

Evaluation of sex differences in health-related quality of life outcomes associated with child abuse: Results from the Ontario Child Health Study

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Aims. Despite the advances in child maltreatment research, there is still the need for comprehensive information about how abuse affects a broad range of categories of young adult functioning, and the extent to which these vary by sex. We examined the associations between child physical abuse (PA) and sexual abuse (SA) and six areas of functioning (mental health, physical health, life satisfaction, illegal substance use, alcohol problems and daily smoking).

Methods. Data were obtained from the 1983 Ontario Child Health Study and follow-up in 2000/2001 ($n=1893$). Multilevel regression estimated the adjusted associations for PA (with severity) and SA with each of the outcomes. Estimates with an entire sample were presented with sex-by-abuse interactions to examine sex differences and then presented separately by sex.

Results. In the adjusted model, severe PA and SA were associated with impairment in mental health, and both forms of PA (severe and non-severe) and SA were associated with low life satisfaction. In addition, severe PA was associated with illegal substance use. Child abuse variables were not associated with poor physical health, alcohol problems or smoking. Although sex-stratified analyses revealed different patterns, there was no significant sex difference in the integrated sample.

Conclusions. This is among the first community-based studies to show a strong association between child PA and SA and low life satisfaction in young adults. The abuse effects were similar for both sexes.

Received 14 August 2013; Revised 11 March 2014; Accepted 12 March 2014; First published online 1 May 2014

Key words: Child physical abuse, child sexual abuse, quality of life, sex difference.

Introduction

Child maltreatment is a global public health problem, with approximately 23% of children experiencing physical abuse (PA) (Stoltenborgh *et al.* 2013), and about 18% of females and 8% of males experiencing sexual abuse (SA) (Stoltenborgh *et al.* 2011). Although substantial evidence exists about the association between exposure to child maltreatment and impaired mental and physical health (Gilbert *et al.* 2009; Norman *et al.* 2012), much less is known about its association with other measures of functioning in young adults, such as life satisfaction. There is also limited evidence in the literature about sex differences in the effects of child maltreatment on health outcomes (Gilbert *et al.* 2009; Tonmyr *et al.* 2010), partly due to methodological problems in available studies, where sampling is restricted to either sex, or there is a

failure to formally test for sex differences when males and females are included.

To date, only a few studies of community-based samples have employed statistical interactions to test for sex differences in abuse outcomes. For example, a birth cohort study in New Zealand examined the association between child SA and a broad range of adult developmental outcomes (to age 30 years), which included mental disorders, psychological well-being, life satisfaction, physical health, among others (Fergusson *et al.* 2013). No significant sex interactions were found, suggesting similar SA effects on outcomes for males and females. A US study involving a sample of urban minority young adults (22–24 years) found the association between cumulative adverse childhood experiences, including reported child abuse and neglect, and self-rated health and life satisfaction, depressive symptoms, anxiety, and substance use, with no significant sex differences (Mersky *et al.* 2013).

Young adult sequelae

Previous studies examining health-related quality of life (HRQOL) of individuals maltreated in childhood

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have reported significant associations between child abuse and impairment in mental and/or physical health (Dickinson *et al.* 1999; Walker *et al.* 1999; Biggs *et al.* 2003; Edwards *et al.* 2003). However, the use of selective samples and failure to control adequately for confounding variables limit the generalisability of many of these studies. A nationally representative cross-sectional survey from the Netherlands reported that child maltreatment was associated with poorer HRQOL independent of socio-demographic factors, psychiatric disorders and physical health conditions (Afifi *et al.* 2007), while another survey of members from a US Health Maintenance Organization also found a significant association between child maltreatment and HRQOL (Corso *et al.* 2008). These findings are generally consistent with previous reports; however, unmeasured confounding variables, such as childhood family socioeconomic status (SES) and childhood health and functioning could have contributed to the observed relationships. In addition, sex differences in these relationships were not extensively examined.

Life satisfaction is influenced by daily activities at school or work, experiences with friends and neighbours and living circumstances associated with income, housing and residency. This concept has not been examined in a community-based sample in relation to child maltreatment, except for the New Zealand study referred to above (Fergusson *et al.* 2013); it may be an important indicator of overall well-being in emerging adulthood.

The relationship between child maltreatment and substance use disorders has been reported in several studies (Widom *et al.* 1995, 2007; Anda *et al.* 1999; Simpson & Miller, 2002; Gilbert *et al.* 2009; Topitzes *et al.* 2010; Goldstein *et al.* 2013). A cross-sectional study involving a US representative adult sample found associations between five types of child maltreatment (physical, sexual, emotional abuse, witnessing intimate partner violence and neglect) and various types of substance use including alcohol, drugs and nicotine (Afifi *et al.* 2012). A prospective US survey also found that child PA and SA were associated with regular smoking in young adults (around 22 years) after adjusting for demographics and depression (Roberts *et al.* 2008).

What is less clear in the relationship between child maltreatment and substance use problems are sex differences (Tonmyr *et al.* 2010). Several studies that employed sex-stratified analyses reported different patterns of findings (Afifi *et al.* 2012), where the associations between child maltreatment and substance use appeared in some studies to be larger for females than males (Widom *et al.* 2006; Wilson & Widom, 2009). In a study of US surveillance data (18 years

and older), Fuller-Thomson *et al.* (2013) found an association between child PA and smoking in both sexes, and a female-specific association between child SA or verbal abuse and smoking. In these studies, sex differences were not statistically tested. Among a few studies with a community-based sample that employed abuse-by-sex interactions to test for sex differences in abuse outcomes, a Canadian cross-sectional survey of a province-wide adult sample (15–64 years) found the associations between SA and PA and alcohol as well as illicit drug abuse/dependence, with a significant sex interaction where the association between PA and illicit drug abuse/dependence was significantly stronger for females than males (MacMillan *et al.* 2001). The New Zealand birth cohort study did not find significant sex interactions for the associations between child SA and illicit drug as well as alcohol dependence in adults (to age 30 years) (Fergusson *et al.* 2013). Smoking was not examined in either one of the latter studies.

We used data from the Ontario Child Health Study (OCHS), a prospective community-based study to examine the association between child PA and SA and each of six areas of young adult functioning (mental health, physical health, life satisfaction, illegal substance use, alcohol problems and daily smoking), adjusting for confounding variables measured at baseline in 1983 (childhood family SES, parental factors, childhood health and functioning) and at follow-up in 2000/2001 (SES of respondents). We provided information about the extent to which the overall associations between two types of child abuse and young adult functioning vary by respondent sex, as well the sex-specific effects of abuse on these outcomes.

The availability of longitudinal data from a young adult sample that has been followed up from early childhood with the correction for loss to follow-up is rare and provides important information about the relationship between child abuse and HRQOL in this critical yet often overlooked developmental period.

Methods

Sample

OCHS respondents were drawn from a representative sample of Ontario children aged 4–16 years who were selected using stratified, cluster random sampling (Boyle *et al.* 1987).¹ Initial data collection took place in 1983; home-visit interviews were conducted with 3294 children from 1869 households (91.1% of eligible households) and their parents. The second and third

¹ The majority (91.7%) of children were born in Canada.

waves of data collection occurred in 1987 and 2000/2001. In the third wave, data were collected from 2355 children (71.5%) then aged 21–35 years, of which 1928 (58.5%) completed questionnaires. Of those, 98.2% had sufficient data to determine their exposure to child PA and SA, resulting in a final sample of 1893. We used data from the first wave (1983) and the most recent wave (2000/2001) that provided sufficient information about childhood background and adult outcomes. A detailed description of the OCHS methodology is provided in other publications (Boyle *et al.* 1987, 2007).

Measures

Independent variable

Childhood abuse was assessed when participants were young adults (21–35 years). Child PA and SA were measured with the Childhood Experiences of Violence Questionnaire (CEVQ) short form (Walsh *et al.* 2008). In the CEVQ, abuse items and the cutoff frequencies to determine the abuse classifications were selected through consultation with a range of experts, including child welfare workers (Walsh *et al.* 2008). In a sample of 179 adolescents aged 12–18 years from clinical and community settings, the CEVQ showed 2-week test–retest reliability with kappas of 0.85, 0.77, 0.92 and 0.87 for PA, severe PA, SA and severe SA, respectively, and criterion validity when measured against clinical assessment with kappas of 0.67 and 0.70 for PA and SA, respectively. The CEVQ has demonstrated content and construct validity. The CEVQ short form has properties comparable with the original CEVQ in a sample of child-welfare involved youth aged 14–16 years (Tanaka *et al.* 2012).

PA was assessed by three items: ‘How many times before age 16 did an adult ... (1) slap you on the face, head or ears or hit or spank you with something like a belt, wooden spoon or something hard? (2) push, grab, shove or throw something at you to hurt you? (3) kick, bite, punch, choke, burn you, or physically attack you in some way?’ Participants were asked to choose one response from: ‘never’, ‘1–2 times’, ‘3–5 times’, ‘6–10 times’, and ‘more than 10 times’. PA was present if item (1) or (2) happened at least ‘3–5 times’, or item (3) happened at least ‘1–2 times’. Severe PA was present if item (1) or (2) occurred ‘more than 10 times’ or the item (3) occurred at least ‘1–2 times’.

SA was measured by one item: ‘Before age 16 when you were growing up, did anyone ever do any of the following things when you didn’t want them to: touch the private parts of your body or make you touch their private parts, threaten or try to have sex with you or sexually force themselves on you?’ SA was assessed with a binary measure

without severity. Any response except ‘never’ was considered exposure to SA. All other responses that did not meet abuse categories were classified as ‘no abuse’. For the analysis, three separate binary variables: (1) non-severe PA (PA without meeting the severe classification), (2) severe PA, and (3) SA were used. Non-severe PA and severe PA are mutually exclusive classifications, while SA could have co-occurred with either form of PA in respondents’ childhoods.

Dependent variables

Six young adult outcomes were measured by self-report in 2000/2001, with a higher score indicating a better outcome for continuous variables. *Mental health and physical health functioning* were measured with the SF-36 Health Survey ($\alpha=0.88$ in study sample), a valid and reliable measure of global mental and physical health and well-being during the past month (Brazier *et al.* 1992; Ware *et al.* 1994). The SF-36 consists of 36 questions that assess eight health indicators – physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and mental health. We used Mental Component Summary and Physical Component Summary scores, which were derived by weighting and summing the original eight dimensions.

Life satisfaction was measured by the newly derived question: ‘Think about those things which are important to you and then tell me, in general, how satisfied you are with each of the following’: (1) health, (2) education, (3) job or main activity, (4) finances, (5) housing, (6) neighbourhood, (7) spouse, living partner or single status, (8) relationship with friends and family members, and (9) life in general. For each of nine areas, respondents were asked to choose one response from: 1 = ‘Very satisfied’ to 5 = ‘Very dissatisfied’. We reverse-scored and summed individual items to create a positively oriented total life satisfaction scale, scored from 9 to 45. The study sample mean was 37.1 (s.d.=5.0), range: 14–45, and $\alpha=0.78$. In the OCHS pilot study conducted on a small adult sample ($n=66$), test–retest reliability was ICC=0.62.

Daily cigarette smoking was assessed by the question: ‘At the present time, do you smoke cigarettes?’ Daily smoking was present if response was ‘daily’ and absent if response was ‘occasionally’ or ‘not at all’.

Current use of illegal substance was assessed by two questions: (1) frequency of marijuana use, and (2) the use of other illegal substances during the past 12 months. For (1), there were 6 response options: ‘not at all’, ‘once or twice’, ‘3–6 times’, ‘monthly’, ‘weekly’, or ‘daily or almost daily’ in the past year. Current marijuana use was defined as present if the frequency

was 'monthly' or greater. For (2), participants were asked to mark 'Yes (=1)' or 'No (=0)' for the use of eight types of illegal drugs² without prescription during the past 12 months. From questions (1) and (2), we created a derived binary indicator for current illegal substance use, defined as the use of marijuana or any other substance.

The *Alcohol Use Disorders Identification Test* (AUDIT, Babor et al. 2001) was used to assess the current use of alcohol. The AUDIT was developed by the WHO as a brief assessment for excessive drinking and is valid across sex, age and culture (Saunders et al. 1993a, b; Allen et al. 1997). The ten-item self-report AUDIT was used for this study ($\alpha=0.83$ in the OCHS sample).³

Control variables

Adulthood family SES was a composite measure derived by the participant's years of education and labour force participation status (and those of spouse, then prorated), and household annual income, with scores ranging from -9.00 to 16.93 with a mean of -0.0041 (s.d. = 1.806).

Childhood family variables were based on information obtained during the home interview of the parent during the first wave in 1983. *Urban v. small urban/rural* residence status was measured and coded as 1 = urban⁴ and 0 = small urban or rural⁵. Other family factors include *young mother* defined as maternal age at birth of the first child younger than 21 years; *low-income family status* defined as the family with a total income that falls below the cutoff for its family size and place of residence classified by Statistics Canada; and a continuous measure of *family SES* derived

² (1) Cocaine or crack, (2) psychedelics, hallucinogens (lysergic acid diethylamide (LSD), mescaline, peyote, psilocybin, dimethyltryptamine (DMT), phencyclidine (PCP)), (3) speed, amphetamines or uppers, (4) heroin (dust, horse, junk, smack), (5) opiates other than heroin (demerol, morphine, methadone, darvon, opium), (6) barbiturates, sedatives, downers, sleeping pills, seconal, quaaludes (without prescription), (7) sniffed or inhaled glue, solvents or gasoline, (8) tranquilizers, valium, librium.

³ For the first eight items, a respondent provides one of five response options ('Never (0 point)', 'monthly or less (1 point)', '2-4 times a month (2 points)', '2-3 times a week (3 points)', '4 or more times a week (4 points)') to questions like: 'How often do you have a drink containing alcohol?' For the last two items (e.g., 'Have you or someone else been injured as a result of your drinking?'), participants were asked to choose one of three response options: 'no (0 point)', 'yes, but not in the last year (2 points)', 'yes, during the last year (4 points)'. The total score is the sum of response points, ranging from 0 to 40. The alcohol problem was indicated by a total score of eight or higher (Babor et al. 2001).

⁴ Area of residence >25 000.

⁵ Area of residence = <25 000.

from three standardised variables: family income, parental years of education and occupational prestige measured by the Blishen scale⁶ (Blishen et al. 1987). For parental capacity, we assessed *parental mental health condition* by determining whether 'one or both parents [was] ever being treated or hospitalised for nervous condition' or 'ever arrested'.

Childhood health and functioning were each assessed by parental report during the first wave for the presence or absence of (1) child functional limitation⁷; (2) psychiatric disorders; and (3) repeated grade in school. A child was classified with a psychiatric disorder⁸ based on problem checklist assessments obtained from mothers and teachers (for children aged 4-11 years) and mothers and youth (for adolescents aged 12-16 years)⁹. A child was classified as repeating a grade if mothers answered yes to the question: 'has __ ever repeated or failed a grade?'

Analysis

The characteristics of the OCHS sample were presented by sex. The main effects of child PA and SA on each of the measured variables were assessed by a series of ANOVAs and chi-square tests. We used multilevel regression analyses¹⁰ to estimate the associations between child PA and SA with each of six outcomes. Multilevel regression analysis partitions response variability between *vs.* within families (siblings in the same household), taking into account response dependencies (i.e., family clustering). For each multilevel regression model, three binary child abuse variables were entered together as independent variables. In the adjusted models, estimates were adjusted for all the confounding variables. In all models, beta coefficients and s.e. (for continuous outcomes) and odds ratios (OR) and 95% confident intervals (CI) (for dichotomous outcomes) were presented (the intercept and random effects are not shown to simplify Tables but are available on request).

Analyses were conducted in the following order: (1) we estimated the adjusted associations for each of six

⁶ Canadian scale of socioeconomic index based on the income and education levels of occupations reported in the Census.

⁷ Limitations in physical activity, mobility, or self-care as a result of an illness, injury or medical condition(s) and/or a limitation in role performance (kind or amount of ordinary play or schoolwork) for more than 6 months.

⁸ One or more of conduct disorder, attention-deficit disorder and emotional disorder.

⁹ These checklists were developed to screen for psychiatric disorders among children in the general population (Boyle et al. 1987; Offord et al. 1987).

¹⁰ Multilevel multiple regression for continuous outcomes and multilevel logistic regression for dichotomous outcomes.

outcomes for the entire sample; (2) we tested for abuse-by-sex interactions in adjusted models in (1); and (3) we conducted sex-stratified analyses.

A number of key variables in the OCHS (e.g., SES, child, parent and family functioning) were associated with sample attrition. Boyle *et al.* (2006) created attrition weights using weighted complete-case analyses (Little & Rubin, 2002). These weights successfully recaptured the original sample characteristics. Attrition and sampling weights were applied for all the analyses.

Results

Table 1 summarises the characteristics of the OCHS sample by sex. As outlined in a previous publication, 33.7% of males and 28.2% of females reported exposure to child PA (non-severe and severe forms

combined); 8.3% of males and 22.1% of females experienced child SA (MacMillan *et al.* 2013). About 4.9% of males and 11.6% of females reported both PA (two forms combined) and SA. Males exhibited significantly better mental and physical health than females, while females had significantly higher levels of life satisfaction than males. Males had a higher prevalence of alcohol use problems, illegal substance use and daily smoking than females; these sex differences were significant except for smoking. Childhood psychiatric disorders and grade repetition were significantly more prevalent among males than females.

Regarding the main effects of child PA with severity on each of the measured variables (Table 2), significant group differences emerged on most of the variables, except for alcohol problem in young adults. In general, means and percentages of the severe PA group indicated poorer outcomes compared with those in the non-PA group (Table 2).

Table 1. Sample characteristics by sex

Variables	Male (<i>n</i> = 924) ^a	Female (<i>n</i> = 969) ^a	Test statistics
Child abuse, % (S.E.)			
Non-severe PA	12.2% (1.2)	9.9% (1.1)	$\chi^2(1, N = 1893) = 2.38$
Severe PA	21.5% (1.6)	18.3% (1.5)	$\chi^2(1, N = 1893) = 3.00$
SA	8.3% (1.1)	22.1% (1.6)	$\chi^2(1, N = 1893) = 71.11^{***}$
Young adult outcomes, % (S.E.)			
Mental health, <i>M</i> (S.E.)	52.94 (0.33)	51.62 (0.31)	$t(1891) = 3.57^{***}$
Physical health, <i>M</i> (S.E.)	53.33 (0.25)	52.65 (0.27)	$t(1891) = 2.18^*$
Life satisfaction, <i>M</i> (S.E.)	36.61 (0.22)	37.22 (0.18)	$t(1891) = -2.54^*$
Alcohol problem	24.9% (1.6)	9.3% (1.0)	$\chi^2(1, N = 1893) = 79.67^{***}$
Illegal substance use ^b	19.5% (1.5)	12.0% (1.2)	$\chi^2(1, N = 1893) = 19.83^{***}$
Daily smoking	27.1% (1.7)	22.9% (1.53)	$\chi^2(1, N = 1893) = 4.47$
Covariate – young adults			
Family SES, <i>M</i> (S.E.)	0.11 (0.07)	-0.06 (0.07)	$t(1891) = 2.01^*$
Covariate – childhood family, % (S.E.)			
Family SES, <i>M</i> (S.E.)	-0.007 (0.15)	0.13 (0.15)	$t(1891) = -0.76$
Urban residence	68.0% (1.6)	67.3% (1.6)	$\chi^2(1, N = 1893) = 0.08$
Low income	22.3% (1.7)	20.5% (1.6)	$\chi^2(1, N = 1893) = 0.93$
Young mother	9.6% (1.2)	10.7% (1.2)	$\chi^2(1, N = 1893) = 0.58$
Parental adversity	23.5% (1.6)	25.8% (1.6)	$\chi^2(1, N = 1893) = 1.27$
Covariate – childhood individual, % (S.E.)			
Age in 1983, <i>M</i> (S.E.)	10.08 (0.15)	10.06 (0.14)	$t(1891) = 0.08$
Psychiatric disorders	14.3% (1.4)	8.1% (1.0)	$\chi^2(1, N = 1893) = 17.98^{***}$
Functional limitation	4.8% (0.8)	3.8% (0.7)	$\chi^2(1, N = 1893) = 1.02$
Grade repetition	11.7% (1.2)	6.6% (1.0)	$\chi^2(1, N = 1893) = 14.10^{***}$

PA, physical abuse; SA, sexual abuse; S.E., standard error; SES, socioeconomic status.

^aUnweighted number. Weighted analysis.

^bMonthly marijuana use or use of at least one of the following substances: (1) cocaine or crack, (2) psychedelics, hallucinogens (lysergic acid diethylamide (LSD), mescaline, peyote, psilocybin, dimethyltryptamine (DMT), phencyclidine (PCP)), (3) speed, amphetamines or uppers, (4) heroin (dust, horse, junk, smack), (5) opiates other than heroin (demerol, morphine, methadone, darvon, opium), (6) barbituates, sedatives, downers, sleeping pills, seconal, quaaludes (without prescription), (7) sniffed or inhaled glue, solvents or gasoline, (8) tranquilisers, valium, librium.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ for sex difference on χ^2 test for binary variables and t test for continuous variables.

Table 2. Characteristics of sample and outcomes by child physical abuse status

Characteristics	No physical abuse (N = 1330) ^a	Non-severe physical abuse (N = 217) ^a	Severe physical abuse (N = 346) ^a	Test statistic
Young adult characteristics				
Mental health, <i>M</i> (s.d.)	53.06 (7.52) _a	52.22 (7.25) _a	49.73 (9.85) _b	$F(2, 1890) = 25.57^{***}$
Physical health, <i>M</i> (s.d.)	53.35 (6.48) _a	52.44 (7.28) _{ab}	52.11 (7.86) _b	$F(2, 1890) = 5.56^{**}$
Life satisfaction, <i>M</i> (s.d.)	37.57 (4.72) _a	36.85 (4.83) _a	34.63 (6.33) _b	$F(2, 1890) = 49.24^{***}$
Alcohol problem	16.9% _a	14.0% _a	20.8% _a	$\chi^2(2, N = 1893) = 4.87$
Illegal drug problem	14.7% _a	14.3% _{ab}	20.7% _b	$\chi^2(2, N = 1893) = 8.17^*$
Daily smoking	23.7% _a	19.6% _a	32.8% _b	$\chi^2(2, N = 1893) = 16.46^{***}$
Family SES, <i>M</i> (s.d.)	0.15 (1.75) _a	0.09 (2.32) _a	-0.43 (1.80) _b	$F(2, 1890) = 14.89^{***}$
Childhood family characteristics				
Family SES, <i>M</i> (s.d.)	0.33 (3.75) _a	-0.13 (3.69) _{ab}	-0.79 (4.08) _b	$F(2, 1890) = 12.88^{***}$
Urban residence	66.0% _a	68.3% _a	73.0% _a	$\chi^2(2, N = 1893) = 6.54^*$
Low income	18.3% _a	21.2% _a	32.5% _b	$\chi^2(2, N = 1893) = 35.01^{***}$
Mother <21 years at first birth	8.6% _a	13.0% _{ab}	13.9% _b	$\chi^2(2, N = 1893) = 11.13^{**}$
Parental adversity	22.8% _a	26.0% _{ab}	30.1% _b	$\chi^2(2, N = 1893) = 8.48^*$
Childhood individual status and health				
Male child	49.7% _a	56.7% _a	55.7% _a	$\chi^2(2, N = 1893) = 6.55^*$
Age in 1983, <i>M</i> (s.d.)	9.88 (3.68) _a	10.77 (3.61) _b	10.33 (3.89) _b	$F(2, 1890) = 6.32^{**}$
Functional limitation	3.2% _a	7.2% _b	7.0% _b	$\chi^2(2, N = 1893) = 14.67^{***}$
Psychiatric disorder	9.0% _a	16.8% _b	16.5% _b	$\chi^2(2, N = 1893) = 23.20^{***}$
Grade repetition	9.5% _a	10.5% _{ab}	15.3% _b	$\chi^2(2, N = 1893) = 10.35^{**}$

SES, socioeconomic status.

^aUnweighted number. Weighted analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Means and percentages with different subscripts within the same row differ significantly at $p < 0.01$.

Table 3 summarises the main effects of child SA. Group differences were found for most variables, except for alcohol problem, illegal drug problem and daily smoking in young adults and grade repetition in childhood. Both child PA and SA were associated with a higher percentage of urban residence compared with no PA and no SA groups, respectively (**Tables 2 and 3**).

Table 4 presents the results from six multilevel regression analyses for the entire sample. In the adjusted model, both severe PA and SA were associated with poor mental health, and both forms of PA and SA were associated with poor life satisfaction. In addition, severe PA showed a significant association with illegal substance use. There were no significant associations between child abuse variables and physical health, alcohol problems and daily smoking.

The test for abuse-by-sex interaction was performed for six outcomes. No significant interactions were found in these analyses (not in **Table 4**).

Tables 5 and 6 present the results from the stratified multilevel regression analyses for males and females, respectively. In the adjusted model for males (**Table 5**), SA showed a significant association with poorer mental health, and both severe PA and SA were significantly associated with lower life satisfaction.

In the adjusted model for females (**Table 6**), both severe PA and SA were associated with poorer mental health, and only severe PA was associated with lower life satisfaction. In addition, SA was associated with daily smoking.

Discussion

In a Canadian study with a representative province-wide sample, we examined the association between child PA and SA and each of six areas of young adult functioning, adjusting for a comprehensive set of covariates. In the integrated sample, we found a significant association between both severe PA and SA and poorer mental health functioning with no sex difference. The association between two types of child abuse and physical health functioning was not significant in the OCHS sample; this result differs from previous studies that reported associations between child maltreatment and both mental and physical health aspects of QOL (Afifi *et al.* 2007). A recent systematic review examining the consequences of non-sexual child abuse and a broad range of health outcomes found strong robust associations for mental disorders, drug use and suicide attempts, among others, while it

Table 3. Characteristics of sample and outcomes by child sexual abuse status

Characteristics	No sexual abuse (N = 1616) ^a	Sexual abuse (N = 277) ^a	Test statistic
Young adult outcomes			
Mental health, M (s.d.)	52.97 (7.34)	48.53 (10.67)	$t(1891) = 8.69^{***}$
Physical health, M (s.d.)	53.18 (6.54)	52.00 (8.44)	$t(1891) = 2.65^{**}$
Life satisfaction, M (s.d.)	37.23 (4.99)	35.08 (5.90)	$t(1891) = 6.49^{***}$
Alcohol problem	17.6%	16.1%	$\chi^2(1, N=1893) = 0.38$
Illegal drug problem	15.3%	18.8%	$\chi^2(1, N=1893) = 2.20$
Daily smoking	24.3%	29.3%	$\chi^2(1, N=1893) = 3.21$
Family SES, M (s.d.)	0.10 (1.82)	-0.38 (1.97)	$t(1891) = 4.05^{***}$
Childhood family characteristics			
Family SES, M (s.d.)	0.22 (3.80)	-0.85 (3.87)	$t(1891) = 4.32^{***}$
Urban residence	66.1%	76.6%	$\chi^2(1, N=1893) = 12.34^{**}$
Low income	19.7%	31.3%	$\chi^2(1, N=1893) = 19.08^{***}$
Mother <21 years at first birth	9.0%	17.0%	$\chi^2(1, N=1893) = 17.23^{***}$
Parental adversity	23.1%	33.5%	$\chi^2(1, N=1893) = 13.98^{***}$
Childhood individual status and health			
Male child	55.8%	28.6%	$\chi^2(1, N=1893) = 71.35^{***}$
Age in 1983, M (s.d.)	9.98 (3.75)	10.59 (3.52)	$t(1891) = -2.57^*$
Functional limitation	3.9%	7.3%	$\chi^2(1, N=1893) = 6.94^{**}$
Psychiatric disorder	10.5%	16.1%	$\chi^2(1, N=1893) = 7.64^*$
Grade repetition	10.2%	14.0%	$\chi^2(1, N=1893) = 3.71$

SES, socioeconomic status.

^aUnweighted number. Weighted analysis.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

did not find a strong consistent association for chronic diseases (Norman *et al.* 2012). The lack of consistent findings may arise from methodological differences across studies. For example, the Netherlands study by Afifi *et al.* (2007) included a sample with a wider age range (18–64 years) than our OCHS sample. The child abuse effects on impaired physical health functioning may become more apparent among older adults. Also, the percentage of PA and SA reported in the Netherlands study (7.3 and 6.9%, respectively) was much smaller than the OCHS sample (31.0 and 15.0%, respectively). It is possible that, in the Netherlands study, the thresholds to report child abuse were higher, thus detecting only severe abuse.

We also found a significant association between both forms of child PA and SA and worse life satisfaction with no sex difference. This finding is similar to the New Zealand study that found a significant association between child SA and life satisfaction (Fergusson *et al.* 2013). Life satisfaction is associated with health indicators in adult populations. In a US cross-sectional survey (n = about 12 million, 18 years and older), Strine *et al.* (2008) found that general life satisfaction was linked with physical inactivity, smoking and drinking. Furthermore, a 20-year longitudinal Finnish study (n = 29 173, 18–64 years) found that dissatisfaction with life at baseline (reduced interest in

life, happiness, general ease of living and loneliness) predicted suicide throughout the follow-up period, adjusting for age, sex, health status, alcohol consumption, smoking status and physical activity at baseline (hazard ratio = 1.74, 95% CI = 1.02–2.97) (Koivumaa-Honkanen *et al.* 2001). Life satisfaction in young adulthood may serve as an early indicator of long-term health risk, and thus is important to measure when evaluating the effectiveness of interventions aimed at improving outcomes among maltreated children and youth.

We found a significant association between severe PA, but not SA, and illegal substance use with the entire sample with no sex difference. The two studies referred to above that used sex interactions reported slightly different findings. MacMillan *et al.* (2001) found a significant association between PA and illicit drug abuse/dependence with significant sex difference where PA effect was stronger for females than males; no sex difference was found for SA (MacMillan *et al.* 2001). The New Zealand study found a significant association between child SA and illicit drug dependence with no sex difference (Fergusson *et al.* 2013).

We did not find significant associations between child abuse variables and alcohol problems. Unlike our results, MacMillan *et al.* (2001) found significant associations between both PA and SA and alcohol abuse/dependence. Fergusson *et al.* (2013) also found

Table 4. Regression of young adult outcomes on child physical and sexual abuse for entire sample (n = 1893^a)

	Non-severe PA		Severe PA		SA	
	Unadjusted ^b (s.e.)	Adjusted ^b (s.e.)	Unadjusted ^b (s.e.)	Adjusted ^b (s.e.)	Unadjusted ^b (s.e.)	Adjusted ^b (s.e.)
Mental health	-0.65 (0.56)	-0.78 (0.56)	-2.58 (0.53)*	-2.60 (0.53)*	-3.46 (0.66)*	-3.06 (0.67)*
Physical health	-0.98 (0.56)	-0.92 (0.57)	-0.61 (0.47)	-0.36 (0.46)	-1.46 (0.58)*	-0.92 (0.58)
Life satisfaction	-0.74 (0.33)*	-0.70 (0.33)*	-2.53 (0.34)*	-2.18 (0.34)*	-1.38 (0.34)*	-1.28 (0.33)*
	OR (95%CI)	AOR ^b (95%CI)	OR (95%CI)	AOR ^b (95%CI)	OR (95%CI)	AOR ^b (95%CI)
Alcohol problem	1.1 (0.8–1.6)	1.1 (0.7–1.6)	1.3 (1.0–1.8)	1.2 (0.9–1.7)	0.8 (0.5–1.1)	1.1 (0.8–1.7)
Illegal drug use	1.2 (0.8–1.7)	1.2 (0.8–1.8)	1.7 (1.2–2.3)*	1.6 (1.1–2.1)*	1.1 (0.8–1.5)	1.4 (0.9–2.0)
Daily smoking	0.9 (0.6–1.3)	0.8 (0.6–1.2)	1.4 (1.1–1.8)*	1.1 (0.9–1.5)	1.3 (1.0–1.7)	1.2 (0.9–1.6)

AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio; PA, physical abuse; SA, sexual abuse; s.e., standard error; SES, socioeconomic status.

^aUnweighted number. Weighted analysis.

^bAdjusted for the following covariates: age; sex; childhood urban residence; childhood family SES; childhood low income; maternal young age; parental adversity; childhood psychiatric disorders; childhood functional limitation; grade repetition; current family SES.

*p < 0.05.

Table 5. Regression of young adult outcomes on child physical and sexual abuse for males (n = 924^a)

	Non-severe PA		Severe PA		SA	
	Unadjusted ^b (s.e.)	Adjusted ^b (s.e.)	Unadjusted ^b (s.e.)	Adjusted ^b (s.e.)	Unadjusted ^b (s.e.)	Adjusted ^b (s.e.)
Mental health	-0.52 (0.63)	-0.65 (0.63)	-1.60 (0.67)	-1.58 (0.67)	-3.61 (1.17)*	-3.55 (1.18)*
Physical health	-1.13 (0.61)	-1.08 (0.62)	-1.20 (0.64)	-0.89 (0.63)	-0.49 (0.85)	-0.12 (0.81)
Life satisfaction	-0.25 (0.44)	-0.34 (0.44)	-2.55 (0.45)*	-2.21 (0.45)*	-2.11 (0.69)*	-1.89 (0.67)*
	OR (95%CI)	AOR ^b (95%CI)	OR (95%CI)	AOR ^b (95%CI)	OR (95%CI)	AOR ^b (95%CI)
Alcohol problem	0.9 (0.6–1.4)	1.0 (0.6–1.6)	1.4 (0.9–2.0)	1.4 (0.9–2.0)	1.4 (0.9–2.3)	1.6 (0.9–2.6)
Illegal drug use	1.0 (0.6–1.6)	1.1 (0.7–1.9)	1.4 (0.9–2.1)	1.5 (1.0–2.3)	1.6 (0.9–2.7)	1.8 (1.0–3.3)
Daily smoking	0.9 (0.6–1.4)	0.9 (0.5–1.5)	1.5 (1.0–2.1)	1.1 (0.7–1.7)	0.9 (0.5–1.5)	0.8 (0.5–1.4)

AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio; PA, physical abuse; SA, sexual abuse; s.e., standard error; SES, socioeconomic status.

^aUnweighted number. Weighted analysis.

^bAdjusted for the following covariates: age; childhood urban residence; childhood family SES; childhood low income; maternal young age; parental adversity; childhood psychiatric disorders; childhood functional limitation; grade repetition; current family SES.

*p < 0.05.

Table 6. Regression of young adult outcomes on child physical and sexual abuse for females (n = 969^a)

	Non-severe PA		Severe PA		SA	
	Unadjusted ^b (s.e.)	Adjusted ^b (s.e.)	Unadjusted ^b (s.e.)	Adjusted ^b (s.e.)	Unadjusted ^b (s.e.)	Adjusted ^b (s.e.)
Mental health	-1.07 (0.88)	-0.75 (0.90)	-3.76 (0.84)*	-3.54 (0.85)*	-2.71 (0.80)*	-2.75 (0.81)*
Physical health	-0.98 (0.96)	-0.82 (0.98)	0.06 (0.66)	0.39 (0.67)	-1.72 (0.56)*	-1.37 (0.76)
Life satisfaction	-1.31 (0.52)	-1.13 (0.52)	-2.34 (0.50)*	-2.00 (0.48)*	-1.21 (0.41)*	-1.01 (0.40)
	OR (95%CI)	AOR ^b (95%CI)	OR (95%CI)	AOR ^b (95%CI)	OR (95%CI)	AOR ^b (95%CI)
Alcohol problem	1.2 (0.6-2.3)	1.3 (0.7-2.6)	0.8 (0.5-1.5)	0.8 (0.4-1.4)	0.8 (0.5-1.4)	1.0 (0.6-1.7)
Illegal drug use	1.4 (0.8-2.5)	1.4 (0.7-2.6)	1.9 (1.2-3.0)*	1.7 (1.0-2.7)	1.1 (0.7-1.8)	1.1 (0.7-1.9)
Daily smoking	0.8 (0.5-1.4)	0.8 (0.4-1.4)	1.3 (0.9-1.8)	1.1 (0.7-1.7)	1.7 (1.2-2.4)*	1.5 (1.1-2.2)*

AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio; PA, physical abuse; SA, sexual abuse; s.e., standard error; SES, socioeconomic status.

^aUnweighted number. Weighted analysis.

^bAdjusted for the following covariates: age; childhood urban residence; childhood family SES; childhood low income; parental adversity; childhood psychiatric disorders; childhood functional limitation; grade repetition; current family SES.

*p < 0.05.

a significant association between SA and alcohol dependence. No significant abuse-by-sex interactions were found in either of these latter studies.

Very few community-based studies are available that examined the association between child maltreatment and smoking behaviour. We did not find significant associations between both forms of PA and SA and daily smoking in the entire sample, with no sex difference; however, our sex-stratified analyses revealed a significant adjusted association for SA only among females. The sex-specific pattern of the association between SA and smoking is somewhat similar to the findings from the US survey referred to above that found an association between PA and smoking in both sexes, however, the effects of SA or verbal abuse on smoking were found only among females (Fuller-Thomson *et al.* 2013).

We used self-report screening or questionnaires to assess illegal substance use, alcohol problems and daily smoking, whereas in the earlier studies (MacMillan *et al.* 2001; Fergusson *et al.* 2013), a diagnostic interview was used to measure psychiatric disorders. Given the variation in measurement of key variables, it is not possible to make meaningful comparisons across studies. More community-based studies that employ validated measures and examine statistical interactions in testing sex differences are required to understand sex-specific associations between different types of child abuse and health-related outcomes.

In our study, the magnitude of adjusted estimates for severe PA was larger than that of non-severe PA for mental health, life satisfaction and illegal substance use, indicating a strong impact of severity of PA on functional impairment in young adults.

Limitations of our study include the retrospective measurement of child abuse, and exclusion of other types of child maltreatment, including emotional abuse, neglect and exposure to intimate partner violence. It was not possible to obtain self-report information about these types of maltreatment, given the time constraints on administering this province-wide survey.

In summary, this study employed two methods to examine sex differences in the relationship between child PA and SA and six areas of young adult functioning. Our results highlight the impact of abuse on mental health and life satisfaction in young adult males and females, with the strongest association being between SA and mental health functioning. The results also indicate a strong association between severe child PA and illegal drug use. We did not find significant sex differences in this study. Community-based studies that employ statistical interaction for examining sex differences, in addition to stratified analyses, provide information about the nature and magnitudes of sex

differences. We need to understand where sex-specific differences exist (and where they do not) in developing and targeting interventions among those exposed to maltreatment.

Acknowledgements

This study was conducted at the Offord Centre for Child Studies, Department of Psychiatry and Behavioural Neurosciences, McMaster University.

Financial Support

This study was funded by a grant from the Canadian Institutes of Health Research (CIHR). The research was also supported by the CIHR Institutes of Gender and Health; Aging; Human Development, Child and Youth Health; Neurosciences, Mental Health and Addiction; and Population and Public Health. Harriet MacMillan is supported by the Chedoke Health Chair in Child Psychiatry. Michael Boyle is supported by a Canada Research Chair in the Social Determinants of Child Health (grant number 950-218803). Tracie Afifi is supported by a CIHR New Investigator Award and a Manitoba Health Research Council (MHRC) Establishment Award.

Statement of Interest

None.

Ethical Standard

The study was approved by the Hamilton Health Sciences/McMaster University Research Ethics Board. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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