

Childhood Attention Deficit Hyperactive Disorder (ADHD) Symptoms and Adolescent Female Sexual Victimization: Mediating and Moderating Effects of Risky Behaviours

By: Jacquelyn White, [Cheryl Buehler](#), Bridget B. Weymouth

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Abstract:

The mediating effects of risky behaviours on the linkage between childhood attention deficit hyperactive disorder (ADHD) symptoms and adolescent sexual victimisation in college women were examined using structural equation modelling (n=374). The moderating effects of timing onset of risky behaviours were also examined. General risky behaviour was not a significant mediator. Rather, findings supported a specificity hypothesis suggesting risky sexual behaviour is a better explanation of the ADHD symptoms–sexual victimisation association than is general risky behaviour. Early onset of alcohol or marijuana use, consensual sexual activity and staying out all night interacted with childhood ADHD symptoms to increase general risky behaviour and sexual risk-taking. We conclude that to understand the risk for sexual victimisation in adolescent females with childhood ADHD symptoms it would be advisable to focus specifically on sexual risk-taking.

Keywords: ADHD symptoms | adolescence | risky behavior | sexual abuse | sexual aggression | sexual victimization

Article:

Introduction

Sexual violence in teen relationships is a particularly important problem because of its prevalence and long-term consequences. Sexual victimisation is defined as a variety of unwanted sexual experiences, from unwanted contact to forced sexual intercourse and other sexual acts coerced using various tactics, such as verbal pressure, use of alcohol and drugs and threat of or use of force (Koss et al., 2007). Within youths' lives, violent and controlling sexual behaviour

seriously compromises transitioning successfully through puberty and negotiating developmental tasks related to intimacy (Furman & Simon, 2006). These coercive sexual experiences also negatively affect relationship quality (Casey & Nurius, 2008), youths' mental and physical health (Clark, DeBillis, Lynch, Cornelius, & Martin, 2003; Martin, Macy, & Young, 2011) and youths' social and educational competence (Casey & Nurius). Coercive sexual behaviours also reinforce gendered power differentials during the relationally formative developmental period of adolescence (White, Koss, & Kazdin, 2011).

Previous research found recently that self-reported attention deficit hyperactive disorder (ADHD) symptoms present before the age of 12 years is an important risk factor for female sexual victimisation during adolescence (White & Buehler, 2012). By excluding from their analyses young women with a history of childhood sexual abuse, the authors identified a new, previously unstudied group of young women at risk for adolescent sexual victimisation and suggested that behavioural impulsivity and inattention that constitute ADHD symptomology may be important predictors of adolescent sexual victimisation. They also found that engaging in risky sexual behaviour linked ADHD symptoms and adolescent female sexual victimisation. Importantly, however, ADHD symptoms present before age 12 were still associated with sexual victimisation during adolescence, even when controlling for risky sexual behaviour. Given that ADHD symptoms are a within-youth predictor, these authors suggested that the necessary support for these young women might not have been forthcoming to date, because of valued efforts aimed at not blaming the victim.

These authors also concluded that the significant remaining association from ADHD symptoms to adolescent sexual victimisation suggests a need for further examination of additional linking mechanisms. The logic of the previous research supports a specific process mechanism approach. This specificity approach suggests that engaging in risky sexual behaviour increases the risk for sexual victimisation in particular. There is an extensive literature, however, that addresses the possibility that, in addition to domain-specific linking mechanisms, risky behaviours in general might increase the occurrence of a variety of deleterious outcomes (Loeber, Farrington, Stouthammer-Loeber, & Van Kammen, 1998; Vega & Malamuth, 2007; Weiss, Susser, & Catron, 1998; Windle & Mason, 2004). Although a general-specific approach has not been applied to sexual victimisation in previous research, this theoretical approach supports Windle and Mason's call for studies that facilitate "the evaluation of the generality and specificity of influences on behavioural and emotional problems during adolescence" (p. 49).

As detailed below, and following the logic of Ingram and Kendall (1987), we hypothesise that there may be both common (i.e. general risky behaviours such as alcohol use or delinquency) and specific process mechanisms (i.e. risky sexual behaviour) that predict female sexual victimisation during adolescence. That is, it is possible that young women are at increased risk for sexual victimisation because they drink, use drugs and engage in other illegal activities, with sexual victimisation being an unintended by-product of being in risky environments. Conversely, sexual risk-taking may be the only significant linking mechanism because of its domain-specific

connection with sexual victimisation. The present study distinguishes the common and specific linking mechanisms of risky behaviours in general and of risky sexual behaviours with regard to explaining the significant association between childhood ADHD symptoms and female sexual victimisation during adolescence.

Probing the linking role of risky sexual behaviour and other general risky behaviours more thoroughly will lead to a deeper understanding of the relation between childhood ADHD symptomology and risk for female adolescent sexual victimisation. We focus only on females who were not victimised sexually during childhood to control for the possibility that childhood sexual victimisation may be a source of ADHD symptoms as well as a predictor of adolescent sexual victimisation. A second important purpose of the study is to examine the moderating role of the timing of various risky behaviours, because “early starters” may be most vulnerable to deleterious effects of childhood risk factors such as ADHD symptoms that may be associated with illegal or antisocial behaviour during adolescence (Moffitt & Caspi, 2001).

Theoretical and empirical background

A large number of predictors of sexual victimisation have been identified at each level of a young woman's social ecology—individual, relational, social networks and community (Ullman & Najdowski, 2011). Less research, however, has addressed specific process mechanisms that link predictors to sexual victimisation (Chu, Pineda, DePrince, & Freyd, 2011). Although previous research has established bivariate relations among: (a) a variety of risky behaviours; (b) childhood ADHD symptoms; and (c) sexual victimisation during adolescence, all three have not been linked in a single study. Below we discuss these three sets of relations and pose hypotheses regarding how they may be connected.

Co-occurrence of risky behaviours

Weden and Zabin (2005), analysing data from the National Longitudinal Survey of Youth, found evidence for co-occurring risky behaviours, including alcohol and marijuana use, smoking, school truancy and fighting. The risk for engaging in multiple risky behaviours was present for girls as well as boys across ethnicities. They concluded that such patterns constitute a continuum of “problem behaviours”. Similar patterns of co-occurrence have been found by others (Elliott & Morse, 1989; Wolff & Crockett, 2011). In the present study, we expect that the “common” risky behaviours during adolescence will be correlated and that creating an aggregated summary score will assess an unobserved construct of “general risky behaviour”.

ADHD symptoms and general risky behaviours

Several longitudinal studies of girls with childhood ADHD found that ADHD symptoms were associated with internalising problems, interpersonal problems, academic impairment, substance use and delinquency (Babinski et al., 2011a; Biederman et al., 1999; Hinshaw, 2002). Recently, Babinski et al. (2011b) reported that childhood ADHD symptoms were associated with elevated

patterns of problem behaviour, including psychopathology and substance use, as well as lower cognitive, family, academic and overall functioning. In the present study, we hypothesise that childhood ADHD symptoms are associated with female youths' general risky behaviours.

General risky behaviours and sexual victimisation

Ullman and Najdowski (2011)'s recent review identified several studies that found associations among multiple risky behaviours and sexual victimisation, including alcohol and marijuana use (Abbey, Ross, McDuffie, & McAuslan, 1996; Ellickson, Martino, & Collins, 2004). Graves, Sechrist, White, and Paradise (2005) found an association between women's physical aggression towards dating partners and sexual victimisation. Fergusson and Woodward (2000) found associations between several educational, psychosocial, adverse sexual outcomes and conduct problems in adolescent girls.

Given these correlational patterns, we hypothesise that girls' general risky behaviours explain partially the association between childhood ADHD symptoms and experiences of sexual victimisation during adolescence. This hypothesis is tested controlling for girls' sexual risk-taking. In the present study, we test the hypothesis that what appears to be a specific relation between risky sexual behaviour and risk for sexual victimisation may be due, in part, to engaging in risky behaviours in general (Hair, Park, Ling & Moore, 2009). Because adolescents diagnosed with ADHD are more likely to engage in these general risky behaviours than those not diagnosed (Babinski et al., 2011b; Loeber, Burke, Lahey, Winters, & Zera, 2000; Whitmore, Mikulich, Ehlers, & Crowle, 2000), it is possible that childhood ADHD symptoms are linked with adolescent female sexual victimisation through both general and sexually specific risky behaviours.

Moderating role of early onset of risky behaviours

There is a well-documented relation between early antisocial behaviour and heightened involvement in a range of risky behaviours during later stages of development (Moffitt, 2006). Tolan (1987) and Nagin and Farrington (1992), for example, found these patterns in a subgroup of females at an early age. Hipwell et al. (2002) later found this relationship to be particularly strong among girls from the most disadvantaged neighbourhoods, although some research has found little association between socioeconomic disadvantage and adolescent female sexual victimisation when controlling for childhood ADHD symptoms and risky sexual behaviours (White & Buehler, 2012). Such findings regarding vulnerabilities incurred by “early starters” are consistent with propensity theory in criminology (Nagin & Farrington, 1992) and developmental/life-course theory in psychology (Moffitt, 2006). For the purposes of the present study, such findings suggest that the relation between childhood ADHD symptoms and adolescent sexual victimisation, as mediated by engagement in general risky behaviours, might be stronger among girls who report an earlier age of first engaging in various general risky behaviours. We test this moderational timing hypothesis by disaggregating early onset of risky

behaviours in the composite general risky behaviour measure: alcohol use, marijuana use, cigarette use, physical fights, staying out all night without permission, verbal aggression, skipping school and being suspended or expelled from school. These particular nine aspects of general risk behaviour were selected because of the frequency of youth engaging in them, implying relatively normative experiences during adolescence, and based on an examination of previous research on adolescent delinquency.

Although we were unable to find studies that have examined the *moderating* effects of early onset of a variety of risky behaviours in one study, there is literature suggesting that early onset of aggression (Miller, Malone, Dodge, & Conduct Problems Prevention Research Group, 2010; Pepler, Jiang, Craig, & Connolly, 2010), substance use (Loeber, Stepp, Chung, Hipwell, & White, 2010) and school problems (Hemphill, Heerde, Herrenkohl, Toumbourou, & Catalano, 2012) is more problematic than later onset. Also, as an extension of the previous findings that risky behaviours co-occur during adolescence (Mason & Windle, 2002), we created a cumulative “early starter” index that summarises early onset across the nine risky behaviours. The moderating effects of *cumulative* early onset of general risky behaviours were then examined.

In summary, a review of the relevant literature suggests that symptoms of childhood ADHD associated with sexual victimisation during adolescence are likely to be linked via female youths' engagement in general risky behaviour (i.e. aggression, substance use, school problems), even after controlling for engagement in risky sexual behaviour. These linking patterns may be stronger for early starters in risky behaviour than for female youths who begin engaging in these behaviours later in adolescence.

Method

Participants

We used an online system to recruit students enrolled in introductory psychology classes at a medium-sized southeastern state university. In the sample of 417 women, 92.7% were freshmen or sophomores [mean age=18.90 years, standard deviation (s.d.)=2.90]. Students were given only a general title and the number of credits to be earned before arriving at a classroom where the survey was administered. Upon arrival, students were told the survey was about “childhood experiences, parental support, rate of physical maturation, and attitudes about dating and sexual behavior ... [and that] results should contribute to a growing understanding of various factors related to adolescent sexual behavior”. They were informed further that the only risk from completing the questionnaire may come from “being asked questions about explicit sexual behaviors”. No students withdrew at the consent phase of the study; hence, it is unlikely that self-selection influenced the results on sexual victimisation and other study variables such as childhood ADHD symptoms.

A subsample of young women who did not report any childhood sexual abuse was selected from the initial sample for further analysis (89.7% of the full sample, $n=374$). Of this subsample, 71.9% self-identified as non-Hispanic white, 20.3% as African American, 2.1% as Hispanic, 3.7% as Asian and 1.9% as “other”. With regard to childhood socioeconomic status, 15.2% were low–low middle class, 51.9% were middle class, 29.5% were upper middle class and 3.5% were upper class.

Data collection procedures

Undergraduate female research assistants administered the survey in 1-hour small group sessions. Informed consent was obtained. Confidentiality was ensured by using randomly determined ID numbers and by not including names on the survey. All procedures and measures were approved by the university Institutional Review Board (IRB).

Measurement

Attention deficit/hyperactivity disorder (ADHD) symptomology

The DuPaul, Power, Anastopoulos, and Reid (1998) modification of Barkley and Murphy's (1998) rating scale asked students to rate the extent to which they experienced 18 different symptoms before the age of 12. Sample items included symptoms of inattention, such as “difficulty sustaining attention in tasks or fun activities” and symptoms of impulsivity, such as “blurt out answers before questions have been completed”. The response format ranged from 1 (never or rarely) to 4 (very often). Items were summed and Cronbach's alpha was .92.

Female adolescent sexual victimisation

The Kosson, Kelly, and White (1997) revision of the Sexual Experiences Survey (SES; Koss, Gidycz, & Wisniewski, 1987) assessed 24 different types of sexual experiences: four outcomes (i.e. unwanted contact, attempted intercourse, completed intercourse, other sex acts) by six tactics (i.e. perpetrator used verbal pressure, used authority, threatened to hurt, used physical force, gave alcohol or drugs, took advantage of self-induced intoxication), with responses ranging from zero to a number indicated by the respondent (i.e. an open-ended response). They were not asked about number of perpetrators nor how many different tactics were used during a single experience. Thus, the resultant count probably includes both multiple experiences with the same perpetrator and experiences with different perpetrators. Because the instrument is reflective of an induced, rather than latent, model, measuring internal consistency is inappropriate (Koss et al., 2007). Respondents also indicated the age at which each experience first happened. The total number of coercive sexual experiences after the age of 12 was summed across the 24 experiences. Using the total sample, which included females who had experienced sexual abuse during childhood, SES scores ranged from zero (56.8% of the total sample) to 953 (mean=18.2, with 67% reporting fewer than 11 and 98% reported fewer than 58). In the sample used for the present study, which omitted female youth who had been victimised sexually during childhood,

the SES scores ranged from 1 to 57. Of these young women, 3.5% experienced verbally coerced sexual intercourse, 9.6% experienced unwanted sexual contact, 10.7% experienced attempted rape and 14.2% experienced being raped. Although lower for verbal coercion, these numbers are consistent with that reported typically by previous researchers.

Risky sexual behaviour

The SES did not assess consensual sexual experiences, hence participants were asked to indicate the age at which they first engaged in each of nine consensual sexual behaviours. Consensual was defined as: “you willingly participated in the sexual experiences”. Risky sexual behaviour was measured using six behaviours that encompassed consensual but casual or vulnerable sexual experiences (White & Buehler, 2012). Sample items included: “How often have you had sexual experiences (vaginal, oral, anal, and/or object sex) where you did not know who else your partner(s) had been with?”, “How often has a condom fallen off or broken during vaginal sex?” and “How often have you had sexual experiences (vaginal, oral, anal, and/or object sex) in a ‘friends with benefits’ relationship?”. The items response format ranged from 1 (never) to 5 (always) and $\alpha=.85$. Items were averaged and higher values indicated riskier sexual behaviour.

General risky behaviours

Female youth completed an 18-item subscale of risky behaviours that was created for the study from existing measures, including delinquency items from Elliott and Morse (1989). First, girls were asked when they first engaged in particular behaviours such as trying alcohol or breaking into someone's house, and were then asked the frequency of these behaviours once they had begun. The index of general risky behaviours was formed using the information regarding frequency. The five-point response format ranged from (1) never to (5) very often. Items were averaged and a higher score indicated more frequent engagement in risky behaviours ($\alpha=.74$ and correlations among risky behaviours ranged from .01 to .61).

Early onset of risky behaviours

Early onset of nine risky behaviours was assessed by dichotomizing the age at which each behaviour was reported as first occurring. This was conducted to create variables that would allow for the examination of the moderating effects of age at onset of each risky behaviour. The determination of early onset for each risky behaviour depended upon the normative or developmental nature of the particular behaviour in combination with preliminary examination of the data. Although definitions of early onset vary widely in existing research, and have not been addressed in great depth in samples of girls (Leve & Chamberlain, 2004), a cut-off of 12 years and younger has been used to signify early onset for some aspects of antisocial behaviour (Loeber & Farrington, 2000). Practical issues focused upon having an adequate sample size for the early-onset subsample were also taken into consideration, as cutoffs were determined for each early-starting variable. Early onset was designated as younger than 12 for verbal insults and getting into trouble at school. The age cutoff for early onset of cigarette and alcohol use and

initiating physical fights was younger than 13. Early onset for consensual sexual activity was operationalised as younger than 14. Early onset for marijuana use and for skipping school was defined as younger than 15. Finally, early onset for staying out too late or all night was designated as younger than 16 years of age. Several of these age cutoffs distinguished between childhood and early adolescence. Older age cutoffs were used for skipping school, consensual sexual activity, marijuana use and staying out all night, because these behaviours occur normatively a little later than the other aspects of risky behaviour (Carver, Joyner, & Udry, 2003; Johnston, O'Malley, Bachman, & Schulenberg, 2009). These older age cutoffs were also needed in order to have adequate sample sizes in the early-onset group to ensure valid statistical estimates of moderating effects. Subsample sizes for early and later starters using these age cutoffs are reported in the Results section.

Data analysis procedures

Structural equation modelling (SEM) was used because it tests parsimoniously for mediating pathways and moderating effects (Byrne, 2001). Manifest rather than latent variables were used in the path models because multiple measures of each construct were not available. SEM accommodates manifest variables easily and adjusts for missing values using full information maximum likelihood estimations (FIML), which is a strong technique that minimises biased estimates (Acock, 2005). Data were analysed using SPSS version 18 for descriptive analyses and AMOS (version 20) for structural equation modelling.

Results

Descriptive information

As reported in the previous study (White & Buehler, 2012), ADHD symptoms ranged from 16 to 69 (mean=30.05, s.d.=9.49). Thirty-eight per cent (38%) of the young women had experienced at least some sexual victimisation (range=1–57), and 64.7% of the young women reported at least some sexual risk-taking during adolescence. For consensual sexual experiences, 96% of the sample had engaged in kissing and at least 50% had done so by 14 years of age. Percentages for felt someone, someone felt you, received oral sex, performed oral sex and vaginal intercourse were 87.1, 89, 74, 71.7 and 71%, respectively. For these behaviours, at least 50% of the sample had experienced at least one type of consensual sexual experience by age 15. Percentages were considerably lower for intercourse with object (19.9%), anal intercourse (18%) and group sex (5.5%), and the 50th percentile was 16 or 17 years old for these behaviours.

In terms of general risky behaviour, the mean score was 1.38 (s.d.=.29). Although very high levels of frequent, general risky behaviour were not present in this normative sample of young women, there was adequate variability of risky behaviour in this sample and only 4.8% of the women reported no general risky behaviour.

There was adequate variability on the risky sexual relationships variable, with 64.7% of the young women having reported at least some risk-taking during adolescence. On a scale of 1–5, risky sexual behaviour scores ranged from 1.00 to 3.67 (mean=1.56, s.d.=.68).

There also was variability on female adolescents' sexual victimisation. Thirty-eight per cent of the young women had experienced at least some victimization, and there was tremendous variability on frequency and severity among those women who had been victimised (range=1–57). The mean was 3.43 (s.d.=8.24).

General risky behaviour as a linking mechanism

The first hypothesis was that, in addition to sexual risk-taking, general risky behaviour links childhood ADHD symptoms and girls' sexual victimisation during adolescence. This hypothesis was not supported (Figure 1). As hypothesised, childhood ADHD symptoms were associated positively with girls' general risky behaviours during adolescence ($\beta=.29, p<.01$). General risky behaviour, however, was not associated with sexual victimisation ($\beta=.06, p=.32$), controlling for the significant pathway through sexual risk-taking and the significant correlation between sexually specific and general risky behaviours ($r=.51, p<.01$).

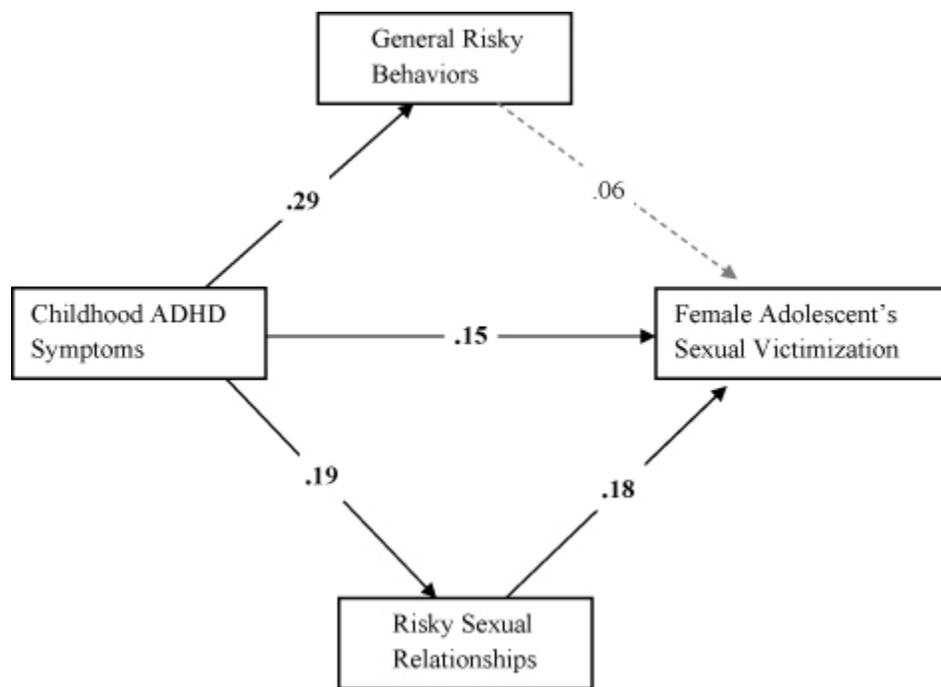


Figure 1. Process model of childhood attention deficit hyperactive disorder (ADHD) symptoms and female adolescent's sexual victimisation. General risky behaviours and risky sexual behaviours were correlated .51, $p<.05$.

Early onset of general risky behaviours

We present the results by beginning with risky behaviours in which we set early onset at younger ages. We considered significance at two levels of decreasing stringency. First, we judged significance at the *model level* that involves a change in χ^2 test from a base model in which the five paths in the model are set to equivalence. The χ^2 from this model is compared to one in which the five paths are allowed to vary, resulting in a change in χ^2 at 5 degrees of freedom (df). Significant differences across the models are probed by examining the critical ratio values (CR) for each path. CRs greater than 1.95 are significant at $p < .05$. Secondly, we judged significance at the *path level* by interpreting a significant CR, even though the omnibus χ^2 change was not statistically significant. This latter approach is consistent with procedures that test paths one at a time, as is often performed when researchers use MPlus for these types of analyses (df=1).

Early onset for verbal insults

The measure for this item asked participants: “At what age did you first yell at, curse at, call names, or insult someone to harm or hurt them (excluding family members)?”. Indicating that this is a normative behaviour during adolescence, 291 of 374 female teens reported verbally insulting others (77.81%). We compared insulters who began between the ages of 1 and 11 ($n=47$, 16.15%) with insulters who began between the ages of 12 and 21 (or current age) ($n=244$, 83.85%) on the model shown in Figure 1. The model differed for early and later starters of verbal insults ($\Delta\chi^2=21.08$, $df=5$, $p < .001$). One of the five associations differed: the path between childhood ADHD symptoms and adolescent sexual victimisation (CR=3.98). The association between ADHD symptoms and adolescent sexual victimisation was significant for girls who began verbally insulting others earlier ($\beta=.53$, $p < .001$), but not for girls who began insulting others later ($\beta=.00$, $p=.99$).

Early onset for school trouble

The measure for this item asked participants: “At what age did you first get into trouble at school (suspended, expelled from school, detention, etc.)?”. A total of 171 of 374 female teens (45.72%) reported this type of school trouble. We compared girls who first had school trouble between the ages of 1 and 11 ($n=28$, 16.37%) with those who had school trouble between the ages of 12 and 21 ($n=143$, 83.63%). The model did not differ for early and later school trouble onset ($\Delta\chi^2=6.37$, $df=5$, $p=.27$), and none of the five individual CRs were statistically significant.

Early onset for cigarette use

The measure for this item asked participants: “At what age did you first try cigarettes?”. Indicating that this is a normative behaviour during adolescence, 230 of 374 female teens reported having smoked a cigarette (61.50%). We compared girls who first tried a cigarette between the ages of 1 and 12 ($n=50$, 21.74%) with those who had first smoked between the ages of 13 and 21 ($n=180$, 78.26%). The model did not differ for early and later cigarette use onset ($\Delta\chi^2=3.89$, $df=5$, $p=.57$), and none of the five individual CRs were statistically significant.

Early onset for alcohol use

The measure for this item asked participants: “At what age did you first try alcohol?”. Because of the way in which these data were coded, never used (9.9%) was combined with later use, so the moderational analyses used the total sample. We compared girls who first drank alcohol between the ages of 1 and 12 ($n=46$, 12.30%) with those who had drunk first between the ages of 13 and 21 or had never used alcohol ($n=328$, 87.70%). The model differed for early and later starters of alcohol use ($\Delta\chi^2=42.31$, $df=5$, $p<.001$). Two of five associations differed: the path between childhood ADHD symptoms and general risky behaviour ($CR=6.18$) and the path between childhood ADHD symptoms and risky sexual behaviour during adolescence ($CR=3.86$). Both paths were significant in each group, but the associations were stronger for early starters than for later starters or non-users. There was a stronger association between ADHD symptoms and adolescent general risky behaviour for girls who began using alcohol earlier ($\beta=.47$, $p<.001$) than for girls who began drinking later ($\beta=.24$, $p<.001$). There also was a stronger association between ADHD symptoms and risky sexual behaviour for girls who began using alcohol earlier ($\beta=.32$, $p<.001$) than for girls who began drinking later ($\beta=.15$, $p<.01$).

Early onset for physical fight initiation

The measure for this item asked participants: “At what age did you first start a physical fight with someone?”. This behaviour was less common among girls in this sample; 100 of 374 female teens reported having initiated physical fights (26.74%). We compared girls who first started fights between the ages of 1 and 12 ($n=59$, 59%) with those who first started fights between the ages of 13 and 21 ($n=41$, 41%). The model did not differ for early and later fighting onset ($\Delta\chi^2=8.16$, $df=5$, $p=.15$), but one of the five individual CRs was statistically significant ($CR=2.69$). Contrary to our timing vulnerability hypothesis, there was a stronger association between ADHD symptoms and adolescent general risky behaviour for girls who began fighting later ($\beta=.44$, $p<.001$) than for girls who began fighting earlier ($\beta=.30$, $p<.01$).

Early onset for consensual sexual activity

The measure for this variable was created by identifying the earliest age in which participants engaged in consensual sexual experiences that ranged from sexual touching to sexual intercourse (not kissing). Consensual sexual activity was normative during adolescence for these young women; 338 of 374 female teens reported having had consensual sexual experiences (90.37%). We compared girls who reported first consensual sexual experiences between the ages of 4 and 13 ($n=54$, 15.98%) with those who reported first consensual experiences between the ages of 14 and 21 ($n=284$, 84.02%). The model differed for early and later starters of consensual sexual experiences ($\Delta\chi^2=15.96$, $df=5$, $p<.01$). Two of five associations differed: the path between childhood ADHD symptoms and general risky behaviour ($CR=3.15$) and the path between childhood ADHD symptoms and risky sexual behaviour during adolescence ($CR=3.22$). Both paths were significant in each group, but the associations were stronger for early than later

starters. There was a stronger association between ADHD symptoms and adolescent general risky behaviour for girls who had earlier consensual sexual experiences ($\beta=.39, p<.001$) than for girls who began later ($\beta=.28, p<.001$). There also was a stronger association between ADHD symptoms and risky sexual behaviour for girls who began consensual sexual activities earlier ($\beta=.32, p<.001$) than for girls who began later ($\beta=.18, p<.01$).

Early onset for marijuana use

The measure for this item asked participants: “At what age did you first try marijuana?”. Of 374 participants, 166 female teens reported having tried marijuana (44.39%). We compared girls who has first tried marijuana between the ages of 1 and 14 ($n=36, 21.69\%$) with those who had first tried marijuana between the ages of 15 and 21 ($n=130, 78.31\%$). The model did not differ for early and later marijuana use onset ($\Delta\chi^2=8.73, df=5, p=.12$), but one of the five individual CRs was statistically significant (CR=2.16). There was a stronger association between ADHD symptoms and adolescent general risky behaviour for girls who began using marijuana earlier ($\beta=.40, p<.001$) than for girls who began using marijuana later ($\beta=.30, p<.001$).

Early onset for skipping school

The measure for this item asked participants: “At what age did you first skip school?”. Indicating that this is a normative behaviour during later adolescence, 262 of 374 female teens reported having skipped school (70.05%). We compared girls who first skipped school between the ages of 1 and 14 ($n=39, 14.89\%$) with those who had first skipped school between the ages of 15 and 21 ($n=223, 85.11\%$). The model differed for early and later onset of skipping school ($\Delta\chi^2=13.02, df=5, p<.05$), but none of the CRs were statistically significant. The highest CR was for the association between ADHD symptoms and adolescent general risky behaviour (CR=1.88), and the pattern was consistent with early starters being at greater risk than later starters.

Early onset for staying out late

The measure for this item asked participants: “At what age did you first stay out late at night or all night when you were not supposed to?”. Indicating that this is a normative behaviour during adolescence, 259 of 374 female teens reported having stayed out too late (69.25%). We compared girls who first stayed out too late between the ages of 1 and 15 ($n=62, 23.94\%$) with those who had first stayed out late between the ages of 16 and 21 ($n=197, 76.06\%$). The model did not differ for early and later staying out too late ($\Delta\chi^2=9.19, df=5, p=.10$), but one of the five individual CRs was statistically significant (CR=2.83). There was a stronger association between ADHD symptoms and adolescent general risky behaviour for girls who began staying out earlier ($\beta=.37, p<.001$) than for girls who began staying out later ($\beta=.27, p<.001$).

Cumulative early onset of risky behaviour

Although scores could range from 0 to 9, the actual range for the number of early-onset risky behaviours was 0–7: 0=45, 1=26, 2=16, 3=6, 4=4, 5=2, 6=1 and 7=1%. Thus, 45% of the female youth in this sample did not start early on any of the nine risky behaviours. We created two dummy variables. The first distinguished between no early starting and early starting on one or more risky behaviours. The second distinguished between no early starting or early starting on one risky behaviour and early starting on two or more risky behaviours. The results were similar for each moderating variable, and therefore we report here the findings for no early starting compared with female youth who started early on one or more risky behaviours.

The model differed for the early starters and not early starters ($\Delta\chi^2=29.72$, $df=5$, $p<.001$). Two of five associations differed: the path between childhood ADHD symptoms and general risky behaviour ($CR=5.22$) and the path between childhood ADHD symptoms and risky sexual behaviour during adolescence ($CR=3.38$). Both paths were significant in each group, but the associations were stronger for early starters than for later starters or non-users. There was a stronger association between ADHD symptoms and adolescent general risky behaviour for girls who were early starters ($\beta=.33$, $p<.001$) than for girls who were not ($\beta=.18$, $p<.001$). There also was a stronger association between ADHD symptoms and adolescent risky sexual behaviour for girls who were early starters ($\beta=.21$, $p<.001$) than for girls who were not ($\beta=.11$, $p<.05$).

Timing summary

There was evidence of timing of risky behaviour differences for six of nine risky behaviours (Table I). All but one of the timing differences supported the hypothesis that early female starters of risky behaviour were more vulnerable to difficulties during adolescence than were later female starters. The path that was affected most consistently by timing was the association between childhood ADHD symptoms and adolescent general risky behaviour. The association between ADHD symptoms and risky sexual behaviour was also affected by the timing of general risky behaviours.

Table I. Summary of results of moderating effects of early onset of risky behaviours

Early onset of	ADHD symptoms → General risky behaviour	ADHD symptoms → Risky sexual behaviour	ADHD symptoms → Sexual victimisation
Cumulative early onset	Significant in both groups; early > not early	Significant in both groups; early > not early	
Alcohol use	Significant in both groups; early > later	Significant in both groups; early > later	
Consensual	Significant in both	Significant in both	

sexual activity	groups; early > later	groups; early > later	
Physical fighting	Significant in both groups; later > early		
Marijuana use	Significant in both groups; early > later		
Staying out all night	Significant in both groups; early > later		
Verbal insults			Significant for early onset but not later onset

Note: Three timing moderators were non-significant: school trouble, skipping school and cigarette use. Timing of risky behaviour did not moderate the path from general risky behaviour to sexual victimisation nor risky sexual relationships to sexual victimisation.

Discussion

The present study contributes to the literature on adolescent risk-taking in girls, as well as to the literature on sexual victimisation. One take-away message is rejection of the hypothesis that general risk-taking behaviour mediates the link between childhood ADHD and female adolescent sexual victimisation. As such, understanding the risk posed to adolescent girls with ADHD should focus specifically upon sexual risk-taking. If we are seeking to reduce risk for adolescent sexual abuse of girls, we need to focus less on general risk-taking behaviour and more on healthy sexuality, and heightening awareness in adolescent girls of the risks inherent in being cavalier in their sexuality.

Although ADHD symptoms were related significantly to general risky behaviour, these risky behaviours did not link ADHD symptoms and female adolescent sexual victimisation, after controlling for the domain-specific assessment of risky sexual behaviour. This finding supports, at least partially, the specificity hypothesis discussed in the Introduction which suggests that it is risky sexual behaviour in particular that provides the link between ADHD symptoms and sexual victimisation. We contend, however, that the support is only partial, in that the direct link between ADHD symptoms and sexual victimisation remains significant even after accounting for risky sexual behaviour.

A second question addressed in this study was whether the timing of onset of engaging in risky behaviours matters. We suggest the answer is “yes”, although the findings showed that specificity also matters. When looking at the association between ADHD symptoms and general risky behaviours, timing matters. The path between childhood ADHD symptoms and adolescent general risky behaviour was affected most consistently by the timing of general risky behaviours, followed by the path between ADHD symptoms and risky sexual behaviour. For young women

with early onset of various risk behaviours—alcohol and marijuana use, staying out all night or engaging in consensual sex—the pathway between childhood ADHD symptoms and general risky behaviour was stronger than for young women with later onset of these risky behaviours. This extends previous work reported by Moffitt and Caspi (2001) regarding vulnerabilities associated with early starting by documenting that the co-occurrence between childhood ADHD symptoms and several other risky behaviours, such as alcohol use and early sexual activity, that place girls at increased risk for deleterious outcomes during adolescence. Contrary to the early starting vulnerability hypothesis, later initiation of physical fighting rather than earlier initiation increased the strength of the path. This finding should be confirmed in future research before providing in-depth interpretation, but this pattern might reflect developmental delays in adequate impulse control and emotion regulation.

Additionally, timing matters for early onset of alcohol use and early consensual sexual behaviour and the ADHD symptoms–risky sexual behaviour link; earlier onset for each of these exacerbated this association. This is consistent with research reviewed in the Introduction that documents that the co-occurrence of alcohol use and risky sexual behaviour, which is likely to include a range of consensual sexual activities (Elliott & Morse, 1989; Wolff & Crockett, 2011) and life-course developmental research that shows early onset of risky behaviour, increases vulnerability for many negative outcomes (Moffitt, 2006; Nagin & Farrington, 1992).

However, early onset was not associated with any direct paths to sexual victimisation, with the exception of early onset of verbal insults. Because early onset for verbal insults was the only risky behaviour linked to sexual victimisation, we should exercise caution and not over-interpret the finding. The finding may be spurious, or may be indicative of a specific high-risk behaviour for sexual victimisation. This timing result suggests that ADHD symptoms may have both a direct link to sexual victimisation and an indirect link specifically through risky sexual behaviour for women who report an early onset of verbal insults. We do not know from the present data whether these insults were directed towards male peers and, if so, whether or not they belittled a male's masculinity. If the insults were challenging a man's masculinity then it is likely that the risk for sexual assault would increase, especially in a context where risky sexual behaviour is occurring. Research has suggested that men who feel threatened by deviations from traditional masculine roles may resort to aggression as a means of coping (Mahalik, 1999). Fish and White (2008) found that high scores on a masculine gender role stress scale correlated with a wide range of sexually aggressive behaviours, including falsely using flattery to have sex with a female, taking advantage of intoxicated women and verbally pressuring women into sex. Men who feel they need to fulfil traditional masculine role expectations may be more likely to coerce women into unwanted sex, especially if they have been insulted by the women.

Engaging in risky sexual behaviour is a known risk factor for sexual victimisation (Testa, VanZile-Tamsen, & Livingston, 2007), but ADHD symptoms experienced during childhood are an additional risk factor for sexual victimisation during adolescence. Impulsivity and inattention may increase the likelihood of risky sexual behaviours, such as not considering using birth

control or thinking about the sexual history of one's sexual partner (Jaffee, 2002; Kessler et al., 1997; Kahn, Kaplowitz, Goodman, & Emans, 2002), but other aspects of ADHD symptoms, not related to risky behaviours, probably also increase risk. Candidates for future research might include factors at various levels of an adolescent female's social ecology beyond the individual level, in accord with CDC's (2010) recent recommendations to also consider the relationship, community and societal levels. For example, at the relationship level, it may be that young women with ADHD symptoms are more likely to socialise with young men who also manifest symptoms of ADHD. This is a tenable possibility based on work by Normand et al. (2011), who found that youth with ADHD had friends with higher levels of ADHD and oppositional symptoms, and that social interactions were often marked by insensitive and self-centred actions. Furthermore, impulsivity, a characteristic symptom of ADHD, is a known risk factor for sexual perpetration (Knight & Sims-Knight, 2004). In this case, it would be something about the perpetrator, not the victim, which increases risk; or perhaps, at the community level, caretakers of young women with ADHD symptoms may find it difficult to provide them with the skills necessary to navigate sexual situations, at least without specialised training in how to intervene. It is well documented that parent training is a necessary part of intervention for youth with ADHD (Monastra, 2008). Nagy, Watts, and Nagy (2003) found that among 9th- and 10th-grade students many reported not being taught sexual refusal skills. In this case, it would be a failure of social networks in the community to provide training, not the victim's problems, which increases risk. Finally, at the societal level, cultural suppression of female sexuality, and thus reluctance to acknowledge its reality, may result in young women not being taught explicit methods to negotiate effectively healthy expression of their sexuality and decline unwanted sexual advances (Gavey, 2012; Tolman & McClelland, 2011).

In sum, the results leave an unanswered question regarding mechanisms that might account for the ADHD symptom–sexual victimisation link once risky sexual behaviour is accounted for. We considered, and now reject, the hypothesis that the mechanism is engaging in risky behaviours in general. We are not claiming that engaging in risky behaviours in general is not associated with sexual victimisation; there is substantial empirical support in the literature that they are. What we are saying is that risky behaviour in general does not account for the association between ADHD symptoms and sexual victimisation in spite of the fact that ADHD symptoms are associated with general risky behaviour. Furthermore, we also contend that to understand risk for sexual victimisation in adolescent females with ADHD symptoms it would be advisable to focus specifically upon sexual risk-taking.

Limitations

There are study limitations that need to be considered when interpreting these findings. Although some of the variables were time-ordered, the research design was cross-sectional. The measure of childhood ADHD symptoms has been validated, but it is important to note that reports of these symptoms was retrospective, separated in time by six or more years for many participants. The measure of sexual victimisation, the Sexual Experiences Survey, is a well-established

measure that assesses a variety of sexual experiences. It does not, however, distinguish initial victimisation from re-victimisation by the same perpetrator. The definition of early onset for each of the studied risky behaviours was exploratory. There was little in the literature suggesting standard cutoffs for early onset of each risky behaviour. Hence, the age cutoffs were determined somewhat arbitrarily, although some developmental logic informed our decisions. Finally, although diverse in many ways, the sample for this study was limited by its college-attending bias and so future research needs to replicate the findings with female youths of this age (i.e. late adolescence, early adulthood) with less education.

Implications

Our results have implications for prevention and intervention. Adopting a general risk approach leads to recommendations to develop programmes that discourage young women from risky behaviours, such as using alcohol and marijuana or getting into fights and to avoid risky situations that are likely to arise by skipping school or staying out late. In contrast, the present results suggest a more targeted and specific approach to sexual victimisation prevention by focusing specifically on adolescent female sexuality by addressing healthy sexuality and training young women to avoid risky sexual interpersonal interactions. The youth sexual offender literature already acknowledges the need for an abuse-specific approach that may not be necessary for other at-risk youth (Ryan, Leversee, & Lane, 2010). Recently the sexual victimisation literature is also coming to this conclusion. Senn, Gee, and Thake (2011) documented that adding an emancipatory sexuality education to a sexual assault prevention programme reduces college women's risk for a sexual assault by known men.

Notes

Note: Three timing moderators were non-significant: school trouble, skipping school and cigarette use. Timing of risky behaviour did not moderate the path from general risky behaviour to sexual victimisation nor risky sexual relationships to sexual victimisation.

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