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Author Manuscript

Matern Child Health J. Author manuscript; available in PMC 2014 December 01.

Published in final edited form as:

Matern Child Health J. 2013 December ; 17(10): . doi:10.1007/s10995-013-1221-1.

Somatic Symptoms Among US Adolescent Females: Associations with Sexual and Physical Violence Exposure

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Abstract

Objective—To examine the association between physical and sexual violence exposure and somatic symptoms among female adolescents.

Methods—We studied a nationally representative sample of 8,531 females, aged 11–21 years, who participated in the 1994–95 Wave I of the National Longitudinal Study of Adolescent Health (Add Health). Female adolescents were asked how often they had experienced 16 specific somatic symptoms during the past 12 months. Two summary categorical measures were constructed based on tertiles of the distributions for the entire female sample: a) total number of different types of symptoms experienced, and b) number of frequent (once a week or more often) different symptoms experienced. Groups were mutually exclusive. We examined associations between adolescents' violence exposure and somatic symptoms using multinomial logistic regression analyses.

Results—About 5% of adolescent females reported both sexual and non-sexual violence, 3% reported sexual violence only, 36% reported non-sexual violence only, and 57% reported no violence. Adolescents who experienced both sexual and non-sexual violence were the most likely to report many different symptoms and to experience very frequent or chronic symptoms. Likelihood of high symptomatology was next highest among adolescents who experienced sexual violence only, followed by females who experienced non-sexual violence only.

Conclusions—Findings support an exposure-response association between violence exposure and somatic symptoms, suggesting that symptoms can be markers of victimization. Treating symptoms alone, without addressing the potential violence experienced, may not adequately improve adolescents' somatic complaints and well-being.

Keywords

somatic symptoms; violence; sexual violence; national sample

Exposure to physical and sexual violence is common among US adolescents. Data from the 2009 Youth Risk Behavior Survey (YRBS) indicate that almost a third (32%) of US students

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in grades 9–12 report having been in a physical fight one or more times during the 12 months before the survey, and about 4% report being injured in a fight.[1] Almost 8% of students had been threatened or injured with a weapon (e.g., a gun, knife, or club) on school property one or more times in the 12 months before the survey, and 20% had been bullied. Over 7% of students had been physically forced to have sexual intercourse. Most types of violent experiences are more common among adolescent males (e.g., 39% of male students report having been in a physical fight in the past year compared with 23% of female students), and are more common among non-Hispanic black and Hispanic males than among non-Hispanic whites. However, sexual victimization is more likely among females (10.5% versus 4.5% of males), and like physical violence, is higher among non-Hispanic black (10.0%) and Hispanic (8.4%) than among non-Hispanic white (6.3%) students.

A link between violence and mental health outcomes has been long reported, [2–4] but increasing evidence suggests that violence exposure can also result in persistent physical (somatic) symptoms, and that co-occurrence or cumulative violence exposure further increases the likelihood of experiencing physical symptoms. [5–9] For example, exposure-response linkages between sexual violence victimization and somatic symptoms have been demonstrated for adult women. [10] In this 2007 study, women who were exposed to sexual violence were more likely to report experiencing all of the 14 somatic symptoms assessed than women who were not. Approximately one-quarter of sexual assault victims reported experiencing pain during intercourse, chest pain, feeling their heart race, constipation/diarrhea, and trouble sleeping, whereas only 12–14% of women who were not victims of sexual assault experienced these same symptoms. In multivariate analysis, as the number of violent events increased, so did the odds of experiencing three or more physical symptoms. Further, exposure to both sexual and physical violence was associated with more symptoms than either alone. However, a significant limitation of the adult literature is that participants reflect selected samples (for example, over-samples of women with fibromyalgia and major depression [e.g., 5] or samples recruited from specialized health care settings [e.g., 8–9], limiting generalizability of findings. Further, studies do not necessarily assess the potential additive effects of different types of violence. [10]

Several theories have been proposed to explain the mechanisms underlying traumatic experiences and somatic complaint, including somatization disorder, attachment theory, family systems approaches, social learning theory, cognitive psychobiological theory, and coping and stress response theories. For a thorough review, see Beck, 2008. [11] Although data limitations preclude testing these mechanisms in the current paper, our analytic approach is based upon research suggesting that stress exposures may induce enduring changes in neurosensory processing. [12] A number of animal models have been developed demonstrating persistent changes in neurosensory processing after exposure to non-noxious stressors such as unpredictable sound, [13] cold environment, [14] a vibrating floor plate, [15] and restraint. [16] Further, recent clinical studies indicate that stress system function may have a greater influence on pain and other symptoms appearing after common trauma exposures than do trauma characteristics (e.g., amount of motor vehicle damage, [17] size of burn injury [18]).

Despite the fact that adolescence appears to be an especially vulnerable period for experiencing physical symptoms, [19–23] relatively few studies have examined the association between violence exposure and physical symptoms among this age group. Among younger adolescents, bullying by peers has been linked to psychosomatic complaints [24]. Based on samples of adolescents spanning a larger age range, work suggests that both relational (i.e., spreading rumors, socially isolating acts, peer rejection) and physical violence are associated with physical symptoms [25–27], with relationship violence perhaps having unique effects, particularly for females. However, virtually all available information

for adolescents is based on retrospective reports or data from small and/or selected samples, such as a subset set of high schools in a single city [25; 27, 28] or undergraduates [29]. These limitations potentially distort our understanding of experiential contributors to somatic symptoms, an important process. Persistently high numbers of somatic symptoms independently predict health status in adult population-based studies [30], and somatic symptoms in youth have been linked to poorer physical and mental health, greater frequency of substance abuse, and worse school performance. [31, 32] Further, progress in understanding the risk and protective factors that contribute to physical symptoms requires an integrative model that includes contextual factors, particularly those that may increase or alleviate stress [11]. Such factors may vary significantly across adolescents from diverse backgrounds.

The current study extends past research by studying the additive and interactive associations between different types of violence exposure and somatic symptoms in a nationally representative sample of 8,531 adolescent females, aged 11–21 years. Somatic symptoms of four non-overlapping groups of adolescent females with varying types of violence exposure are compared, namely, those who experienced: (1) both sexual and non-sexual violence, (2) sexual violence only, (3) non-sexual violence only, and (4) no violence. Somatic symptoms are examined in terms of the specific types of symptoms (e.g., headaches, feeling hot, etc.) experienced, the number of different types of symptoms experienced, and the number of different chronic symptoms (i.e., symptoms that occur at least once a week) experienced.

METHODS

Data Source

We conducted a cross-sectional analysis using data from the Wave I in-home interviews of the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a nationally representative prospective survey of US adolescents enrolled in grades 7 through 12 in the 1994–1995 school year. Details on the study design have been published previously. [33] At Wave I, 20,745 youth completed an in-home interview between April and December of 1995 (response rate 78.9%); audio computer assisted self-interviewing (ACASI) was used for sensitive content. A parent figure, usually the mother, also completed a questionnaire (response rate 85.6%). It is possible that the prevalence of violence exposure or prevalence of somatic symptoms differ between the 1990s, when these data were collected, and the present. However, there are no theoretical or empirical reasons to expect that potential associations between violence exposure and somatic symptoms would be different from those identified in more recently interviewed adolescents.

We limited our analyses to females because information about sexual violence victimization was asked only of females at the Wave I interview (n=10,489). We further limited our analysis sample to females with valid sampling weights (n=9,641). Because of their small sample sizes, we also excluded 776 Asian and American Indian adolescents, and 334 respondents with missing data, yielding a final analysis sample of 8,531 females.

All Add Health protocols were reviewed and approved by the Institutional Review Board (IRB) for the Protection of Human Subjects at the University of North Carolina at Chapel Hill. Current analyses were deemed exempt by the IRB.

Measures

Each adolescent was classified into one of four mutually exclusive “violence exposure groups,” both sexual and non-sexual violence, sexual violence only, non-sexual violence only, and no violence. Classification was based on a series of items: whether the adolescent had ever been physically forced to have sexual intercourse against her will, and whether in

the past 12 months the adolescent had been in a physical fight, witnessed someone shoot or stab another person, had a knife or gun pulled on her, was shot at, was cut or stabbed, or was jumped.

Adolescents were asked how often (never, just a few times, about once a week, almost every day, and every day) they had experienced each of 16 somatic symptoms during the past 12 months: headaches, feeling hot all over for no reason, stomach ache, cold sweats, feeling physically weak for no reason, sore throat or cough, feeling tired for no reason, painful or very frequent urination, waking up feeling tired, skin problems such as itching or pimples, dizziness, chest pain, aches, pains or soreness in muscles or joints, menstrual cramps, poor appetite, and trouble falling or staying asleep. The types of symptoms examined are similar to those in previous studies on violence and somatic complaint. [5, 6, 8–10, 19] We collapsed responses to each item into three categories (never, just a few times, and about once a week or more) and constructed two symptom summary variables. The first summary variable is the total number of different symptoms in the past year: few symptoms (0 to 8); some symptoms (9 to 11); and many symptoms (12 to 16). Second, to examine very frequent or chronic symptoms, we classified adolescents into one of three mutually exclusive groups dependent upon the number of different symptoms that they experienced at least once per week: few frequent symptoms (0–1); some frequent symptoms (2–3); and many frequent symptoms (4 or more). Groupings for both summary variables were based on tertiles of the distribution for the entire female sample.¹ For multivariate analysis, somatic symptoms were grouped together. This is a common analytic strategy [6, 8–10, 19] because there is little evidence to differentiate biological mechanisms that may mediate changes in neurosensory processing in some symptoms versus others.

Covariates included age at Wave I (less than 16 [referent group], 16–18, and greater than 18 years), self-reported race-ethnicity (non-Hispanic white [referent], non-Hispanic black, and Hispanic), and parental education as an indicator of the socioeconomic status of the adolescent's family of origin (no college and some college/trade school or beyond [referent]). Missing parental responses were replaced with the adolescent's report of the educational attainment of the parent.

Analysis

Descriptive statistics (including percentages weighted for sampling probabilities) and bivariate analyses (including Pearson's chi-square tests) were used to compare the distributions of sociodemographic characteristics (age, race/ethnicity, and parental education level) and the 16 somatic symptoms across the four violence exposure groups. We examined associations between adolescents' violence exposure and somatic symptoms in bivariate comparisons (Pearson's chi-square tests) and with multinomial logistic regression models that modeled the log odds of membership in the symptom groups as a function of violence exposure, age, race-ethnicity, and parental education. All analyses were conducted using Stata version 10.0 (StataCorp. Stata Statistical Software: Release 10. College Station, TX: StataCorp LP, 2007), and were adjusted for Add Health's complex design. We tested for possible interactions between violence exposure group and all covariates.

RESULTS

Violence Exposure

Among the 8,531 female adolescents in the analysis sample, 404 (4.7%) reported both sexual and non-sexual violence, 234 (2.7%) reported sexual violence only, 3064 (35.9%)

¹We examined symptom variables as counts and also applied other cutpoints; findings were consistent across variable formats.

reported non-sexual violence only, and 4829 (56.6%) reported no violence. Among adolescents experiencing both sexual and non-sexual violence, 91% reported being in a physical fight, 38% reported having a knife/gun pulled on them, being jumped, stabbed, or shot, and 29% reported observing a shooting or stabbing. Four in 10 (42%) girls who experienced both sexual and non-sexual violence reported more than one type of non-sexual violence. Among adolescents experiencing non-sexual violence only, 89% reported being in a physical fight, 28% reported having a knife/gun pulled on them, being jumped, stabbed, or shot, and 21% reported observing a shooting or stabbing; 30% of this latter group experienced more than one type of non-sexual violence.

Sociodemographic Characteristics of Violence Exposure Groups

Adolescents in the four violence groups differed significantly in sociodemographic characteristics (see Table 1). As with other national data capturing violence exposure, a higher percentage of non-Hispanic white youth reported experiencing no violence (63%) relative to non-Hispanic black (40%) or Hispanic youth (48%). Non-Hispanic black females had the highest past year prevalence of non-sexual violence experiences. Youth whose parents had attained some college or beyond were less likely to report violence, with the exception of sexual violence only. In general, older adolescents were more likely to report violence exposure. Age differences were most apparent relative to sexual violence, which reflects lifetime experiences and therefore a longer exposure period.

Somatic Symptoms and Violence Experiences

Table 2 displays the frequency of experiencing each somatic symptom reported by girls in each violence exposure group. As documented in other work using Add Health data, [23] physical symptoms are common among adolescents. More than half of the symptoms are reported to be experienced once a week or more by 10% or more of the girls in each exposure group. The frequency of somatic symptoms does vary, however, by types of violence exposure (Table 2), although most symptoms show a similar pattern. Adolescents who experienced both sexual and non-sexual violence were the most likely to experience chronic symptoms (i.e., symptoms that occurred once a week or more for the past 12 months), followed by the group who experienced sexual violence only, then the group who experienced non-sexual violence only, and lastly, the no violence group. Youth who experienced both sexual and non-sexual violence, and youth who reported sexual violence only, were generally less likely to report no symptoms during the past year. For every symptom, the association between violence exposure and symptoms was statistically significant ($p < 0.0001$).

Table 3 shows that the number of different symptoms experienced varies significantly by the types of violence experienced ($p < 0.0001$), with an exposure-response pattern being evident. Almost half (46%) of adolescents who experienced both sexual and non-sexual violence were grouped into the highest number of different symptoms per year category (12–16 symptoms per year), compared to 39% of adolescents with sexual violence only, 34% of adolescents with non-sexual violence only, and 27% of adolescents with no violence. There was also a significant relationship ($p < 0.0001$) between adolescents' experiences of violence and the number of chronic symptoms during the past year (i.e., number of symptoms that occurred at least once a week during the past 12 months), with an exposure-response pattern again being evident. The greatest number of frequently occurring symptoms (4 or more frequently occurring different symptoms per year) were experienced by 56% of adolescents with both sexual and non-sexual violence, 48% of adolescents with sexual violence only, 42% of adolescents with non-sexual violence only, and 29% of adolescents with no violence.

Table 4 displays the odds ratios and 95% confidence intervals from adjusted models. No interactions between violence exposure group membership and control variables were significant, so only main effects are shown. Associations between experiences of violence and both symptom variables remained statistically significant after adding controls, and show similar patterns. Adolescent females who experienced both sexual and non-sexual violence were at highest risk of physical symptoms, followed by girls who experienced sexual violence only, girls who experienced non-sexual violence only, and finally girls without violence experiences. Eleven of these twelve estimated odds ratios were statistically significant. Confidence intervals for sexual and non-sexual regression coefficients do not overlap with coefficients for experiencing both types of violence, suggesting significant interactions between experience of sexual violence and non-sexual violence. For example, comparing a high number of different symptoms to a low number of different symptoms, the (adjusted for other covariates) odds ratio measuring the association between sexual violence (in the absence of non-sexual violence) and this dichotomous outcome is 2.10; however, in the presence of non-sexual violence, this odds ratio changes from 2.10 to 3.83, indicating a strong interaction effect. Also, note that the value of 3.83 is not contained in the 95% confidence intervals (1.40, 3.15) and (1.57, 2.14) associated with sexual violence and non-sexual violence, respectively.

Additionally, after adjustment for violence exposure, age and parental education, non-Hispanic black and Hispanic female youth had lower odds of reporting a medium or high number and frequency of symptoms than non-Hispanic white females. In addition, females between the ages of 16 and 18 had higher odds of reporting more symptoms and frequency of chronic symptoms than females younger than 16.

DISCUSSION

Although adolescents are particularly vulnerable to experiencing physical symptoms, few studies have examined associations between symptoms and different types of violence exposure in this age group, and what available information there is primarily reflects analyses of data from small selected samples or from retrospective reports. Our findings indicate, in prospective data collected from a nationally representative sample of US adolescents, that violence exposure is common among adolescent females, and that physical symptoms are differentially associated with different types of violence. Girls who experience both sexual and non-sexual violence are most likely to experience high numbers of different somatic symptoms, and high numbers of chronic symptoms. The “sexual violence only” group is the next highest in terms of likelihood of somatic symptoms, followed by the “non-sexual violence only” group. This pattern suggests an interaction between the effects of sexual and non-sexual violence as well as an exposure-response association between co-occurring and/or cumulative violence exposure and somatic symptoms among a diverse national sample of US adolescents. This is a new finding that is consistent with exposure-response associations between violence and physical symptoms seen in smaller and more select samples of adults [10, 34, 35] and adolescents [6], and between violence and subsequent psychological and emotional symptoms (versus somatic symptoms as examined here) among youth. [36] Our findings are also consistent with a smaller, population-based study of Swedish adolescents [37], which found significant associations among harassment by peers (e.g., “Other students accuse you of things that you haven’t done or things you can’t help,” “One or more students have hit you or hurt you in some way”), perceptions of stress, and two specific somatic symptoms, abdominal pain and headaches.

Although our study was not able to test potential mechanisms linking violence exposures to somatic complaints, we found evidence that the frequencies of all the 16 symptoms assessed

were higher among female adolescents experiencing multiple forms of violence. This suggests that the biological mechanism connecting violence and somatic symptoms is not unique for each symptom. Rather our findings indicate a general elevation across many somatic symptoms with violence exposure. More research is needed to better understand the mechanisms underlying violence exposure and subsequent somatic symptoms, and the interventions that might ameliorate these negative health consequences.

Limitations

Although our analyses have many strengths (they examined a large nationally representative sample of adolescent females using an extensive list of somatic symptoms), they also have limitations. Most importantly, because of data limitations, we are unable to precisely sequence violence exposure and onset of somatic symptoms. This is especially problematic for sexual violence, which was assessed in terms of lifetime exposure. Therefore, it is possible that somatic symptoms preceded some exposures. Second, the questions assessing physical violence are not necessarily inclusive of familial violence or maltreatment by caregivers. Thus the “no violence” category could capture adolescents who have experienced some type of violence, such as parental maltreatment, that was not assessed in the Wave I questionnaire. Further, adolescents in the violence groups may have experienced other forms of victimization that are not included in the study definitions. Additionally, the perceived severity of violence experiences was not assessed, so it is not possible to characterize violence exposure more fully. This limitation points to the need for additional research into the etiology of linkages between violence exposure and somatic symptoms during adolescence. A third limitation is that in Add Health boys were not asked about sexual victimization in the adolescent (Waves I and II) interviews, so we are unable to examine these associations for male youth. Fourth, there may be additional potential confounders that we have not included in our statistical models. For example, a history of excessive alcohol and drug use may be related to other types of violence exposure, as measured here, and to traumatic symptoms. Finally, we note that previous research studies have used a variety of cut points for somatic symptoms, and the tertiles used here do not necessarily carry distinct clinical meaning.

Despite these limitations, our findings suggest the potential importance of somatic symptoms, especially multiple chronic symptoms, as markers for violence exposure and victimization. Given the large numbers of adolescents exposed to multiple types of violence, and the likelihood of repeated violence victimization across the life course, [6, 38] treating symptoms alone, without addressing the potential violence experienced, may not adequately improve adolescents’ somatic complaints and well-being. Health professionals would be well-advised to ask about violence among their female patients presenting with many somatic symptoms, and to explore problems in peer relationships.

As part of an effort to understand the mechanisms underlying violence exposure and subsequent somatic symptoms future research would benefit from longitudinal analysis in diverse samples. Studies that examine the potentially differential effects of violence exposure among males and females are needed. For example, there is some suggestion, albeit in small, non-representative samples, that emotional reactivity and/or personal coping skills may moderate the effects of peer rejection among adolescent girls (more reactive adolescents have more physical symptoms), but appear not to serve as effect modifiers for boys [26]. These types of distinctive associations, especially if examined over time for adolescents of diverse backgrounds and living in different contexts, can inform prevention and intervention programs and potentially lower the risk of future health problems.

Acknowledgments

This work was supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development [Grants R01HD57046 and T32 HD07168] and a training grant from the Department of Health and Human Services, Health Resources and Services Administration (T76MC00004).

This research uses data from Add Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (<http://www.cpc.unc.edu/addhealth>). No direct support was received from grant P01-HD31921 for this analysis. Use of this acknowledgment requires no further permission from the persons named.

References

- Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance – United States. 2009. *MMWR Surveill Summ.* 2010; 59:SS-5.
- Bailey BN, Delaney-Black V, Hannigan JH, et al. Somatic complaints in children and community violence exposure. *J Dev Behav Pediatr.* 2005; 26(5):341–348. [PubMed: 16222173]
- Ciccone DS, Elliott DK, Chandler HK, et al. Sexual and physical abuse in women with fibromyalgia syndrome: a test of the trauma hypothesis. *Clin J Pain.* 2005; 21(5):378–386. [PubMed: 16093743]
- Walling MK, Reiter RC, O'Hara MW, et al. Abuse history and chronic pain in women: I. Prevalences of sexual abuse and physical abuse. *Obstet Gynecol.* 1994; 84(2):193–199. [PubMed: 8041529]
- Chandler HK, Ciccone DS, Raphael KG. Localization of pain and self-reported rape in a female community sample. *Pain Med.* 2006; 7(4):344–352. [PubMed: 16898946]
- Margolin G, Vickerman KA, Oliver PH, et al. Violence exposure in multiple interpersonal domains: cumulative and differential effects. *J Adolesc Health.* 2010; 47(2):198–205. [PubMed: 20638013]
- Golding JM. Sexual assault history and limitations in physical functioning in two general population samples. *Res Nurs Health.* 1996; 19:33–44. [PubMed: 8552801]
- Koss MP, Koss PG, Woodruff WJ. Deleterious effects of criminal victimization on women's health and medical utilization. *Arch Intern Med.* 1991; 151:342–7. [PubMed: 1992961]
- Stein MB, Lang AJ, Laffaye C, et al. Relationship of sexual assault history to somatic symptoms and health anxiety in women. *Gen Hosp Psychiatry.* 2004; 26:178–83. [PubMed: 15121345]
- Eberhard-Gran M, Schei B, Eskild A. Somatic symptoms and diseases are more common in women exposed to violence. *J Gen Intern Med.* 2007; 22(12):1668–1673. [PubMed: 17922169]
- Beck J. A developmental perspective on functional somatic symptoms. *J Pediatr Psychol.* 2008; 33(5):547–562. [PubMed: 18056142]
- McLean SA, Clauw DJ, Abelson JL, Liberzon I. The development of persistent pain and psychological morbidity after motor vehicle collision: integrating the potential role of stress response systems into a biopsychosocial model. *Psychosom Med.* 2005; 67(5):783–90. [PubMed: 16204439]
- Green PG, Alvarez P, Gear RW, Mendoza D, Levine JD. Further validation of a model of fibromyalgia syndrome in the rat. *J Pain.* 2011; 12(7):811–8. [PubMed: 21481648]
- Satoh M, Kuraishi Y, Kawamura M. Effects of intrathecal antibodies to substance P, calcitonin gene-related peptide and galanin on repeated cold stress-induced hyperalgesia: comparison with carrageenan-induced hyperalgesia. *Pain.* 1992; 49(2):273–8. [PubMed: 1376888]
- Vidal C, Jacob J. Hyperalgesia induced by non-noxious stress in the rat. *Neurosci Lett.* 1982; 32(1):75–80. [PubMed: 7145227]
- Gamaro GD, Xavier MH, Denardin JD, et al. The effects of acute and repeated restraint stress on the nociceptive response in rats. *Physiol Behav.* 1998; 63(4):693–7. [PubMed: 9523917]
- McLean SA, Diatchenko L, Lee YM, et al. Catechol O-methyltransferase haplotype predicts immediate musculoskeletal neck pain and psychological symptoms after motor vehicle collision. *J Pain.* 2011; 12(1):101–7. [PubMed: 20688576]

18. Orrey DC, Bortsov AV, Hoskins JM, et al. Catechol-O-Methyltransferase Genotype Predicts Pain Severity in Hospitalized Burn Patients. *J Burn Care Res.* 2012; 33(4):518–523. [PubMed: 22210062]
19. Eminson M, Benjamin S, Shortall A, et al. Physical symptoms and illness attitudes in adolescents: An epidemiological study. *J Child Psychol Psychiatry.* 1996; 37(5):519–528. [PubMed: 8807432]
20. Ghandour RM, Overpeck MD, Huang ZJ, et al. Headache, stomachache, backache, and morning fatigue among adolescent girls in the United States: associations with behavioral, sociodemographic, and environmental factors. *Arch Pediatr Adolesc Med.* 2004; 158(8):797–803. [PubMed: 15289254]
21. Perquin CW, Hazebroek-Kampschreur A, Hunfeld J, et al. Pain in children and adolescents: A common experience. *Pain.* 2000; 87(1):51–58. [PubMed: 10863045]
22. Taylor DC, Szatmari P, Boyle MH, et al. Somatization and the vocabulary of everyday bodily experiences and concerns: A community study of adolescents. *J Child Psychol Psychiatry.* 1996; 35(4):491–499.
23. Rhee H, Miles MS, Halpern CT, et al. Prevalence of recurrent physical symptoms in US adolescents. *Pediatr Nurs.* 2005; 31(4):314–319. 350. [PubMed: 16229130]
24. Gini G, Pozzoli T. Association Between Bullying and Psychosomatic Problems: A Meta-analysis. *Pediatrics.* 2009; 123:1059–1065. [PubMed: 19255040]
25. Nixon CL, Linkie CA, Coleman PK, Fitch C. Peer Relational Victimization and Somatic Complaints During Adolescence. *J Adolesc Health.* 2011; 49:294–299. [PubMed: 21856522]
26. Brendgen M, Vitaro F. Peer Rejection and Physical Health Problems in Early Adolescence. *J Dev Behav Pediatr.* 2008; 29:183–190. [PubMed: 18367992]
27. Nishina A, Juvonen J, Witkow MR. Sticks and Stones May Break My Bones, but Names Will Make Me Feel Sick: The Psychosocial, Somatic, and Scholastic Consequences of Peer Harassment. *J Clin Child Adolesc Psychol.* 2005; 34(1):37–48. [PubMed: 15677279]
28. Singer MI, Anglin TM, Song LY, et al. Adolescents Exposure to Violence and Associated Symptoms of Psychological Trauma. *JAMA.* 1995; 273(6):477–482. [PubMed: 7837366]
29. McGruder-Johnson AK, Davidson ES, Gleaves DH, et al. Interpersonal violence and posttraumatic symptomatology - The effects of ethnicity, gender, and exposure to violent events. *J Interpers Violence.* 2000; 15(2):205–221.
30. Creed FH, Davies I, Jackson J, Littlewood A, Chew-Graham C, Tomenson B, Macfarlane G, Barsky A, Katon W, McBeth J. The epidemiology of multiple somatic symptoms. *J Psychosom Res.* 2012; 72:311–317. [PubMed: 22405227]
31. Wright MR, von Wright J. Habitual somatic discomfort in a representative sample of adolescents. *J Psychosom Res.* 1992; 36(4):383–390. [PubMed: 1593513]
32. Puzanovova M, Arbogast PG, Smith CA, et al. Autonomic activity and somatic symptoms in response to success vs. failure on a cognitive task: A comparison of chronic abdominal pain patients and well children. *J Psychosom Res.* 2009; 67(3):235–243. [PubMed: 19686879]
33. Harris, KM.; Halpern, CT.; Whitsel, E., et al. The National Longitudinal Study of Adolescent Health: Research Design [WWW document]. Carolina Population Center; Website. <http://www.cpc.unc.edu/projects/addhealth/design>. Updated 2009 [Accessed February 21, 2011]
34. Nicolaidis C, Curry MA, McFarland B, Gerrity M. Violence, mental health, and physical symptoms in an academic internal medicine practice. *J Gen Intern Med.* 2004; 19:819–27. [PubMed: 15242466]
35. McCauley J, Kern DE, Kolodner K, Derogatis LR, Bass EB. Relation of low severity violence to women's health. *J Gen Intern Med.* 1998; 13:687–91. [PubMed: 9798816]
36. Alfvén G, Östberg V, Hjercic A. Stressor, perceived stress and recurrent pain in Swedish schoolchildren. *J Psychosom Res.* 2008; 65:381–387. [PubMed: 18805248]
37. Halpern CT, Spriggs AL, Martin SL, et al. Patterns of intimate partner violence victimization from adolescence to young adulthood in a nationally representative sample. *J Adolesc Health.* 2009; 45(5):508–516. [PubMed: 19837358]

Table 1

Sociodemographic Characteristics of Female Adolescents Stratified by their Lifetime Experiences of Sexual Violence and Other Violence Exposures over the Past Year (n=8531)

	Both Sexual* and Non-Sexual Violence [†] (n=404)				Sexual Violence* Only (n=234)		Non-Sexual Violence [‡] Only (n=3064)		No Violence (n=4829)	
	Total	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	p-value
Age (at Wave I)										
< 16 years	4059	119 (2.9)	48 (1.0)	1648 (40)	2244 (56)					0.0001
16–18	3230	205 (6.7)	115 (4.0)	1065 (32)	1845 (58)					
> 18	1242	80 (6.8)	71 (5.3)	351 (27)	740 (61)					
Race/ethnicity										0.0001
White	4936	212 (4.2)	160 (2.7)	1431 (30)	3133 (63)					
Black	2045	128 (7.3)	49 (2.5)	986 (50)	882 (40)					
Hispanic	1550	64 (4.2)	25 (1.3)	647 (46)	814 (48)					
Parental education level										0.0001
Some College or beyond	4359	172 (3.8)	128 (2.7)	1375 (30)	2684 (63)					
No College	4172	232 (5.6)	106 (2.3)	1689 (41)	2145 (51)					

Note: All percentages are adjusted for sampling probability; sample sizes are unweighted.

* Sexual violence is defined as having ever been physically forced to have sexual intercourse against your will.

[†] Non-sexual violence includes at least one or more of the following types of violence in the past 12 months: participating in a physical fight; having a knife or gun pulled on you, being jumped, shot, or stabbed; shot, or stabbed; and observing a shooting or stabbing.

Table 2

Number and Percentage of Female Adolescents Experiencing 16 Somatic Symptoms During the Past Year as a Function of Lifetime Experiences of Sexual Violence and Other Violence Exposures over the Past Year (n=8531)

	Both Sexual* and Non-Sexual Violence [†] (n=404)			Sexual Violence* Only (n=234)			Non-Sexual Violence [†] Only (n=3064)			No Violence (n=4829)		
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Headaches												
Once a week or more	209 (53)	121 (54)	1229 (41)	1649 (35)								
Few times	184 (44)	103 (41)	1675 (55)	2880 (60)								
Never	11 (3.2)	10 (4.9)	160 (4.6)	300 (5.6)								
Feeling hot												
Once a week or more	50 (11)	29 (13)	305 (10)	272 (5.7)								
Few times	167 (42)	89 (37)	1154 (37)	1586 (34)								
Never	187 (47)	116 (50)	1605 (53)	2971 (61)								
Stomach ache												
Once a week or more	138 (36)	75 (31)	798 (25)	868 (19)								
Few times	246 (59)	135 (58)	1969 (66)	3451 (71)								
Never	20 (4.4)	24 (11)	297 (9)	510 (10)								
Cold sweats												
Once a week or more	16 (4.8)	4 (2.4)	101 (3.1)	72 (1.6)								
Few times	81 (21)	46 (15)	615 (20)	806 (17)								
Never	307 (74)	184 (83)	2348 (77)	3951 (81)								
Physically weak												
Once a week or more	84 (20)	41 (18)	409 (12)	409 (8.4)								
Few times	184 (45)	107 (46)	1217 (39)	1867 (38)								
Never	136 (35)	86 (36)	1438 (49)	2553 (54)								
Sore throat/cough												
Once a week or more	72 (17)	31 (15)	435 (14)	445 (9.7)								
Few times	273 (70)	164 (69)	2089 (68)	3566 (75)								
Never	59 (13)	39 (16)	540 (18)	818 (15)								
Very tired												
Once a week or more	157 (41)	80 (35)	928 (29)	1017 (21)								

	Both Sexual* and Non-Sexual Violence ^f (n=404)	Sexual Violence* Only (n=234)	Non-Sexual Violence ^f Only (n=3064)	No Violence (n=4829)
	n (%)	n (%)	n (%)	n (%)
Few times	162 (38)	84 (32)	1210 (40)	2052 (43)
Never	85 (21)	70 (32)	926 (31)	1760 (36)
Painful urination				
Once a week or more	21 (6.7)	10 (4.4)	130 (4.0)	115 (2.6)
Few times	72 (17)	45 (22)	452 (16)	506 (11)
Never	311 (77)	179 (74)	2482 (80)	4208 (87)
Wake up tired				
Once a week or more	220 (56)	111 (52)	1422 (46)	1885 (39)
Few times	139 (34)	103 (40)	1161 (38)	2079 (43)
Never	45 (10)	20 (8.6)	481 (16)	865 (18)
Skin problems/acne				
Once a week or more	138 (35)	78 (36)	995 (33)	1429 (30)
Few times	167 (43)	109 (45)	1319 (44)	2332 (49)
Never	99 (23)	47 (19)	750 (23)	1068 (21)
Dizzy				
Once a week or more	62 (17)	28 (9.6)	297 (10)	326 (6.7)
Few times	167 (41)	96 (41)	1132 (37)	1538 (33)
Never	175 (43)	110 (49)	1635 (54)	2920 (60)
Chest pain				
Once a week or more	41 (8.2)	21 (8.1)	189 (6.6)	142 (2.9)
Few times	126 (30)	61 (25)	848 (27)	997 (20)
Never	237 (61)	152 (67)	2027 (66)	3690 (77)
Muscle/joint pain				
Once a week or more	145 (37)	74 (28)	801 (27)	1001 (21)
Few times	195 (47)	114 (52)	1582 (52)	2740 (58)
Never	64 (16)	46 (21)	681 (22)	1088 (22)
Menstrual cramps				
Once a week or more	169 (42)	74 (32)	958 (29)	1164 (23)
Few times	182 (43)	122 (50)	1577 (53)	2738 (57)
Never	53 (14)	38 (18)	529 (18)	927 (20)

	Both Sexual* and Non-Sexual Violence [†] (n=404)	Sexual Violence* Only (n=234)	Non-Sexual Violence [†] Only (n=3064)	No Violence (n=4829)
	n (%)	n (%)	n (%)	n (%)
Poor appetite				
Once a week or more	120 (36)	65 (23)	608 (19)	636 (13)
Few times	147 (33)	65 (33)	1047 (35)	1831 (38)
Never	137 (31)	104 (44)	1409 (46)	2362 (49)
Insomnia				
Once a week or more	159 (41)	69 (30)	893 (29)	1053 (22)
Few times	139 (33)	86 (37)	1035 (34)	1819 (38)
Never	106 (27)	79 (32)	1136 (37)	1957 (40)

Note: All percentages are adjusted for sampling probability; sample sizes are unweighted.

[†]Sexual violence is defined as having ever been physically forced to have sexual intercourse against your will.

[†]Non-sexual violence includes: at least one or more of the following types of violence in the past 12 months: participating in a physical fight; having a knife or gun pulled on you, being jumped, shot or stabbed; and observing a shooting or stabbing.

Table 3

Number and Percentage of Different Symptoms and Frequent Symptoms During the Past Year among Female Adolescents Stratified by their Lifetime Experiences of Sexual Violence and Other Violence Exposures over the Past Year (n=8531)

	Number of Different Symptoms [#]				Number of Frequent Symptoms [§]				p-value
	High (12 – 16) n (%)	Medium (9 – 11) n (%)	Low (0 – 8) n (%)	p-value	High (4) n (%)	Medium (2 – 3) n (%)	Low (0 – 1) n (%)		
Lifetime Exposure to Violence				0.0001				0.0001	
Both Sexual [*] and Non-Sexual Violence [‡]	187 (46)	138 (35)	79 (19)		221 (56)	121 (30)	62 (14)		
Sexual Violence Only [*]	96 (39)	77 (35)	61 (26)		116 (48)	59 (29)	59 (22)		
Non-Sexual Violence Only [‡]	1047 (34)	1062 (36)	955 (31)		1307 (42)	832 (27)	925 (31)		
No Violence	1272 (27)	1722 (36)	1835 (37)		1399 (29)	1430 (30)	2000 (41)		

Note: All percentages are adjusted for sampling probability; sample sizes are unweighted.

^{*} Sexual violence is defined as having ever been physically forced to have sexual intercourse against your will.

[‡] Non-sexual violence includes at least one or more of the following types of violence in the past 12 months: participating in a physical fight; having a knife or gun pulled on you, being jumped, shot, or stabbed; and observing a shooting or stabbing.

[#] Each adolescent was classified into one of three mutually exclusive symptom groups dependent upon the total number of different types of the 16 symptoms experienced during the past year: few symptoms (0 to 8); some symptoms (9 to 11); and many symptoms (12 to 16).

[§] Adolescents also were classified into one of three mutually exclusive groups dependent upon the number of different symptoms that they experienced at least once per week: few frequent symptoms (0–1); some frequent symptoms (2–3); or many frequent symptoms (4 or more).

Table 4

Multinomial Logistic Regression Modeling Membership in the 3 Symptom Groups (High, Medium and Low Number and Frequency) among Female Adolescents as a Function of Lifetime Sexual Violence and Other Violence Exposures over the Past Year and Sociodemographic Characteristics (n=8531)

	High Number of Different Symptoms vs. Low #	Medium Number of Different Symptoms vs. Low #	High Frequency of Different Symptoms vs. Low §	Medium Frequency of Different Symptoms vs. Low §
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Lifetime Exposure to Violence				
Both Sexual [‡] and Non-Sexual Violence [‡]	3.83 (2.68, 5.49)**	2.16 (1.49, 3.14)**	5.81 (3.96, 8.52)**	2.92 (1.94, 4.39)**
Sexual Violence Only [‡]	2.10 (1.40, 3.15)**	1.45 (0.94, 2.23)	2.96 (2.00, 4.36)**	1.74 (1.12, 2.71)*
Non-Sexual Violence Only [‡]	1.83 (1.57, 2.14)**	1.40 (1.18, 1.65)**	2.13 (1.81, 2.49)**	1.33 (1.14, 1.55)**
No Violence	referent	referent	referent	referent
Age (at Wave I)				
< 16 years	referent	referent	referent	referent
16 – 18	1.32 (1.09, 1.60)**	1.14 (0.97, 1.33)	1.24 (1.06, 1.45)**	1.25 (1.07, 1.46)**
> 18	1.00 (0.79, 1.27)	1.04 (0.85, 1.28)	1.01 (0.80, 1.28)	1.02 (0.80, 1.30)
Race/ethnicity				
White	referent	referent	referent	referent
Black	0.38 (0.30, 0.47)**	0.52 (0.43, 0.63)**	0.58 (0.48, 0.70)**	0.71 (0.58, 0.86)**
Hispanic	0.57 (0.44, 0.74)**	0.61 (0.50, 0.75)**	0.60 (0.46, 0.77)**	0.62 (0.50, 0.75)**
Parental education level				
Some College or beyond	referent	referent	referent	referent
No College	0.86 (0.74, 1.00)	0.87 (0.75, 1.01)	1.04 (0.90, 1.19)	1.05 (0.90, 1.22)

* p .05,

** p .01

[‡] Sexual violence is defined as having ever been physically forced to have sexual intercourse against your will.[§] Non-sexual violence includes at least one or more of the following types of violence in the past 12 months: participating in a physical fight; having a knife or gun pulled on you, being jumped, shot, or stabbed; and observing a shooting or stabbing.

[#]Each adolescent was classified into one of three mutually exclusive symptom groups dependent upon the total number of different types of the 16 symptoms experienced during the past year: few symptoms (0 to 8); some symptoms (9 to 11); and many symptoms (12 to 16).

[§]Adolescents also were classified into one of three mutually exclusive groups dependent upon the number of different symptoms that they experienced at least once per week: few frequent symptoms (0–1); some frequent symptoms (2–3); or many frequent symptoms (4 or more).