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Research article

Associations between body mass index, post-traumatic stress disorder, and child maltreatment in young women☆

Alexis E. Duncan[a,b,c,*], Carolyn E. Sartor[b,d], Melissa Jonson-Reid[a], Melissa A. Munn-Chernoff[b,c], Michaela A. Eschenbacher[f], Elizabeth W. Diemer[a], Elliot C. Nelson[b,c], Mary Waldron[b,e], Kathleen K. Bucholz[b,c], Pamela A.F. Madden[b,c], Andrew C. Heath[b,c]

[a] George Warren Brown School of Social Work, Washington University, St. Louis, MO, USA
[b] Midwest Alcoholism Research Center, Washington University School of Medicine, St. Louis, MO, USA
[c] Department of Psychiatry, Washington University School of Medicine, St. Louis, MO, USA
[d] Department of Psychiatry, Yale University School of Medicine, New Haven, CT, USA
[e] School of Education, Indiana University, Bloomington, IN, USA
[f] E. Kenneth Hatton Institute for Research and Education, Cincinnati, OH, USA

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ABSTRACT

The objective of this study was to examine interrelationships between child maltreatment, post-traumatic stress disorder (PTSD) and body mass index (BMI) in young women. We used multinomial logistic regression models to explore the possibility that PTSD statistically mediates or moderates the association between BMI category and self-reported childhood sexual abuse (CSA), physical abuse (CPA), or neglect among 3,699 young women participating in a population-based twin study. Obese women had the highest prevalence of CSA, CPA, neglect, and PTSD ($p < .001$ for all). Although all three forms of child maltreatment were significantly, positively associated with overweight and obesity in unadjusted models, only CSA was significantly associated with obesity after adjusting for other forms of maltreatment and covariates (OR = 2.21, 95% CI: 1.63, 3.00). CSA and neglect, but not CPA, were associated with underweight in unadjusted models; however, after adjusting for other forms of maltreatment and covariates, the associations were no longer statistically significant (OR = 1.43, 95% CI: 0.90–2.28 and OR = 2.16, 95% CI: 0.90–5.16 for CSA and neglect, respectively). Further adjustment for PTSD generally resulted in modest attenuation of effects across associations of child maltreatment forms with BMI categories, suggesting that PTSD may, at most, be only a weak partial mediator of these associations. Future longitudinal studies are needed to elucidate the mechanisms linking CSA and obesity and to further evaluate the role of PTSD in associations between child maltreatment and obesity.

Introduction

One-fifth to more than one-third of women report a history of child maltreatment, such as childhood sexual abuse (CSA), childhood physical abuse (CPA) and/or child neglect (Dube et al., 2003; MacMillan, Tanaka, Duku, Vaillancourt, & Boyle,

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* Corresponding author.

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2013). Child maltreatment is associated with a wide variety of adverse physical and mental health outcomes, including post-traumatic stress disorder (PTSD) (Chou, 2012; Cougle, Timpano, Sachs-Ericsson, Keough, & Riccardi, 2010; Molnar, Buka, & Kessler, 2001; Sugaya et al., 2012). For example, in a prospective study 41.7% of female participants with court substantiated child maltreatment went on to develop PTSD (Koenen & Widom, 2009), and 45.8% and 34.9% of National Comorbidity Survey Replication respondents who met criteria for PTSD in their lifetimes reported physical or sexual abuse, respectively (Cougle et al., 2010).

Child maltreatment has also been linked to weight gain and obesity (Alvarez, Pavao, Baumrind, & Kimerling, 2007; Bentley & Widom, 2009; Boynton-Jarrett, Rosenberg, Palmer, Boggs, & Wise, 2012; Chartier, Walker, & Naimark, 2009; Mamun et al., 2007; Noll, Zeller, Trickett, & Putnam, 2007; Shin & Miller, 2012; Williamson, Thompson, Anda, Dietz, & Felitti, 2002). Although a recent meta-analysis demonstrated a significant positive association between obesity and CSA, CPA, and a "general abuse," a category that included child neglect (Hemmingsson, Johansson, & Reynisdottir, 2014), many of the studies included only examined one form of child maltreatment or examined forms of child maltreatment separately. Given that many who experience any form of child maltreatment experience more than one form (Briere & Elliot, 2003; Chu & Dill, 1990; McCutcheon et al., 2010), it will only be possible to determine whether an association between a single form of child maltreatment and obesity is direct, rather than due to other co-occurring forms of maltreatment, by jointly estimating the effects of all types of maltreatment in the statistical model.

The majority of studies on associations between child maltreatment and obesity have used a binary outcome variable, comparing obese vs. all non-obese individuals. This classification may not be ideal, as people who are overweight (Mamun et al., 2007; Roenholt, Beck, Karsberg, & Elklit, 2012) and underweight (Veldwijk, Proper, Hoeven-Mulder, & Bemelmans, 2012) have also been shown to report elevated rates of child maltreatment histories. Therefore, studies using binary outcome variables likely underestimate the strength of association between child maltreatment and obesity relative to normal weight. The use of a multi-category outcome variable would allow for examination of relationships between forms of child maltreatment and under- and over-weight, as well as obesity.

PTSD has also been found to be associated with obesity (Kubzansky et al., 2013; Perkonigg, Owashi, Stein, Kirschbaum, & Wittchen, 2009; Scott, McGee, Wells, & Oakley Browne, 2008). Given that PTSD is associated both with child maltreatment and obesity, it is possible that observed associations between child maltreatment and obesity may be due – at least in part – to comorbid PTSD, or that PTSD may serve as a moderator of the relationship between child maltreatment and obesity. Surprisingly, however, research that examines child maltreatment, PTSD and obesity simultaneously is limited (cf. Roenholt et al., 2012). Therefore, the objective of this study was to examine interrelationships between child maltreatment (CSA, CPA and neglect), PTSD and BMI in a well-characterized, population-ascertained sample of young women.

Methods

Sample

The Missouri Adolescent Female Twin Study (MOAFTS) is a study of female twin pairs identified from state birth records as born in Missouri between July 1st 1975 and June 30th 1985 to a mother who was a state resident. Participants included both African American (AA: 14.6%) and European/other Ancestry (EA: 85.4%) women, reflecting the racial distribution in the state during this time period. The Wave 1 (baseline) interview was conducted with the twins beginning in 1995 ($n = 3{,}258$; median age = 15) (Glowinski, Madden, Bucholz, Lynskey, & Heath, 2003). When possible, interviews were also conducted with a parent (usually the mother) at the time the twins entered the study. Two years after the Wave 1 interviews, retest (Wave 3) interviews were conducted with a subset of participants ($n = 1{,}370$; median age = 19). (Data were not drawn from the brief Wave 2 interview, as it did not cover all domains of interest.) The first full-length young adult follow-up interview (Wave 4) was conducted an average of six years after the baseline assessment ($n = 3{,}787$; median age = 22) when all participants were $\geq$18 years of age. Unless they or their families had asked not to be re-contacted, all individuals from the original sampling frame were invited to participate at Wave 4, even if they had not participated at Wave 1 (non-participation at Wave 1 may have been due to parent refusal for twins of minor age, twin refusal or because we were unable to locate the family at that time). Wave 5 interviews were administered approximately two years later ($n = 3{,}428$; median age = 24). All protocols were approved by the institutional review board at Washington University School of Medicine. Additional details regarding the sample are available elsewhere (Glowinski et al., 2003; Heath et al., 1999, 2002; Waldron, Bucholz, Lynskey, Madden, & Heath, 2013).

Assessment

Twins were interviewed at each wave of data collection using a telephone adaptation of the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA), a comprehensive structured psychiatric diagnostic instrument shown to be a reliable and valid diagnostic assessment of lifetime DSM-IV psychiatric disorders (Bucholz et al., 1994; Hesselbrock, Mesa, Bucholz, Schuckit, & Hesselbrock, 1999). BMI at Wave 4 was calculated from self-reported height and weight, which were queried in the zygosity section of the interview, in which each twin also provided an estimate of her co-twin's height and weight. Respondents' BMI based on self-reported height and weight was highly correlated with that calculated based on their