

**Exploring the Role of Connectedness in Children and Adolescents with Autism
Spectrum Disorder: A Scoping Review**

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Abstract

Background. Autism spectrum disorder (ASD) is linked to impairments in social interactions, restricted interests, and behaviour repetition. Consequently, children and adolescents with ASD have difficulties connecting with peers, themselves and the world, posing risks to their mental health and development. Despite the known challenges, there is a notable gap in literature reviews specifically addressing the dimensions of connectedness to the self, others, and the world in children and adolescents with ASD. **Aim.** This review aims to provide an overview of the existing literature regarding the dimensions of connectedness to the self, to others and the world in children and adolescents with ASD. **Method.** A scoping review was conducted following the PRISMA guidelines, using a relevant search string in three databases (Web of Science, PsychInfo, Scopus). Data regarding the role of connectedness concerning children and adolescents with ASD, the form of connectedness, the measurements and main findings were analysed using a thematic analysis. **Results.** The 17 studies were published between 2010 and 2022, with sample sizes ranging from 4 to 875 participants. Results underline predisposing factors, such as peer support that enhance connectedness to the self and others. Further, deposing factors, such as severity or lack of reciprocal friendships present barriers to the dimensions of connectedness. Connectedness to the world was not directly represented in the reviewed literature. **Conclusion.** Understanding the predisposing and deposing factors of connectedness could lead to more effective interventions that enhance the connectedness of children and adolescents with ASD, consequently positively affecting their overall well-being.

Keywords: autism spectrum disorder, connectedness, predisposing factors, deposing factors, scoping review

Exploring the Role of Connectedness in Children and Adolescents with Autism Spectrum Disorder: A Scoping Review

Human beings are inherently social creatures who have a fundamental motivation for connectedness. As a psychological construct, connectedness plays a crucial role in developing identity and is an important factor in mental health (Townsend & McWhirter, 2005; Watts et al., 2022). Therefore, connectedness is especially important for children and adolescents' healthy development. Lacking connectedness can negatively impact individuals' well-being and overall health (Diendorfer et al., 2021; Townsend & McWhirter, 2005; Watts et al., 2022). As a result, children and adolescents can feel a disconnection between the internal self and the external (social) world, which may lead to feelings of psychological distress, isolation or lack of purpose in life (Buchholz & Vatton, 1999; Townsend & McWhirter, 2005). Thus, lack of connectedness can be described as a multifaceted problem, affecting both social relationships and internal psychological well-being, which underlines the importance of further investigating connectedness and its conceptualization, definitions, and measures in various fields of literature (Townsend & McWhirter, 2005).

Research increasingly conceptualizes connectedness as a multidimensional construct, expanding the relational component to acknowledge the individual's role within relationships (Barber & Schluterman, 2008; Bellingham et al., 1989; Carroll et al., 2017; Townsend & McWhirter, 2005). Watts et al. (2022) contribute to this understanding by defining connectedness as a "state of feeling connected to self, others, and the world". Specifically, connectedness to the self can be understood as an individual's relationship with themselves, including aspects of self-awareness, emotional connectivity, and regulation. Connectedness to others refers to how one is socially connected, particularly their sense of belonging, quality of interactions, and relationships that individuals form and maintain. Furthermore, connectedness to the world can be defined as connecting to the larger world, including feeling of purpose, spiritual connection or engagement within a community and nature (Watts et al., 2022). Moreover, their research proposes that the different dimensions of connectedness may interrelate and potentially interact, sharing a common relationship with underlying factors, key determinants, or global connectedness factors. This holistic perspective is particularly relevant as it provides a comprehensive framework for exploring the impact of connectedness on human well-being and personal development.

Understanding these dimensions is critical, as studies suggest that each dimension guides in getting a greater understanding of connectedness and plays a critical role in shaping individuals mental and physical health, influencing factors such as self-esteem, resilience, and

social competence (Diendorfer et al., 2021; Leung et al., 2015; Watts et al., 2022). Despite the importance of this multidimensional perspective, there is limited research that comprehensively explores these dimensions. Hence, it is essential to explore further how the dimensions of connectedness, as defined by Watts et al. (2022), are represented in literature.

While studies suggest that each dimension of connectedness plays a critical role in shaping mental and physical health, there is a significant gap in understanding how these dimensions are experienced by children and adolescents facing additional challenges in forming these bonds (Diendorfer et al., 2021; Leung et al., 2015; Watts et al., 2022). Specifically, for children and adolescents with neuro-developmental disorders, particularly autism spectrum disorder (ASD), these connections are even more crucial yet often challenging to achieve (Chang & Locke, 2016). ASD is a complex psychopathological condition that surfaces in childhood and is linked to impairments in communication, social interactions, restricted interests, and behaviour repetition (Felipe, 2019; Leung et al., 2015). According to the DSM-5 criteria, the primary feature of ASD is challenges in social communication and social interaction. Among others, individuals with ASD have difficulties reading social cues or engaging in interpersonal communication, which causes difficulties interacting with their peers (Chang & Locke, 2016). Without these peer connections, children with ASD are at a greater risk of social isolation, which can further impact their mental health and development.

Moreover, individuals with ASD often have difficulties with their emotional connectivity (Mul et al., 2018). Furthermore, individuals could face challenges connecting to the broader world due to sensory sensitivities. These challenges are evident across multiple contexts, including social reciprocity, non-verbal communication, and developing, maintaining, and understanding relationships (Lord et al., 2020). Regarding the clear importance of connectedness and the unique challenges this population faces, it is particularly important to map the existing evidence on the different dimensions in the context of children and adolescents with ASD, as fostering these connections could greatly support their social, emotional, and cognitive development.

Connectedness to Others

Autistic individuals often face social challenges, which can result in increased social isolation. This isolation can present various difficulties if it is not by choice. Notably, many autistic children do not see their isolation as freely chosen and report a higher level of loneliness compared to non-autistic children. This isolation may arise because non-autistic individuals sometimes avoid or misinterpret autistic behaviours and communication styles,

perceiving them as unusual (Jaswal et al., 2020). Consequently, studies highlight that children and adolescents with ASD have fewer reciprocal friendships and reduced connectedness to others, also referred to as social connectedness (SC), compared to the non-autistic (Diendorfer et al., 2021; Wolstencroft et al., 2018). Research suggests that SC positively affects one's physical and mental health. However, children experiencing the negative spectrum of SC are at higher risk for a decline in mental health and may experience loneliness (Diendorf et al., 2021). Hence, focusing on SC is potentially guiding in developing protective factors in children and adolescents with ASD who are at risk for increased social and mental health concerns during adolescence (Tomfohrde et al., 2022). Fostering a sense of connectedness in autistic individuals could lead to a stronger sense of belonging, expanded social networks, increased participation in community activities, better access to information and resources, and more positive relationships (Cohen & Willis, 1985).

Fostering connectedness is relevant across many domains of life for children and adolescents with ASD, but it is particularly crucial in the school environment, which serves as the primary social domain where children develop peer relationships and social skills. However, connectedness to others in this setting is often particularly challenging for autistic individuals due to the structured and socially demanding nature of school environments, which can exacerbate difficulties with communication, social interaction, and interpreting social cues (Lord et al., 2020). These difficulties can limit opportunities for building reciprocal friendships and engaging in meaningful social interactions, often contributing to a heightened sense of isolation. Therefore, early interventions are crucial for supporting autistic individuals and their social environments in addressing common challenges, such as communication and social interaction (Lord et al., 2020). School-based strategies and parent-mediated approaches delivered within the natural environment have been shown to significantly improve peer social connections in classroom settings (Kasari et al., 2011).

In addition, to supporting social engagement, fostering social connectedness can also help mitigate internal challenges such as anxiety and depression that individuals on the autism spectrum often experience (VanderBroek Stice & Layner, 2019). However, the availability of resources and evidence-based interventions for this age group remains limited, leading to a lack of support for these social and emotional difficulties (Tomfohrde et al., 2022; Rudacille, 2017). Despite research suggesting the importance of social connection for individuals with ASD, also the individuals themselves express a strong need for seeking social connections. Specifically, on their own terms such as only with few individuals or with likeminded (Tesfaye et al., 2022). Hence, promoting social connectedness in children and youth with

ASD has the potential to improve their wellbeing and development. Therefore, it is especially important to explore the role of the dimension connectedness to others further through literature.

Connectedness to the Self

Similarly to the SC, children and adolescents with ASD also face challenges in connectedness to the self. Research underlines that individuals may have difficulties with emotional connectivity and diminished self-awareness, affecting their self-identity and self-esteem (Hobson & Hobson, 2013). Furthermore, autistic individuals process self-relevant information differently from non-autistic individuals. For example, children with ASD often endorse a lower view of one self-concept, reporting lower global self-appraisal (Burrows et al., 2016).

Additionally, growing evidence suggested a link between interoceptive awareness and the ability to identify, describe and connect with one's emotions. Here, greater awareness enhances the connection to one's emotions, which may also affect the empathy autistic individuals feel for others. Nevertheless, findings suggest that autistic individuals have lower interoceptive awareness and sensitivity than participants without ASD (Mul et al., 2018). Consequently, it is believed that individuals with ASD have less insight into their body, emotions and senses, which are aspects relevant to connectedness to the self as defined by Watts et al., 2022. Accordingly, Huang et al. (2017) suggest that autistic individuals have difficulties understanding self and other thoughts and feelings. Despite these challenges, individuals with ASD often feel positive about themselves and may be unaware of their reduced self-insight. Therefore, it is still important to further investigate the dimension of connecting to the self and whether children and adolescents with ASD perceive these difficulties in connecting to the self as negative (Huang et al., 2017). While connectedness to the self focuses on one's internal relationship and understanding, connectedness to the world broadens this perspective to include external connections, such as one's sense of purpose and relationship with society, nature, and spirituality

Connectedness to the World

The dimension of connectedness to the world remains largely underexplored in the context of children and adolescents with ASD. Watts et al. (2022) highlight components such as connection to purpose, nature, and spirituality as key aspects of this dimension, yet these areas have only been partially investigated. Autistic individuals, compared to individuals without ASD, often struggle with contributing meaningfully to society and connecting to a sense of purpose. Quinn et al. (2019) underlines that autistic adolescents can connect to a

purpose. Additionally, research on autistic adults shows results in their connection to nature that also seem promising for children and adolescents with ASD. For instance, Friedman et al. (2023) findings state that individuals experience nature as supporting relatedness through connecting in and to nature and perceived enhancement of well-being when being in nature. Next, research suggests that autistic individuals have difficulties expressing spiritual understanding and being part of a broader community practising spirituality or religion (Hills et al., 2019). Despite being investigated to a lesser extent, spirituality and religiosity are associated with quality of life. Especially for individuals with ASD, practising and fulfilling spiritual and religious needs may be seen as a resource. Whereas for other autistic individuals, it could be debilitating (Cwik, 2021). Although breaking the construct of connectedness to the world into separate components offers some insight, a clear lack of comprehensive studies addressing the dimension as a whole in the context of children and adolescents with ASD remains evident.

Despite substantial insights from existing literature on the importance of connectedness for children and adolescents with ASD, no study comprehensively explores the three dimensions of connectedness to the self, others, and the world. This review aims to address the clear gaps, particularly in the nuanced understanding of how connectedness manifests across various dimensions in children and adolescents with ASD. By conducting a scoping review, this research will examine the current literature on the role of connectedness and its relevance. The central research question is: What is the current state of the literature regarding the dimensions of connectedness in children and adolescents with autism spectrum disorder? The objectives are as follows: First, to explore how existing literature characterizes the dimension of connectedness to others among children and adolescents with ASD, how this connectedness relates to outcomes such as loneliness and mental well-being, and to identify predisposing factors that can enhance connectedness to others. Second, to investigate how connectedness to the self, including aspects of self-awareness, emotional connectivity, and interoceptive awareness, is represented in the literature concerning children and adolescents with ASD, how these factors impact self-esteem and identity, and to identify aspects that can enhance connectedness to the self. Lastly, to examine the extent to which connectedness to the world (connection to nature, spirituality, and a sense of purpose) is explored in the literature on children and adolescents with ASD, to identify associated challenges in achieving a sense of meaning and purpose in life, and to explore possible factors that can enhance connectedness to the world.

Method

The conduct and reporting of this scoping review followed the Preferred Reporting Items for Systematic review and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines (Tricco et al., 2018) (see Appendix A).

Eligibility Criteria

The target group includes children and adolescents diagnosed with ASD. Hence, articles with deviating foci were not included, such as articles with a focus on particularly Asperger Syndrome. However, articles considering parental viewpoints on the matter or educational experts were incorporated to provide a well-rounded understanding of the issue. Following the definition of connectedness and its dimensions, only studies were considered contained in this definition. Furthermore, empirical articles, regardless of their designs (e.g., quantitative, qualitative, or mixed methods) were included, while non-empirical articles or book, as well as conceptual papers were excluded. The articles had to be written in English or German and published in a peer-reviewed journal. During the screening process, eligibility criteria were adjusted to include only articles published in the last 15 years (2009-2024) to focus on the most recent developments.

Information Sources and Search Strategies

Comprehensive literature searches were conducted. First, an initial limited search was implemented in the databases Scopus, PsycINFO and Web of Science to investigate whether the keywords in the search string identified relevant articles. Next, necessary adjustments were made before initiating the official searches. Based on the previously mentioned criteria, one search string was created, found in Table 1.

The databases Scopus, PsycINFO and Web of Science were used to find relevant articles. Specifically, these databases were chosen as they encompass a broad spectrum of articles related to the field of psychology. The databases were searched on the 5th of February 2024. Further, the website Covidence was used to support the researcher in screening articles and the data extraction process (Kellermeyer et al., 2018). Here, the findings of the search strings were exported from each database and imported into Covidence. In Covidence the articles were independently screened on a title and abstract, and subsequently, full-text basis. Through this process, the data extraction process was documented, which increases transparency and enables future replication.

Table 1*Search String Developed for Scopus, Web of Science and PsycInfo*

Key Words	Synonyms
Autism Spectrum Disorder	("autism spectrum disorder" OR "autism" OR "autistic children" OR "ASD" OR "autistic disorder")
AND	
Connection	(connectedness OR relatedness OR "feeling connected" OR "social connection" OR "connection to nature" OR "connection to self")
AND	
Children	(child* OR adolescent OR teenager OR youth)
NOT	
Adults	

Study Selection Process

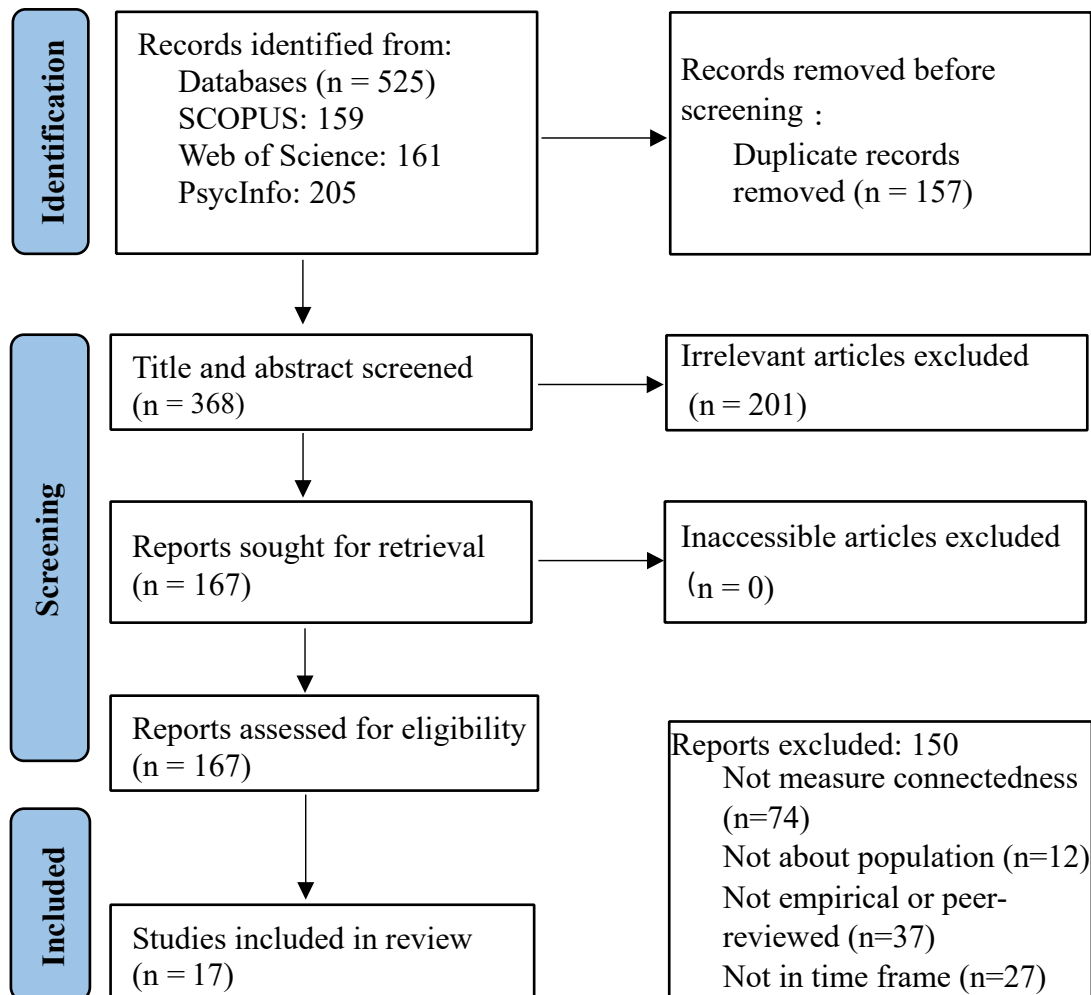
The PRISMA flow diagram (figure 1) overviews the searched literature and the screening process. The initial screening of the most relevant databases using the identified search string generated 525 hits. Of these hits, 159 articles were found on SCOPUS, 161 on Web of Science and 205 on PsycINFO. In the following step, the articles were exported from the databases in RIS format to be imported into the online software Covidence. In Covidence, the records were first examined for duplications, excluding 157 records before the screening process. Next, the title and abstracts of 368 articles were screened for relevance by the researcher. The relevance was based on including keywords relating to ASD and connectedness. In this step, 201 articles were excluded, leaving 167 records to be assessed on a full-text basis. Here, articles were closely analysed based on the eligibility criteria. In total, 150 articles had to be removed, most commonly due to not measuring connectedness but rather mentioning the dimension of connectedness to others as a common characteristic in ASD. Moreover, 27 articles were excluded due to not fitting in the adjusted time frame as eligibility criteria regarding the time frame was adjusted during the screening process,

resulting in not having excluded articles based on the publication time beforehand.

Consequently, the scoping review included 17 articles that fulfilled all criteria. The screening and data extraction process was conducted independently by the researcher under supervision.

Figure 1

PRISMA Flow Chart of the Literature Screening Process



Synthesis of Results

The data extraction was divided into two parts, starting with general information about the studies (table 2) and synthesized data in text form. For the general information, the extent and nature of the literature were summarized using Microsoft Excel. The following data were extracted from the full text: author, year, country, study design, participants characteristics, study aim, description of measurement (relevant for measuring connectedness), outcome and the form of connectedness (i.e., connectedness to the self, others, and the world). The findings were synthesized by conducting an inductive thematic analysis and extracting data by organizing them into themes. This process was carried out following the thematic analysis approach outlined by Braun and Clarke (2006). Here, multiple stages of reviewing the data

guided finding potential goal-oriented themes, notably by screening the data to discover underlying patterns. These patterns were then organized into potential themes. Further, the potential themes were reviewed before eventually defining and naming them. Finally, the themes were, if needed, adjusted, and the findings were presented in the form of a narrative text. This systematic approach ensured the results could be extracted reliably to answer the research question.

Results

A total of 17 studies were included in the current scoping review, see Table 2. The studies were published between 2010 and 2022. All studies were conducted in Western-oriented and primarily English-speaking countries, namely the United Kingdom ($n=3$), the United States of America ($n=9$), Canada ($n=1$) and Australia ($n=4$). The largest sample focusing exclusively on autistic children and adolescents was by Kasari et al. (2015), who included 148 children diagnosed with autism. The smallest samples, on the other hand, included four adolescents diagnosed with ASD each by Hochman et al. (2015) and Carter et al. (2017). Moreover, six studies were comparing individuals with ASD and “typically” developed individuals, such as Kasari et al. (2011), where 815 “typically” developed students were compared with 60 students with ASD. Reddy et al. (2010) compared 12 preschool children with autism, with 13 preschool children with Down Syndrome and 13 “typically” developing children. Also, three studies involved the parents of children with ASD, such as O’Haren et al. (2021), where 21 mothers of children on the spectrum were included. Lastly, Hodges et al. (2021) included 76 experts in their sample, and no children or adolescents with ASD were present.

The current scoping review included various designs, precisely six observational studies, one Delphi study, five mixed method designs, two qualitative method studies and three experimental studies. Two of the mixed method studies were longitudinal, so measured over a period of time. Furthermore, there were no direct measures of connectedness. The studies measured connectedness indirectly through, for example, the friendship surveys in the study by Dean et al. (2014) or the Psychological Sense of School membership scale in the study by Shochet et al. (2022). Lastly, all studies focused primarily on the dimension of connectedness to others. At the same time, there were five studies simultaneously touching upon connectedness to self (Hodges et al., 2021; Hodges et al., 2022; Lense et al., 2022; Reddy et al., 2010; Shochet et al., 2022). One study offered limited insights into connectedness to the world, namely the study by Lense et al. (2022).

Table 2*General Information about the Included Studies*

Author(s) and Year	Country	Study Design	Participant Characteristics	Study Aim	Description of measurements	Outcomes	Form of Connectedness
Beurkens et al. (2012)	USA	Mixed-Method Design; Cross-Sectional Study	25 parent–child dyads (children with ASD age 4-14)	Examine effect of severity of autism on children’s interactions and relationships with their parents	Dyadic Coding Scales (Humber & Moss, 2005); Self-Report Inventory; Interaction Rating	Higher autism severity correlated with decreased parent-child connectedness	Connectedness to others
Boyd et al. (2011)	USA	Direct Observation	Eight children diagnosed with ASD (Age 3.9 through 5.10); Six males and two females	Describe social interactions between children with ASD and their peers in classroom settings; Maintenance factors	Descriptive observation system	Limited Peer Engagement; Prosocial behaviour only to achieve a purpose	Connectedness to others
Carter et al. (2017)	USA	Single-Case Experimental design	Four male high school students with ASD (Age 16-19 years)	Evaluate the efficacy of peer support arrangements	Observational measures; Semi-structures interviews	Increased social peer interactions	Connectedness to others
Dean et al. (2014)	USA	Secondary Exploratory Analysis	Elementary school children with and without ASD (N=100)	Examines the social relationships of elementary school children with high-functioning autism	Friendship survey (Cairns & Cairns, 1994)	Preference same-gender friends; fewer connections than neurotypical peers; Gender differences in connectedness	Connectedness to others

Table 2 (Continued)

Author(s) and Year	Country	Study Design	Participants Characteristics	Study Aim	Description of Measurements	Outcomes	Form of Connectedness
Hebron (2017)	UK	Longitudinal	28 students with ASD and 21 “typically developing” students	Explore school connectedness during transition from primary to secondary school	Psychological Sense of School Membership (Goodenow, 199)	Lower school connectedness than their neurotypical peers; need for ongoing support and monitoring	Connectedness to others
Hobson et al. (2015)	UK	Observation	18 parent-child dyads (children aged between 2 and 12); 16 boys and 2 girls	Examine the relations between severity of children’s autism and qualities of parent-child interaction	Observation Schedule; Dyadic Coding Scales	Higher autism severity correlated with lower parent-child interaction quality	Connectedness to others
Hochman et al. (2015)	USA	Randomized Controlled trial (RCT); Observation	Four adolescents with ADS (Age 15 to 17)	Evaluate effectiveness of peer network interventions in increasing social connectedness for students with ASD	Observation Schedule	Significant increases in connectedness; Barriers included inherent social challenges, attributional issues, and limited structured opportunities	Connectedness to others

Table 2 (Continued)

Author(s) and Year	Country	Study Design	Participants Characteristics	Study Aim	Description of Measurements	Outcomes	Form of Connectedness
Hodges et al. (2021)	Australia	Delphi Study	Seventy-six expert clinicians, educators, and researchers	Gain expert consensus to inform the development of a school-based intervention to improve the school participation and connectedness of elementary students with ASD	Self-composed online survey	School-based interventions must address attendance, involvement, sense of self, and school connectedness	Connectedness to others Connectedness to self
Hodges et al. (2022)	Australia	Mixed-Method Design	Ten students with ASD and 200 “typically developing” peers	Explore the feasibility, fidelity, and preliminary effectiveness of school-based intervention to enhance school connectedness	Behavior Assessment System for Children (BASC-3 SOS)	Increased peer connection and connection to self	Connectedness to others Connectedness to self
Kasari et al. (2015)	USA	Randomized Controlled Trial	148 children with ASD (Age between 6 and 11 years)	Compare the effectiveness of different social skills intervention approaches for children with ASD	Friendship survey (Cairns & Cairns, 1994); Playground Observation of Peer Engagement (POPE); Student Teacher Relationship Scale (STRS); The Social Skills Improvement System	Participants with ASD preferred groups with social challenges over mixed groups; Preference for skill-based interventions	Connectedness to others

Table 2 (Continued)

Author(s) and Year	Country	Study Design	Participants Characteristics	Study Aim	Description of Measurements	Outcomes	Form of Connectedness
Kasari et al. (2011)	USA	Randomized Controlled Trial	60 children with ASD and 815 “typically developing” children	Compare two interventions for improving the social skills of high functioning children with ASD	Semi-structures interviews; observations; the Social Network Survey	Children receiving peer-mediated treatments showed improved in connectedness to others	Connectedness to others
Larkin et al. (2013)	USA	Observation	20 children with ASD, 20 in the comparison group; 16 males and 4 females; and their parents	Replicate and extend findings from two recent studies on parent child relatedness in autism	Parent-Child Relationship Inventory and the Relationship Development Assessment (RDA-RV)	Preliminary support for a clinical tool measuring parent- child relatedness. The tool showed strong validity and reliability, effectively capturing parent- child dynamics, including rigid interaction patterns common in ASD.	Connectedness to others

Table 2 (Continued)

Author(s) and Year	Country	Study Design	Participants Characteristics	Study Aim	Description of Measurements	Outcomes	Form of Connectedness
Lense et al. (2022)	USA	Mixed-Method Design	Preschool-aged children with ASD (n=33) and “typically developed” children (n=28) and their parents	Investigated the mechanisms by which parent–child music classes for autistic and neurotypical children can support community participation	Semi-structures interviews; Positive and Negative Affect Schedule and IOS scales to assess perceived social connection	Enhanced social connection, communication, and emotional engagement	Connectedness to others Connectedness to world Connectedness to self
O’Hare et al. (2021)	Australia	Qualitative Research Design	21 mothers of children aged 11–16 years who are on the autism spectrum	Explore how mothers of children with autism support their children's school connectedness	Semi-structured interviews	Mothers of children on the autism spectrum taking on roles such as case managers, advocates, and educators to support their child's school connectedness	Connectedness to others

Table 2 (Continued)

Author(s) and Year	Country	Study Design	Participants Characteristics	Study Aim	Description of Measurements	Outcomes	Form of Connectedness
Reddy et al. (2010)	UK	Exploratory Observational Study	12 pre-school children with autism, 13 pre-school children with Down Syndrom and 13 typically developing toddlers	Investigate differences in self-recognition, social relatedness, and affective responses	Mental Development Index of the Bayley Scales of Infant Development; MacArthur Communicative Development Index; Mirror Self Recognition Test	Children with ASD showing less social engagement and positive affect toward their reflection; indicating a dissociation between self-recognition and social connection in autism	Connectedness to others Connectedness to self
Shochet et al. (2022)	Australia	Longitudinal Mixed-Methods Design	30 adolescents with ASD; 31 parents of 23 of the adolescents, and school staff	Assess the feasibility of a multilevel school-based intervention to enhance school connectedness and self-regulation	Psychological Sense of School Membership Scale (PSSM; Goodenow, 1993); Coping Self-Efficacy Scale (CSES; Chesney et al., 2006)	Enhanced coping self-efficacy, emotional regulation, and school connectedness. Stronger sense of belonging and acceptance at school for ASD individuals	Connectedness to others Connectedness to self

Table 2 (Continued)

Author(s) and Year	Country	Study Design	Participants Characteristics	Study Aim	Description of Measurements	Outcomes	Form of Connectedness
Tesfaye et al. (2022)	Canada	Qualitative Study	31 participants (Age between 11 and 18); Six female and 26 males	Identify key themes around the focus on the facilitators and barriers youth perceived throughout multiple environmental contexts and social relationships	Semi-structured interview	Need for meaningful connections, preferring quality relationships with like-minded individuals or other autistic peers, countering the assumption that autistic people lack social motivation.	Connectedness to others

Thematic Analysis

In the data analysis process, two overarching themes became evident: “Connectedness predisposing factors” and “Connectedness deposing factors”. Each of these themes contains multiple subthemes that reflect specific aspects of connectedness relevant to children and adolescents with ASD (table 3). The first theme “Connectedness predisposing factors” covers the factors that positively influence or enhance connectedness to others, the self and the world among children and adolescents with ASD and help answering the research question by identifying the conditions under which connectedness is fostered. The second overarching theme “Connectedness deposing factors” introduces factors that negatively influence or hinder forming meaningful connections to the self, others and the world.

Table 3

Themes Resulted from the Literature Review.

Connectedness predisposing factors	Connectedness deposing factors
Peer Support	Severity
Preference for Similarities	Lack of Reciprocal Peer Relationships
Promoting Inclusive Educational Environment	Lack of Structured Opportunities
Parental Support	Challenges in Sense of Self

Connectedness Predisposing Factors

Peer Support

Peer support plays a critical role in fostering connectedness among individuals with ASD, particularly in school settings, where it enhances social interactions and strengthens relationships. Peer-mediated interventions have gained popularity as an evidence-based approach for improving social skills and peer interactions among students with ASD (Carter et al., 2017). These interventions typically involve structured peer groups, where peers are trained to support their classmates with ASD in various social situations. For example, Carter et al. (2017) demonstrated the effectiveness of peer support interventions in general education classrooms, finding that these interventions significantly increased social skills and peer interactions for all four participants. The peers involved in these interventions also reported genuine connections with students with ASD, describing them as friends. Similarly, Hochman et al. (2015) found that participation in peer support networks helped students with ASD build more substantial and positive relationships with their peers, contributing to a greater sense of

belonging and inclusion within the school community. Key factors such as regular meetings and the structured nature of the peer groups played an important role in these positive outcomes.

Implementing peer-mediated interventions in school environments has also been shown to be both feasible and effective. Kasari et al. (2011) demonstrated that even brief peer-mediated interventions could reduce feelings of isolation and increase the number of friendships reported by participants. In addition to improving social connections with others, peer support can also positively impact self-connectedness. Hodges et al. (2022) highlighted that peer-mediated interventions not only increased students' social awareness but also boosted their self-awareness and confidence by focusing on the sense of self.

Preference for Similarities

A central aspect of social connectedness among children and adolescents with ASD is their tendency to prefer contact with peers who share certain similarities, such as gender, common interests, or specific needs. Dean et al. (2014) highlight that, despite having significantly fewer connections compared to their neurotypical peers, children with ASD consistently preferred same-gender friends and were more socially connected with same-gender classmates. This preference for similarity extends beyond gender, as seen in Kasari et al. (2015) study, where participants clearly preferred social skills groups composed entirely of children with social challenges rather than mixed groups that included typically developing children. Tesfaye et al. (2022) further supported this by exploring first-person experiences of children and adolescents with ASD. They found that many expressed a strong desire to connect with like-minded or other autistic peers. These individuals sought meaningful relationships where the quality of the connection was valued over the number of social interactions. However, it is essential to recognize that interactions with typically developing peers also hold value. As Kasari et al. (2015) noted, such interactions can expand social networks and enhance social connections, contributing to a broader and more diverse social experience for children with ASD.

Promoting Inclusive Educational Environment

An inclusive educational environment plays a critical predisposing factor in supporting the academic, social, and emotional development of children and adolescents with ASD and their sense of connectedness. The reviewed studies demonstrate that inclusive settings provide the necessary support to help students with ASD engage more fully with both the curriculum and their peers, leading to improved social skills, emotional regulation, and overall connectedness (Hebron, 2017; Hodges et al., 2022). Despite the well-documented benefits of school connectedness and inclusion, these practices are not yet mainstream (Hodges et al., 2021; Hodges et al., 2022). For instance, a consensus study involving seventy-six experts highlighted

that only 23% reported actively working on fostering inclusive environments in their current curriculum (Hodges et al., 2021). By fostering a setting where diverse learning needs are acknowledged and addressed, these environments promote not only the integration of students with ASD but also their connectedness to others and themselves. As a result, these environments may influence their overall well-being and sense of belonging.

Furthermore, the role of parents and families in supporting school inclusion, which potentially leads to a greater sense of connectedness, cannot be overlooked. Mothers of autistic children, for example, emphasize the need for open communication and education about ASD to enhance understanding and promote inclusion (O'Hare et al., 2021). The article indicate that schools should remain mindful of the critical role parents play in their children's connectedness and overall school experience.

Focusing on an inclusive school environment is particularly essential in periods where children and adolescents with ASD experience lower levels of connectedness. The reviewed studies indicate that an especially vulnerable period for students with ASD is the transition phase from primary to secondary school, which often results in lower levels of school connectedness compared to their neurotypical peers (Hebron, 2017). The reduced feeling of connectedness in this period could negatively affect the student's mental health. Thus, continuous monitoring and support of the autistic individual's connectedness and mental well-being during such transitions are essential. Hebron (2017) underlines that through an inclusive school environment this matter could be counteracted. Additionally, research by Shochet et al. (2022) demonstrates the effectiveness of school-based interventions focusing on inclusive school environments in enhancing resilience, self-efficacy, and emotional regulation, all of which are vital for fostering a strong sense of self and school connectedness in adolescents with ASD. Educating peers and teachers to be more sensitive and supportive towards children with ASD has been shown to be an effective and ecologically valid approach to improving social connectedness (Kasari et al., 2011).

Parental Support

The involvement and advocacy of parents are often essential in fostering their child's connectedness to others, as well as in helping them navigate the challenges of autism both at home and within educational settings. Several reviewed articles highlight the importance of parental support, with a particular focus on the elements that contribute to parent-child connectedness (Larkin et al. 2013; Lense et al., 2022; O'Hare et al., 2021). For instance, Lense et al. (2022) demonstrates that integrated parent-child music classes for preschoolers with ASD can significantly strengthen the parent-child bond through shared musical activities. These

classes not only enhance social connection, communication, and emotional engagement between parent and child but also potentially foster a broader sense of connectedness within the community and to the child's own sense of self.

Despite the recognized importance of these connections, there remains a notable shortage of reliable and valid measures for assessing parent-child relatedness. Larkin et al. (2013) address this gap by providing preliminary support for a clinical tool designed to measure parent-child interaction among children with ASD, offering a valuable resource for further understanding and enhancing these crucial connections.

Connectedness Deposing Factors

Severity

The reviewed literature consistently highlights severity as a critical barrier to connectedness. Beurkens et al. (2012) found that higher autism severity was associated with lower quality interactions, particularly with parents, suggesting that more severe forms of autism can hinder effective interaction and connectedness with others. Similarly, Hobson et al. (2015) observed a correlation between the severity of autism and lower quality of parent-child interactions, though they also noted that targeted interventions could improve these interactions.

Lack of Reciprocal Peer Relationships

A critical aspect challenging connectedness to others, the self and the world in children and adolescents is the lack of reciprocal peer connectedness. Boyd et al. (2011) highlights that children with ASD often seek social interactions with adults rather than peers, likely due to the lower likelihood of receiving responsive attention from peers. This behaviour can result in fewer peer interactions and a weakened sense of connection, inadvertently contributing to social exclusion. These challenges are further amplified by gender-specific dynamics. Dean et al. (2014) shows that while children with ASD prefer same-gender friendships and are primarily socially connected to same-gender classmates, they still have significantly fewer connections than their neurotypical peers. Particularly, girls with ASD are often overlooked, placing them at unique social and emotional risk. This lack of reciprocal friendships, critical for social development, suggests that girls with ASD struggle with the complex social dynamics of female relationships.

Contributing to these social challenges are structural barriers that limit opportunities for reciprocal peer interactions. Hochman et al. (2015) identifies several factors, including the inherent social difficulties of ASD, attributional barriers from typically developing peers, and the lack of structured opportunities for ASD students to connect with their peers. The study

marks the importance of structured peer support interventions to overcome these barriers and enhance social connectedness for students with ASD.

Lack of Structured Opportunities

Hochman et al. (2015) highlight the significant barrier posed by the lack of structured opportunities for students with ASD to connect with their typically developing peers, which limits their ability to form meaningful social relationships. Structured opportunities refer to specific, planned interactions that foster social engagement, such as peer-mediated interventions, buddy systems, or facilitated social groups. Without these efforts, students with ASD often remain isolated despite being in close proximity to their neurotypical peers.

An inadequately structured environment enhances this issue by failing to provide a clear framework or strategy for enhancing school connectedness in children and adolescents with ASD. This includes environments where no formal plans or interventions are in place to encourage social integration, leaving students with ASD without the necessary support to engage with their peers (Hodges et al., 2021). As Hochman et al. (2015) points out, simply placing students with ASD in inclusive settings does not automatically result in social interactions. Instead, schools must provide intentional opportunities for social connectedness, such as employing special education staff to facilitate peer interactions or organizing peer support programs. This gap in structured opportunities is not confined to the school setting alone. Tesfaye et al. (2022) state the importance of accessible opportunities for social connections beyond the school setting, noting that this lack of access persists into adulthood, making it challenging for individuals with ASD to maintain friendships and social networks.

Challenges in Sense of Self

The study by Reddy et al. (2010) outlines a significant barrier related to the sense of self in children with autism, which directly impacts their connectedness to themselves and others. While these children can recognize their reflection in the mirror, they tend to view it more as an object rather than engaging with it as a social or emotional entity. This dissociation suggests a broader difficulty in connecting with their own identity on a social level, which can hinder the development of self-awareness. This challenge in self-connection not only affects their ability to relate to their own image but also likely extends to difficulties in forming meaningful social interactions with others.

Discussion

This scoping review aimed to explore and synthesize existing literature on connectedness with children and adolescents with ASD. The primary purpose was to provide a comprehensive understanding of how different dimensions of connectedness, namely social

connectedness, connectedness to self and connectedness to the world, are represented in the literature concerning this population. Overall, the findings suggest that connectedness, across the dimensions of others and self, plays a critical role in the social and emotional well-being of children and adolescents with ASD. However, connectedness to the world is less explored in the existing literature. Across all three dimensions, the review highlighted predisposing factors that enhance connectedness and disposing of factors that present barriers. By identifying these predisposing and disposing factors, this review provides a clearer picture of the current state of the literature.

Connectedness to Others

The findings highlight that social connectedness plays a crucial role in the well-being of children and adolescents with ASD. Important predisposing factors must be considered to foster connectedness to others. The results emphasize the predisposing factor of similarity to enhance connectedness to others (Tesfaye et al., 2022; Dean et al., 2014; Kasari et al., 2015). This tendency likely stems from the comfort of familiarity, where social interactions are more predictable and less stressful for children and adolescents with ASD. This preference for similarity suggests that connecting with peers with common characteristics fosters supportive social bonds and may enhance feelings of connectedness. However, Kasari et al. (2015) also highlight the benefits of broadening social networks to include diverse interactions, despite the challenges these may present for children with ASD, such as adapting to different social cues. Encouraging diverse social connections can enhance their social competence and help them navigate various social situations. While similarity is essential, in the practical implementation, promoting broader interactions could build more resilient social networks and foster greater overall connectedness that, in turn, has a positive effect on the mental and physical health of the population (Diendorfer et al., 2021). This insight suggests that future interventions should balance the comfort of similarity with opportunities for social growth, ensuring that children with ASD are gradually introduced to more diverse interactions.

Furthermore, the findings highlight that making connections in the school environment can be particularly challenging for children and adolescents with ASD (Lord et al., 2020). Schools serve as the primary context for socializing and academic growth, offering unique opportunities for social engagement that are difficult to replicate in other settings (Shochet et al., 2016). Despite the recognized importance of fostering connectedness, it has yet to be a universal focus in all educational environments (Hodges et al., 2021), highlighting the need for more consistent implementations in the school setting. Here, peer-mediated interventions, such as peer buddy systems and structured social activities, could effectively

improve social connectedness and reduce feelings of isolation (Carter et al., 2017; Hochman et al., 2015). These interventions create structured opportunities for children with ASD to engage with their peers, fostering a sense of belonging and enhancing social competence. To implement this support effectively in practice, it is crucial to educate peers and teachers about the unique needs of students with ASD. Increased sensitivity and awareness among school staff and students can help create a more supportive and inclusive environment, ensuring that interventions to enhance connectedness are successful and sustainable (Morrier et al., 2010). The long-term success of these interventions depends not just on their initial implementation but on fostering a school culture that continually supports inclusion.

On the other hand, deposing factors also present barriers to connectedness with others. Foremost, as highlighted in the outcomes, higher levels of ASD severity are associated with lower-quality interactions, particularly in parent-child relationships, and pose greater challenges in forming and maintaining connections with others (Beurkens et al., 2012; Hobson et al., 2015). This finding highlights the importance of considering the severity of ASD in the design and implementation of interventions aimed at enhancing connectedness, as more severe cases may require additional support. In practice, researchers should assess the severity before an intervention through a standardized measurement such as the Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 2008). When there is a higher severity, one could, for instance, adjust the group size of an intervention, creating a less overwhelming environment or providing alternative communication tools such as technologies for non-verbal communication (Ganz et al., 2011; Locke et al., 2010).

Furthermore, while most children and adolescents with ASD desire social connection, they often face difficulties in forming mutually beneficial relationships, which can result in lower self-esteem, increased loneliness, and isolation (Diendorfer et al., 2021; Wolstencroft et al., 2018). These experiences of a lack of reciprocal friendship may become recurrent, possibly leading to further withdrawal, creating a self-reinforcing loop of social disengagement. Thus, peer-mediated interventions and social skill programs specifically targeting reciprocal friendships are relevant, as well as creating environments that actively encourage peer interactions for children with ASD to reduce the risk of social isolation and enhance their social connectedness. For instance, implementing peer buddy systems or inclusive group activities (Carter et al., 2017; Hochman et al., 2015).

Connectedness to the Self

Previous research suggests that connectedness to self for children and adolescents with ASD is crucial for the overall well-being, self-esteem, and identity formation of individuals

with ASD. It was noted that individuals with ASD often struggle with these aspects, leading to difficulties in forming a cohesive self-identity and managing emotions effectively (Burrows et al., 2016; Mul et al., 2018). However, the reviewed literature provided limited insights into connectedness to self, though it identified potential barriers and predisposing factors that may influence this dimension.

A potential barrier to connecting with oneself is establishing a sense of self. For example, the study by Reddy et al. (2010) identifies significant difficulties for children with ASD in developing self-awareness, a crucial component of personal identity and emotional regulation. These challenges not only affect the ability of children and adolescents with autism to relate to their self-image but also extend to difficulties in forming meaningful social interactions with others. Without a clear and integrated sense of self, individuals with ASD may find it challenging to recognize and regulate their emotions, leading to an unclear self-concept. This fragmentation can create internal conflicts, making it harder for these individuals to develop a stable and cohesive identity. Consequently, their ability to engage in self-reflection and personal growth is impaired, essential for achieving a healthy connection to self (Hobson, 2010). However, Reddy's study, which relied on the "mirror recognition test" to assess self-awareness, presents some limitations. While this test provides behavioural indicators of self-recognition, it doesn't fully capture the complexity of connectedness to the self. The interpretation that children with ASD perceive their reflection more as an object than a social-emotional entity is speculative and may oversimplify the multifaceted nature of self-awareness. Moreover, the research may not fully account for the individual variability for instance in severity within the ASD population. Children and adolescents with different levels of functioning may experience this barrier in varied ways, which warrants more nuanced exploration in future studies and the necessity for reliable measurements of connectedness to self in the population.

An additional barrier to connectedness to self is that autistic individuals often have difficulties understanding their thoughts and feelings (Huang et al., 2017). This raises an important consideration: while these difficulties are evident, it is still unclear whether individuals with ASD perceive these challenges in making connections with themselves as negative. Huang et al. (2017) notes that many individuals with ASD may feel positive about themselves despite having less insight into their self-concept. This suggests that the subjective experience of connectedness to self might differ from external assessments, highlighting the need for further investigation into how these individuals perceive their self-awareness and whether they view it as an area needing improvement. Furthermore, this suggests that

implementing interventions aimed at improving self-awareness might not align with the individual's own perceptions or desires for development.

Additionally, there are also predisposing factors that support connectedness to self. For example, through peer-mediated interventions in the school setting, not only is social connection improved, but these interventions also offer possibilities to influence autistic individuals' self-connectedness by, for instance, boosting their self-awareness and self-efficiency (Hodges et al., 2022; Kasari et al., 2015; Shochet et al., 2022). Focusing on interventions that support the development of self-awareness and emotional connectivity can help these individuals build a stronger, more integrated sense of self, leading to a greater connection to their selves. This, in turn, can improve their overall mental health and empower them to navigate their internal experiences more effectively. Prioritizing connectedness to self in therapeutic and educational practices is therefore essential for fostering the internal well-being and personal development of individuals with ASD.

Lastly, the reviewed literature lacks theoretical framework for understanding connectedness to self in children and adolescents with ASD. While emotional connectivity and self-awareness are emphasized, the interactions between these components remain underexplored. The potential for interventions that integrate emotional regulation, identity formation, and connectedness to self-offers a promising direction for future research. Additionally, researchers should focus on measures to assess connectedness to self in autistic populations, ensuring that these tools capture both subjective and objective aspects of this dimension.

Connectedness to the World

The scoping review revealed that connectedness to the world is not as thoroughly explored in the context of children and adolescents with ASD as other forms of connectedness. Only the study from Lense et al. (2022) provides vague insights into one aspect of connectedness to the world. For instance, shared parent-child activities such as music classes may enhance the connectedness within the community as the parent may model the community participation from which the individual with ASD can learn (Lense et al., 2022). Moreover, these shared activities can develop a supportive environment, which may connect parents and children to a greater community. When individuals with ASD engage in activities with peers or caregivers, they often develop a sense of belonging and shared purpose with others in the group, contributing to a broader sense of community (Dahary et al., 2022). Nevertheless, there was no article directly exploring connectedness to the world.

Connectedness to the world is less prevalent in research on children and adolescents with ASD, possibly because it involves broad and complex concepts, such as connection to community, nature, spirituality, or purpose, which are harder to measure or define in this population (Hills et al., 2019). These abstract dimensions may be less tangible than more direct forms of connectedness, such as social relationships with peers or self-awareness. Core challenges for individuals with ASD often revolve around social communication and interpersonal relationships, which makes social connectedness and self-connectedness the primary focus of research and interventions. Broader, more abstract forms of connectedness, such as spirituality or purpose, may not hold the same immediate practical significance or may be more challenging for those with ASD to relate to due to their distinct ways of processing and engaging with the world.

Additionally, connectedness to the world, being a more ambiguous concept, might not directly address the most pressing needs of this population, such as fostering peer relationships, improving self-esteem, and navigating social contexts. As such, while connectedness to the world could improve overall well-being, the immediate focus on enhancing peer relationships and self-awareness is likely prioritized because these areas are most aligned with the core challenges and developmental needs of children and adolescents with ASD. Nonetheless, research into aspects such as spirituality, connection to nature, or a sense of purpose could reveal possible benefits in areas such as emotional regulation, resilience, and mental health. Investigating this dimension may offer new ways to support long-term well-being and community integration for children with ASD. Therefore, while the immediate focus should remain on connectedness to the self and the others, the potential contributions of connectedness to the world underlines further exploration to provide a more holistic approach to the well-being of individuals with ASD.

To further investigate the dimensions and the role of connectedness, developing a universal measurement tool would be highly beneficial. Many of the reviewed studies assessed connectedness indirectly, often relying on semi-structured interviews or observational methods. While Dean et al. (2014) included a repeated measure using friendship surveys, which demonstrated good psychometric properties in assessing perceived friendship, this concept only overlaps with, but does not directly measure, connectedness. Looking at prior research, Watts et al. (2022) introduced the Watts Connectedness Scale, developed within the context of psychedelic therapy. While Watts et al. (2022) offered this research a theoretical foundation on the dimensions of connectedness, the scale developed in their research may not be directly applicable to other domains, particularly to children and

adolescents with ASD. Future research could investigate the applicability of the Watts Connectedness Scale in other contexts and populations or focus on developing new universal scales that accurately measure connectedness and its distinct dimensions across different populations.

When developing a measurement, it should be taken into account that for instance, children with ASD often have difficulties with self-awareness and emotional recognition, meaning that questions measuring these areas may need to be more concrete and specific (Garfinkel et al., 2015). Moreover, many individuals with ASD struggle with abstract thinking and nuanced emotional states. Thus, using visual aids, simplified language, or a combination of self-report and observational measures may enhance the accuracy and reliability of the assessments (DuBois et al., 2016). Consequently, incorporating structured observational methods along with self-report scales, could provide a more holistic understanding of how children with ASD perceive their connectedness across the three dimensions (self, others, and the world).

Lastly, the reliance on the dimensions of connectedness as defined by Watts et al. (2022) is to acknowledge. While their study provided a framework for understanding connectedness through the dimensions of connectedness to self, others, and the world, these definitions and their associated measurement scales were not directly applicable to the specific context of this research. Consequently, there may have been challenges in fully capturing the nuances of connectedness across children and adolescents with ASD, potentially limiting the generalizability of the findings.

Strengths

This scoping review offers a comprehensive overview of recent research on the dimensions of connectedness across children and adolescents with ASD. The method of a scoping review allowed to explore a broad range of studies that examine the dimensions connectedness to self, others and the world providing a greater understanding of the topic. The variety of included research methods offers a multifaceted synthesis of relevant information to answer the research question. Additionally, though the thematic analysis approach, the review effectively identified recurring themes, thereby was able to provide an exploratory overview.

Limitations

Despite the valuable insights this review offers, several limitations should be addressed. Firstly, while the literature focused on children and adolescents with ASD, it also incorporated the perspectives of experts and parents about the population. However, this

review did not analyse the differences between the viewpoints of children and adolescents with ASD themselves, and those of experts and parents. Exploring these potential disparities would provide a more nuanced understanding of connectedness in this population. Moreover, the search string could have been more attributional to the dimension's connectedness to self and the world. For example, the search string could include synonyms for spirituality connectedness or connectedness to purpose to obtain more results regarding the dimension. Additionally, by limiting the results to English-written articles, the outcomes were limited to primarily Western societies.

Furthermore, the review was conducted by one researcher. Therefore, no inter-rater reliability assessment was conducted. Consequently, a decreased level of objectivity and generalizability limits this scoping review (Daudt et al., 2013). As a result, the study is subject to multiple potential biases, including selection and interpretation bias. As previously mentioned, there was a fine line between interpreting the dimensions of connectedness, which may have led to subjective decisions about how specific themes were categorized or reported. Such subjectivity is a common limitation in scoping reviews conducted by single researchers (Levac et al., 2010). This may have influenced how specific themes were identified, affecting overall conclusions.

Conclusion

This scoping review offered valuable insights into the multidimensional concept of connectedness in children and adolescents with ASD, specifically focusing on the dimensions of connectedness to others, the self and the world. The findings identified significant deposing factors for the development of connectedness across the dimensions such as severity and lack of reciprocal friendships. Moreover, predisposing factors such as peer-mediated interventions which consider for instance the individuals' preferences such as similarities with others, show promise in improving connectedness. Furthermore, the lesser explored area of connectedness to the world is of lower priority for future research as it may not have a direct or substantial impact on the daily social and emotional well-being of children and adolescents with ASD, compared to the more pressing effects of connectedness to self and others. Consequently, a greater understanding of connectedness in children and adolescents with ASD could lead to more effective implications that enhance their overall well-being and the quality of life.

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Appendix A

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3 - 7
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	7
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	8
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	8
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	8 - 9
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	8 - 10
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	9 - 10
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g.,	9 - 11

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	10 - 11
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Not done
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	10 - 11
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	10
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	11 - 19
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Not done
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	11-19
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	10 - 23
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	24 - 29
Limitations	20	Discuss the limitations of the scoping review process.	29 - 30
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	30
FUNDING			

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	--

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

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