



Gender specific association of child abuse and adult cardiovascular disease in a sample of patients with Basal Cell Carcinoma[☆]

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ABSTRACT

Objective: The aim of this study is to examine whether child abuse or neglect is more strongly associated with adult cardiovascular disease, and whether these associations differ by gender.

Methods: A total of 116 participants (mean age 57.75 years) reported their experience of childhood maltreatment using the well-validated Childhood Experience of Care and Abuse Questionnaire. Cardiovascular disease was assessed using the Older Adults Resources Survey Multidimensional Functional Assessment Questionnaire.

Results: Child abuse but not neglect was significantly associated with adult cardiovascular disease. The significant relationship between child abuse and cardiovascular disease was specific to women.

Conclusion: The results of this study indicate that being abused as a child is significantly associated with cardiovascular disease in adulthood, particularly among women.

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Introduction

Cardiovascular diseases, including stroke, heart disease and high blood pressure, are the leading cause of death worldwide (Lopez, Mathers, Ezzati, Jamison, & Murray, 2006). Cardiovascular disease is also associated with profoundly poorer quality of life, including substantial restrictions in daily activities (Ski & Thompson, 2010).

Although smoking (Ambrose & Barua, 2004), unhealthy diet (Ness & Powles, 1997) and physical inactivity (Katzmarzyk, Church, Craig, & Bouchard, 2009) are well-documented risk factors for cardiovascular disease, psychosocial factors also appear to be important (Wegman & Stetler, 2009). Evidence from large scale studies suggests that childhood maltreatment (i.e., abuse and neglect) are related to adult onset cardiovascular disease (Batten, Aslan, Maciejewski, & Mazure, 2004; Dong et al., 2004), findings that have been replicated in multiple countries (Scott et al., 2011).

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Notwithstanding the importance of these findings, several researchers have begun to refine our understanding of the specific nature of these associations (Fuller-Thomson, Brennenstuhl, & Frank, 2010). For instance, findings in a major cross-national study indicated that child abuse but not neglect was significantly linked to heart disease in adulthood (Scott et al., 2011). Several studies have shown that the association between childhood maltreatment and cardiovascular disease in adulthood is found in women but not men (Batten et al., 2004; Goodwin & Stein, 2004).

Several methodological issues raise questions about the validity of this profile. First, most studies in this area have been limited by reliance on a few brief items to assess childhood maltreatment, with little use of validated measures (Batten et al., 2004; Fuller-Thomson et al., 2010). Some researchers have used items with potentially ambiguous terminology, for example, items that ask about physical or sexual abuse without providing thresholds or definitions to participants (Fuller-Thomson et al., 2010). Second, previous studies examining the association between childhood maltreatment and adult cardiovascular disease have focused on individuals aged 50 years or younger (Melchior, Moffitt, Milne, Poulton, & Caspi, 2007), with some study samples having a mean age of 33–35 years (Batten et al., 2004; Goodwin & Stein, 2004). Given that the risk and prevalence of cardiovascular disease increases as one ages it is important for future studies to use older cohorts.

The aim of the present study is to examine the specific associations of child abuse versus neglect, as well as gender on adult cardiovascular disease, while addressing limitations in the available literature. That is, we aim to examine gender differences of the association between child abuse and adult cardiovascular disease in an older sample, using the well validated Childhood Experiences of Care and Abuse questionnaire [CECA-Q] (Bifulco, Bernazzani, Moran, & Jacobs, 2005) to assess childhood maltreatment.

Method

Sample

A total of 116 participants (see Table 1 for sample description) were included in the present investigation and were taken from a larger study of Basal Cell Carcinoma (Fagundes, Glaser, et al., 2012; Glaser et al., 2011). For this study a total of 1,215 persons were invited to participate, 577 were deemed ineligible to participate as they did not meet the inclusion criteria. From the remaining 638 invitees 148 people were enrolled in the study. For the current investigation only those participants that had full data on childhood maltreatment and adult cardiovascular disease were included ($N = 116$).

The study focused on Basal Cell Carcinoma, which is a common form of skin cancer, the lifetime risk of this condition is up to 30% in white populations (Wong, Strange, & Lear, 2003) with high survival rates (Leman & McHenry, 2001).

Patients who had a newly diagnosed, histologically verified BCC received a letter from their treating dermatologist that invited their participation in the study. Those who responded were contacted by phone to verify their medical history and study eligibility. The exclusion criteria included presence of immunosuppressive disorders, use of immunosuppressive medication to treat other medical conditions, diagnosis of another cancer within the last five years (except for a prior BCC), and any history of squamous cell carcinoma or melanoma. Individuals meeting the study criteria were invited to complete the interview and self-report measures with the research team. All participants provided written informed consent prior to their participation. The study was conducted between April 2005 and October of 2008 and was approved by the Ohio State University institutional review board.

Measures

Childhood maltreatment. Parental abuse and neglect was assessed using the CECA-Q (Bifulco et al., 2005). The CECA-Q is a self-rated instrument that is derived from the validated CECA interview (Bifulco, Brown, & Harris, 1994). The CECA-Q includes four subscales: Sexual abuse from any adult, Parental Neglect, Parental Antipathy, and Parental Physical Abuse. All four

Table 1
Sample description ($N = 116$).

Characteristic	<i>n</i> (%)
Female	56 (48)
Age [mean (<i>SD</i>)]	57.78 (13.68)
White ethnicity	116 (100)
Employed	74 (64)
Highest educational level	
High School	22 (19)
Some college	34 (29)
College degree	60 (52)
Marital status	
Single	8 (7)
Married or common law	93 (80)
Divorced	10 (9)
Widowed	5 (4)

Abbreviations: *SD* = standard deviation.

subscales have high internal consistency (with significant alpha scores ranging from 0.80 to 0.81) and adequate test–retest reliability over a 24-month period (with significant correlation coefficients ranging from 0.53 to 0.84) (Bifulco et al., 2005). In addition, the CECA.Q showed good concurrent validity with the CECA interview with significant correlations as high as 0.66 and other measures of adverse childhood experiences (i.e., Parental Bonding Instrument) (Bifulco et al., 2005).

Respondents rate relationships and experiences before age 17 separately for their mother and father figures. Neglect (sample item, 'S/he would leave me unsupervised before I was 10 years old') and Antipathy (sample item, 'S/he made me feel unwanted') subscales included eight items rated on a five-point Likert scale ranging from 0 ('not at all') to 4 ('definitely'). Scores were summed separately for maternal and paternal relationships (range 0–32). The Physical Abuse subscale includes an entry item ('When you were a child or teenager were you ever hit repeatedly with an implement [such as a belt or stick] or punched, kicked, or burnt by someone in the household?'), followed by five additional questions to assess the context and severity of the physical abuse, including age at the time of the abuse, if the abuse occurred more than once, if implements were used, if the abuse resulted in any injuries, and if the 'perpetrator was out of control.' Items were summed to form a severity of physical abuse scale. Sexual abuse from any adult was assessed using four items (e.g., 'When you were a child or teenager did you ever have any unwanted sexual experiences?') requiring a 'yes', 'no' or 'unsure' response. Presence of abuse was coded based on whether scores met or surpassed the cut-off for either paternal or maternal physical abuse (3), antipathy (30/28) or sexual abuse (1). Parental neglect was coded based on whether scores reached or surpassed the cut-off for paternal or maternal neglect (26/25).

Cardiovascular disease. Items taken from the Older Adults Resources Survey [OARS] Multidimensional Functional Assessment Questionnaire (Fillenbaum & Smyer, 1981) were used to assess cardiovascular disease. This self-rated scale enquires about lifetime or current hypertension, heart disease, stroke, or angina with participants responding with either 'yes' or 'no'. Strong psychometric properties have been reported for the OARS, with good test–retest reliability scores (92% of responses identical at two assessment points) and high concordance with clinical interviews (with a significant correlation coefficient of 0.70) (Fillenbaum & Smyer, 1981).

Statistical analyses

Hierarchical Logistic Regression models were conducted to examine the gender differences concerned with the association between child abuse and neglect on adult cardiovascular disease. Age and body mass index were entered in the first block as control variables, gender was entered in the second block, maltreatment was entered in the third block, and the interaction of gender by maltreatment was entered in block four. Three separate, parallel models were examined to distinguish the association between (i) any type of child maltreatment, (ii) child abuse (iii) child neglect and adult cardiovascular disease. All analyses were performed using SPSS for Windows (Version 15.0).

Results

A total of 53 (46%) participants reported being diagnosed with cardiovascular disease. A higher proportion of men (55%) than women (35%) reported being diagnosed with cardiovascular disease ($\chi^2(1)=4.73, p=.03$). Within this sample, 27 persons (23%) reported a history of any type of childhood maltreatment. The prevalence of the different types of maltreatment (by gender) are presented in Table 2. Only one gender difference was observed in this sample: a significantly higher proportion of women reported experiencing sexual abuse during childhood compared to men ($\chi^2(1)=9.06, p=.003$). The perpetrators of the reported childhood maltreatment varied, with paternal rather than maternal neglect being more

Table 2
Prevalence of different types of childhood maltreatment, by gender and perpetrator.

Type of maltreatment	Overall n (%) N = 116	Men n (%) N = 60	Women n (%) N = 56	χ^2 (df)	p	Perpetrators of maltreatment			
						Mother figure n (%)	Father figure n (%)	Relative n (%)	Other n (%)
Any type of maltreatment	27 (23)	12 (20)	15 (27)	0.76 (1)	ns	11 (41)	14 (52)	4 (15)	4 (15)
Neglect	13 (11)	8 (13)	5 (9)	0.56 (1)	ns	4 (31)	11 (85)	Not recorded	Not recorded
Abuse	19 (16)	6 (10)	13 (23)	3.55 (1)	ns	10 (53)	5 (26)	4 (21)	4 (21)
Specific types of abuse:									
Antipathy/emotional abuse	10 (9)	3 (5)	7 (13)	2.08 (1)	ns	8 (80)	2 (20)	Not recorded	Not recorded
Physical abuse	7 (6)	4 (7)	3 (5)	0.10 (1)	ns	4 (57)	3 (43)	–	2 (29)
Sexual abuse	8 (7)	0 (0)	8 (14)	9.06 (1)	.003	Not recorded	Not recorded	4 (50)	4 (50)

Note. Percentages may not add up to 100 since some individuals experienced more than one type of childhood maltreatment or were abused by more than one perpetrator.

Table 3

Number and percentage of participants reporting adult cardiovascular disease by history of childhood maltreatment.

Type of childhood maltreatment	Diagnosed with cardiovascular disease	
	Men [N=33]	Women [N=20]
Any childhood maltreatment		
No	27 (82%)	10 (50%)
Yes	6 (18%)	10 (50%)
Abuse		
No	30 (91%)	11 (55%)
Yes	3 (9%)	9 (45%)
Neglect		
No	29 (88%)	17 (85%)
Yes	4 (12%)	3 (15%)

Table 4

Main and interaction effects of gender and childhood maltreatment on adult cardiovascular disease.

	OR	95% confidence intervals	<i>p</i>
Model one: any type of childhood maltreatment			
BMI	1.20	1.07–1.35	.002
Age	1.04	1.00–1.07	.043
Female gender	0.39	0.14–1.05	<i>ns</i>
Any type of childhood maltreatment	0.039	0.002–0.93	.045
Female × any type of childhood maltreatment	15.58	2.02–120.17	.008
Model two: child abuse			
BMI	1.21	1.08–1.37	.002
Age	1.03	1.00–1.07	<i>ns</i>
Female	0.39	0.15–1.00	.049
Child abuse	0.03	0.001–1.38	<i>ns</i>
Female × child abuse	20.73	1.89–226.90	.013
Model three: child neglect			
BMI	1.19	1.06–1.33	.002
Age	1.03	1.00–1.06	<i>ns</i>
Female gender	0.65	0.27–1.56	<i>ns</i>
Child neglect	0.09	0.002–4.29	<i>ns</i>
Female × child neglect	7.35	0.53–101.58	<i>ns</i>

Abbreviations: OR = odds ratio; BMI = body mass index.

common. Antipathy/emotional abuse was more often perpetrated by mother rather than father figures. The proportion of males and females diagnosed with cardiovascular disease according to their childhood maltreatment history is presented in Table 3.

The results from the three Hierarchical Logistic Regression models are presented in Table 4, particularly noteworthy is the significant interaction between history of any type of childhood maltreatment and gender on cardiovascular disease. A similar pattern was also observed for the interaction between child abuse and gender. As illustrated in Table 3, any type of childhood maltreatment and child abuse specifically were both related to higher risk of cardiovascular disease among women. Child neglect was unrelated to cardiovascular disease as a main effect or in interaction with gender.

Discussion

Findings of the current study indicate that child abuse is significantly associated with adult cardiovascular disease, but only among women. No such pattern was detected for exposure to neglect during childhood. These findings confirm results from previous studies (Batten et al., 2004; Goodwin & Stein, 2004) but extend prior work by utilizing a well-validated measure of childhood maltreatment, and by testing a relatively older sample of adults, who might be expected to have higher base rates of cardiovascular disease (Terry, Wilcox, McCormick, & Perls, 2004).

Findings fit with a growing body of research indicating that adversities occurring early in life continue to effect health in adulthood (Fagundes, Lindgren, Shapiro, & Kiecolt-Glaser, 2012; Scott et al., 2011). Although a number of mechanisms have been implicated in this association, one major model is the biological embedding hypothesis, which suggests that traumatic events during childhood effect development of the hypothalamic-pituitary-adrenal axis [HPA] (Tarullo & Gunnar, 2006). The HPA axis plays a crucial role in the production of cortisol in response to exposure to stress (Tarullo & Gunnar, 2006). In fact, research shows that individuals with a history of childhood maltreatment have a heightened sensitivity of the HPA axis, particularly under stress conditions (Tarullo & Gunnar, 2006). For example, adults with a history of childhood maltreatment have elevated cortisol concentration in the face of stress (Heim et al., 2002). Importantly, elevated levels of circulating cortisol have been linked with higher incidence of heart disease (Smith et al., 2005). Research suggests that there are gender specific effects on cortisol production when responding to stress. In one study females showed greater cortisol responses to social rejection compared to their male counterparts (Stroud, Salovey, & Epel, 2002). The link between child

abuse and cortisol production may be a function of a number of factors. For instance, individuals with a history of childhood maltreatment are more prone to and reactive to stressful life events experienced in adulthood (Hammen, Henry, & Daley, 2000; McLaughlin, Conron, Koenen, & Gilman, 2010). Adult stressful life events are in turn associated with increased cortisol secretion (Van, Berkhof, Nicolson, & Sulon, 1996) impacting on cardiovascular function.

Major depression is another important factor to consider when examining the child abuse–cardiovascular disease association. Childhood maltreatment is a robust predictor of major depression in adulthood (Alloy, Abramson, Smith, Gibb, & Neeren, 2006; Fisher et al., 2012), and depression is itself associated with an increased risk of adult cardiovascular disease (Korszun & Frenneaux, 2006). Thus, models incorporating major depression concerning gender differences in the relationship between child abuse and cardiovascular disease are warranted.

Although child abuse was found to be significantly associated with adult cardiovascular disease among women in this present study, there is some suggestion that this relationship may differ for specific types of abuse in childhood. For example, child physical and sexual abuse, when examined separately, have been linked to adult cardiovascular disease, however the association appears to be strongest for sexual abuse (Fuller-Thomson et al., 2010; Goodwin & Stein, 2004). One study indicates that the relationship between child sexual abuse and cardiovascular disease is only pertinent to women and not men (Goodwin & Stein, 2004). Larger studies in the future would benefit from further exploring the connection between cardiovascular disease, child sexual and physical abuse (separately), focusing on gender specific effects.

Study limitations and strengths

Despite the importance of understanding the forms of early adversity which most profoundly set the stage for later disease, methodological limitations must be considered. First, reliance on self-ratings of cardiovascular disease, rather than a medical professional's diagnosis or tests of cardiovascular function, may have introduced error. Thus future studies should use more objective and reliable measures of cardiovascular disease rather than self report to avoid bias. Of note, self- and health practitioner-report of diagnoses of cardiovascular disease tend to correspond highly (Farmer et al., 2008). Second, people may under-report childhood maltreatment on self-rated questionnaires (Fergusson, Horwood, & Woodward, 2000). Error in this variable could have attenuated the links with cardiovascular disease. Third, participants in the present study were all diagnosed with Basal Cell Carcinoma [BCC], which is most prevalent among Caucasians thus this sample is not racially representative of the US population. Nonetheless, BCC affects up to 30% of the white population (Wong et al., 2003) and most other demographic characteristics of the sample (employment, educational attainment and marital status) are comparable to that of large nationally representative surveys conducted in North America (Batten et al., 2004; Fuller-Thomson et al., 2010). BCC is not associated with an increased incidence of cardiovascular disease (Jensen et al., 2008). Moreover, the generalizability of findings is supported by other studies obtaining similar profiles of child maltreatment as a predictor of adult cardiovascular risk in representative community and ethnically diverse samples (Batten et al., 2004; Fuller-Thomson et al., 2010; Scott et al., 2011), suggesting that the results of the present investigation are not biased. It should be noted that BCC is not associated with an increased incidence of cardiovascular disease (Jensen et al., 2008) and is therefore unlikely to confound the findings of this investigation.

Despite these limitations, this study has two main strengths. First, traumatic childhood experiences were assessed using a well-validated instrument with strong psychometric properties. Second, the study provided a first assessment of the nature of these patterns in a sample that had largely reached middle age, as compared to other studies that had focused on cardiovascular disease in younger samples (Batten et al., 2004; Melchior et al., 2007), many of whom might not have reached the median age (58–64 years) for cardiovascular disease onset (Terry et al., 2004).

Conclusion

The current study suggests that childhood maltreatment, especially abuse might be particularly important to consider for women in relation to cardiovascular disease. These findings are also of clinical value by highlighting a vulnerable group that may benefit considerably from cardiovascular disease prevention and intervention strategies.

Conflict of interest

Georgina Hosang has given a sponsored talk for Bristol-Myers Squibb. All other authors declare that they have no conflicts of interest.

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