

Family Interactions of Children with Down Syndrome: A Scoping Review of Academic Literature

Interações familiares de crianças com Síndrome de Down: uma revisão de escopo

Interacciones familiares de niños con Síndrome de Down: una revisión de alcance

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Abstract

Objective: To analyze how the family interactions of children with DS are described and detailed through a review of the literature scope. **Method:** The PCC strategy was used, where (P) represents “children with Down syndrome and their families,” (C) refers to “family interactions,” and (C) represents “academic research on these interactions in contexts such as the home environment.” Searches were conducted in the Lilacs and PubMed databases. Articles included were case reports, observational, or experimental studies, with the age range of participating children being 0 to 5 years and 11 months. Articles selected were in English and Portuguese, published within the last 10 years. **Results:** 14 articles were included in this review. Most of these were of a cross-sectional observational nature, with the authors carrying out the analysis with standardized procedures and preparing semi-structured activities for interaction. The maternal figure was present in all studies. Mostly, the authors compared the group of children with DS with groups of children with typical development. **Conclusion:** The family plays a fundamental role as a facilitator in the process of linguistic and social development of children with DS, and family interactions are influenced not only by the child’s own characteristics, but also by the environment in which they are inserted.

Keywords: Down Syndrome; Social Interaction; Family; Child Development; Language Development.

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Resumo

Objetivo: Analisar como é caracterizada e estudada a interação familiar de crianças com SD por meio da revisão de escopo. **Método:** Foi utilizada a estratégia PCC, onde (P) seria "crianças com Síndrome de Down e suas famílias", (C) são as "interações familiares" e (C) são "pesquisas acadêmicas sobre essas interações em contextos, como o ambiente domiciliar". As buscas foram realizadas nas bases de dados Lilacs e PubMed. Inclui-se artigos do tipo relatos de casos, observacionais ou experimentais, sendo que a faixa etária das crianças participantes deveria ser de 0 a 5:11 anos. Selecionou-se artigos em inglês e português, publicados nos últimos 10 anos. **Resultados:** 14 artigos foram incluídos nesta revisão. A maioria destes eram de caráter transversal observacional, com os autores realizando a análise com procedimentos padronizados e preparando atividades semi estruturadas para a interação. A figura materna esteve presente em todos os estudos. Majoritariamente, os autores compararam o grupo de crianças com SD com grupos de crianças com desenvolvimento típico. **Conclusão:** A família desempenha um papel fundamental como facilitadora no processo de desenvolvimento linguístico e social de crianças portadoras de SD, sendo que as interações familiares são influenciadas não apenas pelas características próprias da criança, mas também pelo ambiente em que ela está inserida.

Palavras-chave: Síndrome de Down; Interação Social; Família; Desenvolvimento Infantil; Desenvolvimento da Linguagem.

Resumen

Objetivo: Analizar cómo se caracterizan y estudian las interacciones familiares de niños con SD a través de una revisión de alcance de la literatura. **Método:** Se utilizó la estrategia PCC, donde (P) sería "niños con Síndrome de Down y sus familias", (C) son las "interacciones familiares" y (C) son "investigaciones académicas sobre estas interacciones en contextos como el entorno doméstico". Las búsquedas se realizaron en las bases de datos Lilacs y PubMed. Se incluyeron artículos del tipo informes de casos, estudios observacionales o experimentales, en los que la edad de los niños participantes debía estar entre 0 y 5 años y 11 meses. Se seleccionaron artículos en inglés y portugués, publicados en los últimos 10 años. **Resultados:** Se incluyeron 14 artículos en esta revisión. La mayoría de ellos eran estudios observacionales transversales, en los que los autores realizaron el análisis con procedimientos estandarizados y prepararon actividades semiestructuradas para la interacción. La figura materna estuvo presente en todos los estudios. En su mayoría, los autores compararon el grupo de niños con SD con grupos de niños con desarrollo típico. **Conclusión:** La familia desempeña un papel fundamental como facilitadora en el proceso de desarrollo lingüístico y social de los niños con SD, y las interacciones familiares están influenciadas no solo por las características propias del niño, sino también por el entorno en el que está inmerso.

Palabras clave: Síndrome de Down; Interacción Social; Familia; Desarrollo Infantil; Desarrollo del Lenguaje.

Introduction

Down syndrome (DS) is a genetic condition that arises during cell division in the embryonic stage and is caused by an extra copy of chromosome 21. In 95% of cases, individuals have three chromosomes in pair 21, totaling 47 chromosomes. For this reason, the condition is referred to as trisomy 21. Conversely, approximately 4% of cases result from a translocation (in which the extra chromosome attaches to another chromosome, maintaining a total of 46 chromosomes), and 1% stem from mosaicism (in which there are two different cell lines: some cells contain 47 chromosomes, and others contain 46)¹⁻². It is estimated that one in every 700 newborns is affected by the syndrome, regardless of ethnicity or parental socioeconomic status. In Brazil, there are currently about 270,000 individuals with DS³.

Among the physical and neurological/perceptual changes associated with the syndrome, notable features include hypotonia, hearing and vision impairments, thyroid abnormalities, obesity, and cervical spine anomalies⁴. In addition to the specific physical traits resulting from genetic condition, DS is also associated with a likely deficit in the development of cognitive skills. Indeed, Down syndrome is the most commonly associated genetic cause of intellectual disability⁵. Although the severity of cognitive and physical impairments varies across individuals⁶, the literature consistently reports that children with DS typically present with language delays and impairments. Receptive language generally develops more effectively than expressive language, meaning that comprehension tends to surpass speech production⁷⁻⁸.

Despite the biological factors inherent to the syndrome, it is suggested that language development in childhood is influenced not only by the child's intrinsic biological conditions but also by their environment⁷. Similarly, some authors propose that cognitive development is linked to the child's interaction with their surroundings, as learning occurs through social mediation, with information and knowledge acquisition contributing to intellectual growth⁹. Therefore, it can be affirmed that the process of socialization shapes language—that is, by the social interactions within the child's environment.

Individuals construct their identity through linguistic interaction, making language a funda-

mental social practice in this formation¹⁰. In a complementary view, Mayer et al.⁸ suggest that individuals learn how to use language in social contexts through established interactions. The authors emphasize that the family is the first social group to provide stimuli and, as such, constitutes the child's primary social bond. This highlights the importance of the family's role in offering a diversity of stimuli to foster identity formation and overall development.

Although familial interaction plays a crucial role in a child's development, certain variables may influence how families engage with children who present atypical development. While intrinsic characteristics of the syndrome—such as difficulty initiating social contact and potential cognitive skill impairments—may hinder social interaction^{8,11}, the way in which the family responds to these challenges can also impact the child's development.

According to Bowlby¹² the caregiver's behavior may change in response to the child's lack of reaction to stimuli. Given the difficulties the child may exhibit, the mother might adopt a more directive communication style and ask fewer questions in order to elicit simpler responses. As a result, she may maintain the same communication pattern regardless of the child's developmental stage¹³. Despite efforts to provide stimulation, such caregiver behavior often reflects low expectations regarding the child's present and future development. Therefore, even though knowledge about the syndrome is more widely available today, social stigma persists and continues to shape how families perceive and respond to their children¹³.

In this context, it is necessary to examine how familial interactions are formed and characterized to understand their potential impact on the development of children with DS. This study aimed to analyze how family interactions of children with Down syndrome are characterized and investigated in literature through a scoping review.

Methodology

Search Strategy

This study is characterized as a scoping review and follows the criteria established by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).¹⁴ The review was registered with

the Open Science Framework (OSF) under DOI: 10.17605/OSF.IO/H5V2A.

The present review followed a structured six-step process: (1) formulation of the research question; (2) definition of descriptors and keywords; (3) selection of articles based on eligibility criteria; (4) data collection, extraction, reading, and critical analysis of the articles; (5) interpretation and discussion of the findings; and (6) knowledge synthesis and presentation of the review¹⁵.

The PCC strategy (Population, Concept, and Context) was employed to formulate the guiding research question, a useful tool for structuring health research questions. In this case, the first element (P) refers to “children with Down syndrome and their families,” the second (C) is “family interactions,” and the third (C) is “academic research on these interactions in contexts such as the home environment.”

Thus, the guiding question of this review was: How is the interaction between children with Down syndrome and their families characterized/studied?

The databases selected for the search were PubMed and LILACS (Latin American and Caribbean Health Sciences Literature). The descriptors used in the search, based on the DECS (Health Sciences Descriptors), were as follows: “Down Syndrome” AND “Social Interaction” AND “Family”; “Down Syndrome” AND “Parent-Child Relations”; “Down Syndrome” AND “Mother-Child Relations.”

Selection Criteria

The review included original articles in the form of case reports, observational studies, or experimental studies involving children aged 0 to 5 years and 11 months. Articles were selected if they were fully published in Portuguese or English in the chosen databases and had been published within the past 10 years (article selection took place in April 2024).

Articles were excluded if they were duplicates, lacked full-text availability, or did not have the

interaction between the child and family as their main research objective.

Data Analysis

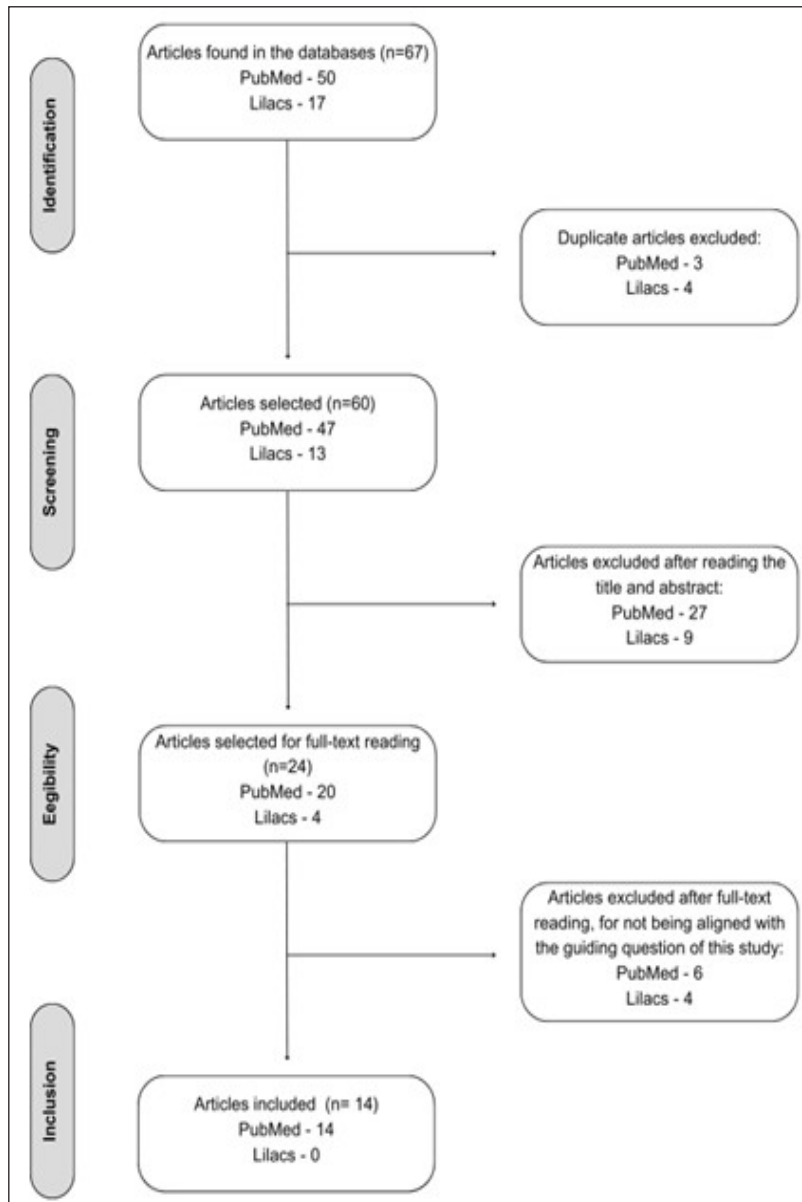
The article selection phase involved two independent reviewers who, without direct interaction, performed the screening process according to pre-established search strategies. In cases of disagreement, a third reviewer was consulted.

Initially, articles were searched using the previously defined descriptors. In the screening phase, titles and abstracts were reviewed to exclude articles that did not meet the inclusion and exclusion criteria. In the eligibility phase, full-text articles were read in detail, and only those aligned with the objective of this review were retained. Finally, in the inclusion phase, all articles meeting the previous criteria were selected for information extraction and analysis.

Extracted data were categorized according to the article title, publication date and country, sample characteristics, study design, objective, procedures, results, and conclusion. This categorization allowed for systematic data organization and ultimately supported the response to this study’s guiding research question.

Results

Figure 1 presents the article selection process. Based on the established search criteria, a total of 67 articles were identified across the selected databases: PubMed (50) and LILACS (17). Of these, 7 duplicates were excluded. After screening the titles and abstracts of the remaining 60 articles, 36 were excluded due to discrepancies in the age range of the study population or because they did not analyze family interaction in children with DS. Subsequently, 10 articles were excluded after full-text reading. In the end, 14 articles were selected for analysis, all of which were indexed in the PubMed database.



Source: prepared by the authors

Figure 1. Flowchart of article selection

The summary and variables extracted from the selected studies are presented in the table below (Table 1).

**Table 1.** Summary of data extracted from the selected articles

AUTHOR, YEAR, COUNTRY	GROUPS	AGE	GENDER	CAREGIVER EDUCATION	STUDY DESIGN	OBJECTIVE	PROCEDURE	RESULTS/CONCLUSION
Sterling et al., 2014 (EUA) ⁽¹⁶⁾	G1 = 22 children with DS and their mothers G2 = 22 typically developing children and their mothers	26 to 63 months, age-matched groups	G1: 11 girls and 11 boys G2: 10 girls and 12 boys	G1: Mean = 15.6 years (SD = 1.6) G2: Mean = 16 years (SD = 2)	Cross-sectional study	To examine maternal responsivity and directive behaviors in mothers of children with Down Syndrome compared to mothers of typically developing children.	Assessments were conducted at each child's home during a single visit lasting 1 to 2 hours. Mothers and children were invited to participate in three structured, videotaped, 10-minute activities: free play, book reading, and snack preparation and consumption. Each child was assessed using the Mullen Scales of Early Learning (MSEL).	During the interaction, mothers of children with DS adapted their parenting style to facilitate their children's linguistic development. Older DS children were more interactive. Responsive style observed. It is concluded that mothers of children with DS build a parenting style rich in linguistic information.
Thiemann-Bourque et al., 2014 (EUA) ⁽¹⁷⁾	G1: 9 children with DS G2: 9 typically developing children	9 to 54 months, age-matched groups	6 girls and 6 boys, each group	7 DS mothers had ≥4-year college degree; 2 had high school. Matched between groups.	Cross-sectional study	To determine differences in vocal interactions between parents and their children with DS and TD children at two age ranges.	Used LENA technology for automated analysis of vocal behavior in home settings. Children wore recorders during the day.	Language delays persist in DS despite parental input. Although some parents continue to provide information that can positively influence the child's language acquisition environment, the transactional process of language acquisition may not occur easily between some children and their parents.
Cárdenas et al., 2014 (Espanha) ⁽¹⁸⁾	One girl with DS and her mother	12 to 18 months	Female	—	Longitudinal case study	To analyze the early symbolic use of objects in triadic interactions (adult-child-object).	Five recorded home sessions with symbolic play using 10 varied objects. A microgenetic analysis was performed to precisely observe the moment of appearance, characteristics and frequencies and the changes in the symbolic uses carried out by the child and the adult.	Symbol use emerged at 13.5 months, influenced by maternal demonstrations. Both child and mother shaped the interaction through shared object use. The interest shown by the girl in the different uses of the objects gave her mother information about her interests and knowledge about the meanings of the objects, which influenced the way in which the interaction was established, because with this information, the mother organized symbolic scenarios and guided the girl in more complex uses. Furthermore, the girl, understanding the symbols performed by the adult, eventually performed her own symbolic uses.
Mitchell et al., 2015 (EUA) ⁽¹⁹⁾	G1: 43 children with DS and their mothers G2: 54 children with other developmental delays and their mothers	3 years, both groups	Approx. 50.5% male children	Mean = 14 years (SD = 2.4) for both groups	Cross-sectional observational study	To expand understanding of the 'Down syndrome advantage' by examining maternal and child behaviors during mother-child interactions.	Home visits included structured assessments, interviews, and questionnaires. Instruments used: NCAT, PSI, FSS, CBCL.	Mothers who were older, had a higher level of education, and reported greater social support were more responsive and communicative with their children. It is noteworthy that both children with Down syndrome and their mothers showed higher levels of contingent interaction, compared to the other groups.
Singh et al., 2015 (Malásia) ⁽²⁰⁾	G1: 12 children with DS, siblings and mothers G2: 12 children with CP, siblings and mothers	G1: 1y10m to 5y4m G2: 1y9m to 5y7m	7 girls and 5 boys in each group	—	Cross-sectional study	To compare interactions in dyadic and triadic contexts involving children with DS or CP with their mothers and siblings.	Three recorded interactions (mother-child, sibling-child, all together) using provided toys in a naturalistic setting.	More communicative behavior observed in mother-child interactions. Responsiveness of mothers and siblings was similar across groups, suggesting that mothers and siblings may have adapted to the children's various early communicative behaviors.
Mastrogriuseppe et al., 2015 (Itália) ⁽²¹⁾	G1: 20 children with DS G2: 20 children with ASD G3: 20 typically developing children	G1: M = 40.9m (SD = 6.3) G2: M = 41.7m (SD = 7.2) G3: M = 25.2m (SD = 3.8)	—	—	Cross-sectional study	To describe gestural communication in children with ASD, comparing them with DS and typically developing children.	10-min play sessions using standardized toys. It was recorded and transcribed.	Children with ASD used fewer referential gestures and more instrumental/requesting gestures. DS children used more gestures than typically developing peers.
Sterling et al., 2016 (EUA) ⁽²²⁾	G1: 19 children with DS and their mothers G2: 19 children with Fragile X Syndrome (FXS) and their mothers	Mean = 39.9 months (range: 20 months to 6 years)	G1: 8 girls and 11 boys G2: 19 boys	G1: Mean = 15.8 years (SD = 1.77) G2: Mean = 15.54 years (SD = 1.61)	Cross-sectional	To examine maternal responsivity and behavior management in mother-child dyads with DS or FXS.	Data collected via video-recorded sessions at participants' homes involving book reading, play, and snack time (total: 21 minutes).	Both groups showed responsive parenting. DS mothers used more gestures, and DS children showed better receptive language scores.
Seager et al., 2018 (Reino Unido) ⁽²³⁾	G1: 25 children with DS and their mothers G2: 30 typically developing children and their mothers	G1: Mean = 19 months G2: Mean = 10 months	G1: 11 girls, 14 boys G2: 14 girls, 16 boys	67% had higher education. No significant difference between groups.	Cross-sectional	Comparing the relationship between joint attention, maternal style, and language skills in DS vs. TD infants.	The participants' development was assessed through tests. After assessments, a 5-minute free play session was conducted. A toy box was provided for interaction.	No significant difference in maternal sensitivity or positivity. Mothers of DS children praised them more often, even without task completion: the greater the child's language impairment, the greater the positivity.
Lorang et al., 2018 (EUA) ⁽²⁴⁾	G1: 22 children with DS and their mothers G2: 22 typically developing children and their mothers	G1: Mean = 42.8 months G2: Mean = 44 months	G1: 11 girls, 11 boys G2: 10 girls, 12 boys	G1: Mean = 15.57 years (SD = 1.55) G2: Mean = 16.14 years (SD = 2.06)	Cross-sectional	To compare gesture use in children with DS vs. TD peers, and how maternal responsiveness varies with child age.	Structured home sessions included play, book reading, and snack time, recorded and analyzed. Two trained coders identified all instances of children's gesture use (signs, head nods, "show" and "give" are some examples of behaviors analyzed).	Children with DS used more gestures. DS mothers responded similarly regardless of age, while TD mothers adjusted responses by child age.
Lorang et al., 2020 (EUA) ⁽²⁵⁾	15 children with DS and their mothers and fathers	24 to 61 months	—	All had completed high school; most had higher education	Cross-sectional observational	To assess electrodermal activity (EDA) in parents and children with DS during interaction, and explore associations with interaction quality	Two home visits included developmental assessment and free play sessions (mother-child and father-child), recorded and monitored via Empatica E4 wristbands for EDA.	Parent and child communication and physiological arousal appear interlinked, especially in father-child dyads. Mothers placed more behavioral demands on children. Results are preliminary due to small sample size.



AUTHOR, YEAR, COUNTRY	GROUPS	AGE	GENDER	CAREGIVER EDUCATION	STUDY DESIGN	OBJECTIVE	PROCEDURE	RESULTS/CONCLUSION
Barton-Hulsey et al, 2020 (EUA) ⁽²⁶⁾	G1: 22 children with DS and their mothers G2: 22 typically developing children and their mothers	G1: Mean = 42.82 months (SD = 12.44) G2: Mean = 44.09 months (SD = 10.39)	G1: 11 girls, 11 boys G2: 10 girls, 12 boys	G1: Mean = 15.57 years (SD = 1.55) G2: Mean = 16.14 years (SD = 2.06)	Cross-sectional	To evaluate maternal language input during shared book reading with children with DS and TD peers.	Home reading sessions using standardized books. Maternal speech and child responses were coded using SALT software. MSEL assessed receptive language.	Higher receptive scores were linked to fewer maternal utterances. DS children used more gestures and vocalizations. They communicated as much as TD peers, but used more combined modes (children with DS used a greater combination of gestures, vocalizations and words to communicate).
Lorang et al., 2020 (EUA) ⁽²⁷⁾	G1: 22 children with DS and their mothers G2: 22 typically developing children and their mothers	G1: Mean = 42.8 months (SD = 12) G2: Mean = 44 months (SD = 10.4)	G1: 11 girls, 11 boys G2: 10 girls, 12 boys	G1: Mean = 15.57 years (SD = 1.55) G2: Mean = 16.14 years (SD = 2.06)	Cross-sectional observational	To examine maternal grammatical and lexical input to children with DS versus TD peers, and its relation to child language skills	Video-recorded structured sessions (play, reading, snack). Transcribed and coded using SALT. Development measured by MSEL.	Mothers of DS children used simpler grammar and less lexical diversity. This simplification aimed to improve child understanding.
Lorang et al, 2021 (EUA) ⁽²⁸⁾	15 children with DS and their mothers and fathers	Mean = 39.67 months (SD = 12.11)	8 girls, 7 boys	Most mothers (12/15) and fathers (11/15) had higher education	Cross-sectional observational	To investigate parental command, use and child compliance during free play interactions	Data for this study were extracted from a previous study by Lorang et al. (2020). Assessments took place in the participants' homes. Parents were instructed to play as they normally do. A set of toys was brought in for the interaction, which was videotaped for later transcription.	Parental command use and child obedience were similar in mother-child and father-child interactions. Children complied with approximately 60% of commands, regardless of their level of receptive or expressive language skills. Compliance was greater for direct vs. indirect commands, likely due to lower grammatical complexity in direct commands.
Hilbert et al., 2021 (EUA) ⁽²⁹⁾	G1: 22 children with DS and their mothers G2: 22 typically developing children and their mothers	G1: Mean = 42.8 months (SD = 12) G2: Mean = 44 months (SD = 10.4)	G1: 11 girls, 11 boys G2: 10 girls, 12 boys	G1: Mean = 15.57 years (SD = 1.55) G2: Mean = 16.14 years (SD = 2.06)	Cross-sectional observational	To characterize maternal use of decontextualized (e.g.: pretend, explanatory, narrative talk) and contextualized language (e.g.: descriptions, praise, conversations, questions) information during mother-child interactions.	Data for this study were taken from a previous study by Sterling & Warren (2014). Mothers and children were recorded during play, book reading and snack time. Language transcribed and coded.	Mothers of children with DS used a greater proportion of make-believe talk compared to other types of decontextualized input and also used a greater proportion of questions, conversations, and descriptions compared to other types of contextualized language. Mothers of children with DS used a lower proportion of decontextualized input compared to mothers of typically developing children.

Source: prepared by the authors

Analysis of the included studies revealed that the age range of the children involved varied from 9 to 64 months, with most authors focusing on children under 45 months of age. Regarding the countries of origin, there was variability among the United States, Spain, Malaysia, Italy, and the United Kingdom, with a predominance of studies from the U.S.

As for the gender of participants, no significant differences were observed between the number of male and female participants. The family members involved in interactions were primarily mothers. Only one study investigated the interaction between the child and both a sibling and the mother, while three studies examined the child's interaction with both the father and the mother. Therefore, the maternal figure was present in all studies included in this review.

Most of the studies employed cross-sectional and observational design, with only one being a longitudinal case study. In 13 studies, researchers used standardized instruments and designed semi-structured interaction activities. These were conducted in participants' homes and recorded with video cameras for later analysis. Formal as-

sessments were also carried out to evaluate the children's language and developmental levels. Only one study employed a different method: a voice recorder was placed in the child's clothing pocket throughout the day to observe family interactions during daily routines.

Among the 14 analyzed articles, 11 compared children with DS to children from other groups, mostly children with typical development. The remaining 3 studies compared children with DS to children with other medical conditions, such as Autism Spectrum Disorder, Fragile X Syndrome, and Cerebral Palsy. Overall, the authors concluded that children with DS used more gestures to communicate with their family members compared to children in the other groups.

Discussion

This scoping review aimed to analyze family interactions of children with Down syndrome and the instruments/procedures used to investigate these interactions.

In the studies assessed, family members played a facilitative role in children's language develop-

ment, adjusting their communication style according to the child's needs and language level. Moreover, adults served as models for the children, who observed and reproduced behaviors and symbols, such as spoken words, gestures, or vocalizations. This finding is consistent with Cielinski et al.³⁰, who suggest that not only do adults adapt their communication with children, but children also respond to their families' behavior, with both parties adjusting to one another's communicative style.

Most of the reviewed articles employed a cross-sectional, observational design^{16-17,19-29} to investigate how these interactions occur. In terms of procedures and instruments, the majority^{16,18-29} used playful activities involving predetermined toys or materials, offering equal opportunities across groups (children with DS, typically developing children, and others) to engage in play-based interactions, thereby standardizing the conditions. One possible reason for this choice, as observed by Cárdenas et al.¹⁸, is that material objects such as toys and books are highly effective tools that facilitate interaction between children and their families by supporting communication and information exchange. Thus, using these tools in home environments is appropriate, as it places the child in a familiar and playful context with the caregiver.

Although play situations were standardized across groups, two of the three studies comparing children with DS to children with other genetic/neurological conditions (Cerebral Palsy, ASD, and Fragile X Syndrome) found group differences, such as greater use of gestures and more frequent maternal comments during interactions²¹⁻²². These findings may relate to the widely recognized "Down Syndrome Advantage" theory by Hodapp et al.³¹, which posits that parents of children with DS experience less parental stress compared to parents of other atypical children of the same age.

The literature also suggests that mothers of children with DS report greater well-being than mothers of children with other developmental conditions. This is partly because children with DS often exhibit fewer behavioral problems and are commonly described as sociable and cheerful³²⁻³³, which may foster more positive parental perceptions and interactions³⁴.

Some authors³⁴⁻³⁶ also suggest that family income/socioeconomic status acts as a protective factor for development. In the studies reviewed, families of children with DS tended to have higher

incomes than families of children with other developmental conditions, which may have contributed to the observed performance differences.

Another protective factor highlighted is maternal education level. Most mothers in the reviewed studies had completed high school or higher education^{16-17,19,22-26,28-29}. Authors concluded that these mothers facilitated positive interactions that supported child development. Similarly, existing literature indicates that mothers with higher education levels tend to engage in more varied interactions, provide greater stimulation, and have greater knowledge of child development.³⁷⁻³⁹ Thus, considering the role of these factors in interaction quality, one might ask: Would the findings of this review differ if the participants were mothers with lower educational and socioeconomic backgrounds?

Most articles examined mother-child dyadic interactions^{16,18-19,21-24,26-27,29} revealing a gap in studies focusing on interactions with other family members such as fathers^{17,25,28} or siblings²⁰. In fact, the literature contains few studies on sibling interactions, despite the well-established notion that sibling relationships can be among the most enduring across the lifespan⁴⁰. Moreover, Anhão et al.¹¹ noted that children with DS are more likely to imitate gestures and behaviors of other children, suggesting that siblings can serve as important models for interaction in the child's environment. Therefore, including siblings in future studies on family interaction in DS is crucial for a more comprehensive understanding of its developmental impact.

A common finding in several articles is that children with DS use a significant number of gestures to communicate²¹⁻²⁴. It is well known that individuals with DS often present deficits in expressive language and develop gestural communication to enhance understanding by their communication partners, adapting their gestures based on environmental context⁴¹⁻⁴². This type of communication is thought to grow similarly to that of typically developing children⁴³, supporting the findings of this review.

In conclusion, although family interaction with children with DS may be challenged by the syndrome's intrinsic characteristics, as previously mentioned in this study, the findings suggest that mothers (the most consistently present family members in the reviewed articles) acted as facilitators during interactions. They successfully adapted

their communicative style to the child's needs, often using more directive strategies and displaying interaction patterns similar to mothers of typically developing children. Nonetheless, it is important to note that most studies used observational analyses in play-based, standardized settings, which may contribute to the consistency of results.

Additionally, most studies focused solely on mother-child dyads. Future research should investigate the impact of interactions with other family members, such as fathers and siblings. It is also essential to include families with lower socioeconomic status and educational levels in future studies to assess how these variables influence the quality of social interaction in children with Down syndrome.

Conclusion

This review analyzed how family interactions of children with Down syndrome are studied and what data have been found in the literature. It was observed that the family—especially the mother—plays a fundamental role as a facilitator in the linguistic and social development of these children. Family interactions are influenced not only by the child's characteristics, such as expressive language deficits, but also by the environment, including the family's socioeconomic status and parental educational levels.

The findings indicate that, in general, mothers of children with DS adopt responsive and adaptive communication strategies that foster cognitive and social development. Furthermore, comparisons with other groups of children with atypical development, such as those with Cerebral Palsy or Autism Spectrum Disorder, suggest that children with DS demonstrate a particular advantage in gestural communication during interactions.

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