and the descriptors Child language; Risk factors; Premature; Postterm child; Apgar score; Early intervention were used. From the findings, the following data were extracted: author, year of publication; objective and study design; participants and inclusion criteria; studied variables; main findings. For the organization and analysis of the studies, we used the thematic content analysis technique. We identified 1,421 articles; 29 met the inclusion criteria of this study. The studies were categorized by similar results. Most of the articles reveal the effect of prematurity on language development. Four studies investigated the association between risk factors in general and problems in language development. One study evaluated school-age children and associated Apgar scores with SLI. The authors' recommendation was unanimous about the monitoring and early intervention. We conclude that the risk factors listed in the study negatively influence children's language development. We reinforce the recommendation of early and qualified care for these children, as it contributes to proper development, in order to avoid and / or minimize risks and future changes.

Keywords: Child Language; Risk Factors; Premature; Apgar Score; Early Intervention (Education)

RESUMO

O objetivo do estudo foi identificar evidências na literatura a respeito da influência dos fatores de risco sobre o desenvolvimento da linguagem da criança e as contribuições da estimulação precoce. Trata-se de uma revisão integrativa, que utilizou as bases de dados Lilacs, PubMed e SciELO e os descritores: linguagem infantil, fatores de risco, prematuro, criança pós-termo, índice de Apgar, estimulação precoce. A partir dos achados, extraíram-se os seguintes dados: autores, ano de publicação, objetivo, desenho do estudo, participantes e critérios, variáveis estudadas, principais achados. Para a organização e análise foi utilizada a técnica de Análise de Conteúdo do tipo temática. Foram identificados 1.421 artigos, 29 atenderam os critérios de inclusão. Os estudos foram categorizados por resultados afins; A maioria dos artigos selecionados trata do efeito da prematuridade sobre o desenvolvimento da linguagem. Quatro estudos investigaram a associação entre fatores de risco e problemas no desenvolvimento da linguagem. Um dos estudos avaliou crianças em idade escolar e associou valores de Apgar com DEL. Foi unânime a recomendação acerca do acompanhamento e intervenção precoce. Conclui-se que os fatores de risco elencados influenciam negativamente no desenvolvimento da linguagem. Reforça-se a recomendação do atendimento precoce e qualificado dessas crianças, evitando e/ou minimizando alterações futuras.

Descritores: Linguagem Infantil; Fatores de Risco; Prematuro; Índice de Apgar; Intervenção Precoce (Educação)

INTRODUCTION

The language process is complex and, due to its relevance, it has been widely studied. The first three years in a child's life correspond to a development phase characterized by the acquisition of new functions and skills and by brain plasticity. In this phase, great advances take place in the motor, cognitive and social areas, as well as the acquisition and mastery of language, which are essential for the child's global development and language¹.

Around the first year of life, children with normal language development start to practice their first words². Before reaching this verbal language form, however, they develop a range of more general communication skills at a non-verbal, pre-linguistic level, which are essential for the normal development of language. In this process, the child's language evolves from the use of a single word to a well-structured grammatical form and becomes increasingly efficient³.

Like other (environmental and socioeconomic) risk factors, the biological risk factors play an important role in the child's development and can impair the cognitive skills and normal language development⁴.

In this review, we focus on the pre, peri and post-natal risk factors, including: prematurity, postmaturity, Apgar score, low birth weight and complications during pregnancy and birth^{5,6}.

Children who fit into any of these situations at birth present a potential risk for language development problems, which can extend from birth until adolescence in the learning process^{2,6,7}.

The Apgar score (or scale) offers a rapid assessment of the infants' responses immediately after birth, as well as of his/her adaptation to extra-uterine life. Infants with Apgar < 7 at 5 minutes are considered as high-risk. The items assessed help to detect problems that require special care⁸.

Preterm infants (PT) are characterized by a gestational age of less than 37 weeks and low birth weight (LW) by a weight of less than 2,000g. Both can be associated with gestational factors like smoking and quality of prenatal care⁸.

Despite all factors harmful to child development, many associated risks can be avoided or minimized, depending on the implementation of effective prevention programs^{9,10}. One of the most effective prevention measures is the early identification. In addition, specialized monitoring is also needed, which should take place as early as possible, implementing stimulation, based on planned neuro-evolutive techniques,

with a view to acting on the nervous system, which is still plastic and moldable⁵.

Authors suggest developmental monitoring for these children and emphasize the importance of early intervention¹¹⁻¹³.

In view of the large number of children with risk factors at birth that can impair their development, especially their language development, the following question emerged: Do the risk factors at birth truly influence normal language development? Can the effects of these adverse conditions on the children's development be minimized through early intervention?

Departing from these questions, the objective in this integrative review was to identify evidence in the literature about the influence of risk factors on child language development and point out the contributions of early interventions for these clients.

METHODS

An integrative literature review was undertaken, which intended to analyze the literature and present the research results' contributions to improve the care practice¹⁴ for high-risk children.

Initially, the procedures that, according to the literature were needed for the integrative review, were listed. The first step was the identification and formulation of the research question, followed by the location of studies that answer it, in predefined databases. Finally, data were collected from the selected studies. The data were analyzed and interpreted, being grouped based on the similarity among the studies and discussing the findings¹⁵.

The guiding question was: Do the factors considered as risk factors at birth truly influence normal language development? Can the effects of these adverse conditions on child development be minimized through early intervention?

To search the articles, the following electronic databases were used: LILACS (*Literatura Latino Americana e do Caribe em Ciências Sociais e da Saúde*), PubMed, digital archive produced by the National Library of Medicine and the electronic library Scientific Electronic Library Online (SciELO).

For the selection, the titles and abstracts were read; then, the material was fully read and the articles were selected for inclusion in the review. The exclusion criteria were: repeated articles, studies that did not address the guiding question, reviews and articles whose full version was not available. The selected key words used the *Descritores em Ciências da Saúde*

(DeCS) and the Medical Subject Headings (MESH) for reference, in their different combinations: child language; risk factors; preterm; postterm child; Apgar score; early stimulation.

The following data were extracted from each article: authors; year of publication; objective and study design; participants and (inclusion and exclusion) criteria; research variables; main findings about the influence of the risk factors for language development and authors' recommendations to minimize the possible effects.

To organize and analyze the data, the thematic Content Analysis technique was used, which consists in the pre-analysis, material exploration or coding (categorization) and treatment of the obtained results/interpretation. The first step (pre-analysis) comprises the skimming, formulation and reformulation of hypotheses or premises and, at the end, the return to the initial inquiries. Categorization is a process in which the text is reduced to significant words and expressions. Finally, the data are classified and combined, choosing the theoretical or empirical data responsible for the specification of the theme. Then, inferences and interpretations are developed¹⁶.

RESULTS

By crossing the descriptors in the consulted databases, 1,421 articles were identified, eight (0.6%) of which in LILACS; 885 (62.6%) in PubMed and 520 (36.8%) in the virtual library SciELO. Based on the reading of the titles, 411 publications were selected; after verifying the abstracts, 78 publications were withheld; after reading the full articles, 29 articles were included in this review.

Information was extracted about the influence of the risk factors on the language development and the contributions of monitoring these children. Twelve (41.4%) studies were developed in Brazil, six (20.7%) in the United States, two (6.9%) in the Netherlands, two (6.9%) in Norway, two (6.9%) in China, one (3.4%) in Italy, one (3.4%) in Finland, one (3.4%) in the United Kingdom, one (3.4%) in Chile and one (3.4%) in South Africa.

The studies were categorized by related results; 11 studies (37.9%) discussed the "*Influence of preterm birth on language development*", five (17.2%) investigated the "*Influence of the association between preterm birth and low weight on language development*", four (13.8%) discussed the "*Influence of risk factors (in general) on language development*", one (3.4%) verified the "*Influence of the Apgar*", three (10.3%) the "*Effect*

of preterm birth on learning" and five (17.2%) studied "*Early intervention in high-risk infants*".

In Figure 1, the categorization of the articles by similar themes and their main characteristics are displayed.

Most of the articles selected discuss the effect of preterm birth on language development. All studies found delays or changes in the groups of preterm children in different areas that were assessed. Only two articles found no statistically significant results for the influence of preterm birth on development. Nevertheless, in the group of preterm infants, lower scores were found in the domains assessed.

The areas mentioned with a lag included expressive and receptive language, cognition, neuropsychological skills, visual-motor and spatial skills, short-term memory, fine and gross motor skills and behavioral aspects.

The authors observed the effect of preterm birth in early development, in the preverbal and language acquisition phases.

When associated with low weight, preterm birth was also related with worse results on standardized developmental assessments in children with this risk.

In four studies, the association between overall risk factors and language development problems was investigated, also presenting similar results. The authors evidenced the biological risk factors.

One of the studies assessed children of school age and associated Apgar scores with SLD (Specific Language Disorder).

Studies indicated the influence of preterm birth on children's learning. Three studies assessed cognitive and reading and writing skills, comparing full-term and preterm children. The results evidence a lag in the skills assessed in the preterm children and highlight that the delays deriving from this risk factors are not only observed in the preverbal and language acquisition phases, but continue over the years and can compromise their learning.

The authors unanimously recommended monitoring and early intervention for these children who, at birth, presented any of the risks described above. Five articles studied early intervention in high-risk infants, all of which found benefits for the development of these children.

Categories	First author/year	Main objective	Participants	Research variables	Main findings and/or recommendations
Influence of premature birth on language development	Isotani 2009	Compare the expressive language of preterm infants with that of term infants at the age of two years.	Experimental group: PTI Control Group: TI	Premature births; Expressive language.	Higher occurrence of expressive language delays for PTI. Recommendation: high-risk children should be monitored through Early Stimulation programs
	Lamônica 2009	Verify performance on linguistic, cognitive, motor development skills, self-care and socialization in preterm infants.	Preterm infants between six and 24 incomplete months of age.	Language: Cognition; Motor Skills; Self-care; Socialization.	Developmental delays were observed in preterm children in all areas assessed.
	Jansson-Verkasalo 2010	Assess the language development capacity of preterm children.	Preterm and term children at 2 years of age.	Preterm birth; Phoneme discrimination skill; Communicative performance.	Harmful effects of preterm birth on linguistic competences were observed in early development, such as delays in phoneme discrimination skills.
	Lamônica 2010	Verify the performance of preterm children in the receptive, expressive and visual auditory areas.	Experimental Group: low-weight PTI Control Group: TI 12 to 24 months of age	Preterm birth; receptive auditory function; expressive auditory function; visual function.	Experimental Group presented alterations in all areas assessed when compared to the CG.
	Dall'oglio 2010	Assess neuropsychological performance and its relation with cognitive development in preterm children when compared to term children.	Preterm children (GI < 33 weeks)	Preterm birth; Cognition; Neuropsychological skills; Language; Short-term memory; Visual-motor and spatial skills; Maternal education level.	Preterm infants presented lower scores on cognition and on all neuropsychological assessment tests, except lexical production, when compared to term children.
	Schuymmer 2011	Assess the preverbal and verbal skills by comparing term and preterm children.	PTI (GI ≤ 32 weeks)	Preterm birth; Preverbal and verbal skills; Receptive and expressive language.	Preterm children presented higher developmental risks in preverbal skills and throughout the verbal development.
Influence of premature birth on language development	Ribeiro 2011	Analyze the reciprocal influences between language and attention problems in preterm children between 18 and 36 months.	1288 low-weight PTI and TI.	Preterm birth; Language; Birth weight; Gestational age; Birth condition.	The attention and language problems verified in the participants were correlated with preterm birth.
	Eickmann 2012	Compare the neuropsychomotor development of preterm and term infants between 6 and 12 months of age and investigate associated factors.	PTI registered at the study hospital were recruited	Preterm birth; Nutritional status; Psychomotor, cognitive development; Language; Fine and gross motor skills;	Preterm birth did not influence the children's psychomotor development. The motor development was the most affected domain in the sample as a whole, especially due to biological factors.
	Lobo 2013	Assess the differences in stability and skills-learning capacity of preterm infants over time.	Preterm and term children monitored up to two years of age.	Preterm birth; Cognitive function; Language; Learning.	Preterm infants presented greater learning difficulties before the age of two years. The authors suggest monitoring and early intervention for these children.
	Stene-Larsen 2014	Investigate the risk of communication alterations in early and late preterm children.	Preterm infants between 18 and 36 months of age.	Preterm birth; receptive communication; expressive communication.	Late and early PTI presented greater risk of communication disorders.
	Goes 2015	Assess the motor, language and cognitive development in preterm infants and perinatal, neonatal and socioeconomic factors associated with abnormal development.	Infants with GI < 33 weeks.	Preterm birth; Perinatal/socioeconomic/family factors; Gross; fine motor skills; Receptive/expressive language; Cognition; Behavioral aspects.	High frequency of language deficit, especially receptive language in the preterm infants assessed. Delays in motor and cognitive skills in preterm infants.

Categories	First author/year	Main objective	Participants	Research variables	Main findings and/or recommendations
Influence of premature birth and low weight on language development	Schirmer 2006	Assess the influence of gestational age and weight on language and neurodevelopment in preterm children up to three years of age.	Low-weight preterm children.	Preterm birth; Low weight; Receptive and expressive language; Mental and psychomotor development	Infants < 1500g obtained the lowest test scores. Associations were found among GI, abnormal behavior and language acquisition delays.
	Ballot 2012	Determine the developmental results in very low birth-weight infants and factors associated with bad prognosis.	Very low birth-weight PTI	Birth weight; Cognitive development; Language; Fine and gross motor skills. Perinatal factors.	One third of the patients were classified as "at risk". These children are more prone to developmental problems in the long term.
	Silveira 2012	Describe and analyze the relations between psychosocial and birth variables and cognitive, linguistic, motor and behavioral performance in low-weight PTI.	Low-weight PTI, between 12 and 36 months of age, registered at the Outpatient Monitoring Sector.	Preterm birth; Low weight; Family routine; Behavioral problems; Cognition; Receptive and Expressive Language; Fine and Gross Motor Skills.	Greater risk for development problems was identified in the cognitive and expressive language areas in low-weight preterm infants.
	Huang 2012	Examine the impact of preterm birth and low-weight on children's cognitive, language, motor, socio-emotional and behavioral aspects.	Hospital in Taiwan (China) Children with normal, low and extremely low birth weight.	Premature birth; Language; Cognition; Motor aspect; Behavior.	The lower the birth weight, the worse the average test performance, mainly concerning language and behavior.
Influence of premature birth and low weight on language development	Caldas 2014	Analyze the language development skills in preterm and low-weight children between 2 and 3 years of age and associated risk factors.	Preterm and low-weight children.	Preterm birth; Low weight; Personal-social development; Fine and gross motor skills; Language; Auditory function; Visual aspect.	Preterm and low-weight children presented delayed skills acquisition in language development; with greater commitment of expressive auditory function.
Influence of risk factors (in general) on language development	Marston 2007	Investigate the factors associated with vocabulary acquisition in children at the age of two years, born with a gestational age of 28 weeks or less.	Children born with GI \leq 28 weeks.	Preterm birth; Communicative performance; Neonatal factors; Impairments.	No significant association between GI and vocabulary. The clinical factors correlated with vocabulary acquisition problems at the age of two years were severe disabilities.
	Schonhaut 2008	Establish the correlation between language and intelligence to identify possible factors involved in preschool children of low socioeconomic level.	Preschool children between three and five years of age.	Language; Grammar; Cognition; Sociodemographic aspects.	Language and intelligence are significantly associated. Biological and hereditary factors were correlated with linguistic difficulties and social factors were associated with cognitive performance.
	Silva 2013	Identify the main risk factors related with the child and its parents associated with speech, language and hearing alterations.	Children of up to five years old with speech, language and hearing complaints.	Sociodemographic and family data; Pre, peri and postnatal data; Child's temperament.	Children with risk factors at birth presented greater alterations. These children should be monitored and forwarded for Early Stimulation.
Influence of risk factors (in general) on language development	Crestani 2015	Investigate the association between presence of child development risks and initial speech production of children between 13 and 16 months of age.	52 mothers and their term, preterm or post-term infants.	Risk for development; Vocabulary; Number of words.	Association between risks at birth and initial speech production. Thus, high-risk infants presented lower initial speech production than infants without risk.
Influence of Apgar on language development	Diepeveen 2013	Assess the relation between perinatal risk factors and the further development of specific language disorders (SLD).	Children with SLD who attended a school for special needs in the Netherlands between four and 13 years of age.	Diagnosed SLD; Apgar scores.	Apgar scores were related with later development of SLD in the children. The authors suggest monitoring their development.

Categories	First author/year	Main objective	Participants	Research variables	Main findings and/or recommendations
Effect of premature birth on learning	Luu 2011	Compare the cognitive and language skills of (preterm and term) 16-year-old adolescents over the school years	Preterm infants admitted at reference centers between 1989 and 1992.	Preterm birth; IQ; Vocabulary; Phonological processing; Reading.	At the age of 16 years, preterm adolescents presented deficits in general cognition and other skills assessed when compared to term adolescents.
	Taylor 2011	Assess the learning problems between extremely preterm kindergarten children and identify risk factors.	Experimental Group: Extremely preterm children (school age) Control Group: Term children	Preterm birth; Performance and cognitive capacity; Birth conditions; Identification of letters; Words; Spelling; IQ.	Preterm children scored lower on all skills assessment tests applied. The authors suggest the early monitoring of these children.
Effect of premature birth on learning	Fraello 2011	Verify commitment of short-term memory in adolescence and whether the neuro-anatomy would differ between term and preterm infants.	Preterm and term infants at the age of 12 years.	Neonatal data; Short-term memory; Working memory; Complex working memory; Image testing.	No differences between short-term and working memory. Groups differed on image testing. Memory scores and volumes of cortical regions responsible for language and memory were reduced in preterm individuals.
Early intervention in high-risk infants	Hekavei 2009	Investigate the evolution of motor and language development in infants with developmental delay from maternal perspective.	Mothers of infants between 0 and 3 years who presented neuropsychomotor delay.	Motor development; Linguistic development.	The mothers noted evolutions in the children's motor and linguistic development when comparing before they entered the early intervention program and the current phase.
	Gross 2012	Verify activity in early stimulation in Caxias do Sul- RS and Flores da Cunha-RS	Speech, language and hearing therapists working in ES in those cities.	Early stimulation; Procedures used; Demand for work with stimulation.	Important assessments: comprehensive and expressive language; speech, language and hearing assessment and of orofacial motor skills. Importance of ES for child development is highlighted.
	McManus 2012	Determine the efficacy of early intervention in the context of different mothers of preterm infants.	Preterm and/or low birth-weight infants and their mothers.	Early intervention; Maternal support; Cognitive function; Mental development.	Greater benefits were observed for preterm infants whose mothers received support during the early intervention. The ES was beneficial, especially for the infants' cognitive function at the age of 24 months.
	Shapiro-Mendoza 2013	Compare characteristics associated with an early intervention program among late PTI; early TI and TI.	PTI born between 1998 and 2005.	Early intervention; Maternal and infant data; Child development data.	Higher prevalence of registration in early intervention programs among late PTI and early TI than among TI. These infants can benefit from more frequent monitoring.
	Chen 2014	Assess the efficacy of multidisciplinary treatment and approaches to reduce neurological impairments in PTI.	EG: PTI - multidisciplinary treatment; CG: PTI – conventional treatment.	Preterm birth; Preverbal, verbal skills; Receptive, expressive language; Mental and psychomotor development.	Infants in multidisciplinary approach presented better development than the control group.

Figure 1. Main characteristics of the articles selected for this review.

DISCUSSION

The objective of this review was to study the influence of the risk factors on language development, particularly the biological risk factors. The findings evidence that the biological risk factors have an important influence on language development.

Authors¹⁷ also sought to investigate the risk factors for the development, especially for language acquisition, and found that children who live with biological risks in the first years of life are more prone to developing problems, which can affect their development, in line with the findings of this review. The influence of the risk factors on the development are noticeable even in the preverbal phase of language development, when preterm children already present delays in the assessment of certain pre-linguistic skills¹⁸⁻²¹. The birth condition affects the language development since the acquisition of preverbal skills. One example is the delay in the expression of stammering, which are the initial sounds the child produces around the age of four months¹⁸.

The articles that studied the influence of risk factors on language development reveal that the impairments deriving from these factors are present in the course of the children's life and last until adolescence²². Preterm or low-weight children present delays at school age and throughout the learning process.

In comparison with full-term children, they present worse performance and deficits in terms of overall cognition, phonological awareness, working memory and other essential metalinguistic skills for the successful learning of reading and writing²³⁻²⁶.

In a literature review, authors addressed the relation between prematurity, birth weight and language development in Brazilian children and found an association between prematurity, low birth weight and language development⁶.

In studies that compared preterm and full-term children, it was evidenced that the former performed worse on the language indicators. It was also observed that the children born with lower weight performed worse on the language assessments when compared to the children with higher weight and a gestational age closer to 37 weeks, in line with the findings of studies included in this review^{27,28}.

During standardized assessment, preterm children have scored lower on intelligence scales, visual perception test, visual-motor integration test, memory and attention, impairments that go beyond the actual

language development, although they do exert influence^{26,29}.

Most of the selected studies recommend that the speech and language development of children with one or more risk factors be periodically monitored and, if necessary, forwarded for early intervention^{12,20}. They further highlight that this monitoring can minimize the effect of birth problems³⁰ and that non-intervention can entail significant health costs, as these children will experience difficulties in the course of their development³¹.

Different authors have studied the contribution of early intervention to the development of high-risk infants^{13,32,33}. Early intervention programs are intended to monitor, guide and stimulate the development of high-risk infants. One of these studies on the theme highlights the importance of early multidisciplinary intervention and points out significant benefits for the infants' development when compared to infants who did not receive the intervention¹¹. Other authors also highlight that the infants who received any early intervention therapy demonstrated better performance in terms of cognitive functions in comparison with the infants who did not^{13,34}.

In a literature review on the theme "early stimulation in premature infants", positive and clinically significant effects of the intervention were found on several aspects involving the mothers and the premature infants. The authors also alert that these should include psychosocial and educational support for the parents and therapeutic interventions with a view to the children's development³⁵.

The importance of the mother-infant relationship was also mentioned in the selected studies, considering that one of the principles of early stimulation is the parents' orientation towards stimulating the child's development. To verify the impact of mother-child interaction on the oral language development of preterm children, in one study, it was verified that the mothers considered it was more important to educate and control the children than to stimulate them and the children, in turn, performed below expectations on all language tests. In that sense, the authors concluded that these results below expectations can be attributed to the insufficient quantity and quality of the mother-child interaction³⁶.

In two of the studies selected for this review, it was concluded that preterm birth did not influence the psychomotor development and vocabulary acquisition of the study populations.

The first study was aimed at comparing the neuro-psychomotor development of preterm infants (with corrected age) and full-term children between six and 12 months of age, as well as to investigate the associated factors. In the analysis of the results, the authors did not observe any significant difference between the development of preterm and full-term children; for expressive communication, however, they found lower development rates for the preterm group³⁷. Although the results were not statistically significant, worse performance was found on the tests involving preterm children, as verified in different studies, previously cited in this review.

The second study intended to investigate the risk factors associated with vocabulary acquisition in two-year-old children born at the gestational age of 28 weeks or less, and found no significant association between gestational age and vocabulary. The only clinical factors correlated with vocabulary acquisition problems at the age of two years were severe disabilities³⁸.

It should be highlighted that the authors of the above study analyzed but one language aspect (vocabulary), while other studies analyzed different aspects of premature children's performance (cognition, receptive and expressive language, phonological processing, working memory, among others) which the preterm risk factor could affect³⁹. Therefore, the analysis of a single variable is regarded as a limitation of that study. If other variables had been studied, language development alterations or delays could have been observed, as verified in most studies included in this review.

CONCLUSION

The objective in this integrative review was to identify evidence in the literature concerning the influence of risk factors on child language development and point out the contributions of early intervention to this development.

Based on the analysis of the studies, it was seen that the risk factors weight at birth, gestational age and Apgar score negatively influenced child language development, and this influence can range from the preverbal skills to adolescence and create problems in school age and in overall learning.

Therefore, early and qualified care for these children is recommended, as it contributes to their appropriate development, which permits avoiding and/or minimizing risks and future alterations.

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