BIOLOGICAL AGING AND PEER VICTIMIZATION:
THE ROLE OF SOCIAL SUPPORT IN
TELOMERE LENGTH AND HEALTH OUTCOMES

by

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Abstract

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The health benefits of social support have been well documented in the literature (Baumeister & Leary, 1995; Newman & Roberts, 2013), as have the somatic and psychological outcomes of being the victim of bullying (Wang, Nansel, & Iannotti, 2011; Knack, Jensen-Campbell, & Baum, 2011). Recent research has looked at the separate role each of these interpersonal processes play in cellular aging via the study of telomeres, which are the protective caps on the ends of chromosomes that shorten with each cell division (Epel, 2009). Data indicate that stress can accelerate this shortening, leading to premature cell death and a shortened lifespan (Epel, 2009); however, social support may arrest this process and slow down cellular aging (Uchino et al., 2012). Results of regression analyses indicated that social, but not physical, victimization significantly predicted telomere length, such that greater instances of being bullied led to shorter telomeres in an adolescent sample (M_{age} = 15.84, SD_{age} = 1.66). Both the frequency and severity of health problems were also negatively correlated with telomere length; that is, adolescents with shorter TLs reported greater frequency and severity of health problems. Furthermore, the presence of negative support interacted with victimization to predict higher rates of depression; additionally, parental discipline,

involvement, and communication all moderated the effect of peer victimization on health outcomes. While PTSD symptoms and depression did not mediate the relationship between peer victimization and telomere length, a direct effect of social victimization on telomere length remained. These findings are the first of their kind to directly link peer victimization to shortened telomeres, while also indicating that the effects of social victimization specifically lead to premature cell death.

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Chapter 1

Introduction

Peer Victimization

It has been estimated that between 10 and 30% of adolescents are bullied by their peers (Nansel et al., 2001). Bullying is defined as aggressive behavior that occurs repeatedly over time when a power imbalance exists (Olweus & Limber, 2010); it is marked by malicious intent and is therefore not the same as arguing or good-natured teasing amongst friends. Several types of victimization have been identified, including physical, verbal, and relational. The former is characterized by punching, kicking, hitting, or otherwise physically harming others (Crick & Nelson, 2002), while verbal aggression includes psychological abuse such as name-calling, taunting, and threatening others (Olweus, 1991). Relational aggression, on the other hand, involves causing harm to one's social relationships by way of spreading rumors, gossiping, or social exclusion (Crick & Grotpeter, 1995). Social victimization, an umbrella term for relational and indirect victimization, has also been introduced into the literature (Rosen, Beron, & Underwood, 2013); it has been linked to higher rates of internalizing problems (Sinclair et al., 2012) and somatic complaints (Nixon, Linkie, Coleman, & Fitch, 2011) than physical aggression. The advent of the internet age has brought about cyberbullying, which is engaging in aggressive behaviors through the use of electronic mediums, such as computers or cell phones (Patchin & Hinduja, 2006); it is considered a separate construct from relational and more overt forms of victimization (Dempsey, Sulkowski, Nichols, & Storch, 2009).

Being the habitual target of peers' aggression is associated with myriad psychological health problems; children who experience peer victimization report more loneliness and social anxiety (Storch, Brassard, & Masia-Warner, 2003) depression

(Wang, Nansel, & Iannotti, 2011), and suicidal ideation and attempts (Klomek, Marracco, Kleinman, Schonfield, & Gould, 2007) than their non-bullied peers. Additionally, peer victimization is associated with poorer physical health outcomes, such as headaches and sleep difficulties (Biebl, DiLalla, Davis, Lynch, & Shinn, 2011) and increased abdominal pain (Knack, Jensen-Campbell, & Baum, 2011). Bullied children also exhibit more stress, as shown by hypo- or hypersecretion of cortisol (Knack, Jensen-Campbell, & Baum, 2011; Vaillancourt et al., 2008). Excessive, prolonged secretion of cortisol to non-threatening stimuli can lead to changes in immune functioning, which then leads to alteration of the HPA axis by way of allostatic load (McEwen, 1998), which may explain why peer victimization is associated with poor health (Knack, Gomez, & Jensen-Campbell, 2011). Individuals who have experienced a chronic stressor--such as childhood abuse--exhibit lower cortisol levels (Ouellet-Morin et al., 2011), while similar results have been found in bullied children (Knack, Jensen-Campbell, & Baum, 2011).

Although it has been traditionally been associated with veterans of combat, post-traumatic stress disorder (PTSD) can be caused by experiencing or witnessing any traumatic event, including rape, chronic abuse, and such social stressors as divorce or death of a spouse. Symptoms are divided into three clusters: (1) Re-experiencing the trauma (having flashbacks, bad dreams, or frightening thoughts of the event); (2) Hyperarousal (being easily startled, very tense, and having sleep difficulties and angry outbursts); and (3) Avoidance (avoiding things/places that remind one of the event, feeling guilt/depression/worry/numbness, having poor memory associated with the event, and displaying a loss of interest in previously-enjoyed activities) (National Institute of Mental Health [NIMH], 2013). Although the bulk of research on the link between bullying and PTSD has been conducted on adult samples in the workplace (Balducci, Fraccoroli, & Schaufeli, 2011; Rodríguez-Muñoz, Moreno-Jimènez, Vergal, & Hernández, 2010),

several studies have indicated that targets of peer aggression exhibit similar symptoms (Idsoe, Dyregrov, & Idsoe, 2012; Houbre, Tarquinio, Thuillier, & Hergott, 2006). Furthermore, children who are peer victimized evidence a flattened cortisol awakening response (CAR), which has been previously associated with symptoms of PTSD (Knack, Gomez, & Jensen-Campbell, 2011; Knack, Jensen-Campbell, & Baum, 2011). Thus, it is important to look for symptoms in a child/adolescent population that is chronically exposed to a social stressor.

A significant aspect of this study attempted to link a not-as-yet studied health outcome to victimization, namely telomere length (TL), a potentially profound health consequence. What is particularly important about telomere length is that is has been associated with not only poorer physical and psychological health outcomes, but also aging. To the extent that being bullied is a stressor, it is anticipated that it will lead to accelerated shortening of telomeres (i.e., accelerated biological aging). I also expect bullied children to report higher levels of somatic complaints, depression, and symptoms associated with PTSD (avoidance, hyperarousal, re-experiencing the traumatic events). Furthermore, it is expected that these psychological problems will mediate the link between peer victimization and TL. Research also needs to understand better why some bullied children experience health problems when others do not. The social support of others, especially friends and parents, may buffer against the negative health effects of being bullied. As such, this study will examine whether positive and negative support from significant others influences health outcomes when bullied. It is anticipated that positive support will buffer against the negative health outcomes associated with bullying while negative support will exacerbate these negative outcomes.

Telomeres

The adverse health effects associated with stress have been well-documented in the literature; individuals exposed to chronic stress get sick more often (Dougall & Baum, 2012), experience impaired cognitive functioning (Boals & Banks, 2012), and—as mentioned earlier—exhibit signs of hypocortisolism by way of depressed HPA axis activity (Knack, Jensen-Campbell, & Baum, 2011). Recent work has suggested that chronic stress exposure can affect individuals at the cellular level through the shortening of telomeres (Epel et al., 2004). Telomeres are nucleoprotein complexes that cap the ends of chromosomes and whose length acts as a marker of cellular age. During cell division DNA polymerase is limited to replicating DNA in the 5' to 3' direction; in stem and germ cells the enzyme telomerase counteracts this shortening by adding the necessary telomeric DNA to the ends (Drury et al., 2011). However, telomerase is not present in somatic cells; thus, telomeres shorten when these cells undergo mitosis. After the cell reaches a critical threshold and can no longer divide (usually after 40 to 60 replications, referred to as the "Hayflick limit"), it enters a state of senescence and undergoes mediated death, or apoptosis (Hayflick & Moorhead, 1961). While it is inversely related to chronological age, this senescence is fully dependent upon the number of replications the cell has undergone (von Zglinicki, 2002).

Although the shortening of telomeres is a natural phenomenon, it can be accelerated by smoking and obesity (Valdes et al., 2005), inflammation (Wolkowitz, et al., 2011), and oxidative stress (von Zglinicki, 2002). This biomarker of aging can also be sped up by chronic psychosocial stress, as seen in mothers who care for a disabled child; those who reported high perceived stress due to the demands of caregiving had shorter TL than those with lower levels of stress, which was equivalent to an additional 9 to 17 years of cellular aging (Epel et al., 2004). Shortened TL has also been shown in those

who experience stress due to low socioeconomic status (Cherkas et al., 2006; Needham, Fernandez, Lin, Epel, & Blackburn, 2012), anxiety (Kananen et al., 2010), work-related exhaustion (Ahola et al., 2012), depression (Wikgren et al., 2012), phobic anxiety (Okereke et al., 2012), and mood disorders (Simon et al., 2006). PTSD has also been implicated as a linkage to shorter TL (Malan, Hemmings, Kidd, & Martin, 2011; O'Donovan et al., 2011). It has been postulated that these effects of stress may be greatest during childhood, when the brain is still forming; indeed, childhood maltreatment has been linked to shorter TL later in life (Tyrka et al., 2010). Kananen et al. (2010) found that chronic or severe illness during childhood predicted shortened TL in middle to late adulthood. Similarly, individuals with PTSD and multiple childhood traumas had shorter TL than a control group or those who had experienced a single trauma (O'Donovan et al., 2011); the results of this study suggest that the difference in TL was accounted for by the traumas, which then led to PTSD. Caregivers to dementia patients who also had a history of multiple childhood adversities also showed shortened TL compared to those with none, even after controlling for their caregiving status; the cells of the participants in this sample had aged an additional 7 to 15 years (Kiecolt-Glaser et al., 2011). Additionally, children exposed to more than one type of violence (domestic violence, bulling/victimization, or physical maltreatment) between the ages of five and ten evinced faster telomere erosion than those who were not maltreated or were only exposed to a single type of violence (Shalev et al., 2012). Shortened TL have also been found in a 9-year old sample raised in disadvantaged social environments (Mitchell et al., 2014). Similarly, institutionalized children showed shorter TL than those that were raised in foster care (Drury et al., 2012); data were collected when the children were no older than ten, indicating that telomere shortening can begin very early in life. As such, this thesis will examine whether higher

levels of bullying are associated with shorter telomere length in a sample of early and middle-aged adolescents.

Social Support

The negative effects associated with victimization, as outlined above, may be related to the fact that being bullied--a form of social rejection (Knack, Gomez, Jensen-Campbell, 2011)--thwarts the desire to belong and form close, lasting interpersonal relationships, which has been postulated as a fundamental need of human beings (Baumeister & Leary, 1995). There is believed to be an evolutionary basis for this, in that those who were afforded the protection of the group had the best chance of survival (Ainsworth, 1989). There is a plethora of research indicating the physical and psychological benefits of having support, such as longer lifespan (Lynch, 1979), lower levels of depression (Weber, Puskar, & Ren, 2010), and greater well-being (McAdams, 1985). Conversely, the absence of social support has been correlated with higher levels of stress (Baumeister & Leary, 1995) and unhappiness (Baumeister, 1991), as well as decreases in immunocompetence (Kiecolt-Glaser et al., 1984).

In adolescence—a time of significant physical, cognitive, and emotional change—friends aid in identity development, and are a source of support and emotional security (Parker & Gottman, 1989). Adolescence is marked by a striving for autonomy and a gradual pulling away from parents (Berndt, 1982). There are also cognitive and emotional changes that occur during this period, such as a burgeoning awareness that one is a separate entity from the parents, thus fostering a need for individuality and a desire to relate to same-age peers who are likely dealing with similar emotions (Buhrmester, 1998; Collins & Repinski, 1994; Moore & Boldero, 1991; Grotevant & Cooper, 1985). Sullivan (1953) postulated that the formation of a “chumship” in adolescence serves the burgeoning need for an egalitarian relationship that provides

validation and emotional intimacy and security, as well as contributing to feelings of self-worth. As such, as children become adolescents their support-seeking behaviors generally turn from parents to peers. Furman and Buhrmester (1992) found their sample of tenth-graders rated same-sex friends as the most frequent providers of support. In the seventh grade group, parents and same-sex peers were cited equally, while children in the fourth grade turned to parents more for support. Similarly, Bokhurst, Sumter, and Westenberg (2009) found that from ages nine to 16, children rated parents and friends as equally supportive, but from 16 to 18 more support was found in friends.

Although adolescents begin to turn to friends more for support, this does not mean that parents are no longer needed; rather, the latter are simply relied on less (Scharf & Mayseless, 2007). Despite this decrease, parental support in adolescence has positive effects; it has been linked to lower aggression and fewer conduct problems in females, and higher leadership and social skills in males (Rueger, Malecki, & Demaray, 2008). The amount of support received from parents in adolescence is often dependent on the gender of the parent; mothers tend to interact with their children more than fathers from infancy to adolescence (Collins & Russell, 1991), and adolescents tend to be closer to their mothers (Hosley & Montemayor, 1997). Additionally, both daughters (Larson & Richards, 1994) and sons (Youniss & Smollar, 1985) report receiving more support from mother than father in adolescence. However, decreases in depression have been linked to maternal (Vaugh, Foshee, & Ennett, 2010) and paternal (Bean, Barber, Crane, & Russell, 2006) support, suggesting that both parents impact adolescent mental health. Additionally, parental support as a whole may also protect against depression in highly-stressed adolescents (Rueger & Malecki, 2011). However, not all relationships provide positive support; conflictual and distressing relationships between parent and child have been linked to emotional and behavioral instability, as well as chronic illness (Davies,

Sturge-Apple, Cicchetti, & Cummings, 2008; Taylor, 2010) and dysregulation of the immune system (Miller & Chen, 2010). Deficient parental support has also been linked to more infections (Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997; Walker et al., 1999), the onset of asthma attacks (Sandberg et al., 2000), and higher blood pressure (Woodall & Matthews, 1989).

Social support from both friends and parents has been found to buffer the relationship between victimization and a number of poor outcomes. Bonanno and Hymel (2010) found that victimized children with low familial support reported more suicidal ideation than those with high amounts of support, while internalizing distress has been found to be lower in bullied children who perceived support from varying sources (Davidson & Demaray, 2007). Support from the father has been found to moderate the relationship between relational victimization and depression, in that children who were bullied but perceived high amounts of paternal support exhibited fewer depressive symptoms than those with low paternal support (Desjardin & Leadbeater, 2010). Additionally, children who are bullied but have social support report a higher quality of life than those without (Flaspohler, Elfstrom, Vanderzee, Sink, & Birchmeier, 2009). Increased perceptions of social support have been found to buffer bullied children from both emotional and somatic outcomes of the victimization (Cohen & Wills, 1985; Holt & Espelage, 2007), as well as the development of long-term high stress levels (Newman, Holden, & Delville, 2005). Furthermore, friendship quality has been found to moderate the relationship between peer acceptance and victimization, such that adolescents who were low in peer acceptance but had a high-quality friendship were less likely to be bullied (Malcolm, Jensen-Campbell, Rex-Lear, & Waldrip, 2006). The same study also indicated a negative relationship between number of reciprocal friendships and victimization, indicating that both quality *and* quantity of friends matters. Similar results regarding the

protective nature of friends was also found by Hodges, Boivin, Vitaro, & Bukowski (1999), in that those individuals with a best friend saw a decrease in victimization over the year. Furthermore, having a friendship that offered a high amount of protection buffered bullied children from the internalizing problems associated with their victimized status, while low amounts of protection exacerbated this relationship. Although Bollmer, Milich, Harris, and Mara (2005) did not find that social support moderated the victimization-internalizing problems link, they did find that those adolescents with a friendship that was high in quality were less likely to be victimized. Findings such as these point to the role friends and support play in the relationship between victimization and poor outcomes, and highlight the importance to study other outcome measures, such as TL and PTSD symptoms, and how they may be impacted by social support.

Preliminary data suggest that accelerated biological aging may be arrested by the presence of social support—Diaz et al. (2010) found that social support attenuated the relationship between coronary artery calcium (an indicator of atherosclerosis) and shortened TL. I suggest that this relationship will also hold true between victimization and TL; that is, those children who are bullied but have social support will have longer TL than those without. Being bullied by one's peers certainly qualifies as a stressor, and has in fact been shown to alter the hypothalamic-pituitary axis by way of increased cortisol production and flattened CAR (Knack, Gomez, & Jensen-Campbell, 2011). Furthermore, the hypocortisolism found in bullied children has also been linked to PTSD symptoms (Knack, Jensen-Campbell, & Baum, 2011). However, there is little known about how these negative peer relationships may affect individuals at the cellular level—that is, if being bullied accelerates biological aging. Although Shalev et al. (2012) did not find a relationship between TL and being bullied in their longitudinal project, their sample may have been too young; victimization status was measured when children were ages 5, 7,

and 10, and research indicates that bullying peaks in the junior high years (roughly around age 12) (Eisenberg & Aalsma, 2005). In addition, they did not assess bullying as a continuum from no abuse to severe abuse. Uchino et al. (2011) found that perceptions of ambivalence in parental and friend relationships predicted shorter TL, albeit in an older, adult sample (the mean age was 60.2 years).

Current Study

The present study is concerned with the relationship between victimization, social support, and health outcomes. As peer victimization has been shown to be a psychosocial stressor, it is suggested that it will have an adverse effect on telomere length, such that higher rates of victimization (that is, chronic victimization) will be related to shorter TL. Furthermore, I suggest positive social support will act a buffer and moderate the influence of victimization on depression, PTSD symptoms, and telomere attrition. In other words, adolescents who are bullied but experience positive aspects of social support will have longer telomeres and fewer symptoms associated with depression and PTSD than those who do not have positive support. Additionally, I suggest that the negative social support will exacerbate health problems; in other words, the TL of adolescents who perceive negative support will be shorter, especially when they are bullied. I also examined whether positive social support from parents, friends, and classmates differentially buffered adolescents against the negative impact of peer victimization. Finally, I suggest that depression and PTSD symptoms as predicted by victimization status will act as a mediator between the latter and TL, such that being bullied by one's peers will lead to the expression of depression and PTSD behaviors, which will then be associated with shorter TL.

Chapter 2

Methods

Participants

The present sample consisted of 115 adolescents aged 11 to 19 (*M* = 15.84, *SD* = 1.66), and included 50 boys and 65 girls. The ethnic composition of the sample was diverse, with 59.1% White/Anglo American, 20.9% Hispanic/Latino, 12.2% African American, 5.2% Asian, .9% American Indian/Alaskan Native, and .9% Other. One individual declined to answer the question.

Recruitment

The majority of the participants were originally recruited from summer camps and local school mailing lists, from which they were randomly selected and their parents called asking if their children were interested in participating. Additionally, members of the research lab visited area schools and explained to classes the purpose of the study; those children who expressed interest were sent home with further information to give to their parent(s). These previous participants were contacted via phone to see if they were interested in the current study. New participants were also recruited as part of the larger study via on-line advertisements and word of mouth. The adolescent and parent were paid $100 total for their participant in the study.

Measures

Measures of social support, victimization, internalizing problems, and physical health complaints were collected for this study; additionally, a saliva sample was procured in order to measure telomere length. Other measures completed at this time but not used in the current study include those for personality, co-rumination, externalizing

behaviors, physical development, and pet support. Additionally, a blood sample was taken.

All scales were completed by the adolescent and his/her parent. Because the subscales were correlated across parent- and self-reports (see Table A1), I created an overall composite for each measure by averaging across parent- and self-reports. This also aids in removing potential biases associated with child- versus parent-raters (Jensen-Campbell & Malcolm, 2007).

Victimization Scales

Direct and indirect aggression scale—Victim version (DIAS-VS)

This 24-item scale (Björkvist, Lagerspetz, & Österman, 1992) measures the frequency of three types of peer victimization: indirect ("How often do classmates tell bad or false stories about you?"), physical ("How often are you hit by other classmates?"), and verbal ("How often are you called names by other classmates?") via a 5-point Likert scale (see Table A2 for alphas).

Children's social experience questionnaire—Self-report (CSEQ-SR)

The CSEQ-SR (Crick & Grotpeter, 1995) assesses peer victimization through questions about relational ("How often does a classmate tell lies about you to make other kids not like you anymore?") and overt aggression ("How often does another kid yell at you and call you mean names?"), as well as being the target of prosocial behavior ("How often does another kid do something that makes you happy?"). This 15-item inventory uses a 5-point Likert-type scale (see Table A2 for alphas). The questions pertaining to prosocial behavior were not used in the current study.

Social Support

Network of relationships inventory (NRI-D)

The NRI-D assesses the quality of the relationship with the mother, father, and two best friends (Furman & Buhrmester, 1985). Both positive (Companionship, Intimate Disclosure, Satisfaction, Support, and Approval) and negative (Pressure, Conflict, Criticism, Dominance, and Exclusion) aspects of these four relationships are assessed across 30 items. Questions such as "How happy are you with your relationship with this person?" and "How often does this person try to get you to do things that you don't like?" were measured via a 5-point Likert scale, with 1 being "Hardly at all" and 5 being "Always or extremely". For the purposes of this study, I collapsed across relationship type to create an overall measure of positive and negative support (see Table A4 for alphas).

Social support scale (SSS)

The SSS (Harter, 1995) is an 18-item scale that assesses perceived support from parents, classmates, and a close friend. Items such as "I have a close friend who I can talk to about things that bother me" and "My parents don't really understand me" are measured via a 4-point Likert scale, with 1 being "Very true" and 4 being "Very untrue". This scale was used to determine how outcomes related to social support may differ based upon who is providing said support (see Table A4 for alphas).

Parenting relationship questionnaire—Child and Adolescent (PRQ)

The PRQ (Kamphaus & Reynolds, 2006) is a 71-item scale that measures seven aspects of the parent's relationship with the adolescent: Attachment, Communication, Discipline Practices, Involvement, Parenting Confidence, Satisfaction with School, and Relational Frustration. Statements such as "I know when my child will become upset" and "I punish my child when he or she misbehaves" are measured via a Likert-type scale of Never, Sometimes, Often, and Almost Always. This scale was used to examine more

closely different aspects of the parent-adolescent relationship that may influence the association between peer victimization and health outcomes (see Table A5 for alphas).

Internalizing Problems

Center for epidemiological studies depression scale for children (CES-DC)

The CES-DC (Weissman, Orvaschel, & Padian, 1980) is a twenty-item scale that measures how often the child has felt or acted in the past week. Questions such as "I wasn't able to feel happy, even when my family and friends tried to make me feel better" and "I felt like I was just as good as other kids" are measured on a 4-point Likert scale, with scores ranging from 0 to 60 and higher scores indicating more depressive feelings (see Table A3 for alphas).

PTSD checklist—Civilian version (PCL-C)

The PCL-C (National Center for PTSD, 2003) is a checklist designed to assess the 17 DSM-IV symptoms associated with post-traumatic stress disorder Participants are asked to rate on a 5-point Likert scale how often in the past month they have evidenced symptoms of PTSD, such as having "repeated, disturbing memories, thoughts, or images of a stressful experience from the past" or being "'super alert' or watchful on guard" (see Table A3 for alphas).

Physical Health

Health symptoms survey (HSS)

This scale (Knack, 2009) is used to assess the frequency and severity of 28 health symptoms and outcomes. Examples include headaches, fatigue, and vomiting, and participants are instructed to indicate how frequently they experience each symptom, as well as to rate the severity of such on a 4-point scale (from Not at all/Does not hurt at all to All the time/Unbearable pain) (see Table A6 for alphas).

Telomeres

Saliva samples were collected from the adolescent participants to assess telomere length. Participants expelled approximately 2mL of saliva into an Oragene DNA collection tube. Samples were then stored at room temperature until they could be sent for analyses.

Procedure

Data for this study were collected across two phases. In the first phase, the adolescent and his/her parent (usually the mother) arrived at the Personality and Social Behavior Lab, where consent and assent were obtained from both, respectively. Participants were then instructed to complete a battery of questionnaires online through Survey Monkey, including measures of victimization, social support, physical health, and internalizing problems, as well as several others that will not be part of this study; parents were to complete modified versions of the surveys that assessed their perception of adolescent's victimization, social support, and health problems. After the adolescent completed the surveys, he/she was brought to another room to collect the saliva sample. DNA was obtained using Oragene® DNA OG-500 (DNA Genotek Inc., Ontario, Canada) tubes. After confirming that the participant had had nothing to eat or drink in the previous thirty minutes, he/she was shown how to fill the tube to the marked line with 2 mL saliva via the passive drool method; once this was complete the sample was capped, releasing a reagent into the saliva that allowed it to be stored at room temperature for up to five years. The adolescents were also instructed in cortisol collection at this time for another study. This phase of the study lasted approximately 60 to 90 minutes; upon completion the dyad was scheduled to come back for the second phase. The adolescent was paid $20 and the parent was paid $10.

The second phase of the study occurred between one and three weeks after the first. The parent and adolescent returned to the lab and completed measures of social support, personality, and internalizing/externalizing difficulties. The adolescent then submitted a blood sample for a separate study. After debriefing, the adolescent was paid $40 and the parent $30; this portion of the study lasted between 30 and 60 minutes.

DNA Extraction and Analysis

The DNA samples were then shipped at room temperature to DNA Genotek Genofind Services located in Salt Lake City, Utah, for analyses. Samples were extracted following the prepIT L.2 protocol (see Appendix E); the DNA sample quantity and quality were then determined using PicoGreen analysis to assess concentration, OD 260/280 ratios using a spectrophotometer to assess purity, and agarose gel electrophoresis to assess integrity. Telomere length was assessed utilizing quantitative polymerase chain reaction (qPCR) and utilizing the methods outlined in O'Callaghan, Dhillon, Thomas, and Fenech (2008). Briefly, mean TL per reaction and mean diploid genome copies were estimated with an oligomer standard containing 14 TTAGGG telomeric repeats and a standard curve using a single copy gene standard (364b). Telomere length per diploid genome and length per telomere were then calculated. Samples were repeated in triplicate and mean results were only accepted if the standard deviation of the CT was <1. Absolute telomere length was then determined from all samples. Once complete, results of the analyses were e-mailed and the remaining DNA was returned to the Personality and Social Behavior Lab.

Chapter 3

Results

Descriptive Statistics

Data were screened prior to analyses, revealing a positive skew for PTSD symptoms (see Tables A2 to A6 for all descriptive statistics); as such, the data were transformed using the log transformation.

Intercorrelations among the health measures were examined (see Table A7). Noteworthy is the relationship between the frequency of health symptoms and telomere length (r = -.19, p = .045). Adolescents with more frequent health symptoms also had shorter telomere lengths, even after controlling for age. There was also a trend for severity of health symptoms. Adolescents with more severe health symptoms also had shorter TLs (r = -.15, p = .11). There was no evidence that telomere length was related to either depression or PTSD symptoms.

Relationships among the types of victimization (physical, relational, overt, verbal, and indirect) were high (see Table A1). Collinearity diagnostics further confirmed these findings (e.g., four condition indices in a variance decomposition analysis were greater than 30.0). As such, I conducted a principal components analysis with VARIMAX rotation. Two factors emerged: (1) Social victimization (relational/indirect) and (2) Physical (overt/physical), which in combination accounted for 87.52% of the variance (see Table A9 for factor loadings). These findings match previous research suggesting that there are two overall types of victimization; furthermore, verbal victimization can be either relational or physical (e.g., physical threat) in nature (Rosen et al., 2013). As such, these two components of victimization were used for Aims 1 and 3 to assess whether peer victimization influenced health outcomes. For Aim 2, I used an overall measure of peer

victimization, given the number of analyses proposed; however, social victimization was the only predictor reported used in the analyses looking at telomere length.[1]

Overview of Analyses

For all analyses, physical health outcomes included the frequency of health problems, the severity of health problems, and telomere length (TL). Outcomes for internalizing problems included depression and symptoms associated with PTSD. Victimization was examined as two separate components, namely social victimization and physical victimization (except in Aim 2).

Social support was examined in multiple ways. First, I compared parent, classmate, and friend support as possible moderators of the victimization-health association using Harter's social support measure. Using the NRI-D, I examined overall positive versus overall negative support as a possible moderator of victimization-health outcomes. Finally, I specifically examined seven aspects of parent-child relationship as possible moderators of health outcomes as assessed by the PRQ. For these moderated multiple regression analyses, I used an overall composite of victimization to limit the number of analyses (again, except for the analyses in which TL was the outcome measure). Due to the number of analyses, only main effects results with $p < .001$ will be reported in the body of the text, with the exception of telomere data. Given the novel proposed relationship between victimization and TL, all analyses $p < .05$ will be reported for TL. Furthermore, given that interactions have lower power, all interactions $p < .05$ will be discussed.

[1] Additional analyses were run with overall victimization as the predictor. Social support did not moderate the relation between victimization and TL. Social victimization was then chosen for the final analyses because of the direct relation found between social victimization and TL; that is, I want to see if this relation was at all buffered by social support.

Aim 1: Peer Victimization Will Predict Poor Health Outcomes, Including Shorter Telomeres, More Depression, Symptoms of PTSD, and Frequent and Severe Somatic Complaints.

Both social and physical victimization were used as predictors of health outcomes. Results of regression analyses revealed that peer social victimization was a significant predictor of depressive symptoms, $b = 2.59$, $SE = .62$, $t(112) = 4.16$, $p < .001$, $sr^2 = .129$. It also predicted more frequent, $b = 3.73$, $SE = .66$, $t(112) = 5.68$, $p < .001$, $sr^2 = .22$, and severe physical health problems, $b = 3.37$, $SE = .57$, $t(112) = 5.90$, $p < .001$, $sr^2 = .23$. Additionally, overall symptoms of PTSD were significantly predicted by being the victim of bullies, $b = .08$, $SE = .01$, $t(112) = 6.32$, $p < .001$, $sr^2 = .26$. (See Table A10 for all results and breakdown of PTSD symptoms).

Because telomere length varies by age ($r = -.14$, $p = .14$), hierarchical regression analyses were run to determine the relationship between peer victimization and TL. The age at which the DNA sample was collected was entered in the first step and the two types of victimization were entered on the second step. Social victimization was negatively related to telomere length after controlling for age, $b = -1.81$, $SE = .86$, $t(105) = -2.10$, $p = .038$. $sr^2 = .04$[2] (see Table A10). Overt/physical victimization did not uniquely predict health problems (see Table A11).

Supplementary analyses were then conducted to determine if the relationship between victimization and poor health outcomes was moderated by the gender of the child. There was no consistent evidence that gender moderated the influence of victimization on health (see Tables A12 and A13). Only one two-way interaction was significant. That is, there was a significant gender X physical victimization interaction for

[2] Six of the DNA samples failed quality control and are thus not included in TL analyses.

severity of health symptoms, b = 1.47, SE = .67, $t(110)$ = 2.18, p = .03. For boys, physical victimization did not influence the severity of health problems, b = .36, SE = .89, $t(110)$ = .38, p = .71. For girls, physical victimization was positively related to severity of health symptoms, b = 3.27, SE = .1.02, $t(110)$ = 3.21, p =.002 (see Figure B1).

Aim 2: Social Support Will Moderate the Relationship Between Peer Victimization and Poor Health Outcomes.

A series of moderated multiple aggression analyses were then run to examine the moderating role social support may play in the relationship between victimization and health. Each mode of support was centered and tested as a possible moderator for all five outcome measures. The victimization composite was also centered and interaction terms were created to run the analyses. The model tested both main effects of victimization and social support, as well as any possible interactions between the two. Analyses were run with each mode of support predicting each of five outcome measures (depression, frequency and severity of health problems, TL, and PTSD), for a total of 25 moderated multiple regression models. Due to the number of analyses, only significant results with $p < .001$ will be reported. Because main effects for the relationship between victimization and poor health outcomes were reported previously, I will not report them again (but see Tables A14 to A18).

Diagnostics for moderated multiple regression were run prior to beginning the analyses; data were checked for leverage, distance, influence, and multicollinearity. An examination of the distance values revealed there to be four multivariate outliers, all of which were valid scores. To determine if these cases affected the results, two MMR analyses were then run: one with the extreme scores and one without. As the results did not differ significantly, all future analyses were run with the outliers included. All MMR analyses (save for the initial one to check for diagnostics) were run following the

procedures outlined by Aiken and West (1991) and with the PROCESS macro for SPSS (Hayes, 2014) (see Figure B2 for model).

Parent Support

Perceiving support from one's parent predicted lower rates of PTSD symptoms, *b* = -.012, *SE* = .003, *t*(111) = -3.58, *p* < .001. The remaining health outcomes were not predicted by parent support, nor were there any significant interactions between parent support and victimization (see Table A14 for all main effects and interactions).

Classmate Support

A main effect was found for low rates of classmate support predicting depression, *b* = -1.78, *SE* = .20, *t*(111) = -5.94, *p* < .001. There were no other main effects or interactions between classmate support and victimization to affect health outcomes (see Table A15).

Friend Support

No main effects of friend support upon health outcomes were found, nor were there any interactions between friend support and victimization (see Table A16).

Overall Positive and Negative Support (NRI-D)

There were no significant main effects or interactions for positive support using the NRI-D (see Table A17). The impact of overall negative support and victimization on health outcomes was then tested. Although no main effects of support were found, the interaction between negative support and victimization on severe health problems was significant, *b* = .05, *SE* = ..02, *t*(111) = 2.50, *p* = .014, 95% CIs: .011 to .096.

The influence of victimization on severity of health outcomes was significant at high, *b* = 3.99, *SE* = .78, *t*(111) = 5.14, *p* = <001, 95% CIs: 5.243 to 5.532, and mean levels of negative support, b = 2.41, *SE* = .63, *t*(111) = 3.83, *p* = <.001, 95% CIs: 1.163 to 3.658 (see Figure B3). There was no relation between victimization and severity of health

outcomes when there were low levels of negative support (p = .408). Overall, negative support seemed to exacerbate the link between peer victimization and the severity of health outcomes. No other interactions were found (see Table A18).

Dimensions of Parenting Quality

Supplementary analyses were then run to examining the possible moderating effects of specific facets of parental support on the victimization-health link. Items from the PRQ were used for these analyses (see Tables A19 to A25 for all main effects and interactions). The amount of communication between parent and adolescent interacted with victimization to increase the severity of health problems, b = .24, SE = .12, t(104) = 2.06, p = 042, 95% CIs: .009 to .465. This relationship held for low, b = 2.93, SE = .81, t(104) = 2.9, p = 004, 95% CIs: .79 to 3.993, mean, b = 3.57, SE = .55, t(111) = 6.49, p < .001, 95% CIs: 2.481 to 4.663, and high, b = 4.75, SE = .78, t(111) = 6.10, p < .001, 95% CIs: 3.206 to 6.294, levels of communication (see Figure B4). In summary, higher levels of parental communication were associated with stronger relationships between peer victimization and the severity of health outcomes.

The parent's discipline practices also interacted with victimization to affect rates of depression, b = -.32, SE = .15, t(107) = -2.14, p = .035, 95% CIs: -.615 to -.023; this relationship held true for low, b = 4.56, SE = 1.03, t(104) = 4.45, p < .001, 95% CIs: 2.525 to 6.593, and mean, b = 2.84, SE = 1.03, t(104) = 4.44, p < .001, 95% CIs: 1.57 to 4.101, levels of discipline (see Figure B5). Low levels of discipline seem to be associated with more depression when adolescents were victimized. This victimization-depression link weakened as levels of discipline practices increased.

Finally, there was an interaction between parental involvement and victimization on frequency of health problems, b = .44, SE = .21, t(107) = 2.10, p = .039, 95% CIs: .024 to .863. This simple slopes for high, b = 5.86, SE = 1.05, t(104) = 5.60, p < .001,

95% CIs: 3.782 to 7.935, mean, *b* = 4.27, *SE* = .67 *t*(104) = 6.40, *p* < .001, 95% CIs: 2.945 to 5.592, and low, *b* = 2.68, *SE* = .97, *t*(104) = 2.76, *p* = .007, 95% CIs: .750 to 4.606, levels of were significant, indicating that parental involvement at all levels interacted with victimization to produce increases in health problems (see Figure B6). Additionally, parental involvement interacted with victimization to produce more severe health complaints, *b* = .38, *SE* = .17, *t*(107) = 2.16, *p* = .033, 95% CIs: .031 to .722, at high, *b* = 5.03, *SE* = .86, *t*(104) = 5.83, *p* < .001, 95% CIs: 3.32 to 6.741, mean, *b* = 3.68 *SE* = .55 *t*(104) = 6.70, *p* < .001, 95% CIs: 2.591 to 4.771, and low, *b* = 2.33, *SE* = ..80, *t*(104) = 2.91, *p* = .004, 95% CIs: .743 to 3.919, levels of involvement (see Figure B7). Contrary to predictions, higher levels of parental involvement were associated with stronger victimization-health problems associations.

Aim 3: Victimization Will Influence Telomere Length via Depression and PTSD Symptoms.

A series of mediated moderation analyses were proposed to examine whether depression and PTSD symptoms mediate the influence of relational victimization on health outcomes. Using the PROCESS macro (Hayes, 2014), relational and overt victimization were entered as predictors, depression and PTSD as the mediators, and health outcomes as the dependent measures (see Figure B8 for model). There was no evidence that either depression or PTSD mediated the link between relational victimization and telomere length (see Table A26). Next, I examined whether social support moderated any of these pathways (see Figure B9 for model). Again, there was no evidence that social supported moderated any of the paths in the model. Relational victimization continued to have a direct effect on TLs, such that adolescents who were socially victimized had shorter telomere lengths.

Chapter 4

Discussion

While the literature examining the victimization-health link is quite abundant, there has been little work done on the effects of this kind of behavior on cellular aging as measured by telomere length. Stressors, including those of a psychosocial nature, have been implicated in the shortening of telomeres, the protective caps on the ends of our chromosomes. Being the victim of bullying behavior qualifies as a social stressor and as such, I suggest that telomere length will be affected by peer victimization. The bulk of the telomere literature is concerned with stressors such as caring for a disabled child (Epel et al., 2004) or Alzheimer's patient (Damjanovic, 2007), chronic pain (Sibille et al., 2012), non-supportive parenting (Brody, Yu, Beach, & Philibert, 2014), and ambivalent social ties (Uchino et al., 2011); to the best of my knowledge, this is the first study to look at telomere attrition as a direct result of peer victimization, as well as the moderating role social support may play in the relationship. Additionally, I was concerned with the impact of victimization and social support on depression, frequency and severity of health complaints, and PTSD symptoms. As the presence of social support has been shown to ameliorate both physical and psychological health problems, I expected it to do the same in this sample. Specifically, I anticipated social support buffering the negative effects associated with peer victimization. Additionally, because bad is stronger than good (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001), I expected the effects of negative support given to victimized children to be stronger than the effects of positive support. Finally, as telomere attrition has been linked to both depression (Simon et al., 2006) and symptoms of PTSD (Malan et al., 2011; O'Donovan et al., 2011), I tested a mediation model with victimization predicting depression and PTSD symptoms, which in turn would lead to shortened TL.

It was found that telomere length was negatively related to frequent and severe somatic complaints; that is, the more one experienced physical health problems and the more severe those problems were, the shorter the telomeres were. This is similar to the findings of Cohen et al. (2013), who noted that telomere length was inversely related to greater susceptibility to illness by way of stress associated with childhood SES.

Peer victimization was then broken into two types: physical/overt and social/relational. None of the health outcomes—depression, PTSD symptoms, frequency and severity of physical health complaints, and TL—were predicted by physical victimization. However, experiencing social victimization was associated with increases in depression and PTSD symptoms, as well as more frequent and physical health complaints. More importantly (for the purposes of this thesis), was the fact that social victimization uniquely predicted shorter telomere length. The implications of this are such that the experience of being socially victimized—whether by being excluded, gossiped about, or being the subject of rumors—led to shorter telomere lengths, indicating that the stress associated with such negative relationships is having a direct impact upon cellular age. This finding supports the previous literature on the subject of psychosocial stress and telomere attrition (Shalev et al., 2013; Epel, 2004), as well as the greater impact of social victimization (Cole et al., 2014; Siegel, La Greca, & Harrison, 2009). Furthermore, these findings speak to the fact that humans are inherently social animals, and the disruption of these bonds can have deleterious effects to the extent of shortening the lifespan through premature cell death. The emotional pain caused by the breaking or dissolution of social bonds—called social pain—has been linked to poor health (MacDonald & Jensen-Campbell, 2011), and as the effects of peer victimization have been implicated as a type of social pain, the current findings add to the literature.

It has been shown that social pain can be relived and has a much longer impact than physical pain (Chen & Williams, 2011; Chen, Williams, Fitness, & Newton, 2008). This may explain the lack of effects for physical victimization in the current study; that is, the harm done by social victimization may be worse and longer-lasting and as such, may then lead to poor health outcomes. Furthermore, the impact of disruptions in these relationships may be especially harmful, as the peer group gains in importance in adolescence (Bukowski, Newcomb, & Hartup, 1998).

As research has shown that girls are more likely to engage in and experience social victimization than boys, who tend toward physical victimization (Crick & Nelson, 2002), there were surprising findings regarding gender. Regarding the relationship between social victimization and psychological health, there were no gender differences; however, past research has shown that social victimization is more deleterious for females than males (Crick & Nelson, 2002), so the current findings were unexpected. However, the impact of relational victimization may be such that it is no longer just affecting females. Also noteworthy is the fact that physical victimization was associated with severity of health complaints, but only for girls. This may be due to the fact that girls experience physical victimization less than boys (Crick & Nelson, 2002), which may make its impact on health that much worse; in other words, by virtue of the fact that it is rare, girls may experience the effects of physical victimization more strongly than boys.

The findings involving support were surprising on several levels. Support from parents, friends, and classmates (as assessed by Harter's Social Support) did not interact with victimization to buffer individuals against the associated health outcomes. However, perceptions of support from parents did predict lower rates of PTSD symptomatology, while classmate support was associated with less depression. Interestingly, there were no main effects from friend support; given the importance of the

peers in adolescence, this was rather unexpected, especially when taken in conjunction with the effects of classmate support. This could perhaps be due to the fact that these adolescents are co-ruminating with friends and parents, and thus effectively "cancelling out" the buffering effects of social support. Co-rumination, the tendency to endlessly discuss and focus upon problems, has been put forth as a combination of self-disclosure and rumination (Rose, 2002). While self-disclosing is linked with a variety of benefits (Parker & Asher, 1993; Camerana, Sargiani, & Peterson, 1990), rumination has been found to predict internalizing problems (Hart & Thompson, 1997; Schwartz & Koenig, 1996). Individuals who co-ruminate tend to report higher quality friendships, but also higher rates of depression and anxiety (Rose, 2002). It has been suggested that this paradox is due to the fact that these dyads are engaging in co-rumination—while the self-disclosure aspect of the relationship leads to feelings of closeness, the ruminative aspect influences rates of depression (Rose, 2002). While the bulk of the literature finds that best friends are usually the co-rumination partner (Schwartz-Mette & Rose, 2012; Starr & Davila, 2009), some studies have found that children also co-ruminate with a parent, usually the mother (Waller & Rose, 2010; Grimbos, Granic, & Pepler, 2013). As such, the possibility of co-rumination between adolescents and the best friend/parent may be responsible for the lack of protective effects usually provided by support from these sources. The relationship between adolescent and classmates may not be strong enough to encourage the self-disclosure necessary for co-rumination; this lack of closeness, then, may paradoxically be providing a buffer against the depressive symptoms associated with peer victimization.

Overall measures of the positive support neither predicted lower rates of health problems, nor did it interact with victimization to lend support to the buffering hypothesis. Negative support, however, exacerbated the severity of somatic complaints in victimized

adolescents. This lends support to the “bad is stronger than good” hypothesis (Baumeister et al., 2001); that is, the idea that negative events have a greater impact upon humans than good events. Previous studies have shown that negative support has a greater impact than positive for depression and anxiety (Vinokur and van Ryn, 1993), psychological adjustment and well-being (Rook, 1984), and relationship satisfaction (Pagel, Erdley, & Becker, 1987). However, it begs the question as to why the presence of negative support did not impact depression, PTSD symptoms, frequency of health problems, or telomere length. One suggestion is that perhaps more “specific” forms of negative support may affect health, rather than a general measure of such. The same may hold true for positive support. Future studies will examine the moderating role of types of positive and negative support.

Specific aspects of parental support were also expected to have a bigger effect than they did, given the fact that–while peers certainly gain in importance during the teenage years—parents are still a great source of support at this time (Collins & Laursen, 2004; Meece & Laird, 2006). Higher rates of parental communication led to more severe health problems for those adolescents who were victimized. This may be explained by parents reaching out to help their victimized adolescent by trying to communicate more, and the positive effects of this are not being seen in the concurrent data. This curious finding warrants a closer look in the future. Lower levels of discipline in victimized adolescents predicted greater reports of depressive symptoms. Furthermore, parental involvement and victimization led to frequent and more severe health complaints. This is somewhat unexpected, given that talking to an adult is usually recommended to children that are bullied. However, given that the average age of the sample was 16, these results may indicate that victimized teenagers actually suffer, rather than benefit, from parental involvement. These adolescents may be exhibiting effects associated with what has been

termed helicopter parenting, or the over-involvement of parents who use developmentally-inappropriate parenting tactics to children who are able to assume autonomy (Segrin, Woszildo, Givertz, Bauer, & Murphy, 2012). Helicopter parenting has been associated with decreased psychological well-being (LeMoyne & Buchanan, 2011) and feelings of autonomy and competence (Schiffrin et al., 2014). While these results have been found in college samples, it is not far-fetched to suggest that older high school students may experience the same outcomes from over-involved parents. Despite the continued importance of parents, adolescence is also a time of growing autonomy and self-discovery (Scharf & Mayseless, 2007); too much involvement from the parents may threaten that burgeoning autonomy and the adolescent's growing sense of self. However, younger adolescents (i.e., aged less than 16) may benefit from increased involvement; future studies should analyze parenting dimensions in both early and late adolescence. An alternative explanation for the parental communication-health link suggests that as victimization increase so does parental involvement—future analyses should examine all aspects of this relationship. While these are somewhat contradictory to the findings associated with overall parent support taken from Harter's scale (i.e., lowered rates of PTSD), the latter did not look at specific kinds or dimensions of support. Furthermore, the parent support variable consisted of only six items; such, it may not be capturing the subtle nuances inherent in the parent-child relationship.

Given the fact that depression often mediates the relationship between victimization and other health outcomes (Guarneri-White, Knack, & Jensen-Campbell, under review), I was interested in how telomere length may be affected by such a link. Furthermore, because being peer victimized predicts PTSD symptoms (Knack et al., 2011), which in turn have been linked to shorter TL (Malan et al., 2011), I also was interested in testing PTSD as a mediator. There were no indirect effects of victimization

on TL via these internalizing problems, nor did social support moderate any of the paths in the model. However, social victimization continued to have a direct effect upon telomere length. Again, this speaks to the power of relationships: the effect of being victimized in this way is so detrimental to cellular aging that it has a direct impact, one that cannot be ameliorated or buffered by the power of social support. Our relationships and the way we are treated by others are so important to our well-being and survival (Leary & Cottrell, 2013) that the thwarting of these is leading to premature cell death.

Limitations and Future Directions

Limitations with this study include the fact that the data were cross-sectional and thus only capture telomere length at one time point; future analyses will examine the longitudinal impact of relational victimization on telomere shortening. Additionally, I did not control for or examine other stressors that could possibly impact TL, such as parents' SES (Needham et al., 2012) and abuse/exposure to domestic violence (Shalev et al., 2012); this information should be collected for future studies to fully capture the impact of psychosocial stress on TL. As genetic variants have been shown to interact with environmental stressors to impact TL (Mitchell et al., 2014) it would be interesting to see how peer victimization affects this relationship. More specific types and sources of support should be examined, as well—while, for instance, the impact of negative support (when interacting with victimization) was only significant on the severity of health problems, it is possible that the deleterious effects of poor support may vary depending upon who is providing it. As such, future studies will examine the differing impacts of parent and friend support on health outcomes.

Despite the limitations inherent in this study, this is the first research to show a direct link between peer victimization and shortened telomeres. Again, the implications of

these findings are such the impact of social bullying on one's health may very well shorten the lifespan.

Appendix A

Tables

Table A1. Correlations between victimization reports

	Parent Report				
Measure	Physical	Verbal	Indirect	Overt	Relational
Self-Report					
Physical	0.12	0.14	0.05	0.07	0.01
Verbal	0.10	0.29**	0.19*	0.28	0.11
Indirect	0.07	0.33***	0.35***	0.17	0.32**
Overt	0.16	0.28**	0.14	0.15	0.13
Relational	0.12	0.37***	0.34***	0.26**	0.37***

Note. *$p < .05$; **$p < .005$ ***$p < .001$

Table A2. Descriptive statistics for self- and parent reports of victimization

Measure	Range	Min.	Max.	*M*	*SD*	Skewness	Kurtosis	α
Total Victimization	4.79	-1.72	3.1	-0.21	0.90	0.78	0.73	
Self-Reports								
Physical	0.39	0.85	1.23	0.90	0.08	1.62	2.45	0.78
Verbal	0.62	0.70	1.32	0.91	0.15	0.45	-0.15	0.80
Indirect	0.56	1.08	1.64	1.28	0.14	0.50	-0.47	0.89
Overt	0.45	0.70	1.15	0.77	0.10	1.39	0.17	0.75
Relational	0.56	0.70	1.26	0.86	0.15	0.52	-0.78	0.81
Parent Reports								
Physical	0.36	0.85	1.20	0.91	0.09	1.42	1.07	0.86
Verbal	0.66	0.70	1.36	0.89	0.15	0.45	-0.20	0.88
Indirect	0.59	1.08	1.63	1.27	0.14	0.43	-0.40	0.92
Overt	0.38	0.70	1.08	0.78	0.10	1.41	1.28	0.81
Relational	0.58	0.70	1.28	0.88	0.15	0.25	-0.92	0.84

Note: Total victimization scores based on the mean of all ten measures (standardized). Self- and parent-report scores reported are based on log-transformed values. The standard error for all skewness measurements is .23, and that for all kurtosis measurements is .45.

Table A3. Descriptive statistics for self-reports of internalizing problems.

Measure	Range	Min.	Max.	*M*	*SD*	Skewness	Kurtosis	α
Total Depression	32.00	2.00	34.00	12.92	6.72	1.38	1.56	0.81
PCL-C	0.62	1.23	1.85	1.47	0.16	0.66	-0.44	0.93
Re-experiencing	0.66	0.70	1.36	0.92	0.19	0.60	-0.59	0.91
Avoidance	0.60	0.85	1.45	1.05	0.17	0.52	-0.80	0.92
Hyperarousal	0.66	0.70	1.36	0.97	0.16	0.50	-0.34	0.77

Note: Values for PCL-C and its related subscales are log-transformed. All standard errors for skewness and kurtosis measurements are .23 and .45, respectively.

Table A4. Descriptive statistics for self-reports of social support.

Measure	Range	Min.	Max.	*M*	*SD*	Skewness	Kurtosis	α
SSS								
Parent Support	14	10	24	19.51	3.79	-0.78	-0.26	0.87
Classmate Support	12	12	24	20.11	2.84	-0.53	-0.18	0.72
Friend Support	13	11	24	21.90	3.00	-1.74	2.79	0.84
NRI-D								
Total Positive Support	196	94	290	208.76	39.33	-0.35	0.44	0.95
Total Negative Support	135	6	199	128.70	29.49	0.25	-0.52	0.90

Note: Values for PCL-C and its related subscales are log-transformed. All standard errors for skewness and kurtosis measurements are .23 and .45, respectively.

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Table A5. Descriptive statistics for parent reports of social support.

Measure	Range	Min.	Max.	*M*	*SD*	Skewness	Kurtosis	α
Attachment	26	7	33	20.92	4.83	-0.60	0.132	0.85
Communication	22	5	27	18.14	4.96	-0.32	-0.43	0.88
Discipline Practices	25	2	27	16.63	5.41	-0.15	-0.45	0.85
Involvement	22	0	22	9.82	3.59	0.46	0.84	0.82
Parenting Confidence	17	7	24	16.34	3.32	-0.27	0.28	0.76
Satisfaction with School	26	7	33	22.02	5.85	-0.18	-0.23	0.91
Relational Frustration	26	0	26	9.42	5.33	0.53	0.69	0.88

Note: The standard error for all skewness is .23, while that for kurtosis is .46.

Table A6. Descriptive statistics for self- and parent reports of physical health

Measure	Range	Min.	Max.	*M*	*SD*	Skewness	Kurtosis	α
Total Frequency	35.5	31.5	67	43.92	7.53	0.82	0.54	
Total Severity	34.1	28.5	62.6	37.62	6.56	1.36	2.17	
Self-Reports								
Frequency of Symptoms	60	29	89	45.61	10.06	1.13	2.35	0.88
Severity of Symptoms	59	28	87	37.80	9.18	2.08	6.93	0.90
Parent Reports								
Frequency of Symptoms	34	29	63	42.23	7.38	0.42	0.10	0.86
Severity of Symptoms	33	28	61	37.42	7.08	1.15	1.49	0.88
Telomere Length	34.8	0.1	34.90	9.14	0.10	1.65	2.10	

Note: Total frequency and severity scores are based on the mean of all four measurements. The standard error for all skewness measurements is .23, while that for all kurtosis measurements is .45 (except for TL, which is .46).

Table A7. Intercorrelations among health measures.

Health Outcome	Telomere Length	Depression	Frequency of Health	Severity of Health	PTSD Symptoms
Telomere Length		-0.04	-0.19*	-0.15+	-0.09
Depression			-0.49**	0.43**	0.71**
Frequency of Health				0.78**	0.63**
Severity of Health					0.58**
PTSD Symptoms					

Note: *p < .05, **p < .001.

Table A9. Factor loadings for VARIMAX rotation

	Component[1]	
	1	2
Relational Total	0.92	0.20
Indirect Total	0.91	0.27
Verbal Total	0.68	0.59
Physical Total	0.14	0.95
Overt Total	0.45	0.81

Note: [1]Rotation converged in 3 iterations

Table A10. Results of regression analyses for social victimization.

Outcome	*b*	*SE b*	β	*t*	*p*	sr^2	ΔR^2
Telomere Length (TL)	-1.81	0.86	-0.20	-2.10	<.001	0.04	0.04
Frequency	3.73	0.66	0.47	5.68	<.001	0.22	
Severity	3.37	0.57	0.48	5.90	<.001	0.24	
Depression	2.59	0.62	0.36	4.16	<.001	0.13	
PTSD Symptoms	0.08	0.01	0.51	6.32	<.001	0.26	
Re-experiencing	0.09	0.02	0.45	5.38	<.001	0.21	
Avoidance	0.09	0.02	0.48	5.86	<.001	0.24	
Hyperarousal	0.07	0.01	0.43	5.05	<.001	0.19	

Note: Tables A10 and A11 involve the same regression model. As such, Table A10 is the relation between social victimization and outcomes controlling for physical victimization. Furthermore, age of participant was a control for TL.

Table A11. Results of regression analyses for physical victimization

Outcome	*b*	*SE b*	β	*t*	*p*	sr^2	ΔR^2
Telomere Length	0.65	0.99	0.06	0.65	0.52	<.001	0.04
Frequency	1.30	0.77	0.14	1.69	0.09	0.02	
Severity	0.80	0.67	0.10	1.20	0.23	0.01	
Depression	0.98	0.73	0.12	1.35	0.18	0.02	
PTSD Symptoms	0.02	0.02	0.11	1.42	0.16	0.02	
Re-experiencing	0.02	0.02	0.08	1.00	0.32	0.01	
Avoidance	0.03	0.02	0.14	1.70	0.09	0.03	
Hyperarousal	0.02	0.02	0.10	1.21	0.23	0.01	

Note: Tables A10 and A11 involve the same regression model. As such, Table A11 is the relation between physical victimization and outcomes controlling for social victimization. Furthermore, age of participant was a control for TL.

Table A12. Regression analyses summary for gender predicting health outcomes

Outcome		Social Victimization	Gender	Social Victimization X Gender
Depression	*b*	2.45	1.04	-0.70
	SE b	0.67	0.66	0.77
	t	3.57	1.57	1.80
	p	<.001	0.119	0.074
PTSD Symptoms	*b*	0.07	0.05	-0.02
	SE b	0.01	0.01	0.01
	t	5.31	3.62	-1.35
	p	<.001	<.001	0.18
Frequency	*b*	2.86	2.48	0.32
	SE b	0.70	0.67	0.69
	t	4.11	3.71	0.47
	p	<.001	<.001	0.639
Severity	*b*	2.70	1.92	0.23
	SE b	0.61	0.59	0.61
	T	4.41	3.27	0.38
	P	<.001	0.001	0.708
Telomere Length	*b*	-2.40	1.41	0.40
	SE b	0.96	0.91	0.93
	t	-2.49	1.55	0.43
	p	0.014	0.123	0.67

Table A13. Regression analyses summary for gender predicting health outcomes

Outcome		Physical Victimization	Gender	Physical Victimization X Gender
Depression	*b*	1.31	1.14	-1.13
	SE b	0.77	0.65	0.77
	t	1.69	1.76	-1.47
	p	0.094	0.081	0.143
PTSD Symptoms	*b*	0.04	0.05	<.001
	SE b	0.02	0.01	0.02
	t	2.74	3.83	-0.01
	p	0.007	<.001	0.989
Frequency	*b*	2.48	2.43	1.06
	SE b	0.78	0.66	0.77
	t	3.16	3.71	1.37
	p	0.002	<.001	0.173
Severity	*b*	1.80	1.89	1.47
	SE b	0.68	0.57	0.67
	t	2.65	3.32	2.18
	p	0.009	0.001	0.031
Telomere Length	*b*	1.25	1.33	-0.06
	SE b	1.09	0.89	1.01
	t	1.15	1.5	-0.06
	p	0.254	0.138	0.956

Table A14. Regression analyses summary for parent support predicting health outcomes

Outcome		Victimization	Parent Support	Victimization X Parent Support
Depression	*b*	2.00	-0.49	-0.13
	SE b	0.70	0.16	0.15
	t	3.03	-3.12	-0.89
	p	0.003	0.002	0.374
PTSD Symptoms	*b*	0.07	-0.01	<.01
	SE b	0.01	<.01	<.01
	t	4.83	-3.58	-0.28
	p	<.001	<.001	0.778
Frequency	*b*	3.56	-0.25	-0.05
	SE b	0.73	0.17	0.16
	t	4.89	-1.42	-0.30
	p	<.001	0.159	0.762
Severity	*b*	3.45	0.02	0.07
	SE b	0.65	0.15	0.15
	t	5.43	0.16	0.47
	p	<.001	0.875	0.642
Telomere Length	*b*	-2.15	-0.27	<.01
	SE b	0.91	0.22	0.22
	t	-2.37	-1.13	0.01
	p	0.02	0.222	0.99

Table A15. Regression analyses summary for classmate support predicting health outcomes

Outcome		Victimization	Classmate Support	Victimization X Classmate Support
Depression	*b*	1.31	-1.18	-0.01
	SE b	0.64	0.20	0.19
	t	2.04	-5.94	-0.05
	p	0.044	<.001	0.957
PTSD Symptoms	*b*	0.07	-0.01	<.01
	SE b	0.02	0.01	0.01
	t	4.44	-2.54	-0.1
	p	<.001	0.013	0.918
Frequency	*b*	3.42	-0.05	-0.35
	SE b	0.78	0.24	0.23
	t	4.40	-0.22	-1.55
	p	<.001	0.829	0.124
Severity	*b*	2.84	-0.04	-0.36
	SE b	0.68	0.21	0.20
	t	4.18	-0.21	-1.81
	p	<.001	0.836	0.073
Telomere Length	*b*	-1.89	-0.05	-0.05
	SE b	0.96	0.32	0.28
	t	-1.98	-0.14	-0.18
	p	0.05	0.887	0.856

Table A16. Regression analyses summary for friend support predicting health outcomes

Outcome		Victimization	Friend Support	Victimization X Friend Support
Depression	*b*	2.50	-0.63	-0.02
	SE b	0.62	0.19	0.24
	t	4.00	-3.24	-0.07
	p	<.001	0.002	0.948
PTSD Symptoms	*b*	0.08	<.01	<.01
	SE b	0.01	<.01	0.01
	t	5.82	-1.95	0.14
	p	<.001	0.053	0.891
Frequency	*b*	3.83	-0.20	0.11
	SE b	0.69	0.22	0.26
	t	5.54	0.94	0.43
	p	<.001	0.349	0.668
Severity	*b*	3.24	-0.24	-0.01
	SE b	0.60	0.19	0.23
	t	5.37	-1.28	-0.03
	p	<.001	0.204	0.976
Telomere Length	*b*	-1.83	0.11	0.11
	SE b	0.89	0.27	0.33
	t	-2.04	0.43	0.35
	p	0.044	0.669	0.73

Table A17. Regression analyses summary for overall positive support predicting health outcomes

Outcome		Victimization	Positive Support	Victimization X Positive Support
Depression	*b*	2.64	-0.02	-0.02
	SE b	0.65	0.02	0.02
	t	4.09	-1.32	-1.03
	p	0.001	0.19	0.308
PTSD Symptoms	*b*	0.08	<.01	<.01
	SE b	0.01	<.01	<.01
	t	5.85	-1.63	-1.15
	p	<.001	0.106	0.253
Frequency	*b*	3.91	<.01	-0.01
	SE b	0.69	0.02	0.02
	t	5.63	-0.17	-0.30
	p	<.001	0.868	0.765
Severity	*b*	6.41	0.01	-0.01
	SE b	0.61	0.01	0.02
	t	5.63	0.82	-0.29
	p	<.001	0.413	0.774
Telomere Length	*b*	-1.88	-0.02	-0.01
	SE b	0.88	0.02	0.03
	t	-2.14	-0.65	-0.55
	p	0.035	0.517	0.581

Table A18. Regression analyses summary for overall negative support predicting health outcomes.

Outcome		Victimization	Negative Support	Victimization X Negative Support
Depression	*b*	2.07	0.05	0.02
	SE			
	b	0.70	0.02	0.02
	t	2.98	2.30	0.70
	p	0.004	0.023	0.485
PTSD Symptoms	*b*	0.07	<.01	<.01
	SE			
	b	0.02	<.01	<.01
	t	4.54	2.01	1.51
	p	<.001	0.047	0.135
Frequency	*b*	3.14	0.04	0.04
	SE			
	b	0.77	0.02	0.03
	t	4.26	1.99	1.42
	p	<.001	0.049	0.159
Severity	*b*	2.41	0.04	0.05
	SE			
	b	0.63	0.02	0.02
	t	3.83	2.34	2.50
	p	<.001	0.021	0.014
Telomere Length	*b*	-1.55	-0.03	0.01
	SE			
	b	0.97	0.03	0.03
	t	-1.61	-0.91	0.30
	p	0.111	0.366	0.763

Table A19. Regression analyses summary for parental attachment predicting health outcomes

Outcome		Victimization	Attachment	Victimization X Attachment
Depression	*b*	2.84	-0.07	0.10
	SE b	0.66	0.12	0.14
	t	4.33	-0.56	0.69
	p	<.001	0.577	0.495
PTSD Symptoms	*b*	0.09	<.01	<.01
	SE b	0.02	<.01	<.01
	t	6.02	-0.13	0.92
	p	<.001	0.91	0.358
Frequency	*b*	4.29	0.14	0.09
	SE b	0.68	0.13	0.15
	t	6.29	1.08	0.63
	p	<.001	0.28	0.534
Severity	*b*	3.76	0.15	0.20
	SE b	0.56	0.11	0.12
	t	6.77	1.47	1.68
	p	<.001	0.145	0.096
Telomere Length	*b*	-1.81	-0.06	0.20
	SE b	0.93	0.18	0.19
	t	-1.93	-0.32	1.03
	p	0.056	0.751	0.307

Table A20. Regression analyses summary for parental communication predicting health outcomes.

Outcome		Victimization	Communication	Victimization X Communication
Depression	*b*	2.88	-0.01	-0.16
	SE b	0.65	0.12	0.14
	t	4.43	-0.09	-1.21
	p	<.001	0.928	0.229
PTSD Symptoms	*b*	0.09	<.01	<.001
	SE b	0.02	<.01	<.01
	t	5.99	0.25	0.05
	p	<.001	0.803	0.959
Frequency	*b*	4.16	0.09	0.21
	SE b	0.67	0.13	0.14
	t	6.17	0.69	1.48
	p	<.001	0.493	0.142
Severity	*b*	3.57	0.10	0.24
	SE b	0.55	0.10	0.12
	t	6.49	0.95	2.06
	p	<.001	0.346	0.042
Telomere Length	*b*	-2.05	-0.11	0.36
	SE b	0.89	0.18	0.19
	t	-2.31	-0.61	1.86
	p	0.023	0.544	0.065

Table A21. Regression analyses summary for parental discipline predicting health outcomes.

Outcome		Victimization	Discipline	Victimization X Discipline
Depression	*b*	2.84	-0.08	-0.32
	SE b	0.64	0.11	0.15
	t	4.44	-0.67	-2.14
	p	<.001	0.502	0.035
PTSD Symptoms	*b*	0.09	<.01	<.01
	SE b	0.01	<.01	<.01
	t	6.01	-1.02	-1.05
	p	<.001	0.312	0.298
Frequency	*b*	4.14	-0.13	-0.16
	SE b	0.67	0.12	0.16
	t	6.15	-1.08	-1.04
	p	<.001	0.282	0.302
Severity	*b*	3.56	0.15	0.09
	SE b	0.55	0.10	0.13
	t	6.42	-1.57	-0.70
	p	<.001	0.12	0.483
Telomere Length	*b*	-1.97	0.01	-0.27
	SE b	0.90	0.18	0.19
	t	-2.19	0.07	-1.38
	p	0.031	0.941	0.172

Table A22. Regression analyses summary for parental involvement predicting health outcomes

Outcome		Victimization	Involvement	Victimization X Involvement
Depression	*b*	2.90	-0.01	0.15
	SE b	0.65	0.20	0.20
	t	4.44	-0.06	0.71
	p	<.001	0.949	0.481
PTSD Symptoms	*b*	0.09	<.01	0.01
	SE b	0.01	<.01	0.01
	t	6.15	0.27	1.33
	p	<.001	0.791	0.183
Frequency	*b*	4.27	0.22	0.44
	SE b	0.67	0.20	0.21
	t	6.40	1.09	2.10
	p	<.001	0.281	0.039
Severity	*b*	3.68	0.11	0.38
	SE b	0.55	0.17	0.17
	t	6.70	0.68	2.16
	p	<.001	0.496	0.033
Telomere Length	*b*	-1.85	-0.12	0.30
	SE b	0.90	0.27	0.28
	t	-2.05	-0.47	1.09
	p	0.043	0.642	0.28

Table A23. Regression analyses summary for parental confidence on health outcomes

Outcome		Victimization	Confidence	Victimization X Confidence
Depression	*b*	2.73	-0.20	<.01
	SE b	0.68	0.18	0.17
	t	4.00	-1.08	<.01
	p	<.001	0.283	0.998
PTSD Symptoms	*b*	0.09	<.01	<.01
	SE b	0.02	<.01	<.01
	t	5.83	-0.18	0.60
	p	<.001	0.861	0.548
Frequency	*b*	4.03	-0.10	-0.06
	SE b	0.72	0.19	0.17
	t	5.64	-0.52	-0.37
	p	<.001	0.603	0.716
Severity	*b*	6.56	-0.02	-0.01
	SE b	0.59	0.16	0.14
	t	6.02	-0.12	-0.04
	p	<.001	0.905	0.972
Telomere Length	*b*	-2.25	-0.43	0.07
	SE b	0.97	0.25	0.22
	t	-2.31	-1.73	0.33
	p	0.023	0.086	0.744

Table A24. Regression analyses summary for parental satisfaction with school on health outcomes

Outcome		Victimization	School Satisfaction	Victimization X School Satisfaction
Depression	*b*	2.70	-0.21	0.03
	SE b	0.65	0.10	0.10
	t	4.14	-2.08	0.31
	p	0.001	0.04	0.756
PTSD Symptoms	*b*	0.09	<.01	<.01
	SE b	0.02	<.01	<.01
	t	5.91	-1.90	1.10
	p	<.001	0.06	0.313
Frequency	*b*	3.83	-0.25	-0.11
	SE b	0.67	0.10	0.10
	t	5.71	-2.45	-1.08
	p	<.001	0.016	0.284
Severity	*b*	3.28	-0.22	-0.12
	SE b	0.55	-0.20	0.08
	t	5.93	0.09	-1.52
	p	<.001	-2.347	0.131
Telomere Length	*b*	-1.83	0.05	0.06
	SE b	0.94	0.15	0.14
	t	-1.94	0.37	0.43
	p	0.055	0.712	0.669

Table A25. Regression analyses summary for parental relational frustration on health outcomes.

Outcome		Victimization	Frustration	Victimization X Frustration
Depression	*b*	2.97	-0.11	0.02
	SE b	0.71	0.12	0.10
	t	4.18	-0.90	0.24
	p	<.001	0.371	0.815
PTSD Symptoms	*b*	0.09	<.01	<.01
	SE b	0.02	<.01	<.01
	t	5.78	-0.27	-0.65
	p	<.001	0.786	0.521
Frequency	*b*	3.91	0.14	0.01
	SE b	0.74	0.12	0.11
	t	5.31	1.11	0.12
	p	<.001	0.269	0.906
Severity	*b*	3.25	0.05	-0.01
	SE b	0.61	0.10	0.09
	t	5.76	0.46	-0.11
	p	<.001	0.649	0.91
Telomere Length	*b*	-2.39	0.10	0.17
	SE b	0.97	0.16	0.13
	t	-2.46	0.62	1.32
	p	0.016	0.53	0.192

Appendix B

Figures

Figure B1. Moderating relationship of gender and physical victimization on severity of health problems

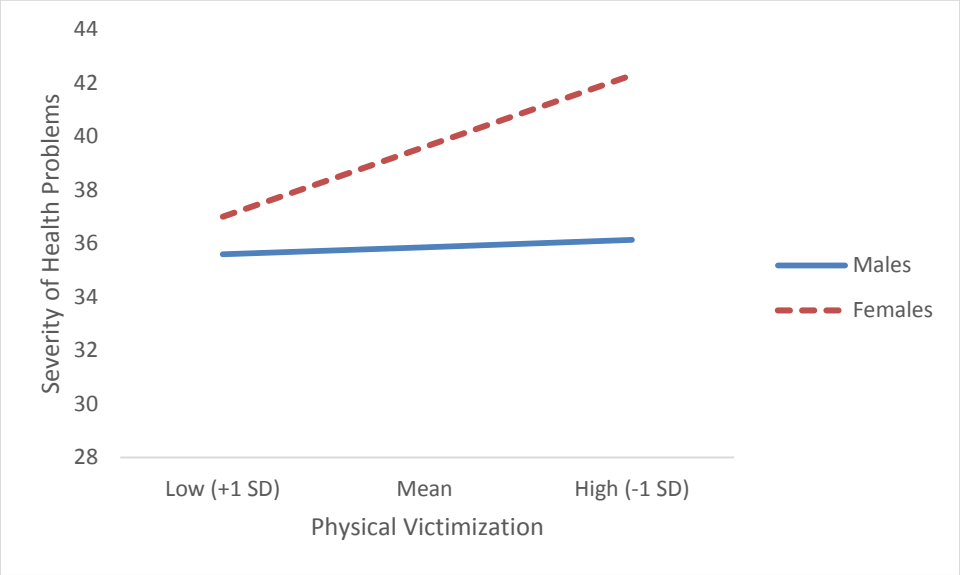


Figure B2. Model 1 from PROCESS

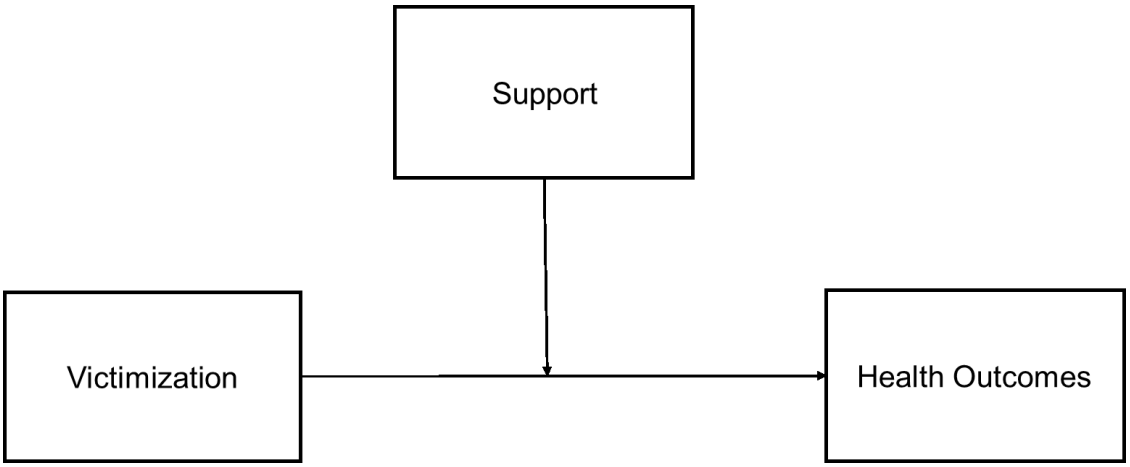


Figure B3. Moderating relationship of negative support and victimization on severity of health problems

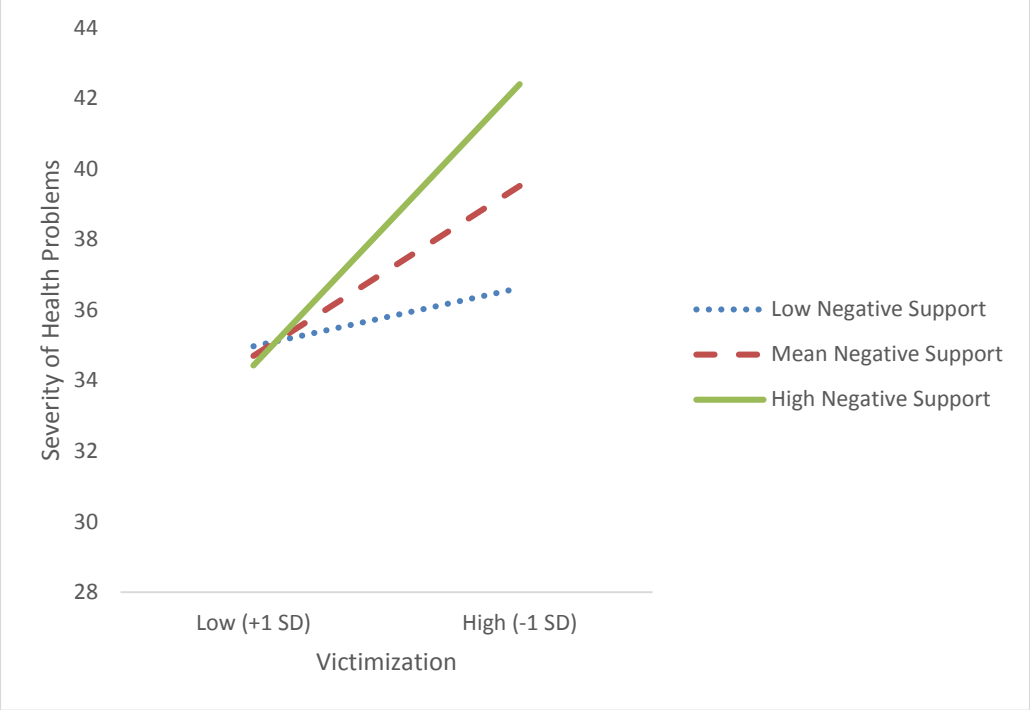


Figure B4. Moderating relationship of parental communication and victimization on severity of health problems.

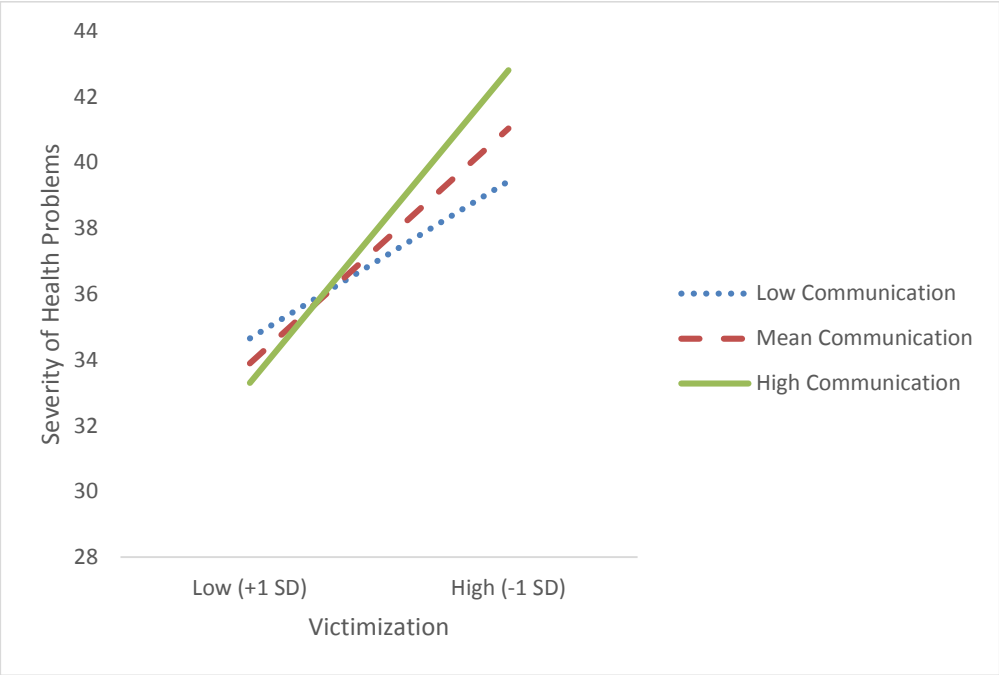


Figure B5. Moderating relationship of parental discipline and victimization on depression

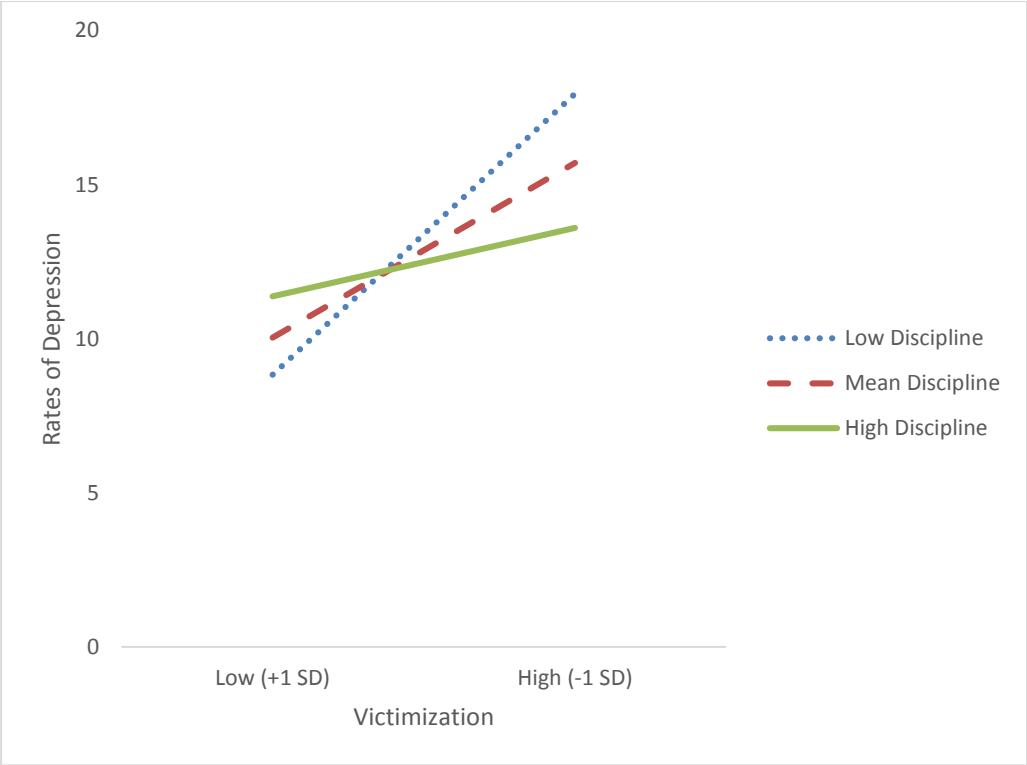


Figure B6. Moderating relationship of parental involvement and victimization on frequency of health problems

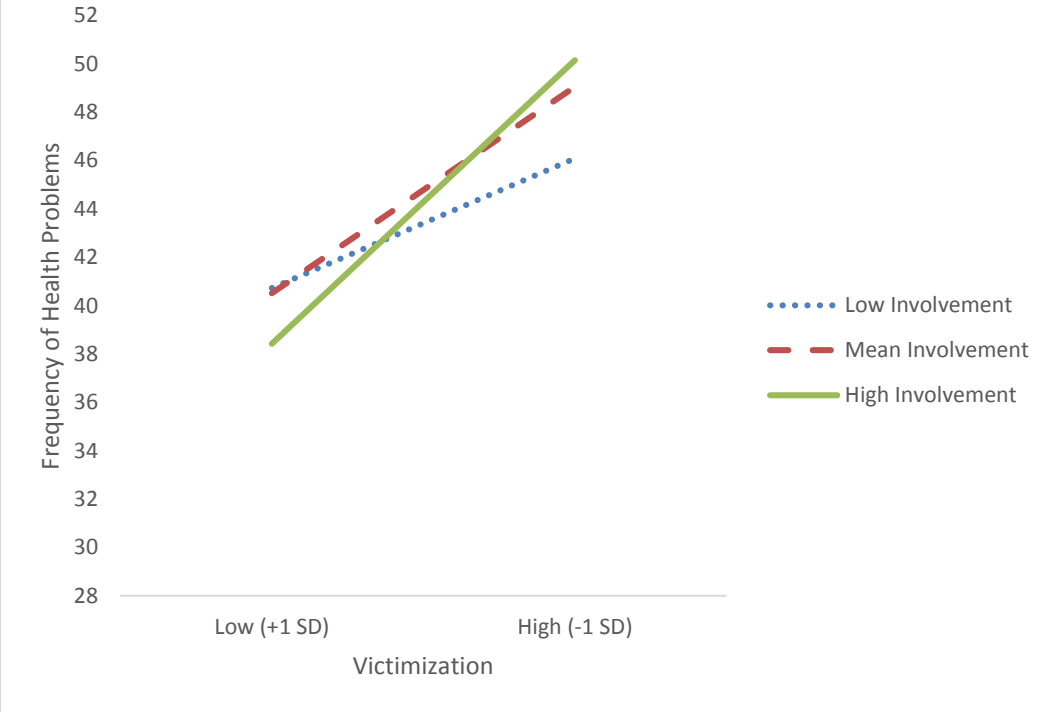


Figure B7. Moderating relationship of parental involvement and victimization on severity of health problems.

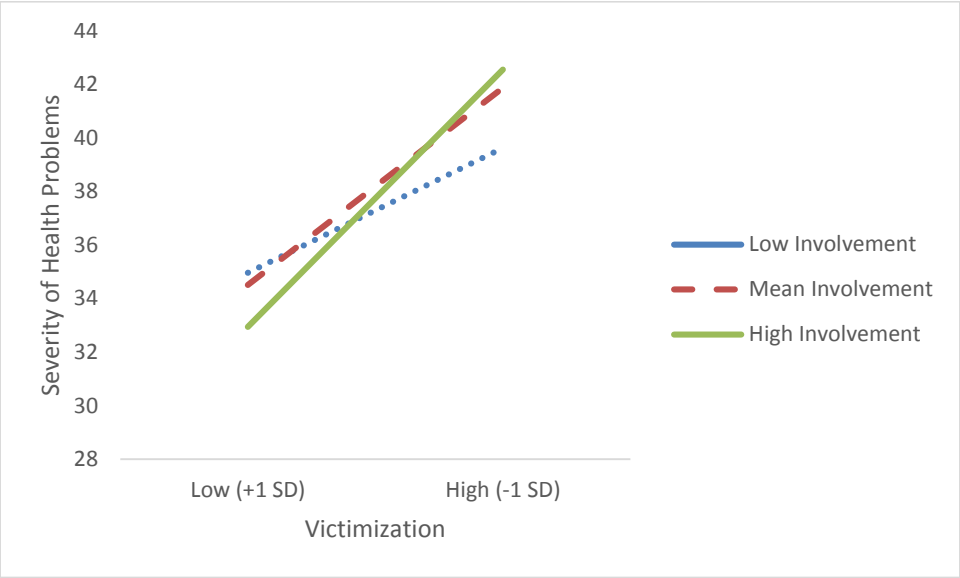


Figure B8. Mediating role of PTSD symptoms and depression on TL via social victimization

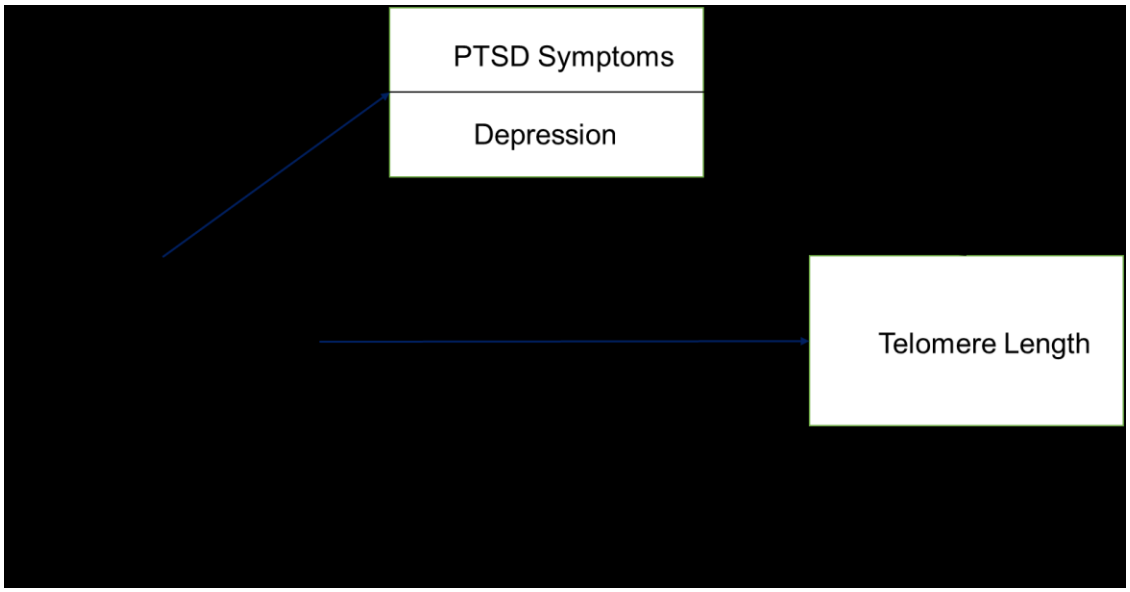
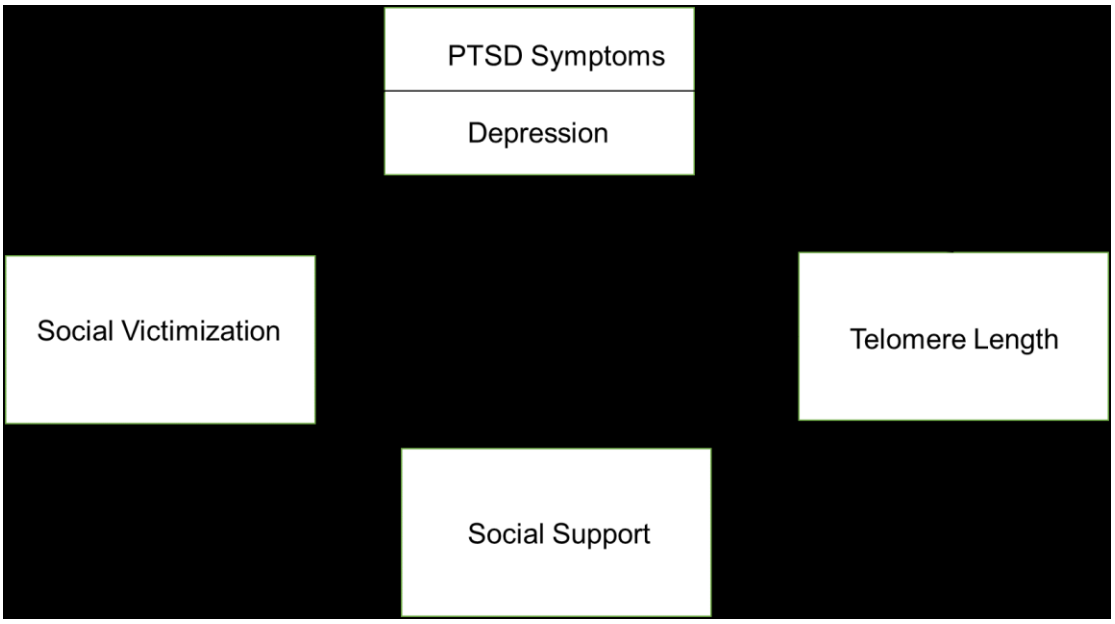


Figure B9. Model 59 from PROCESS



Appendix C

Self-Report Questionnaires

Children's Self-Experiences Questionnaire, Self-Report

(CSEQ-SR; Crick & Grotpeter, 1995)
"Things that Happen to Me at School"

Directions: Here is a list of things that sometimes happen to kids at school. How often did they happen to you while you were at school? Bubble in the circle that best describes your experiences at school.

Scale

1 = Never	3 = Sometimes	5 = All of the time
2 = Almost never	4 = Almost all of the time	

1. At school, other kids make fun of me.
2. At school, I get hit and pushed by other kids.
3. I get picked on by other kids at school.
4. I get beat up by other classmates.
5. I am ignored by other classmates when someone is mad at me.
6. I do not get invited to things (e.g., parties) because my friends sometimes don't like to include me.
7. I get left out of things when someone is mad at me or wants to get back at me for something.
8. Other kids tell rumors about me behind my back.
9. I am very strong.
10. If I were in an arm wrestling contest, I would win.
11. I make fun of people.
12. I hit and push others around.
13. I tell lies.
14. I sometimes take things that belong to someone else.
15. I make noise or bother others in class.
16. I do not follow the rules.
17. I act like a baby.
18. I get upset when called on to answer questions in class.
19. I complain a lot and nothing makes me happy.
20. I try to get other kids to play with me even when they don't want to.
21. On the playground, I just stand around.
22. I don't talk much.
23. I am afraid to do things.
24. I seem unhappy and look sad often.
25. When other kids are playing, I watch them but don't join in.
26. In a group, I share things and give other people a turn.
27. I am always friendly.
28. I am always willing to help my classmates.
29. I try to cooperate with my classmates.

Direct and Indirect Aggression Scale – Victim Version

(DIAS-VS; Björkvist, Lagerspetz, & Österman, 1992)

Directions**:** Answer each question by bubbling in the answer that seems to most closely tell you about how your classmates behave toward you.

Scale

1 = Never
2 = Seldom
3 = Sometimes
4 = Quite often
5 = Very often

1. How often are you hit by other classmates?
2. How often are you shut out of the group by other classmates?
3. How often do other classmates yell at you or argue with you?
4. How often do classmates become friends with another classmate as a kind of revenge?
5. How often are you kicked by other classmates?
6. How often are you ignored by other classmates?
7. How often are you insulted by other classmates?
8. How often do classmates who are angry with you gossip about you?
9. How often are you tripped by other classmates?
10. How often do classmates tell bad or false stories about you?
11. How often do classmates say they are going to hurt you?
12. How often do classmates plan to secretly bother you?
13. How often are you shoved by other classmates?
14. How often do classmates say bad things about you behind your back?
15. How often are you called names by other classmates?
16. How often do classmates tell others “Let’s not be friends with him/her!”?
17. How often do other classmates take things from you?
18. How often do classmates tell your secrets to a third person?
19. How often are you teased by other classmates?
20. How often do classmates write small notes where you are criticized?
21. How often are you pushed down to the ground by other classmates?
22. How often do other classmates criticize your hair or clothing?
23. How often do other classmates pull at you?
24. How often do classmates who are angry with you try to get others to dislike you?

Center for Epidemiological Studies Depression Scale for Children

(CES-DC; Weissman, Orvaschel, & Padian, 1980)

INSTRUCTIONS

Below is a list of the ways you might have felt or acted. Please check how *much* you felt this way during the *past week*.

DURING THE PAST WEEK	**Not At All**	**A Little**	**Some**	**A Lot**
1. I was bothered by things that usually don't bother me.	_____	_____	_____	_____
2. I did not feel like eating, I wasn't very hungry.	_____	_____	_____	_____
3. I wasn't able to feel happy, even when my family or friends tried to help me feel better.	_____	_____	_____	_____
4. I felt like I was just as good as other kids.	_____	_____	_____	_____
5. I felt like I couldn't pay attention to what I was doing.	_____	_____	_____	_____

DURING THE PAST WEEK	**Not At All**	**A Little**	**Some**	**A Lot**
6. I felt down and unhappy.	_____	_____	_____	_____
7. I felt like I was too tired to do things.	_____	_____	_____	_____
8. I felt like something good was going to happen.	_____	_____	_____	_____
9. I felt like things they did before didn't work out right.	_____	_____	_____	_____
10. I felt scared.	_____	_____	_____	_____

DURING THE PAST WEEK	**Not At All**	**A Little**	**Some**	**A Lot**
11. I didn't sleep as well as I usually sleep.	_____	_____	_____	_____
12. I was happy.	_____	_____	_____	_____
13. I was more quiet than usual.	_____	_____	_____	_____
14. I felt lonely, like I didn't have any friends.	_____	_____	_____	_____
15. I felt like kids I know were not friendly or that they didn't want to be with me.	_____	_____	_____	_____

DURING THE PAST WEEK	**Not At All**	**A Little**	**Some**	**A Lot**
16. I had a good time.	_____	_____	_____	_____
17. I felt like crying.	_____	_____	_____	_____
18. I felt sad.	_____	_____	_____	_____

19. I felt people didn't like me. _____ _____ _____ _____
20. It was hard to get started doing things. _____ _____ _____ _____

Network of Relationships Inventory – D

(NRI-D; Furman & Buhrmester, 1985)

Instructions: The questions below ask about your relationships with several types of people listed on the left (i.e., your mother, your father, your best friend, and your second best friend). For each question, bubble in the circle that fits you best. Rate the "father figure" or "mother figure" who lives in your home if you live with someone who is not your natural parent.

Scale:

1 = Never or hardly at all
2 = Seldom or not too much
3 = Sometimes or somewhat
4 = Often or very much
5 = Always or extremely

Companionship (COM)

1. How often do you spend fun time with this person?
11. How often do you and this person go places and do things together?
21. How often do you play around and have fun with this person?

Intimate Disclosure (DIS)

2. How often do you tell this person things that you don't want others to know?
12. How often do you tell this person everything that you are going through?
22. How often do you share secrets and private feelings with this person?

Pressure (PRE)

3. How often does this person push you to do things that you don't want to do?
13. How often does this person try to get you to do things that you don't like?
23. How often does this person pressure you to do the things that he or she wants?

Satisfaction (SAT)

4. How happy are you with your relationship with this person?
14. How much do you like the way things are between you and this person?
24. How satisfied are you with your relationship with this person?

Conflict (CON)

5. How often do you and this person disagree and quarrel with each other?
15. How often do you and this person get mad at or get in fights with each other?
25. How often do you and this person argue with each other?

Support (SUP)

6. How often do you turn to this person for support with personal problems?
16. How often do you depend on this person for help, advice, or sympathy?
26. When you are feeling down or upset, how often do you depend on this person to cheer things up?

Criticism (CRI)

7. How often does this person point out your faults or put you down?
17. How often does this person criticize you?
27. How often does this person say mean or harsh things to you?

Approval (APP)

8. How often does this person praise you for the kind of person you are?
18. How often does this person seem really proud of you?
28. How much does this person like or approve of the things you do?

Dominance (DOM)

9. How often does this person get their way when you two do not agree about what to do?
19. How often does this person end up being the one who makes the decisions for both of you?
29. How often does this person get you to do things their way?

Exclusion (EXC)

10. How often does this person ***not*** include you in activities?
20. How often does it seem like this person ignores you?
30. How often does it seem like this person ***does not*** give you the amount of attention that you want?

Social Support Scale

(SSS; Harter, 1985)

Instructions: We are interested in several types of people in your life. This is a survey, not a test. There are no right or wrong answers. I want you to answer as honestly as possible.

Scale:

1 = Very true 4 = Very untrue
2 = True 3 = Untrue

1. My parents don't really understand me.
2. My classmates like me the way I am.
3. I have a close friend with whom I can tell my problems to.
4. My parents don't seem to want to hear about my problems.
5. I have classmates who I can become friendly with.
6. I have a close friend who really understands me.
7. My parents care about my feelings.
8. I have classmates who sometimes make fun of me.
9. I have a close friend who I can talk to about things that bother me.
10. My parents treat me like a person who really matters.
11. I have classmates who pay attention to what I say.
12. I don't have a close friend with whom I like to spend time.
13. My parents like me the way I am.
14. I don't get asked to play in games with classmates very often.
15. I don't have a close friend who really listens to what I say.
16. My parents don't act like what I do is important.
17. I often spend my recess being alone.
18. I don't have a close friend who cares about my feelings.

PTSD Checklist—Civilian Version

(PCL-C; National Center for PTSD, 2003)

Instructions: Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully and choose the answer that indicates how much you have been bothered by that problem in the PAST MONTH.

Scale

1 = not at all	4 = quite a bit
2 = a little bit	5 = extremely
3 = moderately	

1. Repeated, disturbing memories, thoughts, or images of a stressful experience from the past?
2. Repeated, disturbing dreams of a stressful experience from the past?
3. Suddenly acting or feeling as if a stressful experience were happening again (as if you were reliving it)?
4. Feeling very upset when something reminded you of a stressful experience from the past?
5. Having physical reactions (e.g., heart pounding, trouble breathing, or sweating) when something reminded you of a stressful experience from the past?
6. Avoid thinking about or talking about a stressful experience from the past or avoid having feelings related to it?
7. Avoid activities or situations because they remind you of a stressful experience from the past?
8. Trouble remembering important parts of a stressful experience from the past?
9. Loss of interest in things that you used to enjoy?
10. Feeling distant or cut off from other people?
11. Feeling emotionally numb or being unable to have loving feelings for those close to you?
12. Feeling as if your future will somehow be cut short?
13. Trouble falling or staying asleep?
14. Feeling irritable or having angry outbursts?
15. Having difficulty concentrating?
16. Being "super alert" or watchful on guard?
17. Feeling jumpy or easily startled?

Health Symptoms Survey

(HSS; Knack, 2009)

Please indicate the frequency and severity of the following physical symptoms.

Scale:
Frequency: not at all sometimes often all the time
Severity: does not hurt at all hurts a little hurts a lot
unbearable pain

1. Extreme fatigue
2. Allergic reaction
3. Sleep problems
4. Stomach ache
5. Nausea/vomiting
6. Diarrhea
7. Muscle aches and pains
8. Headaches or migraine
9. Weight change (gain or loss of 5 or more pounds)
10. Respiratory congestion
11. Runny nose
12. Coughing
13. Sore throat
14. Sneezing
15. Blocked nose
16. Fever or chills
17. Dizziness
18. Double or blurred vision
19. Trouble catching breath
20. Having a cold
21. Chest pains
22. Numbness or tingling
23. Low energy
24. Ear infections
25. Getting sick
26. Heart beating too quickly
27. Visits to the doctor
28. Visits to the school nurse

Appendix D

Parent Report Questionnaires

Children's Self-Experiences Questionnaire, Parent-Report

(CSEQ-PR; adapted from Crick & Grotpeter, 1995)
"Things that Happen to Me at School"

Directions: Here is a list of things that sometimes happen to kids at school. How often did they happen to your child while he/she was at school? Bubble in the circle that best describes your child's experiences at school.

Scale

1 = Never 3 = Sometimes 5 = All of the time
2 = Almost never 4 = Almost all of the time

1. At school, other kids make fun of my child.
2. At school, my child gets hit and pushed by other kids.
3. My child gets picked on by other kids at school.
4. My child gets beat up by other classmates.
5. My child is ignored by other classmates when someone is mad at them.
6. My child does not get invited to things (e.g., parties) because his/her friends sometimes don't like to include them.
7. My child gets left out of things when someone is mad at them or wants to get back at them for something.
8. Other kids tell rumors about my child behind their back.
9. My child is very strong.
10. If my child were in an arm wrestling contest, he/she would win.
11. My child makes fun of people.
12. My child hits and pushes others around.
13. My child tells lies.
14. My child sometimes takes things that belong to someone else.
15. My child makes noise or bother others in class.
16. My child does not follow the rules.
17. My child acts like a baby.
18. My child gets upset when called on to answer questions in class.
19. My child complains a lot and nothing makes him/her happy.
20. My child tries to get other kids to play with them even when they don't want to.
21. On the playground, my child just stands around.
22. My child doesn't talk much.
23. My child is afraid to do things.
24. My child seems unhappy and looks sad often.
25. When other kids are playing, my child watches them but doesn't join in.
26. In a group, my child shares things and gives other people a turn.
27. My child is always friendly.
28. My child is always willing to help his/her classmates. My child tries to cooperate with his/her classmates.

Direct and Indirect Aggression Scale – Victim Version

(DIAS-VS; Björkvist, Lagerspetz, & Österman, 1992)

Directions**:** Answer each question by bubbling in the answer that seems to most closely tell you about how your child's classmates behave toward your child.

Scale

1 = Never
2 = Seldom
3 = Sometimes
4 = Quite often
5 = Very often

1. How often is your child hit by other classmates?
2. How often is your child shut out of the group by other classmates?
3. How often do other classmates yell at you or argue with you?
4. How often do classmates become friends with another classmate as a kind of revenge?
5. How often is your child kicked by other classmates?
6. How often is your child ignored by other classmates?
7. How often is your child insulted by other classmates?
8. How often do classmates who are angry with your child gossip about your child?
9. How often is your child tripped by other classmates?
10. How often do classmates tell bad or false stories about your child?
11. How often do classmates say they are going to hurt your child?
12. How often do classmates plan to secretly bother your child?
13. How often is your child shoved by other classmates?
14. How often do classmates say bad things about you behind your child's back?
15. How often is your child called names by other classmates?
16. How often do classmates tell others "Let's not be friends with him/her!"?
17. How often do other classmates take things from your child?
18. How often do classmates tell your child's secrets to a third person?
19. How often is your child teased by other classmates?
20. How often do classmates write small notes where your child is criticized?
21. How often is your child pushed down to the ground by other classmates?
22. How often do other classmates criticize your child's hair or clothing?
23. How often do other classmates pull at your child?
24. How often do classmates who are angry with you try to get others to dislike your child?

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(HSS; Knack, 2009)

Please indicate the frequency and severity of the following physical symptoms.

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6. Diarrhea
7. Muscle aches and pains
8. Headaches or migraine
9. Weight change (gain or loss of 5 or more pounds)
10. Respiratory congestion
11. Runny nose
12. Coughing
13. Sore throat
14. Sneezing
15. Blocked nose
16. Fever or chills
17. Dizziness
18. Double or blurred vision
19. Trouble catching breath
20. Having a cold
21. Chest pains
22. Numbness or tingling
23. Low energy
24. Ear infections
25. Getting sick
26. Heart beating too quickly
27. Visits to the doctor
28. Visits to the school nurse

Parenting Relationship Questionnaire—Child and Adolescent

(PRQ; Kamphaus & Reynolds, 2006)

Instructions: On the pages that follow are statements that describe common feelings, thoughts, beliefs, and situations a parent may have or experience when caring for his or her child. Please read each statement, and mark the response that best describes your recent experiences (over the last few months).

- Circle **N** if the statement never describes your beliefs about or experiences with your child.
- Circle **S** if the statement sometimes describes your beliefs about or experiences with your child.
- Circle **O** if the statement describes your beliefs about or experiences with your child.
- Circle **A** if the statement almost always describes your beliefs about or experiences with your child.

1. My child and I play games together.
2. I know when my child will become upset.
3. My child is getting a good education at school.
4. It is difficult for me to communicate clearly with my child.
5. I enjoy spending time with my child.
6. Children should do what parents tell them to do.
7. My child knows the house rules.
8. I know what my child is thinking.
9. Our family eats together at the dinner table.
10. My child's school meets his or her emotional needs.
11. My child and I argue.
12. It is important for a child to follow family rules.
13. My child tells me about his or her day at school.
14. I remain calm when dealing with my child's misbehavior.
15. I find it hard to talk to my child.
16. My child's school seems to spend its money wisely.
17. I punish my child if he or she talks back to an adult.
18. My child and I plan things to do together.
19. My child tells me about activities at school.
20. My child and I do arts and crafts together.
21. I listen to what my child has to say.
22. I can sense my child's moods.
23. My child tells me about his or her problems.
24. I allow my child to use the Internet without my supervision
25. I teach my child how to play new games.
26. I know when my child wants to be left alone.

27. My child's school meets his or her educational needs.
28. During the last year, my child has been difficult to take care of.
29. When my child is upset, I can calm him or her.
30. It is my responsibility as a parent to punish all of my child's misbehavior.
31. I have the energy that I need to cope with my child.
32. My child enjoys spending time with me.
33. My child and I work on projects together.
34. Teachers seem to understand my child's needs.
35. I lose my patience with my child.
36. I punish my child if he or she shows disrespect to an adult.
37. My child tells me about the things that he or she is doing with friends.
38. It is easy for me to make decisions about what my child should do.
39. My child and I get into arguments.
40. People at school seem to care about my child.
41. I punish my child if he or she destroys someone else's things.
42. I am in control of my household.
43. My child tells me, "I love you".
44. My child and I go on outings together.
45. My child is hard for me to handle.
46. I know what my child is feeling.
47. My child tells me who his or her friends are.
48. My child's school does a good job of controlling its students.
49. My child and I take walks together.
50. I know what to say to calm down my child.
51. I am happy with the services my child's school offers.
52. My child complains about how I treat him or her.
53. I know how my child will react in most situations.
54. I punish my child so he or she learns the proper respect for others.
55. I make good parenting decisions.
56. I have confidence in my child's school principal.
57. I overreact when my child misbehaves.
58. My child's school is run well.
59. My child and I get into heated discussions.
60. I insist that my child follow the rules of the house.
61. I talk to my child's teacher(s).
62. My child and I agree on most things.
63. My child tests my limits.
64. The classes offered by my child's school meet his or her needs.
65. I punish my child when he or she misbehaves.
66. I am confident in my parenting ability.
67. I tell my child, "I love you".
68. My child and I do things together outdoors.
69. I lose my temper with my child.

70. When upset, my child comes to me for comfort.
71. My child tells me what he or she has learned that day.

Appendix E

DNA Extraction Protocol

Quick reference guide:

Laboratory protocol for manual purification of DNA from 0.5 mL of sample

Purification steps
1. Mix the sample in the DNA Genotek kit by inversion and gentle shaking for a few seconds.
2. Incubate the sample at 50°C in a water incubator for a minimum of 1 hour or in an air incubator for a minimum of 2 hours.
3. Transfer 500 µL of the sample to a microcentrifuge tube.
4. Add 20 µL of PT-L2P and mix by vortexing for a few seconds.
5. Incubate on ice for 10 minutes.
6. Centrifuge at room temperature (RT) for 5 minutes at 15,000 x *g*.
7. Carefully transfer the majority of the clear supernatant with a pipette to a fresh microcentrifuge tube. **Discard the pellet.**
8. Add 600 µL of RT 95% to 100% ethanol to the clear supernatant. Mix gently by inversion 10 times.
9. Let the sample stand at RT for 10 minutes to allow the DNA to fully precipitate.
10. Place the tube into the centrifuge with a known orientation. Centrifuge at RT for 2 minutes at 15,000 × *g*.
11. Carefully pipette off the supernatant and discard it. Take care to avoid disturbing the DNA pellet.
12. Add 250 µL of 70% ethanol and let stand at RT for 1 minute. **Completely remove the ethanol, without disturbing the pellet.**
13. Add 100 µL of TE solution and vortex the sample for at least 5 seconds.
14. Incubate overnight at RT or at 50°C for 1 hour vortexing occasionally.
15. Storage: In aliquots at -20°C for long-term storage (recommended) or at 4°C for up to 2 months.

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