

Social functioning and peer relationships in children and adolescents with chronic pain: A systematic review

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BACKGROUND: Peer relationships during childhood and adolescence are acknowledged to be negatively impacted by chronic pain; however, to date there has been no synthesis of this literature.

OBJECTIVE: To systematically review existing literature describing the social functioning and peer relationships in children and adolescents with recurrent or continuous chronic pain.

METHODS: Articles on peer relationship factors studied in samples of children and adolescents with chronic pain published in English or French were identified using EMBASE, Medline, CINAHL and PsycINFO. Two independent reviewers performed initial screenings using study titles and abstracts, and reviewed each eligible article in full.

RESULTS: Of 1740 published papers yielded by the search, 42 articles met the inclusion criteria and were included in the present review. Nine studies had peer relationship investigation as the primary purpose of the study; the remaining 33 examined peer relationships as part of a broader study. A range of specific and more general measures was used to examine peer relationships. Across studies, children and adolescents with chronic pain were reported to have fewer friends, be subjected to more peer victimization, and were viewed as more isolated and less likeable than healthy peers.

CONCLUSIONS: Children and adolescents with chronic pain have peer relationship deficiencies. However, the majority of studies to date measure peer relationships as part of a broader study and, thus, little attention has been paid specifically to peer relationships in this group. Additional research examining the quality of peer relationships of children and adolescents with chronic pain, as well as development of measures specifically designed to assess these relationships, is needed.

Key Words: Adolescent; Chronic pain; Pediatric pain; Peer relationships; Systematic review

Peer relationships have been shown to be an important aspect of normal childhood development (1). Through these relationships, children and adolescents explore their self-identities and develop skills in forming and maintaining peer relationships (1). Not only are friendships important in terms of developing lifelong social skills, reciprocal friendships have been found to serve a protective function when the individual is confronted with difficulties (2-4). Reciprocal friendships

Le fonctionnement social et les relations avec les camarades des enfants et des adolescents ayant des douleurs chroniques : Une analyse systématique

HISTORIQUE : On sait que, pendant l'enfance et l'adolescence, la douleur chronique peut nuire aux relations avec les camarades. Cependant, il n'existe pas encore de synthèse des publications sur le sujet.

OBJECTIF : Procéder à l'analyse systématique des publications qui décrivent le fonctionnement social et les relations avec les camarades chez les enfants et les adolescents ayant des douleurs chroniques récurrentes ou continues.

MÉTHODOLOGIE : Les auteurs ont trouvé des articles sur les facteurs des relations avec les camarades étudiés sur des échantillons d'enfants et d'adolescents ayant des douleurs chroniques, publiés en anglais ou en français, grâce à EMBASE, Medline, CINAHL et PsycINFO. Deux analystes indépendants ont procédé à la sélection initiale au moyen des titres et des résumés des études et ont révisé l'intégralité de chaque article admissible.

RÉSULTATS : Sur les 1 740 articles publiés colligés grâce à la recherche, 42 respectaient les critères d'inclusion et ont fait partie de la présente analyse. Neuf avaient comme principal objectif l'exploration des relations avec les camarades, et les 33 autres incluaient ces relations dans le cadre d'une étude plus vaste. Une série de mesures précises et plus générales permettait d'examiner les relations avec les camarades. Dans les études, on indiquait que les enfants et les adolescents ayant des douleurs chroniques avaient moins d'amis, étaient davantage soumis à la victimisation par leurs camarades et étaient davantage perçus comme isolés et moins sympathiques que leurs camarades en bonne santé.

CONCLUSIONS : Les enfants et les adolescents ayant des douleurs chroniques ont des carences dans leurs relations avec les camarades. Cependant, la majorité des études jusqu'à maintenant mesurent les relations avec les camarades dans le cadre d'une étude plus vaste et, par conséquent, accordent peu d'attention à ce type de relation au sein de ce groupe. Il faut mener d'autres recherches sur la qualité des relations des enfants et des adolescents ayant des douleurs chroniques avec leurs camarades et élaborer des mesures conçues pour évaluer ces relations.

have been found to act as a buffer in children who have negative family relationships (2), as well as provide protection against the negative effects of peer victimization (3). In 2003, Nangle et al (4) found that positive dyadic friendship experiences protect against loneliness and depression in elementary school-aged children.

Difficulties with peer relationships have been acknowledged as one of the major social ramifications of chronic pain in

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adults (5,6). This is not surprising, given that chronic pain is an insidious condition that can negatively impact all aspects of an individual's life. Adults with chronic pain have been found to experience self-imposed isolation due to the embarrassment of their pain disability (6). Additionally, in 2007, Smith and Osborn (5) found that adults with chronic low back pain use self-isolation as a negative coping mechanism. Individuals with chronic pain withdraw from social contact with peers rather than attempt to conceal their discomfort in social situations. Once isolated, interacting with others becomes more difficult, leading some to view themselves as having no social value. Adults with chronic pain may receive fewer social invitations as a result of their changing personality due to pain and because of other's discomfort about the amount of pain the person is experiencing while socializing (6). There is no evidence that the situation is any different for children and adolescents with chronic pain.

Qualitative research suggests that peer relationships are both a source of stress and support for adolescents who live with chronic pain (7,8), and the pain condition may interfere with their ability to maintain friendships (8). Using a focus group interview method in 2008, Forgeron and McGrath (7) asked adolescents with chronic pain to describe daily coping needs related to pain. Results indicated that all participants had experienced negative peer relations in some manner since developing chronic pain (eg, verbal assaults or loss of friendship), but the emotional support and companionship of their remaining friends was helpful in coping with their pain. In a similar study in 2002, Carter et al (8) used a range of methods to examine friendships in adolescents with chronic pain and found that the majority of participants had experienced loss of friendships as a result of having chronic pain. Participants made the distinction between 'sunny day friends' (ie, friends who would come and go) and 'proper friends' (ie, friends who were always available to provide support). Participants also indicated that pain was often problematic in maintaining friendships, as a direct result of being unable to participate in activities with peers and missed school days. In 2002, Sällfors et al (9) used individual interviews with children and adolescents with juvenile chronic arthritis to examine the life situation for these participants. These children and adolescents reported that their pain resulted in negative attitudes from others, which made them feel sad, left out and angry. Across these qualitative studies, participants often indicated that peers did not understand their pain conditions.

Although epidemiological studies (10,11) indicate that 25% to 31% of children and adolescents experience chronic pain at some point in their childhood or adolescence, only one-third of these children and adolescents experience disabling chronic pain (10). Despite the importance of peer relationships during childhood and adolescence, and the negative impact chronic pain may have on these relationships, no formal synthesis of this literature has been conducted to date. Therefore, it is essential to review and synthesize the existing literature in this area to understand current knowledge about peer relationships in youth with chronic pain – areas in which further investigation and implications for clinical practice are required. The purpose of the current review is to investigate the social functioning and peer relationships of children and adolescents with chronic pain.

METHOD

Data sources

Key electronic database searches (EMBASE, Medline, CINAHL and PsycINFO) were conducted by a librarian information specialist using the following search terms: child, adolescent, chronic pain, pain, disability, peer relationships, friendships, school functioning, social functioning, social inclusion, teachers, abdominal pain, headache, migraine, sickle cell disease, arthritis, juvenile fibromyalgia, musculoskeletal pain, and neuropathic pain. The reference lists for each included article were searched by hand to ensure that relevant papers were not missed; two papers were included based on this hand search. An anonymous reviewer suggested two other papers, and one additional paper was identified in the course of retrieving these papers. Two independent reviewers (PF, SK) performed an initial screening using study titles and abstracts. For the databases, reviewers recorded the following details: number of studies found, number meeting inclusion criteria, number excluded, reason for exclusion and whether the article had to be obtained to determine eligibility. Articles that were excluded by one reviewer but included by another were included or excluded based on consensus, with disagreements settled by a third reviewer (the third reviewer was not required). After an agreement on eligibility was reached, the same two independent researchers reviewed each article in full to determine the significant peer relationship findings in each study.

Inclusion and exclusion criteria

The inclusion criteria included peer-reviewed primary quantitative research articles published in English or French between 1988 and 2008, studies of children and/or adolescents with any type of chronic pain (recurrent pain characterized by episodes of pain followed by periods of no pain or continuous pain characterized by ongoing daily pain with and without exacerbations of intensity), and outcome measures of peer relationships, friendships, social functioning, pain or disability. Review articles, commentaries, books, book chapters, dissertations and qualitative research articles were excluded. Although dissertations are primary studies, they were excluded due to retrieval difficulties; inclusion of dissertation evidence has been rarely found to impact the conclusions of a review (12).

Data extraction

Data were extracted by the first two authors using customized forms specifying author, type of study, sample (age of children, type of pain), number of participants, measures used, primary outcomes and primary results. Due to the varied nature of the studies (correlation, descriptive and cohort), methodological rigor was not assessed because bias issues vary in each of these research designs. No intervention studies or randomized controlled trials were found. Studies meeting inclusion criteria were categorized according to their primary focus: peer relationships (ie, the primary focus was to assess various peer relationship factors for children and adolescents with chronic pain), quality of life, mental health factors (eg, anxiety and depression) and 'other'. The 'other' category consisted of studies that included diverse primary focuses such as exploring mothers' attributions for their child's pain, as well as large survey studies exploring risk factors for various types of chronic pain in children and adolescents, but included some relevant

data on peer relationships or social functioning. Each study was reviewed and summarized based on its primary focus, type of social relationship assessed (eg, peers or close friends), rater (ie, self, peer or other), component of peer relationship assessed (ie, quantity or quality), measure used, child factors impacting peer relationships (eg, anxiety, depression), and the extent of pain or pain-related disability.

RESULTS

Description of studies

The electronic database search yielded 1740 possible studies, with 193 duplicate articles, as well as 27 books, book chapters and/or dissertations. Based on abstract review, 1516 studies were excluded and 135 studies were retrieved for further review. After a preliminary review of the 135 studies, 42 met the a priori review criteria and were included in the present review.

Studies meeting inclusion criteria varied widely in primary focus and design. Only nine studies investigated peer relationships as the primary focus. The other 33 studies assessed peer relationships by using measures that included some form of social functioning scale or subscale of a global measure. Given the variety of studies included in the present review (ie, descriptive studies, correlation studies and studies with a variety of goals) (13), a quantitative meta-analysis was not possible; therefore, a descriptive analysis and synthesis of the findings is presented.

Primary focus: Peer relationships

As shown in Table 1, nine studies specifically explored peer relationships of children and adolescents with various chronic pain conditions (eg, headaches and recurrent abdominal pain [RAP]). Given that these studies specifically examined the association between peer relationships and chronic pain, results will be described in more depth because this is the primary goal of the present review. The findings from all but two of these studies suggested that the presence of chronic pain has a negative effect on peer relationships. Six of these studies included healthy comparison groups (14-19), with five of these suggesting that children with chronic pain differ from typical children with respect to peer relationships (14,16-19). In 2007, Greco et al (14) found that children and adolescents with RAP were subjected to more overt and relational self-reported victimization than healthy peers, and that this victimization was especially prevalent in boys with RAP. Victimization rates were also positively correlated with the number of pain sites (ie, headache, stomach ache or backache) in a descriptive school-based study of children and adolescents (20).

Five studies in this category used self- and peer-report measures to examine peer relationships of children and adolescents with juvenile idiopathic arthritis (JIA) (15), juvenile fibromyalgia syndrome (JFS) (18), sickle cell disease (SCD) (16,17) and migraine (19). Children were asked to provide reports about reciprocal friendships, best friends and likeability of peers (Table 1). Only one (15) of these five studies found no peer relationship differences on these classroom measures for children and adolescents with JIA compared with matched healthy classmates, regardless of disease severity. The other four studies found that children and adolescents with other painful chronic conditions were experiencing peer relationship difficulties when compared with matched healthy classmates.

In 2007, Kashikar-Zuck et al (18) found that adolescents with JFS were rated as more isolated and sensitive by peers and themselves, less disruptive or aggressive by teachers, less popular among their peers, and less likely to exhibit leadership skills. Children and adolescents who suffered from migraines also had fewer reciprocal friendships than healthy children (19), with younger children faring worse than adolescents on peer relationship measures. Younger children with migraines were found to be twice as likely to not have any reciprocal friendships and they also received fewer best friend nominations than younger children without migraines, and middle school children with and without migraines.

Two studies by Noll et al, one from 1996 (17) and one from 2007 (16), indicated that peers viewed children and adolescents with SCD differently, in that they had fewer reciprocal friendships and received fewer best friend nominations than typical children. However, there were some inconsistencies across these studies. For example, in the earlier study, sex differences were noted, in that girls with SCD were chosen less often as a best friend and had fewer reciprocal friendship nominations than boys with SCD and healthy controls. On the other hand, boys with SCD were considered by their classmates to be less aggressive than healthy children. However, findings in the 2007 study indicated that children and adolescents with SCD were chosen less often as a best friend and had fewer reciprocal friendship nominations, although they were not perceived as being less likeable. In a 2004 study of social anxiety among children and adolescents with SCD, Wagner et al (21) found that higher pain intensity was associated with greater overall social anxiety in older children and adolescents with SCD, but not in younger children. Results indicated an interaction between pain and age, such that older children experiencing greater pain feared negative evaluation by others.

Only one study (22) in this category examined attitudes and beliefs of healthy children toward hypothetical peers with pain. In 2000, Guite et al (22) used vignettes depicting boys and girls with and without organic causes for their abdominal pain and asked healthy participants to respond to a series of questions related to the hypothetical peer. Regardless of the hypothetical child's sex, both girls and boys considered organic disease to be more severe, although this did not affect the likeability of the vignette character. There was a same-sex preference with respect to the likeability of the hypothetical peer, which is developmentally appropriate given the age of the participants (fourth and fifth graders).

In summary, the majority of studies within this category suggest that establishing peer relationships can be challenging for children and adolescents with a chronic pain condition. Some of the studies in this category examined general peer relationships as opposed to reciprocal friendships. Even those that did examine reciprocal friendships (15-19) focused on the number of reciprocal friendships from a class list rather than the quality of these friendships. However, in these studies, the actual number of reciprocal friendship nominations, best friend nominations or likeability ratings were not provided, meaning that it is difficult to ascertain how many fewer friends children and adolescents with chronic pain have. Given that none of the included studies evaluated friendship quality, it is difficult to draw conclusions regarding the perception of friendship quality among youth with chronic pain.

TABLE 1
Studies with a primary focus on peer relationships

Author, year (reference), country, study type	Sample, age, sex	Measures	Findings
Greco et al, 2007 (14), USA, case-control comparison study	n=120; RAP, n=60; healthy controls, n=60 12.3±1.19 years 41 girls	Child: Abdominal Pain Index, use of school medical services. Peers: Children's Social Experiences Questionnaire – Peer Report. Teachers: Social Skills Rating Scale	In children with RAP, victimization > controls. Modest support for peer victimization moderating relationship between pain and school functioning
Guite et al, 2000 (22), USA, vignette study	Healthy children rating vignette characters with organic and nonorganic RAP, n=363 10.15±0.76 years 52% girls	Child: Study-designed questionnaire: Likeability – 5 items regarding how much the child liked the vignette character; severity – 2 items regarding perceived symptom severity of the vignette character; relief from responsibility – 4 items regarding extent that the vignette character should be relieved from responsibilities	Children with organic disease seen as having more severe disease and pain. Boys and girls viewed RAP in boys as being more severe. Regardless of RAP type, same-sex preferences for likeability. Presence of stressors in vignettes did not impact liking ratings. Severity of symptoms mediated the relationship in some cases. Boys granted ↑ relief of responsibility to girls with organic RAP; boys granted all RAP boys equal relief from responsibility; girls granted nonorganic RAP girls ↑ responsibility relief (unexpected finding) but not boys with nonorganic RAP
Kashikar-Zuck et al, 2007 (18), USA, case-control study	n=110; JFS, n=55; matched classmates, n=55 12–18 years 52 girls with JFS and 52 matched female peers	Adolescents (JFS and controls): RCP, TBF, LRS, 9 additional items to assess nonsocial attributes that may be impacted by chronic illness. Teachers: Teacher RCP	Teens with JFS rated as sensitive/isolated > peers by peers and self. JFS patients viewed as demonstrating popular/ leadership behaviours < by peers and self. Received ↓ best friend nominations. Viewed ↓ aggressive/disruptive by teachers
Natvig et al, 2001 (20), Norway, correlation study	n=856 10–15 years 423 boys	Child: Questions related to presence of psychosomatic symptoms (headache, backache, stomach ache and dizziness), bullying experience, self-efficacy, social support (specifically from teachers and peers) and decision control, and school alienation and distress	Those who were bullied sometimes or more often had ↑ rates of feeling low compared with any other psychosomatic symptom and/or group. Odds were > for bullied children to experience all 3 forms of pain compared with nonbullied peers. The odds of experiencing all 3 pains ↑ as bullying ↑
Noll et al, 2000 (15), USA, case-control study	n=148; JRA, n=74; matched classmates, n=74 8–14 years 40 girls and 34 boys with JRA (sex-matched classmates)	Parent: CBCL, DOTS-R. Children: JRA patients and controls – RCP, TBF, LRS; JRA patients only – CDI, Roberts Apperception Test for Children, LSDQ, SPPC, Wechsler Intelligence Scale for Children – Revised. Teacher: RCP	No differences on peer relationship measures (RCP, TBF, LRS) among teacher, JRA and classmates. Mothers of children with mild JRA (53% of sample) perceived their children as being more socially competent on CBCL versus more active disease. Fathers rate children with mild JRA with ↓ total behaviour problems on the CBCL versus children with active disease
Noll et al, 2007 (16), USA, case-control study	n=86; SCD, n=43; matched classmates, n=43 8–15 years 26 girls with SCD and 26 healthy female classmates	Parent: Demographic questionnaire, DOTS-R. Children: RCP, TBF, LRS, CDI, LSDQ, SPPC. Teacher: RCP	Teachers rated students with SCD as ↑ prosocial and ↓ aggressive. Children with SCD chosen ↓ as a best friend and had ↓ reciprocal friendship nominations by peers but were not less well liked. Children with SCD viewed as ↑ sick, ↑ absent from school, and ↓ athletic by peers; overall ↑ sickness did not mediate a path between illness and outcomes for SCD on best friend or reciprocal friendship nominations
Noll et al, 1996 (17), USA, case-control study	n=68; SCD, n=34; matched classmates, n=34 8–14 years 20 girls with SCD and 20 healthy female classmates	Parent: Demographic background questionnaire, DOTS-R. Children: RCP, TBF, LRS plus 3 questions on who is sick most often, tired most often and misses the most school, LSDQ, SPPC, CDI, Roberts Apperception Test for Children, block design and vocabulary subtests of the Wechsler Intelligence Scale for Children – Revised. Teacher: RCP and student absenteeism. Researcher: Chart review for disease severity	Girls with SCD viewed as ↓ sociable and/or displaying fewer leadership behaviours, chosen ↓ often as a best friend, received ↓ reciprocal friendship nominations and viewed as less acceptable. Boys with SCD viewed as ↓ aggressive. Compared with peers, children with SCD viewed as ↑ sick, ↑ absent from school and 'being tired a lot' compared with peers. Trend for older children with SCD to report ↑ loneliness. Frequency of pain episodes captured in rating of severity of SCD (along with number of complications, major organ involvement and number of hospitalizations) was not a significant factor

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In studies with a primary focus on peer relationships, the aim was to explore some aspect of peer relationships. Age data presented as mean ± SD or range in years. CBCL Child Behavior Checklist; CDI Child Depression Inventory; DOTS-R Revised Dimensions of Temperament Survey; JFS Juvenile fibromyalgia syndrome; JRA Juvenile rheumatoid arthritis; LRS Like rating scale; LSDQ Loneliness and Social Dissatisfaction Questionnaire; RAP Recurrent abdominal pain; RCP Revised Class Play; SCD Sickle cell disease; SPPC Self-Perception Profile for Children; TBF Three best friends; VAS Visual analogue scale

TABLE 1 – CONTINUED
Studies with a primary focus on peer relationships

Author, year (reference), country, study type	Sample, age, sex	Measures	Findings
Vannatta et al, 2008 (19), USA	n=138; migraine, n=69; matched classmates, n=69 8–14 years 31 girls with migraine and 31 female classmates	Child: RCP, TBF, LRS. Teachers: RCP	Children with migraine had ↓ reciprocated friendships. Younger children received ↓ best friend nominations and were twice as likely not to have any reciprocated friendships versus peers and middle school participants with and without migraine. Boys with migraine viewed as ↓ aggressive and ↓ disruptive. Middle school participants with migraine viewed as exhibiting ↑ leadership behaviours. Teachers rated participants with migraine as ↓ aggressive and disruptive. No correlations between migraine frequency or pain intensity and friendship measures
Wagner et al, 2004 (21), USA, correlation study	n=58 SCD patients 8–17 years 57% girls	Parent: Demographic questionnaire (locally designed). Child: Social Anxiety Scale for Children – Revised, VAS pain intensity rating. Medical records: SCD type, disease severity, hemoglobin	Mean (± SD) pain intensity 61.24±29.96 on a 100 mm VAS. Severe pain ratings associated with ↑ overall social anxiety in older children and adolescents but not younger children. Pain × age associated with ↑ fears of negative evaluation by others. Pain × age not associated with social avoidance and distress for new situations or in general situations

In studies with a primary focus on peer relationships, the aim was to explore some aspect of peer relationships. Age data presented as mean ± SD or range in years. CBCL Child Behavior Checklist; CDI Child Depression Inventory; DOTS-R Revised Dimensions of Temperament Survey; JFS Juvenile fibromyalgia syndrome; JRA Juvenile rheumatoid arthritis; LRS Like rating scale; LSDQ Loneliness and Social Dissatisfaction Questionnaire; RAP Recurrent abdominal pain; RCP Revised Class Play; SCD Sickle cell disease; SPCC Self-Perception Profile for Children; TBF Three best friends; VAS Visual analogue scale

Primary focus: Quality of life

Fifteen of the studies selected for inclusion were classified as being primarily focused on quality of life in children and adolescents experiencing chronic pain (Table 2). These studies used a variety of measures to assess quality of life, making direct comparisons between studies difficult. Six of the 15 studies examined the quality of life of children and adolescents experiencing various types of headaches, such as tension-type, chronic daily headaches and migraines (23-28). Based on an examination of social subscale scores, four of these six studies found that quality of life was negatively impacted by the presence of chronic pain. Findings of the 2006 study by Strine et al (27) are of particular note because these authors detailed the type of social difficulties faced by children with headaches. According to parent report on the extended version of the Strengths and Difficulties Questionnaire (27), children with headaches were 3.3 times more likely to face difficulties in friendships, 2.0 times more likely to play alone, 2.6 times more likely to be victimized by others and 1.3 times as likely to relate better to adults, compared with normative data. This being said, not all studies in this domain found significant differences in quality of life for youth with chronic headache. Specifically, studies by Bandell-Hoekstra et al (23) in 2002 and Langeveld et al (25) in 1997 examined quality of life using the Quality of Life Headache in Youth scale and found no difference in social interaction with peers for children and adolescents with headaches, regardless of severity.

Three of the studies (29-31) with a quality of life focus examined the impact of arthritis on quality of life in children and youth. Results from all three studies indicated that social activities were negatively impacted as a result of arthritic pain, but this impact varied considerably depending on pain symptoms. For example, in a two-week study period, 44% of participants reported no impact on their social activities due to arthritis; however, for 12% of the participants, social

activities decreased up to 40% on days with excessive pain symptoms (30).

Results supporting impaired peer relationships when assessing quality of life were reported in the four studies that examined heterogeneous chronic pain populations. All four of these studies (32-35) found a negative relationship between the presence of chronic pain and social functioning in terms of increased limitations in family, social and academic activities among children with chronic pain. In 2003, Merlijn et al (35) also found that adolescent participants with chronic pain had poorer quality of life in all measured domains, including less social acceptance by others, than healthy peers, suggesting that other types of peer-related social functioning apart from activity may be negatively impacted by chronic pain.

The two studies (36,37) that examined the impact of SCD pain on quality of life in children and adolescents suggest that SCD pain negatively affects social functioning, primarily by interfering with participants' engagement with school and leisure activities, but that this negative effect was not uniform for all participants (37). A 1989 investigation by Hurtig et al (37) concluded that SCD negatively impacted peer relationships in adolescent boys, whereas girls or younger boys were not affected to the same degree. These authors suggest that this finding may be influenced by the physically active nature of interactions between adolescent boys compared with girls and younger boys.

Overall, the studies reported that having a chronic pain condition negatively impacted an individual's quality of life, due to missing out on social activities with peers and, thus, decreasing opportunities to interact with peers and build friendships. Given the nature of the measures used in these studies, it is difficult to accurately determine the extent to which the decrease in social activities impacts the peer relationships of these children and adolescents.

TABLE 2
Studies with a primary focus on quality of life

Author, year (reference), country, study type	Sample, age, sex	Measures	Findings
Bandell-Hoekstra et al, 2002 (23), Netherlands, cross-sectional study	n=2815; low HA, n=605; medium HA, n=1626; severe HA, n=342; HA free, n=242 9–16 years Sex not specified	Child: Waters Headache Questionnaire, Paediatric Pain Assessment Tool, PCQ, QLH-Y	No significant difference between the 3 HA groups with regard to social interaction with peers and/or school functioning
Bennett et al, 2000 (32), Canada, descriptive study	n=43 nonspecific chronic pain patients; no controls 7–16 years 35 girls and 8 boys	Parent: Survey developed specifically for their clinic and captured pain interference with social/leisure activities outside of school	35% of parents reported that their child had a ↓ in their social/leisure activities
Brna et al, 2008 (24), Canada, case-comparison study	n=994 HA patients; migraine 9.3%, mood disorders 2.1%, anxiety disorders 1.8% 12–19 years 48.7% female	Child: Medical Outcomes Study 36-item Short Form Health Survey	HA, independent of mood or anxiety, negatively impacted quality of life including the social subscale
Gil et al, 2003 (36), USA, correlation study	n=37 SCD patients, no controls 13–17 years 13 boys	Child: Daily diary (sections on pain, school and other activities, stress, mood), Adolescent Daily Hassles Scale, Symptom Checklist 90 – Revised, Global Severity Index	↑ same-day pain associated with same-day negative mood. Same-day improved pain associated with same-day positive mood. No comment on type of stressor in analysis of daily stressors (daily stressors included friends, family, teachers, school and work)
Hurtig et al, 1989 (37), USA, found by hand, correlation study	n=70 SCD patients 8–16 years 37 girls	Parent: Structured interview designed for study, CBCL. Child: Structured study interview, Wechsler Intelligence Scale for Children – Revised, California Test of Personality. Teacher: Questionnaire to capture school performance. Medical records: Disease-related information	Interaction sex × age on peer relationships; peer relationships of adolescent boys with SCD negatively impacted but not girls. Pain frequency significantly predicted school performance; no comment on peer relationships
Hunfeld et al, 2001 (33), Netherlands, correlation study	n=128 chronic pain patients enrolled (111 included in analysis because 17 had missing data); no controls 12–18 years 95 girls	Parent: Impact on Family Scale. Adolescents: Demographics, pain list, Quality of Life Pain in Youth, 3-week daily pain diary	More pain had a small negative impact on social functioning. Quality of life social functioning subscale included more than just peer relationships
Langeveld et al, 1997 (25), Norway, correlation study	n=64 HA patients (chronic daily or migraine); no controls 12–18 years 42 girls	Adolescents: HA and migraine diary over 4 weeks, QLH-Y	No relationship between HA severity and social interaction with peers across 4-week study period
Merlijn et al, 2003 (35), Netherlands, case-control correlation study	n=548; chronic pain, n=330; matched pain-free controls, n=218 12–18 years Chronic pain group, 58 boys; pain-free group, 32 boys	Parent: IBES – Parent, DPQ, Pain Coping Inventory. Adolescent: Pain questionnaire, DPQ, Achievement Motivation Test, social acceptance by others subscale of the school questionnaire, IBES – Child, PCQ, Quality of Life Questionnaire for Adolescents with Chronic Pain	Chronic pain participants have poorer quality of life in all domains and ↓ social acceptance by others. Chronic pain group perceived ↑ reward from peers when pain-free, compared with reward from parents. Girls: Odds of having chronic pain ↓ as reward from peers in pain situations ↑
Powers et al, 2004 (26), USA, comparison study; normative data on the PedsQL 4.0	n=686 migraine HA patients 2–18 years (2–4 years, n=21; 5–7 years, n=86; 8–12 years, n=298; 13–18 years, n=281) 391 girls (ratio near 1:1 in each age group except 13-18 years, with 73% girls)	Parent: HA centre intake questionnaire (pain intensity, frequency, location, PedsQL 4.0 – Parent Form. Child/Adolescent (5–18 years) PedsQL 4.0 – Young Child/Child/Adolescent Form, self-report of pain, location and frequency. Physician: History and physical to diagnosis migraine HA	All age ranges of children and adolescents with migraine have ↓ quality of life scores versus normative data, including social functioning subscale. Young children scored ↓ on social functioning subscale versus child or adolescent groups. Adolescents scored ↓ on school functioning subscale versus young child and child groups

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In studies with a primary focus on quality of life, the aim was to explore the quality of life for children and adolescents with chronic pain. Age data presented as a range in years. CBCL Child Behavior Checklist; CHAQ Childhood Health Assessment Questionnaire; DPQ Dutch Personality Questionnaire; HA Headache; IBES Illness Behavior Encouragement Scale; JPA Juvenile polyarticular arthritis; PCQ Pain Coping Questionnaire; PedsQL Pediatric Quality of Life Inventory; PPCI Waldron/Varni Pediatric Pain Coping Inventory; QLH-Y Quality of Life Headache in Youth; SCD Sickle cell disease

TABLE 2 – CONTINUED

Studies with a primary focus on quality of life

Author, year (reference), country, study type	Sample, age, sex	Measures	Findings
Sawyer et al, 2004 (29), Australia, correlation study	n=59 juvenile idiopathic arthritis patients 8–18 years 40.7% boys	Parent: CHAQ, PPCI. Child: PedsQL 4.0, PedsQL 3.0 (arthritis module), Varni/Thompson Pediatric Pain Questionnaire, PPCI	Children report better quality of life scores versus parents. Children and parents reported ↓ social functioning problems versus other domains. Child reports: Significant negative relationship between pain and PedsQL (including social functioning subscale)
Schanberg et al, 2003 (30), USA, correlation study	n=41 JPA patients 8–18 years 59% girls	Parent: CHAQ – Parent Report. Child: Daily diaries over 2 weeks (pain, pain location, stiffness, fatigue, reduction of social and school activities), CHAQ – Child Report, Child Depression Inventory, Revised Children's Manifest Anxiety Scale. Physician/researcher: Baseline disease severity	66% of children ↓ social activities for at least 1 day during study period. Children ↓ social activities on 20% of their pain days. 12% ↓ social activities on >40% of their pain days. 33% did not ↓ their social activities on pain days
Schanberg et al, 2005 (31), USA, correlation study	n=51 JPA patients 8–17 years 65% female	Child: Daily diary (pain intensity, location, stiffness and fatigue), daily events inventory, Facial Affective Scale, daily school and social activity reduction, CHAQ – Child Report. Physician: Disease severity	Pain, stress, mood, fatigue and stiffness influenced reductions in social activities. Social activities reduced versus school activities
Strine et al, 2006 (27), USA, cross-sectional study	n=9264 HA patients 4–17 years Sex not specified	Parent: Extended version of the Strengths and Difficulties Questionnaire, demographic data	42.1% of parents of children with HAs reported some degree of difficulty with emotions, concentration, behaviour or getting along with peers. Children with HAs are 3.3 times more likely to face difficulties in friendships, 2.0 times more likely to play alone, 2.6 times more likely to be bullied and 1.3 times as likely to relate better to adults, versus normative data
Talarska and Zgorzalewicz-Stachowiak, 2007 (28), Poland, correlation study	n=117 HA patients 8–18 years (<12 years, n=21; 12–15 years, n=39; >15 years, n=57) 69 girls	Parent: Demographic questionnaire, PedsQL 4.0. Child: PedsQL 4.0	Physical and social functioning negatively impacted by frequent and lasting HA
Tsao et al, 2007 (34), USA, correlation study	n=87 chronic pain patients 10–18 years 62 girls	Parent: Study demographic questionnaire. Child: Childhood Anxiety Sensitivity Index, Child Health Questionnaire – Child Form 87	Anxiety sensitivity was not associated with physical functioning or limitations in school work/activities with friends due to physical problems. Anxiety sensitivity associated with poorer social functioning (greater limitations in family activities and increased likelihood of social/academic limitations due to emotional problems among children with chronic pain). Pain-related characteristics (intensity, location, multiple pain diagnosis) did not account for significant incremental variance in quality of life

In studies with a primary focus on quality of life, the aim was to explore the quality of life for children and adolescents with chronic pain. Age data presented as a range in years. CBCL Child Behavior Checklist; CHAQ Childhood Health Assessment Questionnaire; DPQ Dutch Personality Questionnaire; HA Headache; IBES Illness Behavior Encouragement Scale; JPA Juvenile polyarticular arthritis; PCQ Pain Coping Questionnaire; PedsQL Pediatric Quality of Life Inventory; PPCI Waldron/Varni Pediatric Pain Coping Inventory; QLH-Y Quality of Life Headache in Youth; SCD Sickle cell disease

Primary focus: Mental health factors

Nine studies in the present review focused on examining associations between pain and mental health factors such as internalizing or externalizing problems (Table 3). Similar to studies in the previous categories, pain types included headache, abdominal pain, arthritic type pain, SCD and nonspecific chronic pain. Similar to quality of life studies, data on peer relationships were generally obtained through social subscales on broad measures of social behaviour, as opposed to measures designed to specifically assess peer relationships. Only one

group (38) created a questionnaire specifically for use in the study, based on the fact that standard behavioural and psychological inventories focused on psychopathology and did not adequately assess illness adjustment for urban African-American participants. The remainder of the studies used a wide range of existing measures.

Seven of the studies examining mental health factors, peer relationship difficulties, and chronic pain in children and adolescents indicate that those with chronic pain have increased peer relationship difficulty rates. Specifically, increased peer

TABLE 3
Studies with a primary focus on mental health factors

Author, year (reference)	Sample, age, sex	Measures	Findings
Anttila et al, 2004 (40), Finland, case-control correlation study	n=183; tension-type HA, n=65; migraine HA, n=59; HA free, n=59 12.6 years Tension-type HA, n=21 girls; migraine, n=32 girls; HA free, n=37 girls	Parent: CBCL, McMaster Family Assessment Device, child and family demographic variables (locally developed). Child: Structured HA interview, CDI	Children with migraines scored worse on the CBCL social problems subscale than the other 2 groups but there were no group differences on the CBCL social competence subscale
Barbarin et al, 1994 (38), USA, correlation study	n=327 SCD patients; no controls 4–17 years 145 females	Parent: Custom survey – social adjustment problems (ie, shy, lonely, issues getting along with friends or lacking a close friend). Pain: Frequency of ischemic pain attacks	Shyness, loneliness and lack of a close friend were the social adjustment issues most frequently reported by parents
Campo et al, 2004 (42), USA, case-control study	n=42 RAP patients 8–15 years 18 boys with RAP; controls n=38, n=16 boys	Parent: CBCL, Pediatric Symptom Checklist-17, SCARED, Junior Temperament and Character Inventory, Columbia Impairment Scale. Child: CDI, FDI – Child Form. Health professional: K-SADS-PL, Children's Global Assessment Scale	Statistically significant difference in social phobia for RAP group versus controls on parent SCARED. No differences on the child SCARED between groups. Statistically significant difference on the CBCL social competence and social problems subscales between groups. K-SADS-PL: 21.4% of participants with RAP had social phobia
Gold et al, 2000 (41), Canada, descriptive study	n=62; IBD, n=36; FGI, n=26 8–18 years 63% boys	Parent: CBCL. Child: CDI, Piers-Harris Children's Self-Concept Scale	No significant differences between IBD and FGI groups on CBCL social competence subscale. Significant difference between those with constipation and RAP (both from the FGI group) on the CBCL social competence subscale (constipation scored as being less socially competent)
Hjern et al, 2008 (39), Sweden, correlation study	n=2588 (cross-sectional nationally representative sample) 10–18 years 1296 boys	Child: Statistics Sweden home-based interview with parents and children plus a questionnaire booklet. Questions on pain, school stressors and bullying	Children with ↑ victimization rates, perceived lack of teacher support and schoolwork pressures reported more abdominal pain and HAs
Kaminsky et al, 2006 (46), Canada, correlation study	n=50 RAP patients; no controls 8–17 years 41 girls	Parent: FDI, Brief Symptom Inventory, CBCL. Child: Abdominal Pain Index, FDI, Pain Response Inventory for Children, Social Support Scale for Children, Pain Coping Questionnaire, Children's Health Locus of Control Scale, CDI, State-Trait Anxiety Inventory for Children	Social support by classmates and teachers associated with ↓ depressive symptoms in children with RAP (explained 7% of the variance)
Karwautz et al, 1999 (43), Austria, case-control study	n=341; migraines, n=151; tension-type HA, n=94; HA free, n=96 4–19 years 175 boys (1:1 ratio with girls; both evenly spaced across HA groups)	Mothers: Study-specific questionnaire on psychosocial factors. Clinician interview: HA diagnosis (including pain characteristics of the HA) with parent and child	Participants with tension-type HA reported to have ↓ friends, more likely to have divorced parents compared with participants with migraine or HA-free controls
Mullick et al, 2005 (44), Bangladesh, case-control comparison study	n=80; JIA, n=40; matched peers, n=40 10–18 years 24 boys with JIA	Parent: Strengths and Difficulties Questionnaire, demographic data. Researcher: Semistructured case assessment sheet	52.5% of JIA participants reported peer relationship difficulties. 70.43% (n=10) with both JIA and psychiatric disorders reported peer relationship difficulties. 42.3% (n=11) with JIA only reported peer relationship difficulties
Sandstrom and Schanberg, 2004 (45), USA, correlation study	n=36 juvenile rheumatic disease patients 7–16 years 27 girls	Child: Pain (visual analogue scale), Childhood Health Assessment Questionnaire. Teacher: Teacher Checklist of Social Behavior, CDI. Rheumatologist: Disease severity measure	Social rejection by peers moderated the relationship between pain severity and depressive symptoms in that rejection exacerbated the positive impact of pain on depressive symptoms

In studies with a primary focus on mental health factors, the aim was to explore the association between mental health factors (depression, anxiety and psychosomatic complaints) and chronic pain. Age data presented as a range in years. CBCL Child Behavior Checklist; CDI Child Depression Index; FDI Functional Disability Inventory; FGI Functional gastrointestinal condition; HA Headache; IBD Inflammatory bowel disease; JIA Juvenile idiopathic arthritis; K-SADS-PL Schedule for Affective Disorders and Schizophrenia for School Age Children, Present and Lifetime Version; RAP Recurrent abdominal pain; SCARED Screen for Child Anxiety-Related Emotional Disorders; SCD Sickle cell disease

victimization rates (38,39), poorer scores on the Child Behavior Checklist (CBCL) social problem subscale (40) and social competence subscale (41), a greater incidence of social phobia than in healthy controls (42), and fewer friends (43). However,

as noted by Mullick et al (44) in 2005, although 70% of children with both a comorbid mental health condition and JIA experienced negative peer relationships, a significant number of children and adolescents without a comorbid mental health

condition (42% of those with JIA only) also experienced negative peer relationships, suggesting that mental health difficulties may not be the primary determinant of peer difficulties in children and adolescents with chronic pain. It is important to note that none of the abovementioned studies examined the specific cause and effect relation between chronic pain, mental health concerns and peer relationships.

Two studies in this category suggest that acceptance by peers is important as a moderator in the relationship between peer difficulties, mental health factors and chronic pain. In 2004, Sandstrom and Schanberg (45) examined the associations among severity of juvenile rheumatoid arthritis, social competence and depressive symptomatology, and found that social rejection by peers moderated the relationship between pain severity and depressive symptoms for children and adolescents with juvenile rheumatoid arthritis. Social rejection exacerbated the impact of pain on depressive symptoms for these children and adolescents, whereas social support from classmates and teachers was associated with fewer depressive symptoms in children with RAP (46). More research is needed to examine the protective role of peers for children and adolescents with chronic pain.

Overall, mental health factors and chronic pain were associated with increased rates of peer relationship difficulties. However, mental health factors alone did not account for all the differences in social or peer relationships, meaning that the presence of chronic pain may have a unique impact. Additionally, peers may play a protective mental health role for children and adolescents with chronic pain.

Primary focus: Other

Nine studies were categorized as 'other' due to the fact that their primary focus did not fit into one of the three categories discussed above (Table 4). The primary purpose of these studies ranged from population studies examining physical and behavioural correlates associated with headaches (47) to mothers' attributions of the causes and remedies for their child or adolescent's abdominal pain (48). Similar to most of the other studies discussed in the present review, peer relationships of children and adolescents with chronic pain were assessed using subscale items on more global measures of behaviour and/or psychosocial functioning. Findings with respect to peer relationships in this group of studies were mixed, but generally indicated that there was some negative impact on peer relationships for children and adolescents with chronic pain.

The two studies that employed population-based samples found that victimization and school stress were significantly positively correlated with nonmigraine headaches in girls, whereas migraine headaches in boys were significantly positively correlated with difficulties in getting along with peers (47); and that students with more frequent pain had fewer friends than those with infrequent pain (49). Although Larsson and Sund (49) reported in 2007 that the number of friends did not change over the year of the study, they did not provide information regarding actual quantities of friends; therefore, it is unclear how many fewer friends these children have in relation to healthy children.

The two studies that used school- or clinic-based populations indicated that the frequency of meeting friends was negatively affected for children experiencing pain. In their 2005

school-based study, Roth-Isigkeit et al (50) found that children and adolescents experiencing abdominal pain and headache reported almost twice the amount of pain-related interference with meeting friends compared with those experiencing back or limb pain. In clinical samples of children and adolescents with chronic pain, those with headache-only pain reported the highest modifications to contact with friends (eg, having to stop, reduce or adjust contact with peers) compared with those with musculoskeletal (MSK) pain and abdominal pain (51). Moreover, Konijnenberg et al (51) found in 2005 that participants with unexplained chronic pain (regardless of pain location) had considerably lower levels of physical and role/social functioning than previously published school samples that included subgroups with other chronic diseases, suggesting that chronic pain interferes with peer relationships in a way that other chronic illnesses without pain do not.

Two of the nine studies in this category focused on adolescents with idiopathic MSK pain and found differing results. In 2004, Guite et al (52) found no differences in the social acceptance and close friendship subscales of the Self-Perception Profile for Adolescents between a clinical sample of adolescents with idiopathic MSK and normative adolescent samples. Conversely, in 1997, Flato et al (53) found that participants with idiopathic MSK pain who were still experiencing pain at 10-year follow-up had poorer psychosocial scores, based on the Children's Global Assessment Scale or the Global Assessment Scale, than participants with juvenile chronic arthritis. Although peer relationships are a factor in these scales, other factors, such as functioning at work or school and family functioning, are also included (53), making it difficult to determine the degree to which each of these factors impacted the psychosocial well-being of the participants.

The last three studies within this category investigated social functioning in children and adolescents with recurrent unexplained abdominal pain. In a 1999 study examining maternal attributions for the causes of and remedies for their child or adolescent's abdominal pain, Claar and Walker (48) found that although mothers believed that peer relationship difficulties contributed to their child's abdominal pain, they believed that other nonsocial factors, such as too much acid in the stomach or improper eating, contributed more. Additionally, mothers whose children had unexplained pain believed that problems with peers at school contributed less to their child's pain (8.2%) than mothers whose children had organic abdominal pain (12.7%). The other two studies identified the benefits of positive peer relationships for children and adolescents with RAP. Friend support was associated with improved self-perceived social competence for children with RAP (54), and greater social support from peers was noted to buffer the effects of negative family events on the health of these children and adolescents (55). These three studies suggest that peer relationships can be a source of both stress and support for children with abdominal pain.

In summary, all but one study in this category found some form of impact on social functioning and/or peer relationships for children and adolescents with chronic pain. Pain resulted in decreased opportunities to engage with friends, having fewer friends and increased rates of peer victimization. However, supportive peers may help buffer some of these negative effects.

TABLE 4
Studies with a primary focus categorized as 'other'

Author, year (reference), country, study type	Sample, age, sex	Measures	Findings
Claar and Walker, 1999 (48), USA, case comparison study	n=153; organic disease, n=55; unexplained abdominal pain, n=98; no controls 6–18 years Organic disease, 52.7% girls; unexplained abdominal pain, 61.2% girls	Parent: Inventory of Causes for Abdominal Pain, Inventory of Remedies for Abdominal Pain	Most mothers attributed causes and remedies of both types of abdominal pain to factors other than peer relationships. 8.2% of mothers in unexplained pain group indicated problems with peers at school contributed to their child's pain. 12.7% of the mothers in organic abdominal pain group indicated difficulties with peers as a contributing factor to their child's pain
Flato et al, 1997 (53), Norway, correlation study	n=109 MSK pain patients; idiopathic, n=37; JCA, n=72 ≤16 years on initial assessment, follow-up 9 years later Idiopathic MSK, n=24 girls; no sex information on JCA group	Rheumatologist: Clinical and laboratory data, and radiographic examinations. Adolescent: Childhood Health Assessment Questionnaire, Health Assessment Questionnaire, author-administered semistructured psychiatric interview	Idiopathic MSK pain group still experiencing pain at follow-up had worse psychosocial scores than JCA group. Psychosocial issues included school, friends and family functioning
Guite et al, 2004 (52), USA, correlation study	n=115 MSK pain patients 13–18 years 96 girls	Parents: Family demographics, onset and duration of adolescents' pain problem, school absences, Hollingshead Four-Factor Index of Social Status. Adolescents: Pain VAS, FDI, SPPA	SPPA subscales related to peers and friend relationships minimally correlated with pain or functional disability. Global self worth contributed minimally to disability variance
Konijnenberg et al, 2005 (51), Netherlands, correlation study	n=149 HA, MSK pain and abdominal pain patients 8–18 years 73% girls	Child: CSI, Child Health Questionnaire – Child Form 87, Pediatric Pain Questionnaire	40% of participants had ↓ or adjusted contact with friends. Two participants reported complete isolation from friends. 14% of children with school absences missed 3 or more consecutive months. Suffering from HA resulted in ↑ interference with role/social functioning compared with MSK or abdominal pain; social impairment evolved after sport and school activities were affected. Children with unexplained chronic pain had considerably ↓ levels of physical and role/social functioning compared with a previously reported school sample including subgroups with chronic diseases
Larsson and Sund, 2007 (49), Norway, longitudinal correlation study	n=2360 (representative school sample of adolescents) with multiple pain types (HA, abdominal, back and limb pain) 12–15 years 50.5% girls	Adolescents: Demographic characteristics, social factors (number of friends 0–1 or 2 or more, divorced parents, school absence and reduced leisure time activities), pain symptoms, daily hassles, Mood and Feelings Questionnaire (youth self-report)	Students with ↑ frequent pain (regardless of number of sites) had fewer friends than those with infrequent pain at both time 1 and one year later at time 2
Metsähonkala et al, 1998 (47), Finland, population-based, nonselective, prospective cohort study	n=3580; migraine HA, n=95 (2.7%); nonmigraine HA, n=977 (27.3%); HA free, n=2246 (62.7%) 8–9 years Girls – migraine 43.2%, nonmigraine 49.7%	Parents: Questionnaire to capture general health status, school attendance and HA information	Peer relationship difficulties strongly associated with migraine in boys. Bullying and school stress significantly associated with nonmigraine HA in girls
Roth-Isigkeit et al, 2005 (50), Germany, school-based cross-sectional study	n=749 multiple pain types 4–18 years 52.5% girls	Older children: Luebeck Pain-Screening Questionnaire – version 2, VAS for pain, 'smiley' faces scale. Adolescent: Luebeck Pain-Screening Questionnaire – version 3, VAS for pain, 'smiley' faces scale. Parent: Luebeck Pain-Screening Questionnaire – version 1 (parent version for young children), VAS, 'smiley' faces scale	83% had pain within the previous 3 months, with 54.4% having frequent pain over the previous 3 months. 46.7% of the total participants did not meet with friends due to pain at least once (32.9% sometimes, 13.8% often missed out meeting friends due to pain). Those with HA and abdominal pain missed meeting friends more than those with limb or back pain. Girls between 13–15 years of age had ↑ pain-related interference with friends; no sex differences in other age groups (4–9 years; 10–12 years; 16–18 years)

Continued on next page

In studies with a primary focus of 'other', the aim of the studies included association of risk factors with pain, mother's attributions of their child's pain, etc. CSI Children's Somatization Inventory; FDI Functional Disability Inventory; HA Headache; HRI Health Resources Inventory; JCA Juvenile chronic arthritis; MSK Musculoskeletal; RAP Recurrent abdominal pain; SPPA Self-Perception Profile for Adolescents; SPPC Self-Perception Profile for Children; VAS Visual analogue scale

TABLE 4 – CONTINUED
Studies with a primary focus categorized as ‘other’

Author, year (reference), country, study type	Sample, age, sex	Measures	Findings
Walker et al, 2002 (54), USA, correlation study	n=151 RAP patients 8–18 years 57% girls	Child: Social consequences of pain, CSI, SPPC, Multidimensional Scale of Perceived Social Support	Friend support had a significant, moderate, positive correlation with self-perceived academic and social competence for children with RAP
Walker et al, 1994 (55), USA, longitudinal correlation study	n=197 chronic abdominal pain patients; organic pain, n=68; specific pain syndrome, n=26; nonspecific pain syndrome, n=103 6–18 years 59% girls	Parent: Family Inventory of Life Events, HRI, Symptoms Checklist 90. Child: CSI, SPPC. Teacher: HRI	Social competence had a significant, moderate, negative correlation with child symptoms at time 1 and time 2. Interaction between negative family life events and social competence (social skills and peer acceptance) on CSI scores. High social competence (peers) appears to buffer negative effects of family life events for children with chronic abdominal pain

In studies with a primary focus of ‘other’, the aim of the studies included association of risk factors with pain, mother’s attributions of their child’s pain, etc. CSI Children’s Somatization Inventory; FDI Functional Disability Inventory; HA Headache; HRI Health Resources Inventory; JCA Juvenile chronic arthritis; MSK Musculoskeletal; RAP Recurrent abdominal pain; SPPA Self-Perception Profile for Adolescents; SPPC Self-Perception Profile for Children; VAS Visual analogue scale

DISCUSSION

Despite two decades of research examining chronic pain in children and adolescents, very little is known about the peer relationships of this group of children. As part of the current review, only nine studies were specifically designed to assess peer relationships in this population. Based on the available research, it appears that peer relationships may be problematic for some children and adolescents with chronic pain; however, findings are not uniform across studies or pain conditions, making it difficult to draw broad conclusions regarding the exact nature of peer relationships in this population. For example, in some studies, children with migraines were found to have more difficulties with peer relationships, but other studies found that tension headaches appeared to be more predictive of peer difficulties. A similar pattern was observed in studies of children and adolescents with abdominal pain, in that some studies reported no differences (or unexpected differences) between organic and nonorganic abdominal pain, whereas other studies indicated that children and adolescents with nonorganic abdominal pain were subjected to increased rates of peer victimization.

Overall, children and adolescents with chronic pain were found to participate in fewer peer activities, have fewer friends, and were perceived as being more isolated than their healthy peers. Findings from two studies (17,18) indicated that children and adolescents with chronic pain were perceived as less likeable by their peers, but this pattern was not observed among school-age children when assessing the likeability of a hypothetical peer in a series of vignettes (22) or a more recent study (16) of children and adolescents with SCD. This being said, it remains unclear whether participating in fewer activities or having fewer friends translates into poor friendship quality, nor is it clear whether decreased participation or fewer friends negatively impacts a child or adolescent’s pain. Pain limits the individual’s engagement in activities; however, research to date has not identified whether pain becomes worse when the individual does not engage in these activities.

Despite pain being a major symptom in all of the health conditions described above, it is difficult to draw conclusions regarding the impact of pain intensity, frequency and duration on peer relationships because most studies did not examine these pain factors and/or used various pain measures. For

example, among the studies in the peer relationship category, few pain-specific factors were assessed. In a study of adolescents with JIA (15), 47% of the participants had moderate to severe disease, as well as active disease, but ratings of pain variables were not obtained. Additionally, with respect to adolescents with JFS (18), severe pain in at least five of 11 tender points constituted part of the study inclusion criteria; however, no ratings of pain intensity or frequency were provided. In 2008, Vannatta et al (19) included reports of pain frequency and intensity, but did not include these ratings in their study because they did not correlate significantly with scores on the peer relationship measures. In their original 1996 study of children and adolescents with SCD, Noll et al (17) collected ratings of pain frequency, but not intensity, as part of a general measure of disease severity. Given that disease severity was not found to be significantly associated with scores on friendship measures, the authors chose not to include pain or disease severity when replicating this study. As part of their 2007 study of victimization of children and adolescents with RAP, Greco et al (14) asked participants to complete the Abdominal Pain Index, a tool that measures frequency, duration and intensity of abdominal pain; however, no discussion of these variables was provided. Finally, in 2004, Wagner et al (21) included pain intensity ratings (measured on a 100 mm visual analogue scale) as a single variable, and were therefore able to investigate the association between pain ratings and scores on social measures. Interestingly, their study found that pain intensity was a contributing factor to how participants viewed peer interactions. Studies included in the three other categories had similar deficiencies in reporting pain variables, which complicates our understanding of pain’s impact on peer relationships in youth challenged by chronic pain.

In addition to the variety of methods and primary focuses of the studies included in the present review, direct comparison between studies is complicated by the range of pain types studied, the age range within studies and the variety of measures used to assess social functioning. Studies focusing specifically on peer relationships made use of self-report measures and some included peer-report measures, which was not the case in the other categories. All but one of the studies included in the current review were conducted in western countries and, therefore, understanding cultural differences in peer relationships

for children and adolescents with chronic pain requires further study.

Although our intent was to extract child factors in addition to pain that may impact peer relationships, this was difficult because many of these factors were not assessed. In particular, the age range of participants is noteworthy because age ranged from four to 19 years, with most studies including both children and adolescents. The few adolescent-only studies included both early and late adolescent participants. Including participants of such diverse ages in a single study makes it difficult to detect developmental differences in peer relationships. The qualities one needs and desires within friendships develop as the individual's understanding of the world increases and his or her social needs expand (1).

Participants experienced five broad types of pain in the 42 studies reviewed: headache, abdominal pain, arthritic types of pain, SCD pain and chronic pain of unknown etiology. These types of pain represent both recurrent and continuous pain. None of the studies captured the recurrent or continuous nature of the participants' pain, leaving the underlying condition as the only way to determine whether the pain was recurrent or continuous. This being said, no one type of recurrent pain was found to negatively impact peer relationships more than another. Studies including chronic pain of unknown etiology did not differentiate recurrent from continuous pain within the participant group, meaning that it is unclear whether certain types of pain conditions affect peer relationships more than others. In 2007, Kashikar-Zuck et al (18) were the only group to include only participants whose pain could be characterized as continuous; results indicated that adolescents with JFS were perceived more negatively by their peers.

In trying to understand the causes of differences between adolescents with JFS and healthy peers, Kashikar-Zuck et al (18) suggested in 2007 that the prevalence of comorbid mental health conditions, such as increased anxiety, social withdrawal and depressive symptoms, may be a contributing factor in their findings. However, the cause and effect relation between JFS and mental health difficulties was not examined in their study, making it difficult to draw conclusions regarding the nature of this association. Additionally, the other studies (16,17,19) employing the same classroom measures did not suggest comorbid mental health conditions as contributing to the differences they found in peer relationships. However, the summary of findings within the primary focus of mental health difficulties suggest that comorbid mental health difficulties may add to peer relationship difficulties for children and adolescents with chronic pain. Therefore, more research is needed to examine the relationship between comorbid mental health difficulties, peer relationships and chronic pain.

In addition to comorbid mental health conditions as potential contributing factors to differences in peer relationships between adolescents with JFS and healthy peers, in 2007, Kashikar-Zuck et al (18) questioned whether unknown etiology could influence the peer relationships and peer perceptions of children experiencing chronic pain. Although the etiology of JFS is not as clearly understood compared with the etiology of JIA, SCD or migraine, in 2000, Guite et al (22) offered preliminary support for the assertion that underlying pain etiology may not be an important factor in determining likeability and peer acceptance of children and adolescents experiencing

chronic pain. Certainly, more research is warranted to better understand the relation between perceived pain etiology and peer perceptions of youth with chronic pain. It is possible that younger children remain concrete in their understanding of the underlying causes of pain; therefore, the underlying etiology is not a factor in determining their acceptance of an individual with chronic pain. Alternatively, it is possible that ongoing contact with children and adolescents experiencing pain may negatively impact relationships with healthy peers.

Most studies included in the current review used standard behavioural measures with social subscales (eg, CBCL, Children's Somatization Inventory, Child Depression Inventory, Pediatric Quality of Life Inventory, Functional Disability Inventory) to assess peer relationships and social functioning, and parent reports were the most common source of information. In studies that included self-report, the individual child or adolescent did not necessarily complete the measures containing the social subscale. The CBCL was the most frequently used measure of social functioning and was included in nine of the studies; the social subscale of this measure includes items tapping family and sibling engagement in addition to peer engagement, making it difficult to determine which specific factors contribute to social problems or competencies.

Little is known about the impact of chronic pain on the quality of peer relationships. It appears that children and adolescents with chronic pain are subjected to higher rates of victimization than healthy children (14,20,38), but population-based studies do not address the cause and effect nature of this association. That is, it is not clear whether the stress of victimization results in pain or whether children and adolescents with chronic pain are viewed as vulnerable and/or different, thus leading them to become targets for victimization (39,47).

In children and adolescents who do not suffer from chronic pain, it has been suggested that a reciprocal friendship can buffer the negative effects of victimization, negative family environments and depression linked to loneliness (2-4). Three studies illustrated the power of positive friendships, in that they may improve pain and buffer negative family interactions (55) or peer effects (46) on a child's abdominal pain and improve self-perceived social competence (54). Several unanswered questions remain with respect to the nature of reciprocal friendships in youth with chronic pain, namely whether protective effects of reciprocal friendships exist for other pain types; the manner in which reciprocal friendships exert their protective effects; the number of reciprocal friendships needed to exert a protective effect on a child or adolescent who is more isolated from activities and school compared with healthy peers; and the impact of childhood chronic pain on adult peer relationships. Additionally, it is unclear whether children with chronic pain value different qualities in their peer relationships than healthy children.

Examination of qualitative research was beyond the scope of the current review. As noted above, some of the concerns raised by children and adolescents with chronic pain within such studies indicate that peer relationships can be challenging for this population. In addition to missing out on activities, children and adolescents voiced experiencing disbelief by some friends and nonfriend peers, and having friends that were only

there on the good days. Lack of pain knowledge and understanding by peers was noted as a source of frustration (7,9,56). Some children and adolescents described supportive, understanding friends (7,56) who provided them with opportunities to engage in conversations and other activities that helped them to forget their pain condition (56) or distracted them during pain exacerbations (7). The measures used in the quantitative studies reviewed would not have adequately assessed many of the concerns or benefits of peer relationships raised by these adolescents.

FUTURE DIRECTIONS

Future research should focus on the development of specific measures to assess peer relationships in children and adolescents with chronic pain using ratings from a variety of sources (eg, parents, self, teachers and peers). This multidimensional approach to assessment is ideal because it is possible to assess the individual across multiple settings. Additionally, given the personal nature of friendships, it is possible that informants such as parents or teachers would lack some degree of insight into the quality and quantity of the child or adolescent's peer relationships. Additionally, more studies could make use of the pain diary method to examine interpersonal factors impacting pain.

Although five of the studies (15-19) included in the present review used classroom measures that included items related to likeability, reciprocal friendships and leadership skills, it is plausible that the friends of a given participant were in a different class or associated with a context other than school. With this in mind, it is important to assess relationships other than with classmates to gain a complete understanding of social functioning in children and adolescents with chronic pain. Many of these studies concentrated on the number of friendships, which may be indicative of an individual's popularity as opposed to true mutual friendships. More research specifically investigating the dyadic reciprocal friendships of children and adolescents with chronic pain is needed to understand whether these children experience differences compared with children and adolescents without pain. Victimization and chronic pain were found to be associated in studies from the four primary focus categories, but empirical research is needed to examine the relationship between pain and victimization rates. No longitudinal or developmental studies were retrieved as part of the literature search for the current review; therefore, it is difficult to determine whether living with chronic pain as a child or adolescent impacts adult peer relationships. It is also unclear how pain affects the development of relationships or social skills. As noted previously, most studies included a very wide range of ages; studies examining peer relationships in a more limited range of participants would perhaps provide insight that remains elusive in studies involving wide age ranges.

Finally, inconsistencies in reporting pain-related characteristics made it difficult to determine which components of

pain were most problematic in social relations with peers. Future research would benefit from a standardized method of examining pain characteristics, thereby facilitating direct comparisons between children with chronic pain and healthy controls. A more direct examination of the relation between specific pain factors and peer relationships could potentially lead to more direct and streamlined interventions for children and adolescents challenged by chronic pain. A call for standardized pain assessment in research has been made in the area of clinical trials and is being addressed by the Pediatric Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (57). Although more research is needed to ascertain which pain characteristics are most appropriate to measure when examining peer relationship outcomes, it is important that key pain information, such as pain intensity, frequency and duration, be assessed and reported.

CONCLUSION

Despite acknowledging the importance of peer relationships in children and adolescents with chronic pain, little research exists that specifically and empirically examines the impact of chronic pain on peer relationships. Studies included in this descriptive systematic review suggest that children and adolescents with chronic pain may have fewer friends, are more isolated, and may be subjected to increased rates of victimization by peers compared with children and adolescents without pain. However, the range of study objectives and measures used makes it difficult to conclusively identify which pain factors contribute to negative or positive peer relationships, and how negative or positive peer relationships impact a child or adolescent's pain experience. More directed empirical research will ultimately lead to increased awareness of peer relationship challenges for children with chronic pain among patients, parents, clinicians and researchers, and will ensure positive outcomes for youth challenged by pain.

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