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Determinants of Social Connectedness in Children and Early Adolescents with Mental Disorder: A Systematic Literature Review

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Abstract

Social connectedness (SC), as a sense of belonging and a psychological bond a person may feel towards other people or groups, is imperative for the positive mental and physical development of children and early adolescents. Particularly children and early adolescents with a mental disorder often face difficulties feeling socially connected, experiencing the detrimental effects of loneliness. The present systematic review aims to investigate how far SC differs in children and early adolescents with a mental disorder compared to in those that develop neurotypically. Furthermore, it aims to examine the determinants of SC and predominant SC measurement techniques applied in youth with a mental disorder. Following a systematic PRISMA approach, 33 studies were included. In the majority of studies, SC was reduced in the affected population, with varying manifestations over different diagnoses. Determinants could be divided into skills, behavioral and social aspects and symptoms. Various measurement techniques were applied, exploring friendship quality, loneliness and peer relations along several dimensions. Interventions and possibilities of influencing SC in certain disorders seems possible and necessary to bring SC more into the focus of daily clinical routine and prevent adverse outcomes in this vulnerable population.

Keywords: social connectedness, mental disorder, friendship, loneliness, early adolescents, children

Determinants of Social Connectedness in Children and Early Adolescents with Mental Disorder: A Systematic Literature Review

Social connectedness (SC) is a basic human need (Baumeister & Leary, 1995). It can be defined as a sense of belonging and a psychological bond a person may feel towards other people or groups (Haslam et al., 2015). Loneliness can be regarded as the negative spectrum of SC (Hare-Duke et al., 2019), not only referring to the act of being alone per se but also the perception of social isolation when being with other people (S. Cacioppo et al., 2014) or even the perception that existing social relationships are inadequate (Weiss, 1973). In response to these feelings, a person moves towards or away from others through positive or negative affect and activity (Karcher, 2001). Hence, with respect to individual needs, preferences, and social goals, social connectedness can manifest in varying quality and quantity aspects.

A recent model of social connectedness in healthy adolescents highlights the importance of identity for relationships with peers. Many determinants point to the assumption that forming an organized self is based on several internalized factors, supported by the environment of early adolescents (Mitic et al., 2021). It can be argued that this formation of identity can be impaired in children with mental disorders.

Social connectedness has a positive impact on mental and physical health, e.g. reducing substance abuse amongst youth and increasing their physical activity (Bond et al., 2007; Hill et al., 2015; Weatherson et al., 2018), while loneliness is a risk factor, e.g. for increased inflammation processes (Eisenberger et al., 2017), elevated blood pressure (Louise et al., 2006), reduced physical activity (Hawkley et al., 2009), depressive symptoms (Cacioppo et al., 2010; J. T. Cacioppo et al., 2006), addiction, and other health threats (Yang et al., 2016). There is even a suggestion that social ties during adolescence can have an impact on the healthy development of the adolescent brain (Lamblin et al., 2017).

Childhood and adolescence represent periods during which SC plays a critical role in social-emotional development. As the focus of interest gradually shifts from intrafamilial

relationships towards social relationships with peers (Larson et al., 1996; Miller-Slough & Dunsmore, 2016), positive contact with peers provides the experience of intimacy and thereby helps to build trust and self-worth (Asher et al., 1996; Bagwell et al., 1998; Rubin et al., 2004). Close social networks with peers provide emotional support, companionship, and opportunities for meaningful social engagement and thus improve self-esteem, coping, experience of distress, sense of wellbeing, and quality of life (Berkman & Glass 2000; Fudge & Mason 2004; Bee 2013). At the same time, in adolescence youths face repeated changes in their social environment, particularly during school transitions (Rice et al., 2011). These changes may be viewed as indicator periods, showing typical social-emotional development and growth in the general population (Gifford-Smith et al., 2003); and they may pose additional challenges to youth with mental health problems.

Mental disorders often start during adolescence (Merikangas et al., 2010). The relationship between the symptoms of mental disorders and SC can be bidirectional (Cruwys et al., 2014), which might lead to a downward spiral for affected youth. For example, it has been shown that loneliness can lead to symptoms of depression (Cacioppo et al., 2010) and depression can also cause social withdrawal (ICD-10). Similar relationships likely play a role in other mental disorders such as (social) anxiety disorder or drug abuse. Other conditions that begin during childhood often encompass symptoms that can make the achievement of good SC more challenging e.g. social communicative deficits in autism spectrum disorders (ASD) (Valla & Belmonte, 2013; Woodcock et al., 2019), or are commonly associated with problematic peer interaction, e.g. in attention deficit hyperactivity disorder (ADHD) (de Boo & Prins, 2007). Children with mental disorders appear to be not only more likely to have low SC, they are also more vulnerable to peer victimization (Acquah et al., 2016; Paul et al., 2018), reinforcing the downward spiral. Interventions to improve SC will likely improve these children's psychological development during adolescence. However, despite its

undoubtable importance, SC and its determinants in children and adolescents with mental disorders are so far poorly understood.

One of the factors that is likely to have contributed to the limited available knowledge on SC in persons with mental disorders is the challenges around measuring SC in such populations, where cognitive and emotional deficits may limit the validity of available measures. Thus, measurement is important to consider in the quest for greater understanding of SC in persons with mental disorders (Hare-Duke et al., 2019).

In summary, SC plays an important role in coping with the many challenges of adolescence and supports mental health and wellbeing during this critical period in life. Understanding the determinants of SC is the basis for improving social ties and preventing children from experiencing loneliness and its detrimental effects. However, so far, there has been no systematic analysis of the factors that may determine SC in such populations. Hence, the aims of this systematic review are (1) to investigate differences in SC between children and early adolescents with mental disorders and healthy subjects (2) to understand the determinants that influence SC in children and early adolescents with mental disorders; (3) to summarize the measurement tools for SC and their constituent dimensions used in research in this population.

Method

Social connectedness is defined as a sense of belonging and a psychological bond a person may feel towards other people or groups. For this review, SC was operationalized through any aspect(s) of quality (such as intimacy, value, supportive function, or closeness) of social relations with at least one specific peer or with peers in general. Given that SC can be regarded as the positive end of a continuum on the other end of which lies the concept of loneliness, we also targeted studies investigating loneliness.

Data Sources and Search Strategy

This review was in part being handled with a review on determinants of peer connectedness in typically developing early adolescents (Mitic et al., 2018). The initial search, title, and parts of the abstract-screening were one procedure for both reviews. However, the aim and inclusion criteria were specifically defined for the current review and secondary searches, data extraction, and analysis were performed separately.

For the initial search, five electronic databases were included, i.e. Medline, EMBASE, PsychINFO, Education Resources Information Center (ERIC), and Cochrane Collection Library with keywords describing participants ('child*', 'adoles*', 'teenage*', 'youth*', 'young*') combined using an AND operator with a set of terms describing SC ('peer support', 'emotional support', 'emotional connection', 'social network(s)', 'social relation(s)', 'social relationship(s)', 'social connection(s)', 'social connectivity', 'social connectedness', 'belongingness', 'loneliness', 'social isolation', 'social acceptance', 'social withdrawal', 'friendship(s)', 'friend(s)', 'peer relation(s)', 'peer relationship(s)', 'peer connection(s)', 'peer connectedness', 'well\$being'). Secondary searches included all citing references identified via Google Scholar, hand searching reference lists of included studies, and relevant systematic reviews retrieved during the database search.

The identification, screening, and data extraction of eligible studies was conducted in accordance with the PRISMA statement (Moher et al., 2015), both for extracting and reporting data. References identified through the database search and secondary searches were screened independently by two authors (LS, TD). The full texts of potentially eligible studies were retrieved and assessed for eligibility by one author and controlled by a second author. Any disagreement about eligibility was resolved through discussion with a third author (BS). A standardized, pre-piloted excel form was used to extract data from eligible studies for assessment of study quality and evidence synthesis. This excel form was derived from other reviews within the study group, adapted to the specific needs of the present one and subsequently used by all authors who extracted data. The form comprised a separate column

for each extracted data point (e.g. study design, recruitment method, inclusion/exclusion criteria, etc.) and therefore allowed for an easy overview of all the data.

To assess methodological quality of included articles, risk of bias was double rated by two authors. The Newcastle-Ottawa Scale (NOS) was used to rate the quality of case control studies and longitudinal studies. Cross-sectional studies were assessed using the checklist recommended by the Agency for Healthcare Research and Quality (AHRQ). These tools were chosen based on recommendations from the recent systematic review on methodological quality assessment tools for preclinical and clinical studies (Zeng et al., 2015). To allow a comparison between the two assessment methods, the percentage of the criteria met in the respective system was determined for each study (Table 1), indicating the overall quality of the study in reference to the best possible outcome for either NOS or AHRQ.

Inclusion and Exclusion Criteria

Articles were eligible for inclusion if they met the following criteria: (1) published between January 1990 and January 2018, (2) assessed early adolescents (i.e. 8 to 14 year-olds) with any mental disorder diagnosed by a trained specialist (e.g. doctor, psychologist) or identified via medical record based on the ICD-10, (3) comparison with a healthy control group, (4) applied quantitative measures of subjective SC, (5) assessed the association of SC with at least one psychological, social, or environmental factor, (6) available in English or German language.

Studies were excluded if they: (1) applied the wrong study design (i.e. interventional studies, systematic reviews and meta analyses, opinion papers, case studies, dissertations, conference proceedings, and book chapters), (2) assessed delinquent and/or homeless adolescents, (3) focused on narrow cultural comparisons, e.g. in population with an immigration background (incl. refugees), ethnically or religiously defined samples (incl. indigenous populations), sexual and religious minorities, and (4) populations with an acute or chronic physical illness and populations with sensory, physical and/or intellectual disabilities.

We defined the latter restriction as combined disabilities and/or an IQ < 70. This was based on the concern that the assessment of SC would not necessarily be comparable in adolescents with an intellectual disability. In addition, this review aims to provide an understanding of determinants of SC to inform future intervention strategies. Many children with an intellectual disability engage with different educational environments relative to their typically developing peers and the intervention strategies applicable often differ.

Analysis

Results are presented descriptively due to the large variation in assessed determinants, dimensions, and diagnoses. Results from included studies that were relevant to answer the present review questions are presented in Tables 1 to 4. Determinants and dimensions were grouped into categories after discussion and consensus by the study authors (LS, BS, TD). Differences in SC between the two groups were identified and tabulated, indicating the direction of difference of SC in children with mental disorders compared to healthy controls. Likewise, determinants of SC in affected children were tabulated, clustered, and grouped according to diagnostic clusters. SC measures were equated to allow a logical indication of the direction of difference, i.e. negative measures were treated inversely to reflect positive scores. For measures of SC, constituent factors were listed and presented study results were grouped into five categories of SC dimensions captured by those measures. The reported categories were then plotted against the diagnostic categories the measures were used in.

Results

Overall, 33 studies were included in the analysis. Study selection is shown in Figure 1.
--- insert Figure 1 here ---

Most studies were conducted in the US, and the most frequently investigated population was children with autism spectrum disorders (ASD). For a full list of countries and investigated disorders see Table 1.

--- insert Table 1 here ---

The study quality was overall mediocre, as most studies only fulfilled half of the possible quality criteria. Only two studies met more than 80% of the quality criteria, none met all. Most studies did not fulfil the following criteria: representativeness of cases, ascertainment of exposure, indication of non-response rates, description of the recruitment procedure, clear description of inclusion/exclusion criteria, and the listing of competing interests and sources. The use of validated outcome measures, the description of statistical analyses, and the selection and description of control cases were most often met.

Social Connectedness in Children and Early Adolescents with Mental Disorders

As displayed in Table 1, the SC of affected children was reduced in most studies (1, 2, 5-7, 9-17, 20, 22-24, 28-33) compared to healthy controls. None of the studies found elevated SC for children with a mental disorder.

Amongst the 19 studies on ASD, only one (8) found no significant reduction in SC relative to neurotypical children. This study investigated the effect of sleep quality and daytime sleepiness on SC (closeness) as well as discord between peers. However, gender and ethnicity differed strongly between the ASD and control group, which might have affected closeness ratings. Mixed results in one study are due to the reporting of separate analyses for subscales with no overall SC score and children had non-significant differences on some of the sub-scores (3). In another study, mixed results arose because more than one SC measure was applied and whilst ASD was linked with significantly lower acceptance, companionship, and reciprocity, it was linked with higher loneliness (4).

Similarly, amongst the eight studies with children with attention disorders, only one (21) found no difference in SC. This study reports on the application of a loneliness scale in adolescents with ADHD and neurotypical controls, with no significant differences demonstrated on any sub-score (21). Two studies found mixed results, one of them was the only study investigating specifically hyperkinetic disorder (in contrast to ADHD) in boys in a special school setting (18) and one included children with ADHD in regular schools (19).

Children with an attention disorder reported no higher levels of overall loneliness than adolescent boys from regular schools (18), but difficulties in making friends was strongly associated with ADHD (18). Another study found no differences in self-reports about loneliness at school between children with attention disorder and neurotypical children (19), but children with ADHD felt less lonely at home (19). Interestingly, parents and teachers of children with ADHD perceived the children as lonelier than parents and teachers of children without ADHD (19).

In children with mood and anxiety disorders, those investigating samples with anxiety disorder and particularly social phobia and generalized anxiety disorder found no difference in SC between groups with all of them investigating friendship quality (25, 26, 28). One study examining children with bipolar disorder found differences in positive and negative friendship functioning depending on mood state in comparison with controls (30).

Determinants of Social Connectedness in Children and Adolescents with Mental Disorders

Throughout all included studies, several additional variables were assessed in both healthy and ill populations. Table 2 provides an exploration of the difference in determinants between the investigated populations.

--- insert Table 2 here ----

Determinants of SC investigated in the included studies are described in Table 3. Determinants of SC were divided into four groups: symptoms, skills, behavior, and social factors. Overall, the most frequently assessed determinant of SC was depressive symptoms, followed by social support.

--- insert Table 3 here ----

For ASD, results were broadly consistent across studies, suggesting a negative effect of mental health symptoms, especially depression, on SC and increased depression and anxiety in ASD populations relative to neurotypical controls. For sleep quality, the picture is

more complex as not all relevant effects were significant across subjective and objective measures. But there was some evidence of sleep quality being poorer for ASD populations and being associated with poorer SC, even in the context of one of these studies being very small (8).

In terms of behavior, social media use and school participation were reduced in ASD populations relative to neurotypical controls, and increases in both were associated with increases in SC.

The picture for skills was very mixed. While abstract reasoning skills appeared to have a positive effect on SC (16), two skills that are at the heart of ASD, i.e. mentalizing (3) and difficulties making friends (7), had no significant effect on SC. However, population differences in these skills were not empirically examined and the two studies presenting these results were of extremely low study quality. One of these low quality and in addition very small studies (3) also contributed to the inconsistent findings on verbal and nonverbal communication skills.

Social support was reported as lower in ASD populations relative to neurotypical controls, positively correlating with the self-reported social connectedness in this sample. For hyperkinetic disorders, few determinants were investigated and only social support emerged as significantly positively correlated with SC (18). Although notably, one study found that cyberbullying was higher in an ADHD population relative to neurotypical controls. For mood and anxiety disorders, hypomanic and depressive states had different and complex relationships with SC (30). Self-reports showed that depressive and hypomanic symptoms in adolescents predicted higher negative friendship quality.

Assessment of Social Connectedness and Constituent Dimensions

Table 4 summarizes all assessment tools used in the included studies together with their dimensions and usage.

--- insert Table 4 here ---

The questionnaires explored friendship quality, loneliness, and peer relations. Subscales of the questionnaires were clustered inductively into dimensions with repeated discussions amongst the authors.

Different dimensions of friendship quality were most often explored in the ASD population, whereas children with hyperkinetic disorders were primarily assessed with loneliness questionnaires. In the mixed population, the focus of research was solely on friendship quality and peer relationships.

Discussion

The present systematic literature review explored differences in SC and its determinants between early adolescents with mental disorders and their healthy peers, with a view to informing potential intervention strategies to improve SC as an important protective factor. Furthermore, the review explored the measurement of SC in children with mental disorders to facilitate further research in the area.

Following a broad literature search for articles pertaining to SC in youth – during which more than 14,000 records were screened – 33 studies met inclusion criteria, which functioned primarily to limit the review to studies examining SC in children with mental disorders. Most research was conducted with ASD adolescent populations or (to a lesser degree) populations diagnosed with attention disorders (mostly ADHD). Fewer studies assessed different psychiatric illnesses such as anxiety, affective disorders, and OCD, and these were categorized into a mixed group for analysis.

SC in Child Populations with Mental Disorders and Healthy Peers

The general finding of reduced SC in children with mental disorders relative to healthy peers is consistent with our expectation based on the specific challenges faced by children with mental disorders and the impact these are likely to have on SC (e.g. Bond et al., 2007; Hawkey et al., 2006; Yang et al., 2016). However, notably, these differences were demonstrated primarily in neurodevelopmental disorder populations (ASD, ADHD) and the

limited evidence available was more mixed for anxiety/affective disorders. This raises the important possibility that the specific cognitive, emotional, or behavioral profiles associated with ASD and ADHD put children at particular risk of poor SC. The issue has been infrequently addressed directly (see determinants section below). Nevertheless, theoretical perspectives on relevant pathways can help to inform future directions in the area.

In addition to repetitive behaviors, ASD is characterized by impaired social communication, which includes a variety of domains such as social reciprocity or nonverbal communication (Bölte & Hallmayer, 2011). These social impairments are associated with difficulties in peer relationships and can therefore be assumed to also lead to lower SC compared to unimpaired individuals. In line with diminished social functioning as a core disorder mechanism in the reduced SC observed in ASD populations, Whitehouse and colleagues (2009) found that increased autism symptoms – measured using a scale that included a strong focus on impaired social functioning – were associated with reduced SC.

Hence, targeting social skills in children with ASD as part of interventions seems a logical consequence. Indeed, the use of social skills interventions (especially group social skills interventions) for children and adolescents with ASD has increased considerably during the last decades and both systematic literature reviews (e.g. Wolstencroft et al., 2018) and meta-analyses (e.g. Gates et al., 2017) show mostly small to moderate positive effects of such interventions. Yet, these improvements may pertain to social knowledge rather than actual social behavior (Gates et al., 2017), raising the question which direction future interventions should go.

One promising direction might be technology: First, technology in general and social media specifically is becoming an increasingly important tool in early adolescents' life (Lenhart et al., 2015). Second, several common special interests of autistic children are linked to technology (computer games/technology; Harrop et al., 2019) and third, our results show that increased social media is linked to increased SC, making the use of technology such as

computer-based programs or serious games to improve social skills in children and adolescents with ASD seem warranted. A recent meta-analysis comparing face-to-face interventions with computer-based interventions found no differences concerning efficacy (Soares et al., 2021). Still, research should continue to focus on rigorous testing of computer-based interventions as only four studies met the criteria for this meta-analysis, leaving much room to investigate different types of computer-based programs, length of intervention, or possible combinations of face-to-face and computer-based social skills training in the future.

Given the diverse populations in studies with children with mental illnesses, conclusions for specific illnesses are difficult to draw. Even amongst the four studies on anxiety disorders, results are inconsistent. While it might be assumed that social anxiety leads to decreased SC, the results of this review show that this does not appear to be the case. This might be explained by the effect of one (or few) very close relationships which the person with anxiety disorder heavily relies on to cope with anxiety and consequently feels very close to. Indeed, research shows that one stable mutual friendship is enough to improve SC (Sanderson & Siegal, 1995).

Determinants of SC in Affected Adolescents and Healthy Peers

The several studies that showed relationships between increased depressive or anxiety symptoms and reduced SC in ASD populations are important. One possibility is that such symptoms contribute to the reductions in SC observed. Indeed, affective and anxiety disorders are particularly prevalent among autistic individuals (Lugnegård et al., 2011), and depressive symptoms have been linked to maladaptive emotion regulation (Burns et al., 2019), which is an important determinant of SC in the general population (Mitic et al., 2021). However, given the present mixed results from the limited literature available that has examined SC in children with affective/anxiety disorders, future research is necessary to inform on this possibility.

For the other diagnostic clusters, it is safe to say that social skills, social support, and the social self-concept are important determinants of SC. This implies that in order to improve SC of children with mental health challenges three distinct strategies should be combined:

(1) Their skills should be one target, e.g. via social skills training or, arguably, training of skills relevant for social interaction such as emotion regulation or meta-cognition. This is also supported by research showing the importance of these skills for SC in the general population (Mitic et al., 2021; Newcomb et al., 1993; Slaughter et al., 2015).

(2) The practical supportive interaction between peers should be fostered, e.g. via providing opportunities for getting to know each other and for supportive interaction. This is also supported by research showing positive effects of playing and training a videogame together with a non-ASD peer for ASD children and their peer's perceived quality of friendship (Chiang et al., 2004). Compared to an intervention solely focusing on behavioral management, a behavioral management intervention with additional focus on encouraging peers to be socially inclusive towards ASD peers has been shown to improve their acceptance by peers and promote more reciprocated friendships (Mikami et al., 2013).

(3) Their self-concept should be addressed, e.g. via school-based support groups targeting social acceptance, behavioral conduct and global self-worth (Frame et al., 2003). In addition to addressing gender, which is becoming an increasingly important aspect of the self-perception in early adolescence (Maïano et al., 2004), and seems to be an important determinant for well-being in adolescents (Mittmann & Schrank, 2020), other aspects of self-concept such as self-esteem, body image, self-efficacy, hope and optimism, and shyness have also been found to be relevant for social connectedness in other populations (Gorrese & Ruggieri, 2013; Mitic et al., 2021; Purton et al., 2019) and might be explored in interventions for adolescents with mental health challenges.

All these determinants might lead back to the earlier assumption that the development of an organized self, resulting in an internalized identity, might be impaired in children with

mental disorders. According to a recent model from Mitic et al. (2021), identity is an important prerequisite for building relationships with peers and therefore social connectedness.

As evidenced in Table 2, healthy and affected children differed in many potential determinants of SC, but the variables were not examined in relationship with SC in the respective studies. This was mainly due to the fact that those studies assessed SC as a secondary outcome and performed correlation analyses only with the main but not the secondary outcome measure. However, our results show that affected children do have deficits and/or suffer in many areas potentially relevant for SC such as social information processing, academic achievement, cyber bullying, social behavior and behavior problems, friendship motivation, fear of negative evaluation, desire for social interaction, social network connections, and the mother child relationship.

Some of these variables have been targeted in interventions addressing SC in other populations. Interventions targeting bullying and peer rejection, for example, have been shown to increase affected children's positive peer relationships compared to a control group (DeRosier, 2004; DeRosier & Marcus, 2005; Healy & Sanders, 2014; Mikami et al., 2005). Similarly, mentoring programs with an academic component, which also create a context for interaction and thus promote positive peer relationships, have been shown to reduce the percentage of children without friends (Dion et al., 2005) and increase peer connectedness (King et al., 2002). Thus, these aspects might warrant further attention in children with mental health challenges. So far, most existing interventions for ASD or ADHD populations are mainly targeting behavioral problems and thus focus on introducing and training behavioral skills such as conversational skills, problem solving skills, peer entry or expanding and developing friendship networks (e.g. Frankel et al., 2010; Hoza et al., 2005; Kasari et al., 2016).

Measurement of SC

Sixteen different questionnaires were used to evaluate SC in the included studies, most prominently the Friendship Quality Scale (Bukowski et al., 1994), the Loneliness and Social Dissatisfaction Questionnaire (Asher et al., 1984) and the Friendship Quality and Closeness Questionnaire (Parker & Asher, 1993). Questionnaires exploring friendship quality are usually divided into several friendship dimensions such as practical and emotional support, companionship, intimacy, closeness, validation, security, exclusivity, dominance, jealousy, betrayal, conflict, criticism, and isolation. However, children and early adolescents tend to divide friendship quality often only in positive and negative aspects but do not distinguish between more complex dimensions (Berndt & McCandless, 2013b). Therefore, it might be more important to observe changes over time in one or the other direction on any given dimension, illustrating the children's world view more accurately and more realistically. Results show that most children and early adolescents with a mental disorder experience reduced positive and increased negative friendship aspects.

Most of the loneliness questionnaires used in the included studies divide loneliness into different aspects, using a multidimensional approach. The following dimensions of loneliness, for example, are mentioned in different questionnaires: emotional, social (friendship, peers, acquaintances) and family loneliness (Houghton et al., 2014; Williams & Asher, 1990) as well as romantic loneliness (DiTommaso & Spinner, 1997). Loneliness is often used as a counterpart to the feeling of belonging. If SC is considered as a continuum, loneliness can be regarded as the negative spectrum of SC (Hare-Duke et al., 2019; Wong et al., 2018). It cannot be measured objectively by others, as perception and evaluation are subjective. For example, it has been shown that the perceived feeling of loneliness is not necessarily related to objective social encounters or actual social isolation (Dias et al., 2018). Therefore, when looking at loneliness questionnaires, it must be considered which dimension of loneliness was used (see Table 4), especially if interventions to reduce loneliness are evaluated.

One apparent issue with multi-dimensional measures is that the operationalization of many concepts often overlap and are not easily distinguishable from one another. One example is social support, which was identified as a determinant here, but is also used as separate sub-scale in e.g. friendship scales. When considering the larger construct of SC, social support is only one of many parts that join together to one larger picture.

Given we were unable to identify validation studies with children and adolescents with special needs, we concluded that identified measures have been validated in the neurotypically developing populations and applied in these special populations without prior validation. Thus, future research should bridge this gap and focus on adaptation and validation of these instruments according to needs of children and adolescents with mental health difficulties.

Strengths and Limitations

The present review considered the areas peer connectedness, loneliness, and friendship quality. Other concepts arguably describing or overlapping with SC or lack thereof include bullying or peer victimization. Those outcomes were not included in the present review though, as they emerged later in the analysis and were not included in the initial search. It could be assumed that children who are bullied or feel victimized by their peers feel lonelier and report a lower SC (Andreou et al., 2015). Children and early adolescents with mental health challenges might experience more bullying and victimization than their neurotypically developed peers (Twyman et al., 2010).

We opted to include studies using quantitative self-assessments only, as we were especially interested in children's subjective perception of social connectedness and its determinants. When aiming to improve SC as a protective factor, it is most important to do this in a way that is meaningful to children, rather than e.g. to adult observers. In addition, children are able to reliably assess the status of their friendships (Berndt & McCandless, 2013a). As a study showed, fourth and seventh graders' nominations of their social clusters

were reliably correlated with observed interaction profiles (Gest et al., 2003). An objective external measurement of loneliness does not exist yet. Nevertheless, which measurement might be most useful depends on the question to be answered (Berndt & McCandless, 2013b). Hence, in some situations it might be better to use external ratings or look at multiple perspectives and perceptions of SC (self-perception, parents, teachers, friends, peers).

The present review did not include studies that employed sociometric methods to measure social connectedness. Sociometric assessment is widely used to understand the positions of individuals in social networks and to quantitatively assess the number of connections within the network. For example, Locke et al. (2010) showed with a sociometric test that children with ASD had significantly lower social network salience and fewer received friendship nominations compared to typically developing children across one academic school year. However, the evidence on the relative importance of quantity and quality aspects of social relations is somewhat conflicting in the literature on neurotypically developing youth (Flannery & Smith, 2017; Gifford-Smith et al., 2003). Nevertheless, so far, authors from other systematic reviews did either not differentiate between these two aspects of peer relations (Pallini et al., 2014) or focused solely on quantity aspects, without adding a qualitative point of view (Meter & Card, 2016; Wrzus et al., 2013). Hence, we decided to bridge this gap and focus exclusively on the quality aspect of social connectedness.

Meta-analysis was not possible due to the highly heterogeneous studies with differing designs populations, and assessment tools. However, given the relatively small number of identified studies addressing the research question we aimed to provide the broadest possible picture and understanding of SC in children and early adolescents with mental disorders.

The very broad search strategy is a major strength of the study. The broad focus of the initial review, which resulted in a high number of retrieved studies and included beyond 300 studies from healthy populations (Mitic et al., 2021), makes us confident we identified the majority of relevant papers for populations with mental disorders.

Despite the small number of included studies, the investigation of a broad range of mental disorders and their relation to SC is a strength of this review. A broad range of concrete determinants of SC was explored in a comprehensive manner (both with and without comparison between affected children and healthy peers). Results indicate specific directions for future investigation of SC in children with mental disorders.

Our results also do not allow inference of directionality. However, we provide a comprehensive overview which allows hypothesis generation for future investigations. Aspects of mental disorder appear to affect SC together with characteristics of the peer group, however, what comes first remains to be investigated. For example, it is an important research question whether the predisposition to a mental disorder leads to prematurely reduced SC or vice versa.

Conclusion

Since SC in children with mental disorders appears to be reduced compared to a neurotypically developed population, the high health risk of loneliness makes it urgently necessary to evaluate interventions that directly improve SC in this population. Further research is necessary to specifically address possibilities of influencing SC in certain disorders. The question of subjective SC should be brought more into the focus of treatment in daily clinical routine. Corresponding determinants, which can be strengthened through interventions, were identified in this review and showed a wide range of possible indications. Investigation of long-term outcomes of these interventions and their possible effect on health and well-being seems necessary. Only a few studies assessed SC in children with a disorder other than ASD. A focus on less well-researched disorders might be favorable. Thus, the present review proposed initial concrete indications by illustrating the definitive need for improvement in SC in children with mental disorders as well as pointing out determinants that are connected to SC.

Conflict of interest

None

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Figures and tables

Figure 1: Flow chart of study selection of the present systematic literature review

Table 1: Overview of included studies, sorted by illness. "SC" indicating the direction of social connectedness of children with mental illness compared to the healthy control group.

Table 2: Differences in certain determinants between children with mental illness and a healthy control group

Table 3: Relationship between social connectedness in the ill population and certain determinants.

Table 4: Questionnaires used in the included studies that explore SC

Acronyms:

SC... Social connectedness

RoB... Risk of Bias Assessment

AS... Asperger's Syndrome

ASD... Autism Spectrum Disorder

ADHD... Attention Deficit Hyperactivity Disorder

PBD... Paediatric Bipolar Disorder

OCD... Obsessive-compulsive disorder

SAD... Social Anxiety Disorder

GAD... Generalized Anxiety Disorder

DLD... developmental language disorder

PSDD... Pervasive and specific developmental disorders

SP... Social phobia

ED... Emotional disorder

SEN... Special education needs

LD... Learning Disorder

ES... Educational setting

HCS... Health Care Setting

PA... Public Advertisement

U... Univariate analysis

M... Multivariate Analysis

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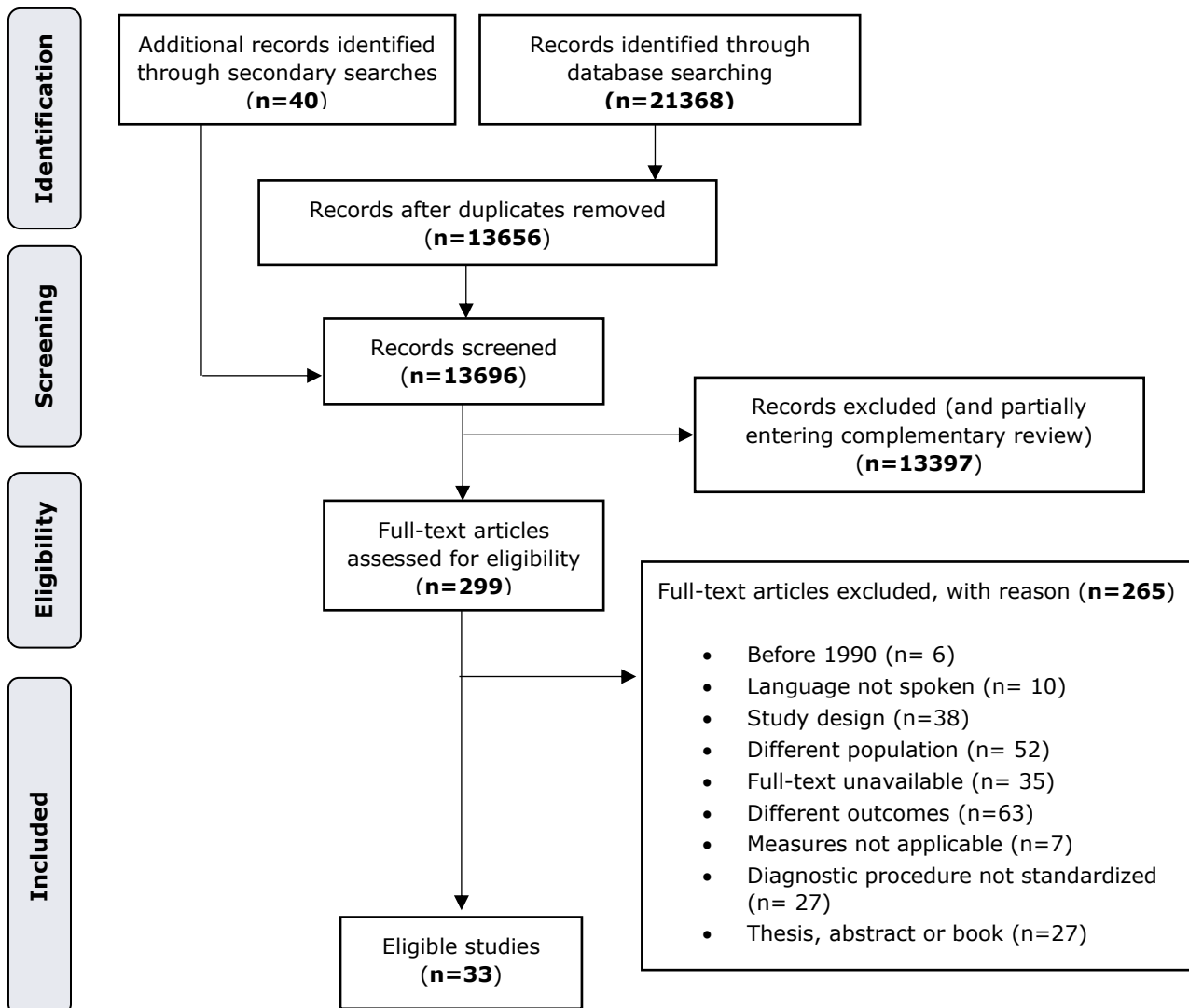
Figure 1*Flow chart of study selection of the present systematic literature review*

Table 1

Overview of included studies, sorted by illness. "SC" indicating the direction of difference in social connectedness between children with mental health challenges and healthy controls

Ref	Country	Study Type	Target investigation	Diagnosis	n	Age	Recruitment Setting	SC	RoB	Table*
Autism Spectrum Disorder										
1 (Pisula & Lukowska, 2012)	Poland	Case Control	The perception and attitude of children with AS towards their classmates	AS	AS: 25 Control: 25	AS: 15.32 (±1.70) Control: 15.92 (±1.49)	ES, HCS	↓	43 %	2, 3
2 (Whitehouse et al., 2009)	Australia	Case Control	The relation between friendship, loneliness, and depressive symptoms	AS	AS: 35 Control: 35	AS: 14.2 (±0.8) Control: 14.4 (±0.10)	ES	↓	71 %	2, 3
3 (Calder et al., 2013)	UK	Case Control	The extent and nature of autistic children's friendships	ASD	ASD: 12 Control: 11	ASD: 10.3 Control: 10.3	ES	n.s. ↓	29 %	2
4 (Chamberlain et al., 2007)	USA	Case Control	The involvement of children with autism in typical classrooms	ASD	ASD: 17 Control: 381	-	ES	n.s. ↓	57 %	-
5 (Chang et al., 2018)	Taiwan	Case Control	The friendship quality, activity participation, and emotional well-being in adolescents with ASD	ASD	ASD: 101 Control: 101	ASD: 15.6 (±2.1) Control: 16.1 (±2.3)	ES, HCS	↓	71 %	2, 3
6 (Kasari et al., 2011)	USA	Case Control	Social relationships in children with ASD	ASD	ASD: 60	ASD: 8.14 (±1.56)	ES	↓	57 %	-

7 (Lasgaard et al.,2010)	Denmark	Case Control	Loneliness and social support in adolescents with ASD	ASD	Control: 60 ASD: 39 Control: 199	Control: 7.86 (±1.43) ASD: 14.2 (±1.03) Control: 14.1 (±0.43)	ES	↓	29 %	2
8 (Phung & Goldberg, 2017)	USA	Case Control	The associations between nocturnal sleep problems and day time sleepiness in relation to the quality of peer relationships among adolescents with ASD	ASD	ASD: 19 Control: 10	ASD: 16.88 (±2.5) Control: 15.73 (±2.0)	ES	n.s.	43 %	2, 3
9 (van Schalkwyk et al., 2017)	USA	Case Control	The relationship between social media use, anxiety and friendship quality	ASD	ASD: 44 Control: 56	ASD: 14.86 (±2.04) Control: 15.11 (±1.73)	ES	↓	57 %	2, 3
10 (Bauminger & Kasari, 2000)	USA	Case Control	The constructs of loneliness and friendship in children with autism	ASD	ASD-HF: 22 Control: 19	ASD-HF: 10.7 (±2.14) Control: 10.9 (±2.10)	ES	↓	43 %	-
11 (Baulminger et al., 2003)	Israel	Case Control	The frequency and quality of social interaction between children with ASD-HF and with typical development	ASD	ASD-HF: 18 Control: 17	ASD-HF: 11.0 (±2.83) Control: 11.51 (±2.62)	ES	↓	43 %	-
12 (Bauminger et al., 2008)	Israel + USA	Case Control	The characteristics of friendship in children with ASD-HF	ASD	ASD-HF: 44 Control: 38	ASD-HF: 10.5 (±1.2) Control: 10.3 (±1.4)	ES	↓	29 %	2
13 (Bauminger et al., 2010)	Israel + USA	Case Control	How attachment security, theory of mind, and development affect the friendship of children with ASD-HF	ASD	ASD-HF: 44 Control: 38	- -	-	↓	71 %	3

14 (Locke et al., 2010)	USA	Case Control	Loneliness, friendship quality and the social networks of adolescents with and without ASD-HF	ASD	ASD-HF: 7 Control: 13	ASD-HF: 14.71 (± 1.11) Control: 14.20 (± 0.63)	ES	↓	29 %	3
15 (Solomon et al., 2011)	Israel	Case Control	The relationships between abstract reasoning abilities in ASD-HF and social functioning involved in friendship	ASD	ASD-HF: 20 Control: 22	ASD-HF: 9.7 (± 1.2) Control: 10.2 (± 1.4)	ES, HCS	↓	43 %	2
16 (Pouw et al., 2013)	The Netherlands	Case Control	Aspects of emotional coping and social functioning and their relation to depression symptoms	ASD + co-occurring depression	ASD-HF: 63 Control: 57	ASD-HF: 11.7 (± 1.3) Control: 11.5 (± 1.3)	ES, HCS	↓	71 %	2, 3
17 (Storch et al., 2012)	USA	Cross sectional	Associations among peer victimization, loneliness, autism-related social impairment, and psychopathology	ASD + co-occurring anxiety	60	12.2 (± 1.1)	-	↓	45 %	2
Hyperkinetic Disorder										
18 (Elmose & Lasgaard, 2017)	Denmark	Case Control	Loneliness in adolescents with ADHD in a special educational setting	Hyperkinetic Disorder	ADHD: 25 Control: 199	ADHD: 14.6 (± 1.04) Control: 14.1 (± 0.43)	ES	↓ n.s.	29 %	2
19 (Heiman, 2005)	Israel	Case Control	Characteristics of friendship and loneliness in children with ADHD	ADHD	ADHD: 39 Control: 17	ADHD: 11.2 (± 2.05) Control: 10.2 (± 1.1)	ES	↓ n.s.	29 %	-
20 (Heiman et al., 2015)	Israel	Case Control	Relationships between involvement in cyberbullying and loneliness	ADHD	ADHD: 140 Control: 332	ADHD: 14.73 (± 1.18) Control: 14.23 (± 1.14)	ES	↓	14 %	-
21 (Houghton et al., 2015)	Australia	Case Control	Loneliness in children with and without ADHD	ADHD	ADHD: 84	ADHD: 15.3 (± 2.4)	ES, HCS	n.s.	43 %	-

22 (Kouvava & Antonopoulou, 2018)	Greece	Case Control	The differences in and associations between perceptions of friendship relationships of children with ADHD	ADHD	Control: 84 ADHD: 40 Control: 120	Control: 15.2 (±2.4) ADHD: 9.75 (±1.21) Control: 9.43 (±1.06)	ES	↓	43 %	2
23 (Normand et al., 2013)	Canada	Longitudinal	How the friendships of children with ADHD and comparison children evolved over time	ADHD	ADHD: 87 Control: 46	7.60 (±0.92) at Time 1 ADHD: 15.28 (±1.54) Control: 15.41 (±1.75)	ES, HCS	↓	85 %	-
24 (Rokeach & Wiener, 2017)	Canada	Case Control	quality of same-sex and other-sex friendships in adolescents	ADHD	ADHD: 61 Control: 54	ADHD: 15.28 (±1.54) Control: 15.41 (±1.75)	PA	↓	85 %	-
Mood and anxiety disorders + obsessive compulsive disorders										
25 (Baker & Hudson, 2014)	Australia	Case Control	The association between perceived friendship quality and social information processing	Anxiety + SP	Anxiety+ SP: 16 Anxiety: 12 Control: 32	Anxiety+SP: 8.88 (±1.75) Anxiety: 9.25 (±1.55) Control: 9.31 (±1.58)	HCS, PA	n.s.	43 %	3
26 (Baker & Hudson, 2015)	Australia	Case Control	The friendship quality of children with anxiety disorders	Anxiety + SP	Anxiety + SP: 39 Anxiety: 28 Control: 29	Anxiety+SP: 9.76 (±1.77) Anxiety: 9.21 (±1.86) Control: 9.93 (±1.81)	HCS, PA	n.s.	71 %	-
27 (Motoca et al., 2012)	USA	Cross sectional	The relations among anxiety symptoms, positive and negative peer interactions, and social skills	Primary & secondary anxiety disorder	397	10.11 (±2.35)	HCS	↓	27 %	2

28 (Scharfstein & Beidel, 2015)	USA	Case Control	The social repertoire and peer acceptance of youth with SAD and youth with GAD, relative to normal control youth	SAD, GAD	SAD: 20 GAD: 18 Control: 20	SAD: 8.70 (±2.0) GAD: 8.72 (±1.6) Control: 9.65 (±1.8)	PA	SAD : ↓ GA D: n.s.	71 %	-
29 (Borda et al., 2013)	Argentina	Case Control	Comparing peer relationship of children with/without OCD	OCD	OCD: 23 Control: 30	OCD: 9.43 (±1.85) Control: 7.67 (±0.8)	ES, HCS	↓	71 %	3
30 (Siegel et al., 2015)	USA	Cross sectional	Perceived friendship quality and peer victimization in adolescents with PBD	PBD	189	13.5 (±1.9)	HCS	↓↑	55 %	2
Mixed Populations										
31 (Zach et al., 2016)	Israel	Case Control	To what extent academic achievements, learning disorders, behavior problems and loneliness explain the variance of students' social skills	Learning Disorder (LD)	LD: 91 Control: 642	8.82 (±1.54)	ES	↓	29 %	3
32 (Bossaert et al., 2012)	Belgium	Case Control	The loneliness and its relations between number of friends, friendship quality and social self-concept	ASD, motor and/or sensory disabilities (mixed population)	ASD: 58 Motor/se nsory: 50 Control: 108	7th grade students	ES	↓	43 %	2
33 (Deckers et al., 2017)	The Netherlands	Case Control	Loneliness and its correlates in children and adolescents with ASD, ADHD and controls	ASD, ADHD	ASD: 73 ADHD: 76	ASD: 11.22 (±2.42) ADHD: 11.79 (±2.48)	ES, HCS	ASD : ↓ AD	57 %	3

Control:	Control: 11.61	HD:
106	(±2.63)	n.s.

SC... Social connectedness; RoB... Risk of Bias Assessment; AS... Asperger's Syndrome; ASD... Autism Spectrum Disorder; ADHD... Attention Deficit Hyperactivity Disorder; PBD... Paediatric Bipolar Disorder; HF... High functioning; OCD... Obsessive-compulsive disorder; SAD... Social Anxiety Disorder; GAD... Generalized Anxiety Disorder; DLD... developmental language disorder; SP... Social phobia; ED... Emotional disorder; SEN... Special education needs; LD... Learning Disorder; ES... Educational setting; HCS... Health Care Setting; PA... Public Advertisement, n.s. ... non-significant

* indicating in which table the mentioned studies are further described.

Table 2

The difference in determinants of social connectedness between populations with mental disorders and healthy controls

Determinants		Reference	ASD	Hyperkinetic disorder	Mental illness	Mixed population
Symptoms	Depression	2*, 8, 16*	H			
	Anxiety	5*, 8	H			
	Self-perceived sleep quality	8	L			
	Objective sleep quality	8*	L			
Skills	Coping strategies	16	L			
	Social information processing	25*			L	
	Academic achievement	31*			L	
Behavior	Social media use	9*	L			
	Pattern of internet surfing	20		n.s.		
	Cyberbullying (victim & perpetrator)	20*		H		
	Participation	5*	L			
	Social behavior	31*			L	
	Behavior problems	31*			H	
Social	Friendship motivation	2*	L			

Social support	1*	L		
Fear of negative evaluation	29*		L	
Desire for social interaction	33*			L
Social network connections	14*	L		
Attachment security	13	L		
Mother-Child relationship	13*	L		

H... Determinant in children with mental illness higher than in healthy control group; L ... Determinant in children with mental illness lower than in healthy control group; n.s. ... non-significant relationship with no direction stated; light grey shading ... no significant relationship between SC and determinant; dark grey shading ... significant relationship between SC and determinant

Table 3*The relationship between social connectedness and its determinants in adolescents with mental disorders*

Determinants		Reference	ASD	Hyperkinetic disorder	Mental illness	Mixed population
Symptoms	Depression	2, 16*, 17*, 30*	N		P/N	
	Anxiety	5*	N			
	Autism-related functioning	5*	N			
	Hypomanic	30*			N	
	Self-perceived sleep quality	8*	N			
	Objective sleep quality	8	n.s.			
Skills	Social	27*			P	
	Verbal & Non-verbal	3, 12*	n.s./N/ P			
	Mentalizing		n.s.			
	Abstract reasoning	15*	P			
	Difficulties in making friends	7, 18	n.s.	n.s.		
Behavior	Social media use	9*	P			
	Social participation	5*	P			

Social	Social support	1*, 7*, 18*	P	P
	Amount of contact with peers outside school	7	n.s.	
	Social self-concept	32*		P
	Quality in sibling relationship	22		P

P... positive relationship between SC and determinant; N ... negative relationship between SC and determinant; n.s. ... non-significant relationship with no direction stated; * ... significant relationship between SC and determinant;

Table 4*Questionnaires used in the included studies that explore SC*

Instrument, Author (Year)	Validation	Structure	Dimensions	Studies used this questionnaire or a modified version per disorder			
				ASD	Hyperkinetic disorder	Other mental disorder	Mixed population
Friendship							
The Friendship Qualities (Grotmeter & Crick, 1996)	Unclear	43 item scale; 12 subscales	Validation/Caring, Companionship/Recreation, Help/Guidance, Conflict Resolution, and Intimate Exchange, Conflict, Exclusivity, Overt Aggression (in and out of the friendship), and Relational Aggression		23		
Friendship Quality and Closeness Questionnaire (Parker & Asher, 1993)	Yes	40 item scale; 6 subscales	Help and guidance, intimate exchange, validation and caring, companionship and recreation, conflict resolution, conflict and betrayal	2	22	25, 26, 28	
The Friendship Questionnaire (Bierman & McCauley, 1987)	Yes	32 items	Subscale for positive interactions, subscale for negative interactions and extensiveness of peer network	9		27	
Friendship Qualities Scale (Bukowski et al., 1994)	Yes	23 item scale; 5 subscales	Companionship, help, security, closeness, conflict	3, 4, 5, 6, 10, 12, 13, 14, 15			
Friendship Quality Questionnaire (Heiman, 1995)	Unclear	24 items	Examine the children's perception of quality of support, affection and feelings related to friendship.		19		
Friendship quality (Malcolm et al., 2006)	Unclear	Unknown	Companionship, intimacy/affection, support				32

Loneliness						
Perth A-Loneliness Scale (Houghton et al., 2014)	Yes	24 item scale; 4 subscales	Friendship loneliness, isolation, negative attitude to solitude, and positive attitude to solitude		21	
Loneliness and Social Dissatisfaction Questionnaire (Asher et al., 1984)	Yes	24 item scale; 1 subscale	Feelings of loneliness, feelings of social adequacy, subjective estimations of peer state	4, 10, 11, 14, 17	19	31
The Loneliness Rating Scale (Williams & Asher, 1990)	Unclear	24 items; 2 subscales	Social loneliness, emotional loneliness		19, 20	
Loneliness and Aloneness Scale for Children and Adolescents (Marcoen et al., 1987)	Yes	12 items; 1 subscale	Loneliness in relationships with parents and peers, and for aversion to and affinity for aloneness			32, 33
UCLA Loneliness Scale (Russell, 1996)	Yes	20 items	Emotional loneliness, social loneliness, self-esteem, depression, and personality traits.	7	18	
Peer relationships						
The Network Relationships Inventory- Relationship Qualities Version (Buhrmester & Furman, 2008)	Yes	30 items	Five positive features, including companionship, disclosure, emotional support, approval, and satisfaction; Five negative relationship features including, conflict, criticism, pressure, exclusion, and dominance.	8	24	30
Best Friend Index (Kouwenberg et al., 2013)	Yes	18 items	Positive and negative friendship qualities	16		

Peer Relations Questionnaire (Rigby & Slee, 1993)	Unclear	20 item scale; 3 subscales	The tendency to be victimized by others, the tendency to bully others, and the tendency to act in a pro-social or cooperative manner	29
My classmates' attitude towards me: & my attitude towards my classmates (Zwierzyn´ska, E., & Matuszewski, 2006)	No	Includes two inventories (26 items; 24 items)	Need for safety, affiliation, attachment (taking care of someone and being taken care of), influencing others, as well as approval and appreciation.	1
Bully Questionnaire (Rieffe et al., 2012)	Unclear	20 items	Negative friendship aspects such as conflict, dominance, jealousy, and betrayal. Best friendship. Frequency of bullying.	16
