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Sensitive periods in child development: a scoping review

Períodos sensíveis do desenvolvimento infantil: revisão de escopo

Periodos sensibles del desarrollo infantil: revisión del alcance

ABSTRACT
Objective: To map knowledge about sensitive periods in child development in the scientific literature. **Method:** A scoping review was conducted following the steps outlined by the Joanna Briggs Institute and the PRISMA statement. The protocol was registered with the Open Science Framework (OSF). The study period began in July 2025. The databases were searched: Scopus, Cochrane Library, MEDLINE via PubMed, Science Direct, Embase, Virtual Health Library (VHL), and gray literature. **Results:** Twenty-three studies were included in the scoping review, eight of which were from the scientific literature and 15 from the gray literature. The included documents addressed the context of child development, and they were given different names: developmental leaps, critical periods, periods of rapid change, sensitive periods, and developmental transitions. **Final remarks:** The mapping showed that knowledge about sensitive periods is concentrated in international countries, mainly in the areas of psychology and neuroscience, as well as the polysemy of the term and the scarcity of conceptual definitions on the subject.
Descriptors: Child behavior; Child development; Nursing; Child health.

RESUMO
Objetivo: Mapear na literatura científica o conhecimento sobre os períodos sensíveis no desenvolvimento infantil. **Método:** Foi conduzida uma revisão de escopo seguindo as etapas de acordo com o Instituto Joanna Briggs e a declaração PRISMA, sendo o protocolo registrado no Open Science Framework (OSF). O período do estudo ocorreu em julho de 2025, tendo como fonte de pesquisa as bases de dados Scopus, Cochrane Library, MEDLINE via Pubmed, Science Direct, Embase, Biblioteca Virtual de Saúde (BVS) e literatura cinzenta. **Resultados:** Foram incluídos 23 estudos na revisão de escopo, dos quaisoito foram da literatura científica e 15 da literatura cinzenta. Os documentos incluídos abordaram o contexto de desenvolvimento infantil,o qual apresenta diferentes denominações: saltos do desenvolvimento, períodos críticos, períodos de mudança rápida,períodos sensíveise transições no desenvolvimento. **Considerações finais:** O mapeamento evidenciou que o conhecimento sobre os períodos sensíveis está concentrado em países estrangeiros, principalmente na área da psicologia e neurociência, como também a polissemia do termo e escassez de definições conceituais sobre o tema.
Descritores: Comportamento infantil; Desenvolvimento infantil; Enfermagem; Saúde da criança.

RESUMEN
Objetivo: Mapear el conocimiento sobre los períodos sensibles en el desarrollo infantil en la literatura científica. **Método:** Se realizó una revisión de alcance siguiendo los pasos descritos por el Instituto Joanna Briggs y la declaración PRISMA. El protocolo se registró en el Open Science Framework (OSF). El período de estudio comenzó en julio de 2025. Se realizaron búsquedas en las bases de datos: Scopus, Biblioteca Cochrane, MEDLINE vía PubMed, Science Direct, Embase, Biblioteca Virtual en Salud (BVS) y literatura gris. **Resultados:** Se incluyeron veintitrés estudios en la revisión de alcance, ocho de los cuales eran de la literatura científica y 15 de la literatura gris. Los documentos incluidos abordaron el contexto del desarrollo infantil y se les dieron diferentes nombres: saltos de desarrollo, períodos críticos, períodos de cambio rápido, períodos sensibles y transiciones de desarrollo. **Consideraciones finales:** El mapeo mostró que el conocimiento sobre los períodos sensibles está concentrado en los países internacionales, principalmente en las áreas de psicología y neurociencia, así como la polisemia del término y la escasez de definiciones conceptuales sobre el tema.
Descriptores: Comportamiento infantil; Desarrollo infantil; Enfermería; Salud infantil.

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INTRODUCTION

Child development is a complex, continuous, dynamic, and progressive process[1] that involves a series of initially simple changes, gradually evolving into more advanced skills. In this progression, children acquire social, emotional, motor, and cognitive abilities in accordance with their developmental stage[2].

During infancy, defined as the period from 28 days after birth to two years of age, children undergo rapid developmental changes driven by brain plasticity. This plasticity is reflected in the brain's capacity to modify responses based on specific experiences or stimuli. These changes are particularly complex, as they encompass characteristics that vary across stages and age groups[3].

When children reach new developmental milestones, they often experience a period of acceleration marked by behavioral disorganization during so-called "sensitive periods." These periods manifest as temporary disruptions in child development or family dynamics, followed by subsequent reorganization[4]. They are generally accompanied by heightened anxiety and parental stress[5]. Studies on parent–child relationships describe these changes as touchpoints—predictable patterns of disorganization within the course of development that may influence family interactions[5,6] Mothers and caregivers commonly refer to these as "developmental leaps." Despite the variation in terminology, such phases represent the acquisition of new cognitive, motor, sensory, social, and linguistic skills. As children learn new words, begin writing, engage in sports, and develop other abilities, these changes ultimately signal healthy and expected developmental progress[7].

Thus, the conceptual fragility surrounding this subject becomes evident, as various authors underscore the polysemous use of terms such as developmental leaps, critical periods, sensitive periods, and transition periods, among others[4]. This ambiguity highlights the need for further discussion and conceptual analysis to clarify the term's meaning, thereby enabling parents and caregivers to better understand the phenomenon and effectively monitor child development.

In this context, parents and caregivers may experience confusion and distress, as they often struggle to recognize these manifestations as intrinsic aspects of child development. Conversely, some children progress through these stages with little difficulty, showing no marked behavioral changes[8]. Such developmental variations are sometimes misinterpreted as negative symptoms, particularly when parents lack adequate information and professional guidance[7].

These moments often become conflictual, leading parents and caregivers to seek information through informal channels, such as social media or unreliable websites, in an effort to interpret and associate the signs and symptoms displayed by their children. However, accessible scientific evidence for this audience is scarce, leaving them reliant on content disseminated through superficial conversations within peer groups facing similar challenges. Moreover, the subject is seldom addressed during consultations with health professionals or incorporated into health education activities within childcare services[9,10].

From this perspective, this study aims to map the scientific literature on sensitive periods in child development.

METHOD

This study is an excerpt from the academic master's thesis "Sensitive Periods of Child Development: Construction and Validation of the BASENP Mobile Application," conducted within the Graduate Nursing Program at the International University of Afro-Brazilian Lusophony.

It consists of a scoping review[10], developed in accordance with the Joanna Briggs Institute (JBI) guidelines. The study protocol was registered with the Open Science Framework (OSF) to ensure proper storage, organization, and transparency(11). The protocol is available at DOI: https://doi.org/10.17605/OSF.IO/3JTDZ and follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist, under the scoping reviews section[12].

Identification of the Theme

The PCC framework (P: Population, C: Concept, C: Context) was applied to guide the development of the research question and search strategy. Based on Arksey and O'Malley[13], the following research question was formulated: What scientific evidence exists regarding sensitive periods of child development in early childhood?

Identification of relevant studies

The search for studies was conducted in Scopus, Cochrane Library, Virtual Health Library (VHL), MEDLINE via PubMed, ScienceDirect, and Embase databases, carried out independently by three researchers in July 2025, in an attempt to reduce selection bias.

Selection of Studies for Review

Controlled descriptors from Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS), as well as uncontrolled descriptors (keywords), were defined in accordance with the research question. The controlled descriptors included child development, child behavior, nursing, and child health. The uncontrolled descriptors (keywords) comprised regression periods, sensitive periods, developmental transitions, developmental disorganization, unexpected crises, mental development, mother–baby interaction, infant regression, child regression, and their corresponding English synonyms.

The descriptor nursing was included in the search strategy, given that nurses play a fundamental role in childcare consultations within Primary Health Care. They are also central to promoting child developmental health, particularly through the early identification of changes during the first years of life. Therefore, the inclusion of studies addressing the role of nurses contributed to strengthening the quality and comprehensiveness of this review.

For the eligibility criteria, studies were selected from the Scopus, Cochrane Library, Virtual Health Library (VHL), MEDLINE via PubMed, ScienceDirect, and Embase databases. Publications in English, Spanish, and Portuguese were considered, as well as review studies that met the PCC criteria. In addition, texts, opinion articles, theses, dissertations, expert reports, and technical documents were included, given the substantial amount of gray literature identified, which was deemed essential to the study's contribution. No time restrictions were applied to the selection of studies.

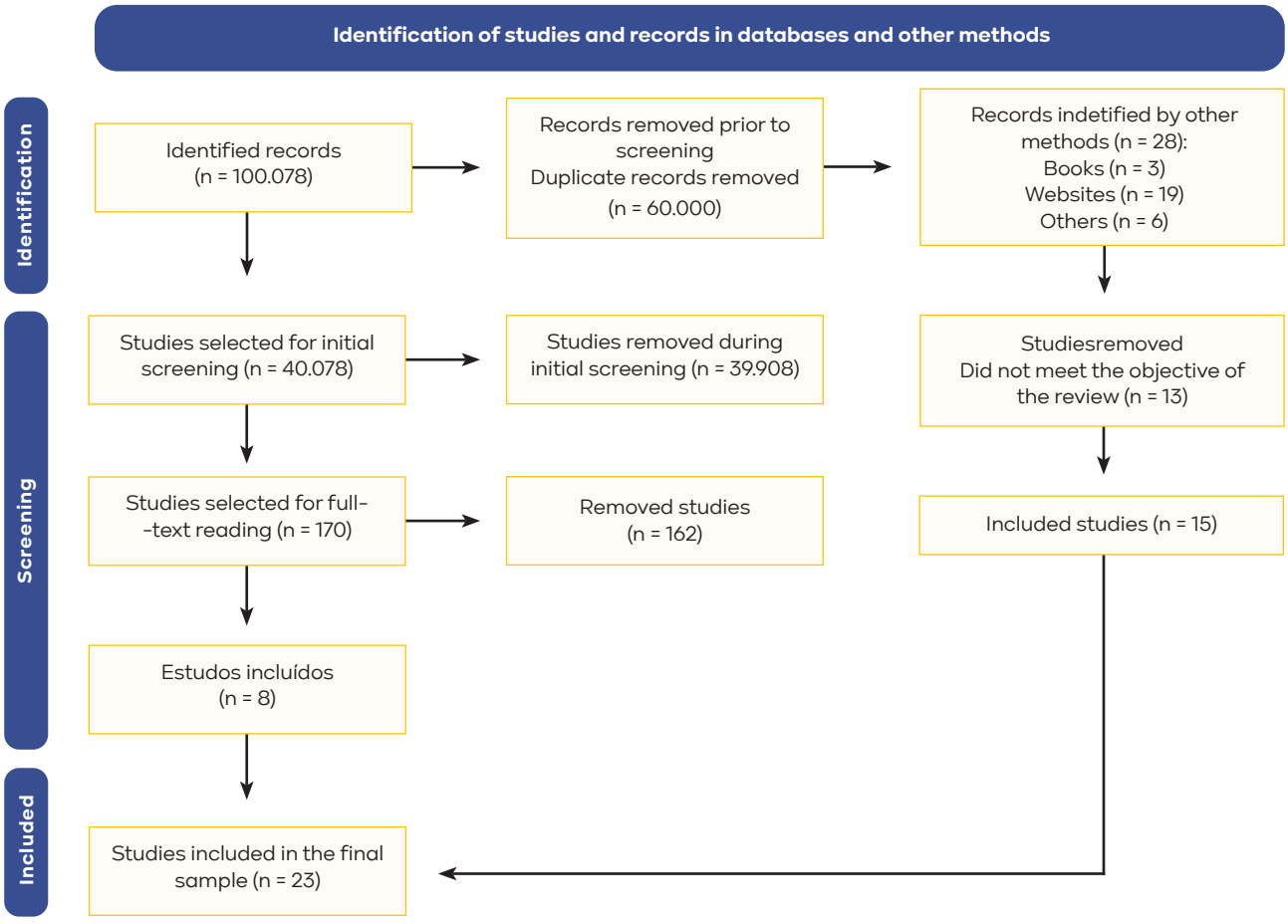
Thus, it was necessary to include materials extracted from gray literature, including textbooks, Portuguese language

dictionaries, and manually selected scientific articles, websites, and personal blogs[12].

To ensure consistency in the article search and minimize potential biases, descriptors and keywords were applied both individually and in combination to broaden the scope of results. The Boolean operators AND and OR were employed, taking into account the specific characteristics of each selected database.

The following flowchart (Figure 1), adapted from Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA), presents a summary of the publication search strategies[12].

Figure 1. Flowchart of the study screening process: preferred reporting items for systematic reviews and meta-analyses (PRISMA). Redenção, Ceará, 2025



Source: Prepared by the authors, 2025.

The studies identified through the search strategy were exported to Rayyan software. To facilitate the selection process, three researchers independently and simultaneously screened the articles. In cases of disagreement, a fourth researcher served as a tiebreaker. The selection was carried out in two stages: first, by screening titles and abstracts, and subsequently, by full-text reading of studies that met the inclusion criteria, applying both inclusion and exclusion parameters[14].

Data Mapping

The information extracted from the selected articles was organized for analysis according to categories defined in an instrument developed by the reviewers, based on the model provided in the JBI manual[10]. The instrument included the following items: journal, title, author, year, objectives, method, main conclusions, definition of sensitive periods, age range in which sensitive periods occur, number of sensitive periods in early childhood, timing of occurrence, and children's reactions to each sensitive period.

RESULTS

A total of 100,078 studies were initially identified across the scientific databases. Of these, 60,000 duplicates were removed, leaving 40,078 studies for title and abstract screening. Following this stage, 39,908 studies were excluded, and 170 articles were selected for full-text evaluation based on the eligibility criteria. Ultimately, eight studies from the technical–scientific literature were included in the review.

In the gray literature, 28 materials were identified, including books (n = 3), websites (n = 19), and other sources (n = 6). After excluding 13 materials that did not align with the review's objective, 15 remained. Thus, the final sample for the scoping review consisted of 23 studies: eight from the scientific literature and 15 from the gray literature.

As shown in Table 1, 87.5% (n = 7) of the articles were published in English and 12.5% (n = 1) in Portuguese. Geographically, the studies were concentrated in four countries—Spain, Brazil, the United Kingdom, and the United States—with only one study (12.5%) conducted in Brazil. The majority of publications appeared between 1999 and 2016, with 2014 standing out as the year with the highest frequency, accounting for 25% (n = 2) of the studies published in the past nine years.

Table 1 - Description of studies selected from databases, Redenção, Ceará, 2025

Título	Área de conhecimento/ Formação dos autores	Método	Local do estudo	Objetivo	Principais resultados
Outlining the windows of achievement of intersubjective milestones in typically developing toddlers[15]	Human Sciences/ Psychologists	Observational	Home	Viewing age-related leaps as windows of opportunity for achieving intersubjective milestones.	These age-related developmental stages or leaps should be examined in larger and comparative samples to identify potential cultural variations in the expression of intrinsic motive formation, as well as deviations associated with developmental disorders.
The neurological development of the child with the educational enrichment in mind[1]	Human Developmental Neuropsychology/ Neuroscientist	Reflective study	Books/ articles	Examine the genetic foundations of brain development—such as synaptogenesis, neural plasticity, and critical periods—in relation to numerical, linguistic, and perceptual development.	The article explores how the child's home and school environments can be integrated with the structures, functions, and ongoing changes of the developing brain.

Título	Área de conhecimento/ Formação dos autores	Método	Local do estudo	Objetivo	Principais resultados
Self-sitting and reaching in 5- to 8-month-old infants: the impact of posture and its development on early eye-hand coordination[17]	Human Sciences/ Psychologists	Experimental and observational	Springfield, Massachusetts	Report on advances in postural control, with particular attention to the attainment of an approximate sitting posture and the subsequent developmental transitions.	The findings demonstrate the interaction between postural development and the morphology of reaching in children. Infants who are not yet able to sit display symmetrical and synergistic use of both arms and hands, except when placed in a sitting posture. In contrast, infants who can sit exhibit asymmetrical and lateralized reaching across all postural conditions.
La importancia de las emociones en los períodos sensibles del desarrollo. Infancia y Aprendizaje[18]	Human Sciences/ Psychologist	Note	Center for Longitudinal Studies, Institute of Education for use, and the UK Economic and Social Data Archive and Data Service.	Several studies have also identified a correlation between brain reorganization during the first year of life and manifestations of irritability and emotional restlessness in infants.	They present research demonstrating a correlation between brain reorganization in the first year of life and signs of irritability and emotional distress in infants. In both instances, difficulties in regulating emotional impulses are likely to influence the quality of the parent–child relationship.
Estimating the critical and sensitive periods of investment in early childhood: A methodological note[19]	Economists	Methodologic note	Métodos quantitativos	Introduce Heckman's analytical framework for modeling human skill formation and offer a rigorous definition of the concepts of critical and sensitive periods, along with their operationalization.	In the recursive formulation, current capacity is explained as a function of both capacity and investment in the immediately preceding period. By contrast, the non-recursive formulation defines current capacity as a function of a sequence of past investments. To adequately examine critical and sensitive investment periods, the non-recursive approach is required.
The Temporal Relation between Regression and Transition Periods in Early Infancy[20]	Education and Clinical Psychology/ Psychologists	Observational	Home	Examine whether the identified regression periods are	During childhood, changes in development, periods of instability, and disorganization in

Título	Área de conhecimento/ Formação dos autores	Método	Local do estudo	Objetivo	Principais resultados
				temporally associated with any transition.	social and emotional behavior in both humans and nonhuman primates often precede major developmental achievements or transitions.
A perspectiva histórico-dialética da periodização do desenvolvimento infantil[21]	Developmental and historical-cultural psychology/ Psychologist	An analysis of the stages of child development from a historical-cultural perspective.	Unidentified	Emphasize the historical and dialectical dimensions of the author's propositions.	A historical approach to child development emphasizes the child–society relationship and the concrete historical conditions that shape the developmental process. The fundamentals of age periodization are presented, underscoring the connection between the author's propositions and the principles of the dialectical method.
Using the language of the child's behavior in your work with families[22]	Pediatric nurse	Unidentified	Hospital Infantil de Boston	Unidentified	In discussing behavior, parents articulate their perspectives, shaped by past experiences, values, and culture, while also expressing concerns about their children's development.

Source: Prepared by the authors, 2025.

The documents included in this review addressed various aspects of child development[14–18]. Among the selected articles, five employed different terms to describe the phenomenon, including developmental leaps, critical periods, periods of rapid change, sensitive periods, and developmental transitions.

Although child development is studied across multiple fields of knowledge, most research has been conducted by authors in psychology, particularly neuropsychology. Greater integration among nursing, psychology, and neuroscience could therefore foster more innovative practices in this area[15–18, 20, 21].

Regarding study settings, most investigations were conducted in the domestic environment[15,20], with only one carried out in a hospital[22]. This distribution is likely related to the focus of the topic—promoting child health—which is primarily addressed in primary health care during childcare consultations, where comprehensive monitoring of child development takes place[23].

In 2014, a greater number of studies on the subject were published. This incre-

ase may be associated with the implementation of the National Policy for Comprehensive Child Health Care (PNAISC), established in Brazil in 2015, which aims to ensure child monitoring and to promote the detection, protection, and rehabilitation of conditions that may compromise healthy development. Overall, these studies share a common focus on promoting child health and must continually advance through scientific research to strengthen the theoretical and practical knowledge of professionals involved in pediatric care[24].

DISCUSSION

Based on this review, four subtopics related to sensitive periods in child development were identified for further exploration and will be discussed in detail with support from the relevant literature: (1) definition of sensitive periods, (2) age range in which they occur, (3) number of sensitive periods in early childhood, and (4) children's reactions during these periods.

Definition of Sensitive Periods

The results reveal that authors employ different terms to describe this subtopic of child development. Plooij[25] uses the term "leaps" to refer to the acquisition of new information and skills that enable a baby to grow both physically and mentally, with each leap typically preceded by a challenging phase requiring increased maternal attention. Another study describes these phases as "periods of rapid change"—predictable moments that occur shortly before a surge or accelerated growth in any domain of development, even within a short timeframe[26].

Other authors define "sensitive periods" as developmental phases during which the brain is especially responsive to experiences expressed through activity patterns. Sanduní [27], in turn, characterizes them as periods marked by profound and discontinuous modifications in the structure and function of components within the child's physiological system.

From this perspective, the literature search revealed multiple terms used to describe developmental leaps, which complicated the retrieval process due to the absence of a single standardized term or concept. Several synonyms were identified, including periods of regression, childhood developmental surges, developmental transitions, disorganization, unexpected crises, developmental leaps, and sensitive periods—the latter being the most widely accepted scientific terminology[15–17, 21].

In this context, the definitions cited by the authors converge on the idea that each stage of a child's development involves the acquisition of new skills, encompassing not only physical growth but also brain development, in line with the components of the child's physiological system [25,26].

Quantity and Age Range of Sensitive Periods in Early Childhood

Regarding the age range of sensitive periods in child development, most studies indicate that these periods begin at birth and extend up to approximately 18 months of age[15–18, 20, 21].

The literature presents varying accounts regarding the duration of sensitive periods. Some studies report that these periods last approximately one week[27, 28], while others suggest a broader range, from one to six weeks [29, 30]. Additional research indicates that sensitive periods may span only a few days or extend over

several weeks [25,26]. Conversely, certain authors argue that these periods cannot be clearly delimited, as no definitive boundaries mark their onset or conclusion[30].

One study provides a detailed account, noting that the onset of sensitive periods may vary by one to two weeks and can extend from birth until shortly after 18 months of age[32]. It further explains that the intervals between the initial periods are relatively short, averaging three to four weeks. Moreover, the existence of a sensitive period may be contingent upon specific environmental conditions, suggesting that early developmental trajectories can become biased, thereby making subsequent changes increasingly difficult[33].

Number of Sensitive Periods in Early Childhood

The literature presents divergent findings regarding the number and duration of sensitive periods in early childhood, largely depending on the age range considered. Some studies report that sensitive periods begin at birth and extend until approximately six years of age [24–27, 30, 32, 41]. In contrast, other studies suggest a more restricted timeframe, beginning around the fifth week of life (approximately one month) and lasting until the seventy-third week (around 17 months) [14, 18, 19, 26, 28, 29, 32, 33].

Thus, the studies summarized provide quantitative data on the number of sensitive periods experienced during childhood. Seven articles report ten sensitive periods, five studies identify eleven, and eight studies describe two regression periods considered as sensitive periods. In contrast, one article[21] proposes the existence of only four distinct periods across the human lifespan: intrauterine, early childhood, late childhood, and adulthood. Notably, nine studies do not present sufficient data to substantiate these findings.

Children's Reactions During Sensitive Periods of Development

Regarding children's reactions during sensitive periods, studies have shown disturbances in sleep patterns (increased or decreased [n = 19 scientific articles]), changes in eating habits (increased or decreased [n = 19]), constant crying (n = 14), need for physical contact and attention (n = 13), disobedience (insubordination [n = 10]), irritability (n = 8), and more frequent breastfeeding (n = 5).

Other reactions were reported less frequently. These include mood swings (n = 4), solitary play (n = 4), thumb sucking (n = 3), negativism (n = 3), and rejection of acquaintances or strangers (n = 2). Additional behaviors observed with lower frequency were clapping or stamping (n = 2), requesting to be picked up (n = 2), displaying new skills (n = 2), prolonged staring (n = 2), and expressing desires or judgments (n = 2). Single studies also reported agitation (n = 1), slowness (n = 1), reduced vocalization (n = 1), shyness (n = 1), jealousy (n = 1), mischievousness (n = 1), friendliness (n = 1), concentration on activities (n = 1), hyper- or hyposensitivity to stimuli (n = 1), and "childish" behavior (n = 1).

From this perspective, the present study contributes to mapping sensitive periods in child development within the scientific literature, identifying central concepts, and highlighting existing gaps and limitations. In doing so, it underscores the importance of further research aimed at addressing these shortcomings and advancing the contextualization of key information on the topic.

Thus, several of the reactions identi-

fied in this review among children during sensitive periods appear to be associated with the developmental stage they are undergoing (newborn, infant, toddler, preschooler, or school-age child). It is essential to emphasize, however, that each child experiences sensitive periods and related reactions in ways that reflect their individual characteristics and family environment.

Limitations and Contributions of the Study

This review highlights the still-limited number of publications on the subject available in scientific databases. Much of the material analyzed was drawn from gray literature, which provides detailed and contextual information not typically found in scientific publications. While gray literature—particularly textbooks—cannot replace peer-reviewed studies, it contributes valuable insights that enrich the discussion.

Furthermore, the difficulty in establishing a precise number of terms associated with the phenomenon highlights the complexity of advancing studies on child development. This challenge extends to researchers, psychologists, educators, and health professionals—including nurses—who play a key role in disseminating knowledge. By serving as multipliers of health, these professionals contribute to the production and transmission of scientific information to parents and caregivers, particularly through health education initiatives across diverse health and educational settings.

This study contributes to nursing practice by enhancing the monitoring professionals' knowledge of child growth and development during primary healthcare consultations. Such knowledge supports the early detection of developmental delays and helps strengthen the parent–child bond.

Therefore, future studies on child development are recommended across a broad range of fields that directly influence childcare, while also promoting monthly monitoring and follow-up within primary health care.

FINAL CONSIDERATIONS

This review revealed that existing knowledge on sensitive periods, as presented in both scientific and gray literature, is predominantly derived from foreign studies, particularly within the fields of psychology and neuroscience. The analysis also identified variation in the reported number of sensitive periods: scientific literature spans from four to ten, while gray literature indicates ten to thirteen. Furthermore, the findings highlight the polysemy of the term, reflecting a lack of consensus in its conceptualization.

The mapping revealed a wide range of reactions that children may display during sensitive periods. The most commonly reported include alterations in sleep patterns, changes in eating habits, withdrawal from physical contact, irritability, and excessive crying. Besides, the review highlighted a relative scarcity of scientific studies exploring advances in knowledge about sensitive periods in development.

This study contributes to advancing knowledge and understanding of sensitive periods, supporting the development of strategies for health education directed at parents and caregivers, as well as ongoing training for professionals engaged in childcare consultations.

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