

Let's get physical: Recent research on relations of adolescent peer victimization with psychosomatic symptoms, sleep, and body weight

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Abstract

Purpose: Victimization by peers is known to have a detrimental effect on emotional and educational adjustment. Yet, there is also a sparser research literature on the potential negative effects of peer victimization on physical health. Our purpose was to draw from meta-analyses and studies of peer victimization and physical health (including psychosomatic symptoms, sleep, and body weight) to highlight key findings and future directions in the area. We also briefly summarize research findings that associate peer victimization with stress physiology.

Method: Narrative research summary.

Results: Peer victimization is associated with poorer physical health among youth, including more somatic complaints (e.g., health concerns, pain) and disrupted sleep. Also, victimized youth are at more risk than other youth for increasing weight problems. These effects seem to be both immediate and long-term, with associations found into later adolescence and even adulthood.

Conclusion: Future directions for research are proposed that take a biopsychosocial perspective, by integrating the domains of physiology, mental health, and physical health, in order to test holistic models that better illuminate the negative effects of peer victimization. Additionally, future research should continue to address potential mechanisms,

such as neurophysiological reactions and recovery from stressful events.

KEYWORDS

peer problems, physical aggression, psychosomatic symptoms, relational aggression, sleep, weight

1 | INTRODUCTION

Throughout the lifespan, having close relationships with others and a sense of belonging to a group or a community have been described as some of the most important foundations for optimal mental and physical health. However, it is well-known that such positive social experiences can be intermittent or even elude some children and adolescents, with a substantial minority reporting that they feel rejected, bullied, and victimized by their peers at school (McDougall & Vaillancourt, 2015; Zimmer-Gembeck, 2016). For instance, in the USA and Canada, about 23% of boys and 17% of girls can be classified as a bully, a victim, or both a bully and a victim, with similar rates in Australia and New Zealand (Cross et al., 2009; Denny et al., 2015). Yet, the experience of being bullied and victimized is not confined to only some regions of the world; it is a global phenomenon, with one study of 40 countries finding the prevalence of bullying and aggression (including both personal bullying behavior and victimization) was lowest in some Scandinavian countries (e.g., Sweden, Iceland) and highest in other parts of Europe (e.g., Greece, Estonia, and Lithuania; Craig et al., 2009; Harel-Fisch et al., 2011).

The terms bullying, aggression, and victimization will be used throughout this summary, and reference will be made to physical victimization, overt victimization, and relational victimization. Throughout, we attempt to use the terminology that aligns with the terms used in the papers we describe. In general, however, each of these terms has a distinct definition. Bullying has been defined as an aggressive act that is repeatedly perpetrated and involves a power imbalance between the victim and the bully (Olweus, 1993). Physical aggression and victimization include physical acts against others enacted with the intention of causing physical harm, whereas overt aggression and victimization usually include both acts to cause physical harm and direct verbal insults (e.g., yelling, calling names). Relational and social aggression include more indirect forms of harm, typically via social relationships, with relational victimization specifically defined as being the target of acts that aim to harm relationships or status with peers (see also Crick, Casas, & Nelson, 2002; Desjardins & Leadbeater, 2011; Zimmer-Gembeck & Pronk, 2012). Thus, relational and social victimization includes acts designed to hurt relationships and ostracize and marginalize youth (e.g., social exclusion; Zimmer-Gembeck, Pronk, Goodwin, Mastro, & Crick, 2013).

Victimization rates change with age, with global peak prevalence estimated to be at about age 14 or 15 (Volk, Camilleri, Dane, & Marini, 2012). Perhaps even more important, however, is that the most prevalent form of victimization seems to change with age, such that overt aggression and victimization decrease throughout the teenage years, especially for girls, while at the same time relational or social aggression and victimization remain high and relatively stable (and may even increase) as children get older (Card, Stucky, Sawalani, & Little, 2008; Craig et al., 2009; Harel-Fisch et al., 2011).

Regardless of the form, when children experience peer victimization, these acts are not usually benign. Many studies conducted over the last 50 years show that peer victimization is associated with elevated symptoms of emotional maladjustment and mental health concerns among children and adolescents. These symptoms and negative outcomes include depressive and anxiety symptoms, body image concerns and eating disorders, and suicidal ideation (Bierman, 2004; Lavell, Webb, Zimmer-Gembeck, & Farrell, 2018; Parker, Rubin, Erath, Wojslawowicz, & Buskirk, 2006; Rudolph & Asher, 2000; Webb & Zimmer-Gembeck, 2014). Such research findings support the notion that psychopathology can be an outcome of negative experiences within the peer system. Moreover, chronic

victimization, bullying, and rejection can have serious long-term negative effects on social cognition, personality, mental health, and social behavior (Lansford, Malone, Dodge, Petit, & Bates, 2010; McDougall & Vaillancourt, 2015; Wolke, Copeland, Angold, & Costello, 2013).

In parallel to the research on peer victimization and social and emotional outcomes, there has been a sparser but emerging body of research on the negative impacts of peer victimization in childhood or adolescence on concurrent or later physical health. Some of this research emerged as early as the 1970s, with the publication of seminal and widely cited longitudinal cohort studies that examined childhood social isolation in general (e.g., Berkman & Syme, 1979; Kaplan et al., 1994) or, more specifically, peer social isolation (e.g., lack of friends) as precursors of physical health outcomes in adulthood (e.g., Almquist, 2011; Caspi, Harrington, Moffitt, Milne, & Poulton, 2006). Building on this work, in the last 20 years, research has more specifically examined physical, verbal, or relational victimization by peers, rather than social isolation or lack of friends, as influencing physical health outcomes. There have been multiple meta-analyses and systematic reviews published in recent years that address these findings. For example, since 2005, comprehensive reviews have addressed topics such as how victimization by peers can affect physical functioning (Vaillancourt, Hymel, & McDougall, 2013; Wolke & Lereya, 2015), the association between peer victimization and sleep problems (van Geel, Goemans, & Vedder, 2016), and the association between obesity, weight stigmatization, and peer victimization (Griffiths, Wolke, Page, & Horwood, 2006; Puhl & Latner, 2007; see also Gray, Kahhan, & Janicke, 2009). Other reviews summarize what is known about victimization and headache (Gini, Pozzoli, Lenzi, & Vieno, 2014) and victimization and psychosomatic complaints in childhood (Gini & Pozzoli, 2013). Our aim in the current review was to provide some general descriptions of these areas of research, to provide a detailed summary of recent findings, and to identify where future research might be directed. To do this, we were guided by past reviews, along with the most recently published studies, to introduce the reader to many of these areas of study and the general findings.

Between January and June 2018, we scanned the literature by searching Medline and PsycInfo using the terms physical, somatic, pain, illness, weight, obesity, sleep, physiological, immune, cortisol, or biological combined with bully*, victimization (or victimisation), health, child*, adolescen* and peer*. We limited our search to publications from 2011 to June 2018, given that a number of reviews had been published summarizing earlier studies (e.g., Vaillancourt et al., 2013). However, we also included some reviews or widely cited studies published before 2011. The studies we included treated peer victimization as a predictor or an outcome of physical health in adolescence, and most of those we located considered psychosomatic complaints (e.g., general health concerns, pain, illness) (see Table 1). We summarize this research on psychosomatic complaints in the next section. We follow this section with two additional sections, which describe the studies we located that focused on peer victimization as associated with sleep and body weight, given that sleep disturbance and excess body weight are features of childhood and adolescence that have been implicated in other physical health problems (e.g., Gradisar, Gardner, & Dohnt, 2011; Gunnell, Frankel, Nanchahal, Peters, & Davey, 1998; Puhl & Latner, 2007). Although all of these are emerging fields of research, there has been sufficient attention directed toward these areas so that we were able to draw some conclusions about the relationships of peer victimization during childhood and adolescence with health-related concerns. We focus primarily on the associations of peer victimization with physical health, sleep, or body weight as concurrent correlates or longitudinal outcomes, but also draw attention to more complex associations when supported by the research, such as potential mediators linking peer victimization to physical health or bidirectional associations between peer victimization and physical health.

Finally, as part of this summary, we draw conclusions about the robustness of evidence and highlight some strengths and limitations of this research. We follow these conclusions with a brief overview of research on peer victimization and stress physiology, using this as a bridge to a discussion of potential mechanisms via which peer victimization might impact on physical health. We end by proposing one general and three more specific future research directions.

TABLE 1 Focus and design characteristics for reviewed studies of psychosomatic symptoms and concerns, sleep, and body weight

Authors	Physical health construct	Bullying construct	Design & Country	N	Age	Victimization measure(s) analyzed; Reporter
Psychosomatic symptoms						
1 Biebl et al. (2011)	Overall physical health T3 Physical Health Q Self-report	General victimization; subgroups: chronic victims, desisters, late-onset victims, non-victims	Longitudinal USA	65-70	Age 5 at T1; Age 12-20 at T3	
2 Bogart et al. (2014)	Overall physical health Physical health subscale of Pediatric Quality of Life Inventory Self-report	Physical and emotional victimization	Longitudinal USA	4,297	Grades 5, 7, 10	6-item Peer Experience Questionnaire—assesses physical and emotional victimization in the past 12 months; Self-report
3 Dahlqvist et al. (2016)	Somatic symptoms CES-D depression scale—one factor (of three) was somatic symptoms Self-report	Harassment and victimization	Longitudinal Sweden	2,342	Age 14-16 years	14 items from a measure used in previous research—items asked how often people had experienced a range of behaviors in past 6 months; EFA showed 3 factor solution—physical, verbal name-calling, and public displays; Self-report
4 Day et al. (2017)	Presence or absence of 24 chronic health conditions (e.g., high blood pressure, cardiovascular disease, cancer, arthritis) Count of total conditions used in analyses Self-report	Physical and verbal victimization	Longitudinal Canada	T1 179 extremely LBW & 145 matched, normal BW; at age 29-36 retained sample was 100 LBW and 89 normal BW	Ages 8, 22-26, and 29-36	Participants at age 22-26 retrospectively reported on experiences with physical and verbal victimization before age 16 (Childhood Exposure to Violence Questionnaire); Self-report (retrospective)

(Continues)

TABLE 1 (Continued)

Authors	Physical health construct	Bullying construct	Design & Country	N	Age	Victimization measure(s) analyzed; Reporter
5 Janssens et al. (2011)	Somatic complaints Subscale of the YSR Self-report	General victimization	Longitudinal The Netherlands	2,149	Approximately age 12–16 years	Peer nomination of who bullied me; coded as bullied or not; Peer-report
6 Knack et al. (2011)	Composites of frequency of health problems, severity of health problems, visits to nurse/doctor, abdominal pain, all problems Self-report and parent-report	Peer physical and relational victimization; direct and indirect victimization; Created composites of victimization—variable and person-centered (using cluster analysis)	Cross-sectional USA	72–107	Grade 5–8	Variable composites and victimized/non-victimized cluster groups; Self-report and parent-report
7 Kretschmer, Barker, Dijkstra, Oldehinkel, and Veenstra (2015)	Somatic complaints consisted of 10 items, such as "I have headaches for no specific reason" Self-report	General victimization	Longitudinal The Netherlands	1,816–2,935	Age 11–16 years	"Were you bullied?" The teacher assessment three-item scale; Self-report and teacher-report
8 McGee et al. (2011)	Somatic complaint subscale of the YASR, age 21 Self-report	Bullied, age 14	Longitudinal Australia	1,694	Age 14 and 21	One item at age 14 "ever been bullied by kids at school" with frequency from never to almost every day or more; subsample of 830 reported more info at age 15; Self-report
9 Nixon et al. (2011)	Somatic complaints Headaches, felt tired, stomachaches, not feel like eating, trouble sleeping Self-report	Physical and relational victimization	Longitudinal USA	1,595	Grades 5–8	7 items; Self-report

(Continues)

TABLE 1 (Continued)

Authors	Physical health construct	Bullying construct	Design & Country	N	Age	Victimization measure(s) analyzed; Reporter
10 Sigurdson et al. (2014)	How do you evaluate your own health? Also assessed bodily pain and headaches Self-report	Teased, physically assaulted, frozen out of friendships; also aggression toward others	Longitudinal Norway	2,464 at T1; 1,266 at T4	Bullying involvement assessed at age 14–15; general health outcomes assessed at age 26–27	Teased, physically assaulted or frozen out of friendships in past 6 months; dichotomized as once a week or more versus never or 1–2 times; Self-report
11 Stuart and Jose (2014)	One item measuring poor health status and one item measuring presence of a long-term illness in late adulthood	Overall bully, victim, bully-victim, and non-involved	Longitudinal Scotland	610 (305 in each matched condition)	Bully at age 7 years old, outcomes in middle adulthood	Bullying and victimization; teacher report of bullying in childhood; self-report of victimization in adulthood
12 Vernberg et al. (2011)	Visit counts for health complaints (somatic, illness, injury) Physical health records taken by nurse	Overt and relational victimization & aggression	Cross-sectional USA	590	Grades 3–5	Peer Experiences Q; Self-report of victimization, peer report of aggression
13 Wolke et al. (2013)	Physical illness, serious accident, HIV, BMI, smoking, perceived poor health, high illness contagion risk, and slow illness recovery Self-report (interview)	Bullied or teased	Longitudinal USA	1,420	Three cohorts aged 9, 11, and 13 at T1	Interview—bullied or teased in 3 months prior; then asked how often in the school setting; Self-report and parent-report (interviews)

(Continues)

TABLE 1 (Continued)

Authors	Physical health construct	Bullying construct	Design & Country	N	Age	Victimization measure(s) analyzed; Reporter
SLEEP						
14 Chang, Wu et al. (2017) (see also Chang, Chang et al., 2017)	Sleep problems	General Victimization	Longitudinal Taipei & Taiwan	2,006	Age 14–16 years	Items concerning classmates: hit them, purposely exclude them from other peer groups, or spread a false rumor about them; Self-report
15 Donoghue and Meltzer (2018)	Sleep problems Sleep hygiene, sleep disturbances, and sleep patterns over the past week Self-report	Verbal, physical, social, cyber victimization, and bullying	Cross-sectional USA	885	Age 14–17 years	Multiple items to assess being victimized and bullied, in-person or online, in the past month; Self-report
16 Tu et al. (2015)	Sleep minutes; Sleep efficiency; Sleep habits Actigraphy to measure sleep minutes and efficiency Sleep habits self-reported	Peer victimization	Cross-sectional slice of longitudinal study USA	252	Mean age 15.8 years	Physical and relational victimization; Self-report
17 Tu et al. (2019)	Sleep quality Four items from the Sleep-Wake Problems Scale Self-report	Peer victimization	Longitudinal USA	123	Grades 5 and 6 students	Physical and relational victimization; Self-report, parent-report, and teacher-report

(Continues)

TABLE 1 (Continued)

Authors	Physical health construct	Bullying construct	Design & Country	N	Age	Victimization measure(s) analyzed; Reporter
18 Wolke and Lereya (2014)	Sleep problems Measure developed for this study Self-report and parent-report	Bully/victim/bully-victim status	Longitudinal UK	6,796	Age 8–12/13 years	Bullying and Friendship Interview Schedule; Self-report
19 Herge et al. (2016)	Somatic complaints and sleep problems Somatic symptom subscale of YSR Sleep deficit and sleep excess items Self-report	Overt, relational, reputational, and cyber victimization	Longitudinal USA	1,162	Average age at T1=15.8 years; 3 times with 6 weeks between assessments.	Revised Peer Experiences questionnaire (relational, reputational, and overt victimization) + Cyber Peer Experiences questionnaire; rated experiences over the past 2 months; Self-report
20 Luntamo et al. (2012)	Headache, pain, sleep difficulties Self-report	Bullied as part of a constellation of problems	Cross-sectional Finland	2,215	Age 13–18 years	Frequency of bullying and being bullied in and outside of school (2 items each); Self-report
BODY WEIGHT						
21 Ames and Leadbeater (2017)	Height, weight; non-overweight versus other Self-report T1-T5 Interviewer measured T6	Physical, relational, verbal victimization	Longitudinal Canada	662	Age 12–18 years at T1	Social Experiences Q (Crick & Grotpeter); dichotomized to none versus sometimes/almost all the time; Self-report
22 Eisenberg et al. (2015)	Height, weight Categorized as non-overweight, overweight, obese Self-report	Bullied	Cross-sectional USA	122,180	Grades 8, 9, 11	Perpetration of physical and relational bullying; physical and relational victimization; formed 4 categories: no involvement, victim, perpetrator, perpetrator/victim; Self-report

(Continues)

TABLE 1 (Continued)

Authors	Physical health construct	Bullying construct	Design & Country	N	Age	Victimization measure(s) analyzed; Reporter
23 Gooding et al. (2015)	Height, weight Self-report	Relational, physical, reputational victimization	Cross-sectional USA	147	Age 13–17 years	Child Trauma Q; one item of witnessing DV; 32-items Community Violence exposure; 18 items to overt, relational and reputation victimization (Peer Experiences Q); Self-report
24 Gray et al. (2014)	Obesity Medical record	General victimization	Cross-sectional USA	214	Age 6–17 years; classified as children (6–12) or adolescent (13–17)	Social Experiences Q, 15 items to assess overt, relational victimization. Analyzed as total victimization; Self-report
25 Jeong et al. (2016)	Height, weight 4 groups: underweight, normal weight, overweight, obese groups Self-report	Emotional, physical victimization	Cross-sectional USA	6,578	NR	Groups: no victimization, emotional victimization only or physical victimization with or without emotional victimization; Self-report
26 Lister et al. (2015)	Height, weight at age 15 Reporter NR	General victimization	Longitudinal Peru	714 (680 with data at age 8 and 15)	Age 8, 12, 15 years	One item "picked on or bullied" at age 8, "tease me" or "bullied by peers"; Bullying at T1 or T2 but not reported at T2 or T3 categorized as outgrowing victimization. Categorized into groups based on victimization. At age 8 and 15 (no/no, yes/no, no/yes and yes/yes); Parent-report at age 8. Child- and parent-report at age 12. Child at age 15.

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TABLE 1 (Continued)

Authors	Physical health construct	Bullying construct	Design & Country	N	Age	Victimization measure(s) analyzed; Reporter
27 Mamun et al. (2013)	Height, weight at age 14 and 21; Researcher measured	Bullied	Longitudinal Australia	1,694	Bullying measured at age 14; BMI assessed at age 21	One item at age 14 "ever been bullied by kids at school" with frequency from never to almost every day or more; subsample of 830 reported more info at age 15; Self-report
28 Pryor et al. (2016)	Height, weight at 6, 7, 8, 10, and 12 years Used to form three trajectories: early onset, late onset, never overweight; Researcher measured	Verbal, physical victimization	Longitudinal Canada	1,221	Age 6–13 years	3 items focused on verbal and physical victimization by peers at age 6, 7, 8, 10, and 12 years; Teacher-report
29 Qualter et al. (2015)	Height, weight at 3, 4, 5, 6, 7, 8, 10 years; Researcher measured	Verbal, physical, relational victimization	Longitudinal Canada	1,344	Age 3–10 years	3 items to assess verbal and physical victimization when reported by mother; 5 items to verbal, relational and physical aggression when reported by child; Mother-report at age 3, 4, 5, and self-report at 6, 7, 8, 10 years
30 Sutin et al. (2016)	BMI and waist circumference Measured by trained staff	Bullied	Longitudinal Australia	3,929	Age 6 assessment of bullying; BMI and waist circumference measured from age 4 to 15 years	One item—in the last 12 months, has your child been bullied at school? (yes/no response); Parent-report

2 | PEER VICTIMIZATION AND PHYSICAL HEALTH OUTCOMES

2.1 | Psychosomatic symptoms and concerns

Studies we located relied on a range of techniques and took a number of different approaches to considering the associations between peer victimization and physical health (see Table 1). In particular, physical health was measured in ways that ranged from general psychosomatic complaints to specific types of pain, illness, or injury. In some cases, health examinations and testing were completed. Some researchers conceptualized poorer or declining physical health as an outcome of peer victimization or other peer problems (e.g., Gini et al., 2014; Gustafsson, Janlert, Theorell, Westerlund, & Hammarström, 2012; Herge, Greca, & Chan, 2016; Sigurdson, Wallander, & Sund, 2014), whereas others compared the health complaints of victimized and non-victimized youth (e.g., Fales, Rice, Aaron, & Palermo, 2018; Pinquart, 2017; Wei et al., 2017). Understandably, the reasons for these different approaches were sometimes driven by the physical health concern under study—some concerns are amenable to being conceptualized as outcomes of victimization, such as headache or other physical pain or general somatic complaints, whereas other aspects of physical health status, such as chronic conditions or disability, seem to be factors that might draw negative attention from peers and prompt greater victimization.

What do the research findings suggest? Most generally, and despite some variability in findings, significant associations between peer victimization and health problems/complaints have been reported in multiple cross-sectional studies (see Tables 1 and 2). Elevated peer victimization has been concurrently associated with poorer general health (Sigurdson et al., 2014), more frequent and severe health problems (Knack, Jensen-Campbell, & Baum, 2011), more general somatic complaints (Herge et al., 2016; Vernberg, Nelson, Fonagy, & Twernlow, 2011), more illness (Vernberg et al., 2011), more injury (Vernberg et al., 2011), more abdominal pain (Knack et al., 2011; Luntamo et al., 2012) and more headaches (Luntamo et al., 2012; Sigurdson et al., 2014), as well as more health care use (Knack et al., 2011; Vernberg et al., 2011). The growing number of studies in the field has also meant that meta-analyses are becoming increasingly possible. One meta-analysis (Gini et al., 2014) focused on peer victimization and headache, supporting a link between them and concluding that youth who are bullied or victimized are about twice as likely to report headaches as their non-bullied peers (32.7% and 19.1%, respectively).

Notably, many recent studies have used longitudinal designs. Yet, these studies have not considered such a wide range of physical health conditions, and the findings are not as consistent, as in the cross-sectional studies described above. Some studies have found no association between earlier victimization and later physical health concerns (e.g., Janssens, Oldehinkel, Dijkstra, Veenstra, & Rosmalen, 2011; McGee et al., 2011), but others have found associations between peer victimization in the teenage years and (at least) some of the multiple measures that were used to assess physical health problems in later adolescence (Herge et al., 2016; Nixon, Linkie, Coleman, & Fitch, 2011) or in the mid-20s or beyond (Day et al., 2017). For example, in one study (which was published before 2011) being the target of verbal and physical harassment at the age of 12–13 years was linked to poorer general health at 16–17 years (Abada, Hou, & Ram, 2008). More specific associations between peer difficulties during childhood and adolescence and headaches (Biebl, DiLalla, Davis, Lynch, & Shinn, 2011; Sigurdson et al., 2014), bodily pain (Sigurdson et al., 2014), and chronic illness (Stuart & Jose, 2014) in adulthood have also been supported.

Associations between victimization and physical health can also be moderated by demographic characteristics, health history, or the type of victimization itself. In particular, participant sex has been found to be a moderator, affecting the strength of the association between peer victimization and physical health. For example, peer bullying or victimization was found to contribute to poorer health outcomes among females but not males in three recent studies (Biebl et al., 2011; Dahlqvist, Landstedt, Young, & Gådin, 2016; McGee et al., 2011), but Gini et al. (2014) reported in their meta-analysis that the association between peer victimization and migraine was weaker when a greater proportion of girls was included in studies. Regarding health history, one moderator may be low birthweight. Day et al. (2017) concluded that low birthweight may bring sensitivity that results in a

TABLE 2 Results for reviewed studies of psychosomatic symptoms and concerns, sleep, and body weight

	Authors	Results
Psychosomatic symptoms		
1	Biebl et al. (2011)	Significant group difference in physical health problems; found for females only when analyzed separately for girls & boys. Chronic victims more health problems than nonvictims; no other group differences. For specific health problems, group differences were found for headaches and sleep problems for girls, but not gastro and respiratory. Chronic victims more headaches than nonvictims & desisters; late-onset victims more headaches than non-victims. No differences in health between victimization groups among boys
2	Bogart et al. (2014)	Bullying associated with worse physical quality of life. Effect of being bullied in present (only) had a stronger association with physical quality of life than being bullied in the past (only). Being bullied in both the past and present versus being bullied in present had similar associations with poorer health outcomes
3	Dahlqvist et al. (2016)	Different types of sexual harassment generally correlated with somatic symptoms across time for boys and girls (although correlations more consistent for boys). SEM results for boys: somatic symptoms preceded name-calling. SEM results for girls: physical sexual harassment linked to future somatic symptoms (in reciprocal manner) and name-calling sexual harassment precedes somatic symptoms
4	Day et al. (2017)	In the combined sample, greater peer victimization was associated with higher levels of chronic health conditions. Analyses of low and normal birthweight (BW) groups separately showed that there was an association between peer victimization and more chronic health conditions for those of LBW but not for those of normal BW
5	Janssens et al. (2011)	235 were bullied (22%). Peer victimization was not associated with somatic complaints
6	Knack et al. (2011)	Victimization group had more health problems (frequency and severity), abdominal pain, and health visits relative to non-victimized group: Some differences in cortisol patterns throughout the day between groups; expected victimized to have lower daily levels of cortisol than non-victimized peers, especially in the morning (a flattened or blunted CAR). Victimized did show a lower CAR slope and, in turn, CAR slope was associated with fewer health problems. So, some of the effect of peer victimization on health problems was mediated via CAR slope, but was not full mediation
7	Kretschmer et al. (2015)	Victimized adolescents were at greater risk to develop internalizing problems between early and mid-adolescence than non-victimized adolescents
8	McGee et al. (2011)	No association between bullying at age 14 and somatic complaints at age 21 for all participants combined; also not significant in males. Females who reported more bullying at age 14 had more somatic complaints at age 21
9	Nixon et al. (2011)	Both physical and relational victimization had unique positive associations with somatic complaints. In a model not controlling for RV T2, RV T1 was positive associated with somatic complaints at T2 relative to T1
10	Sigurdson et al. (2014)	Those who reported more experience as victims of bullying reported poorer general health, more bodily pain, and more headaches than those non-involved; bully-victims also reported poorer health and more bodily pain than those non-involved

(Continues)

TABLE 2 (Continued)

	Authors	Results
11	Stuart and Jose (2014)	Bullies and bully-victims more likely to have a long-term illness relative to victims and non-involved groups
12	Vernberg et al. (2011)	Controlling for significant confounds (grade & gender), victimization was related to all health problems—somatic complaints, illness, injury. Similar findings for aggression in separate models; one victimization x aggression interaction was found for illness visits, with victimization related to more illness visits only among children low or moderate in aggression
13	Wolke et al. (2013)	Bully-victims have an elevated likelihood of serious illness, regular smoking, illness contagion, illness recovery, and slow illness recovery. Victims were elevated on regular smoking. When health outcomes were combined, victims and bully-victims showed poorer health than others. Chronicity of victimization did not impact health outcomes for victims
SLEEP		
14	Chang, Wu et al. (2017) (see also Chang, Chang et al., 2017)	Peer victimization elevated the risk of antisocial behavior via increased levels of sleep problems
15	Donoghue and Meltzer (2018)	Victims and bully/victims reported more sleep disturbance than bullies and others. These differences were found for all forms of victimization
16	Tu et al. (2015)	Peer victimization was correlated with self-reported sleep-wake problems, but not associated with objectively measured sleep minutes or sleep efficiency
17	Tu et al. (2019)	Youth reported and parent reported victimization was associated with lower sleep quality. In multivariate analysis examining all reports of victimization and control, self-report victimization was associated with lower sleep quality 10 months later
18	Wolke and Lereya (2014)	Being bullied at age 8 predicted having nightmares or night terrors at age 12–13 years. Being a chronic victim was especially strongly associated with both nightmares and night terrors. Being a bully/victim also increased the risk for any parasomnia at ages 8 or 10 years (8 years. In contrast, bullies had no increased risk for any parasomnias
PSYCHOSOMATIC SYMPTOMS and SLEEP		
19	Herge et al. (2016)	All types of victimization were positively correlated with sleep deficits, sleep excess, and somatic complaints (correlations typically weak; strongest with somatic complaints—around 0.20–0.25). The association between T1 relational victimization and T1 reputational victimization and T3 somatic complaints was mediated by T2 depression. T1 cybervictimization was directly associated with T3 somatic complaints. The same patterns were found when T3 sleep excess and T3 sleep deficits were included as outcome variables. Association between T1 relational victimization and T3 somatic complaints was mediated by T2 social anxiety (the same pattern was found when T3 sleep deficits and T3 sleep excesses included as outcome variable)

(Continues)

TABLE 2 (Continued)

	Authors	Results
20	Luntamo et al. (2012)	In the multivariate model, victimization predicted headache, abdominal pain and sleep disturbance. They suggest "in the present study, victimization was associated with all three outcome variables in a dose-response relationship, even after controlling for the confounding variables." No significant effects were found for bullying
BODY WEIGHT		
21	Ames and Leadbeater (2017)	Used time varying effect model to examine associations at each age. Between ages 15-21, males who were overweight were not more physically victimized but females reported more physical victimization. No associations of overweight with relational victimization. Overweight youth reported more verbal victimization than others between the ages of 15-21 and 25-28
22	Eisenberg et al. (2015)	Overweight and obese boys and girls were more likely perpetrators of physical bullying relative to non-overweight peers (18.1% and 19.9% for boys relative to 15.2%; 12% and 15.6% for girls relative to 7.9%). No group differences in relational bullying. Slight and significant difference in being perpetrator/victim when overweight or obese group, relative to nonoverweight group for both boys and girls (difference of about 1% between non-overweight and overweight and 2% between nonoverweight. and obese for boys; 3% between nonoverweight and overweight. for girls, and 4% between nonoverweight. and obese for girls)
23	Gooding et al. (2015)	21% overweight or obese (11% overweight, 10% obese); Peer victimization was not significantly associated with BMI z-score either prior to or after controlling for demographics and confounds
24	Gray et al. (2014)	Obese group reported more peer victimization, health weight mean and overweight did not differ, but obese mean victimization about 3 points higher; no statistical test? Peer victimization was positively associated with BMI
25	Jeong et al. (2016)	No association between victimization and BMI group either before or after control for other measures
26	Lister et al. (2015)	No association between four victimization groups based on age 8 and 15, and BMI at age 15. Those in the lowest quartile of BMI were significantly more likely to be bullied at age 8. Those in the lowest quartile of BMI continued to show increased risk of victimization. At age 12 and 15 years, but the level of victimization was low
27	Mamun et al. (2013)	No differences in BMI between victimization levels for males; girls who reported victimization every few weeks or almost every day or more had a higher average BMI than those who reported no or occasional bullying (about 4-5 points higher). Without adjustment for covariate, males who were occasionally/often bullied at age 14 had 0.64 greater BMI by age 21 than those not bullied; for females the difference was 1.52. These differences remained significant after adjustment for all but BMI at age 14. When control for BMI at age 14 was added, the difference in BMI by victimization group was no longer significant for males, but remained significant for females

(Continues)

TABLE 2 (Continued)

	Authors	Results
28	Pryor et al. (2016)	73% never overweight group, 17% late onset, 11% early onset; Early onset group was more likely to become depressed/anxious via peer victimization and then desire to be thinner; Late onset more likely dep/anxious via only desire to be thinner; The three groups differed in their average trajectories of victimization—never overweight had generally low and stable victimization, late onset had a significant linear increase in victimization, early onset were quite high in victimization by age 7 and then stable until there was a decline post age 10
29	Qualter et al. (2015)	Significant associations between BMI and victimization at last three waves (ages 7, 8, and 10) but not earlier, ranged from $r = 0.09-0.15$ for boys and $r = 0.14-0.19$ for girls. For girls, cross-lag associations were found at age 6, 8 and 10: higher BMI predicted increasing victimization and victimization influencing increasing BMI. For boys, BMI was associated with declining victimization between ages 7 and 8, and 8 and 10
30	Sutin et al. (2016)	Children bullied at age 6 weighed more on average and gained more weight from ages 6 to 15 than children who were not bullied; same pattern for waist circumference. Relationship between bullying and increases in BMI/waist circumference mediated by symptoms of depression. Patterns similar for males and females

greater impact of victimization on health problems. Finally, regarding victimization itself, the type of victimization and the chronicity of victimization experienced may be important moderators. Nixon et al. (2011) concluded that relational victimization was potentially more harmful to health than physical victimization, and, in a separate study (Biebl et al., 2011), chronic victimization over a significant period of time was reported to be more detrimental to later physical health than intermittent periods of victimization. Also, supporting the additional impact of chronic bullying, Bogart et al. (2014) found that adolescents (followed from grade 5 to 10) who reported that they were chronically bullied (both bullied in the past and the present) had worse psychosocial health compared to adolescents bullied only in the past or only in the present; yet, when analyses focused only on a measure of physical quality of life, the proportion of youth who reported the poorest physical quality of life was highest, ranging from 22% to 30%, in the groups that reported current bullying and the group that reported current and past bullying experiences.

2.2 | Sleep

Cross-sectional studies of the relationship between peer victimization and sleep have led to rather consistent findings of an association, with peer victimization related to more sleep disturbances (see Table 2). More specifically, in one meta-analysis (van Geel et al., 2016), it was concluded that children and young adolescents who were more bullied had more general sleep/wake problems (such as falling asleep or staying asleep; see also Tu, Erath, & El-Sheikh, 2015). Peer victimization has also been related to more experiences of parasomnias (e.g., nightmares, night terrors, and sleep walking; Wolke & Lereya, 2014) and bedtime phobias (Donoghue & Meltzer, 2018). In fact, in an international, cross-cultural study of low- and middle-income countries, victims of bullying were found to have significantly higher ratings of insomnia in comparison to non-victims in all of the 17 countries studied (Fleming & Jacobsen, 2010).

Additionally, research findings suggest it is important to focus on both victimization and aggressive behavior when studying sleep problems. In particular, victimized youth, but also bully/victims, have higher insomnia symptoms, parasomnias, and subjective sleep-based distress as compared to bullies (who are non-victimized) and non-involved children, regardless of the type of victimization measured, with chronic victimization being particularly problematic (Donoghue & Meltzer, 2018; Luntamo et al., 2012). Furthermore, in an earlier study of peer relationships, sleep, and behavioral problems, peer aggressors were found to have shorter sleep duration overall and higher variability in their sleep schedules (Kubiszewski, Fontaine, & Potard, 2014). In the same study, interaction effects were evident, such that bullies who lacked sleep displayed higher levels of externalizing mental health symptoms, whereas victims with sleep disturbance had higher levels of internalizing mental health symptoms.

Most of the above findings hold up in longitudinal research. Studies have found that, when controlling for sleep disruption in childhood, greater victimization leads to poorer sleep quality and more parasomnias over time (Tu, Spencer, El-Sheikh, & Erath, 2019; Wolke & Lereya, 2014). Additionally, in a longitudinal study predicting both excesses and deficits in sleep (Herge et al., 2016), cyber victimization was found to directly predict sleep deficit, but relational victimization had a positive indirect effect on both sleep excess and deficit as mediated by depression. Another study also found that peer victimization predicted transitions in sleep problems over time, with higher victimization related to a higher likelihood that children who were initially good sleepers would transit into poor sleep patterns 2 years later (Chang, Chang, Lin, Wu, & Yen, 2017; Chang, Wu et al., 2017).

In summary, evidence suggests that sleep problems are elevated among children and adolescents who report more experiences of peer victimization. The direction of causality between peer victimization, aggressive behavior, and sleep, however, remains an area that requires more research attention to further isolate directional pathways. In addition, associations between peer victimization and sleep might be further clarified by considering other negative outcomes that result from peer victimization. For example, the relationship between peer victimization and sleep disruptions may occur via the mediating role of the emotional distress induced by peer victimization. There is evidence that emotional distress can disrupt sleep, consistent with the research

on stress reactivity and the vigilance-arousal framework (Gradisar et al., 2011). Finally, an additional research direction would be to test sleep disruptions as a potential mediator linking peer victimization to other physical health problems.

2.3 | Body weight

Whereas, the research on psychosomatic symptoms and concerns and the research on sleep suggest that these are likely outcomes of peer victimization, research on weight, overweight, and obesity more often conceptualize weight as an explanation or cause of peer victimization (see Tables 1 and 2). One reason for this is the stigma that overweight or obese youth may face. With such a focus on meeting societal standards of appearance and attractiveness as almost a prerequisite for social acceptance and peer status (Webb & Zimmer-Gembeck, 2014, 2016), stigma may result in peer teasing and ostracism (Ames & Leadbeater, 2017; Puhl & Luedicke, 2012; Qualter et al., 2015; Salvy & Bowker, 2014; Wang, Ianotti, & Luk, 2010). Consistent with these notions, small to moderate associations between body mass index (BMI) and victimization by peers have been reported in cross-sectional studies (e.g., Eisenberg, Gower, McMorris, & Bucchianeri, 2015; Gray, Janicke, & Dumont-Driscoll, 2014) or cross-sectional analyses in longitudinal studies (Mamun, O'Callaghan, Williams, & Najman, 2013), but this finding has not been universal (Gooding, Milliren, Austin, Sheridan, & McLaughlin, 2015; Jeong, Davis, Rodriguez, & Han, 2016) (see Table 1).

Overweight or obesity may not be the only weight-related risk factor for victimization, however. It may also be the case that being underweight can lead to victimization in middle or later adolescence. Puhl and Luedicke (2012) reported that adolescents who are underweight have about a 50% chance of reporting weight-related teasing. This dropped to 20% for average weight adolescents, and was higher again (at 50%) for adolescents who had a BMI one standard deviation or more above the mean. There is some evidence that indirect aggression (which includes aspects of relational and social aggression) may be more targeted at thin, perceived attractive girls because of the competition for social status and partners (Vaillancourt, 2013). Thus, just as popular and unpopular youth can be victimized by peers, but for different reasons (Pronk & Zimmer-Gembeck, 2010; Zimmer-Gembeck & Duffy, 2014; Zimmer-Gembeck et al., 2013), it is possible that being underweight or overweight may be risks for peer victimization for different reasons and uncovering these associations could depend on considering participant sex and age.

In more recent years, the evidence from cross-sectional studies has been enhanced through access to longitudinal data. In one longitudinal study (Qualter et al., 2015), data were collected in the Quebec (Canada) Longitudinal Study and were used to examine associations of verbal, physical, and relational victimization with BMI across seven age periods—ages 3–8 and age 10. Broadly, for girls, significant bidirectional associations between BMI and victimization emerged. BMI at age 6, age 7, and age 8 was associated with increased peer victimization by the next year. At the same time, peer victimization predicted increasing BMI, but these associations were usually only found when paths over periods greater than 1 year were tested (i.e., victimization at age 3 was associated with higher BMI at age 6; victimization at age 5, 6, 7, and 8 were all associated with a greater increase in BMI by age 10). For boys, examination of the longitudinal associations revealed that victimization was not a significant predictor of later BMI, but BMI at age 7 and 8 was associated with *less* victimization at the next age. Thus, the associations were more complex for girls than for boys; a finding reported in one other longitudinal study (Mamun et al., 2013).

Another recent longitudinal study, conducted by Sutin, Robinson, Daly, and Terracciano (2016) using data drawn from the Longitudinal Study of Australian Children, evaluated the relations between a broad measure of bullying at age 6 and BMI and waist circumference (measured at 2-year intervals) between the ages of 4 and 15. Supporting Qualter et al.'s findings (for girls only), results of this study supported a bidirectional relationship, with greater weight at age 4 associated with a heightened risk of being victimized at age 6 and greater victimization at age 6 associated with greater weight gain and waist circumference between the ages of 6 and 15. However, in contrast to Qualter et al. (2015), none of these associations varied by gender.

Yet, such associations have not consistently been supported. For example, in a study of Peruvian youth assessed at ages 8, 12, and 15 years (Lister et al., 2015), there was no significant difference in the increase in BMI over time when four victimization groups were compared (not bullied at age 8 or 15, bullied at age 8 but not 15, bullied at age 15 but not 8, and bullied at both age 8 and 15). Yet, upon further analysis, different from what was expected, it was weight that predicted experiences of victimization over time; those youth in the *lowest* quartile of BMI (the most underweight) were significantly more likely to be bullied at age 8 and to report increased victimization up to 15 years. However, it should be noted that the level of victimization was still quite low even for this group. Yet, this and other studies (Ames & Leadbeater, 2017; Pryor et al., 2016), suggest that youth's weight can be predictive of later victimization.

In summary, it is clear from the literature that the associations between peer victimization and weight are not consistent across studies, with the prevalence of victimization in typical weight adolescents sometimes not significantly different from the prevalence in overweight children or adolescents (Lister et al., 2015; Puhl & Luedicke, 2012). Also, existing research has found different associations among boys compared to girls, and, although we did not systematically review all available studies, there was some evidence from the studies included here that findings could depend on the year the study was conducted (stronger findings in older relative to newer studies) and the country of origin. In addition, few of the studies included here focused specifically on weight stigma or victimization related specifically to appearance or weight (Zimmer-Gembeck, Webb, Farrell, & Waters, 2018). Weight-related stigma and victimization may have more impact on physical health than general peer victimization (Puhl & Luedicke, 2012). Taken together, gender, culture, community norms, type of victimization, and societal change all need attention in future research.

2.4 | Summary on peer victimization as related to physical health outcomes

Although there is a growing body of evidence that links peer victimization with psychosomatic problems, sleep disturbances, and body weight concerns, empirical evidence examining peer victimization as a precursor of these health difficulties remains scarce relative to research on mental health. Longitudinal studies focused on somatic complaints and weight reveal mixed results, with some studies identifying that peer victimization is related to elevated psychosomatic complaints and higher weight, but other studies revealing no significant associations. Findings were more consistent for associations of peer victimization with sleep, showing that children or adolescents who experience more victimization tend to report or exhibit more disrupted sleep patterns. Finally, our consideration of the research summarized here points to the importance of testing mediators (e.g., emotional problems) or moderators (e.g., gender, victimization type, health history, year of study, or country of origin) in future research on peer victimization and physical health outcomes.

3 | STRESS PHYSIOLOGY, PEER VICTIMIZATION, AND PHYSICAL HEALTH OUTCOMES

As briefly described in previous sections, researchers are at the beginning of testing some of the mechanisms and moderators that might shed more light on the particular reasons that peer victimization is related to physical health. One direction, not described above, has been the investigation of what might be viewed as the physiological foundation for psychosomatic symptoms and sleep disruptions (or other health outcomes)—neurophysiological reactions and recovery from stressful events (e.g., Knack et al., 2011; Monti, Abaied, & Rudolph, 2014; Murray-Close et al., 2014). We located over 35 articles published since 2010 that have focused on responses of the hypothalamic-pituitary-adrenal axis and related neural sensitivities to stress that might be associated with peer bullying, abuse, victimization, or similar stressful peer events. In particular, concerning changes in physiological responses to peer stress, victimization and rejection can be observed with tests of skin conductance

(e.g., Gregson, Tu, & Erath, 2014; Murray-Close et al., 2014), blood pressure (Murray-Close et al., 2014), cortisol in saliva (Behnsen, Buil, Koot, Huizink, & van Lier, 2018; Brendgen et al., 2017; Knack et al., 2011), alpha-amylase (Monti et al., 2014), pro-inflammatory cytokines (Giletta et al., 2018), vagal tone (Scott & Weems, 2014), and vagal withdrawal (Christensen, Aldao, Sheridan, & McLaughlin, 2017).

Although the research on peer victimization and stress reactivity or other physiological responding has been informative, a gap remains in understanding how physiological responses to peer stress relate to physical health outcomes. Instead of focusing on physical health, much of this research has been conducted with the aim of understanding social or emotional outcomes (see Murray-Close, 2012 for a review). Nevertheless, theory does suggest that chronic stress and certain patterns of physiological reactivity would be associated with future stress responding and physical change or injury, eventually impacting on physical health (Gustafsson et al., 2012; Rosmond, 2005; Troop-Gordon, Rudolph, Sugimura, & Little, 2005). In particular, consequences of peer problems consisting of metabolic and cardiovascular disturbance involving high blood pressure and disrupted glucose metabolism have been described (Gustafsson et al., 2012). Such a pattern, which can include multiple conditions including high blood pressure and blood sugar and abnormal cholesterol, has been referred to as a Metabolic Syndrome (MetS). MetS is determined via assessments of raised triglyceride levels, high cholesterol, high blood pressure, and raised fasting glucose or Type 2 diabetes diagnosis (see also Caspi et al., 2006). MetS is thought to develop gradually following from a range of early individual factors (e.g., high BMI) and social experiences (e.g., SES, social isolation). Yet, because research has been scarce, we do not know whether the pathway from peer victimization to physical health problems (such as MetS) can partly be explained by chronic activation of stress systems or inadequate development of regulatory capacities to adaptively respond to stressful events when they occur (Skinner & Zimmer-Gembeck, 2016).

Notably, in the one study that we located that examined peer victimization and physiological responses to stress, along with measuring physical health outcomes and behavior (Knack et al., 2011), adolescents ($n = 107$) in grades 5-8 and their parents reported their physical and relational victimization and the frequency and severity of health problems including stomachaches, influenza, mouth sores, and fatigue. In addition, 72 of these adolescents participated in a social stress test and the authors mapped patterns of cortisol response and recovery. Cortisol patterns were expected to better isolate when peer victimization was related to poorer physical health. More specifically, the authors expected and found that compared to their non-victimized peers, a group of victimized adolescents had more frequent and severe health problems and abdominal pain, as well as lower daily levels of cortisol, especially in the morning (i.e., a flattened or blunted cortisol awakening response). Most importantly, some of the effect of peer victimization on health problems was mediated via the slope of the cortisol awakening response, but a unique association between victimization and health problems remained. Much more attention could be directed to studies expanding on these findings.

4 | LIMITATIONS AND FUTURE RESEARCH

As described above, there is a gap in our knowledge of how chronic activation of stress systems (Rosmond, 2005; Troop-Gordon et al., 2005) or inadequate development of regulatory capacities to adaptively respond to stressful events when they occur (Skinner & Zimmer-Gembeck, 2016) or other markers of poor physiological responding may emerge following victimization by peers and eventually translate into physical health problems. Future research is needed on this broad and complex topic, which depends on the capacity to integrate longitudinal study methodology with intensive laboratory research.

In addition, there are three other research areas that could benefit from further attention. First, researchers have placed a great deal of emphasis on elucidating the emotional health declines that follow from peer victimization (e.g., see McDougall & Vaillancourt, 2015). Yet, poor mental health can spill over into physical health practices and poor health behaviors (lifestyle, aggression, overeating; Biebl et al., 2011; Gustafsson et al., 2012; Hertz, Jones, Barrios,

David-Ferdon, & Holt, 2015; Kerin, Webb, Zimmer-Gembeck, & Mastro, 2018; Murray-Close, 2012; Webb, Zimmer-Gembeck, Scuffham, Rani, & Barber, 2018), as well as disturbing sleep and affecting physical pain and illness (see earlier sections). Studies integrating tests of the role of peer victimization in physical health as mediated by social and emotional adjustment are quite important directions for the future. The small number of studies that have explored such associations to date provide support for the value of such an approach. For example, depressive symptoms have been found to mediate the pathway between victimization and higher BMI and larger waist circumference (Sutin et al., 2016), as well as the pathway between victimization and sleep excesses and deficits (Herge et al., 2016). Similarly, social anxiety has been found to mediate the pathway between victimization and elevated somatic complaints (Herge et al., 2016). Finally, coping (more specifically, *ruminating* as a coping response, which might reflect worry and anxiety) was found to mediate the association between victimization via online sources and poor sleep (Jose & Vierling, 2018).

Second, studies could more closely attend to how peer victimization affects physical health outcomes via other social circumstances. For example, victimization could lower the potential for optimal academic experiences, reducing engagement and achievement in school. These educational challenges could be precursors of declining socioeconomic status, which can then impact on physical health via a number of other mechanisms (e.g., reduced health care access; Caspi et al., 2006; Poulton et al., 2002; Topitzes, Godes, Mersky, Ceglarek, & Reynolds, 2009). Given such potential patterns, studies testing the role of peer victimization on physical health as mediated by academic engagement and achievement are needed.

Third, although a number of the studies we located were based on quite large and often representative samples, many of them assessed peer victimization with one or very few items and without gathering any additional information about the reasons for victimization, how children or adolescents respond to victimization when it does occur (e.g., coping responses) or how others provide support to victimized youth (e.g., defending or not by their peers or others; Duffy, Penn, Nesdale, & Zimmer-Gembeck, 2016). As Puhl and Luedicke (2012) describe, focusing on reasons for victimization and how youth cope, as well as gathering more information about the broader context within which victimization occurs, might help to isolate which youth are at risk for physical health problems when they are victimized by their peers. This highlights the importance of studying factors that can moderate the association between peer victimization and physical health outcomes. For example, when mental health outcomes have been of interest, studies have shown that greater social support (from parents, teachers, classmates, and school) can weaken the relationship between peer victimization or rejection and internalizing symptoms (Davidson & Demaray, 2007; McLachlan, Zimmer-Gembeck, & McGregor, 2010) and that having a mutual best friend can negate the associations between victimization and internalizing and externalizing symptoms (Hodges, Boivin, Vitaro, & Bukowski, 1999). Although there is some preliminary evidence that social support might also buffer children and adolescents against the physiological effects of peer victimization (e.g., having more friends or a higher quality friendship has been shown to reduce the association between exclusion and hypothalamic-pituitary-adrenal axis dysregulation; Peters, Riksen-Walraven, Cillessen, & de Weerth, 2011), whether this extends to maintaining good physical health in the face of peer victimization or other social problems remains to be tested in future research.

As another example, there is some evidence within research on peer victimization and mental health that raises many more possibilities as moderators, such as coping, emotionality, and other temperamental factors, and sensitivity to rejection and behavioral responses to rejection and victimization (Sugimura, Rudolph, & Agoston, 2013; Zimmer-Gembeck & Duffy, 2014; Zimmer-Gembeck & Skinner, 2015). This foundation provides a fertile grounding for research on physical health outcomes.

5 | CONCLUSION

Although studies are limited in number in comparison to the research that has examined associations between peer victimization and social or emotional health problems, peer victimization has been found to set the stage for the emergence and escalation of physical health problems, such as psychosomatic complaints, disrupted sleep,

and body weight. In this narrative summary of meta-analyses and recent empirical studies, we concluded that peer victimization is associated with poorer physical health among youth, including more somatic complaints (e.g., health concerns, pain) and disrupted sleep. Further, the research we summarized suggests that victimized youth are at more risk than other youth for increasing weight problems, with this association between victimization and weight oftentimes stronger among girls than boys. These effects seem to be both immediate and long-term, with associations found into later adolescence and even adulthood. Despite drawing these conclusions, there is still a great deal to investigate on how physical health problems emerge from peer victimization and other social problems. For some physical health outcomes, consistent evidence of the impact of peer victimization is still needed, and dependent on additional longitudinal studies. However, research to address *why* and *when* peer victimization leads to poorer physical health is even more sorely needed. Such research could add significantly to a more complete understanding of peer victimization, emphasizing the full range of costs that problematic peer relations can ultimately have in adolescence and into adulthood. To be most useful, this research will need to draw from the still rather disparate literature on social problems with peers, stress physiology, and the pathways to mental and physical health throughout childhood, adolescence, and the adult years.

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