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Implications of Severe Polyvictimization for Cardiovascular Disease Risk Among Female Survivors of Violence

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Abstract

In this study, we examined the impact of severe polyvictimization on 30-year cardiovascular disease (CVD) risk among female survivors of intimate partner violence (IPV). Data were collected from 34 participants in the “Leave it on the Mat” pilot study. The study was conducted in an urban city in a Midwestern state from August 2012 to April 2014. Severe polyvictimization was considered present if participants reported a history of three or more forms of victimization (childhood exposure to domestic violence, being psychologically or physically abused in childhood, and lifetime sexual assault) in addition to IPV. CVD risk factors included smoking, body mass index (BMI) and systolic blood pressure (SBP). A Framingham-based prediction model was used to estimate 30-year CVD risk. A linear regression model, adjusted for age, education, race/ethnicity, and family history of CVD was calculated. Fifty percent ($n = 17$) of the study participants reported severe polyvictimization and the average 30-year risk of CVD in the full sample was 22.3. Participants who experienced severe polyvictimization had higher 30-year CVD risk scores when compared to participants who experienced two or fewer forms of victimization. The findings revealed that severe polyvictimization was prevalent among survivors of IPV and was associated with increased scores on the 30-year CVD risk model. Screening for abuse history could aid identification of individuals at high CVD risk.

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Keywords

polyvictimization; cardiovascular disease; intimate partner violence; maltreatment

Introduction

Cardiovascular disease (CVD) is the leading cause of death among females in the United States (Mozaffarian et al., 2015) and the annual mortality rate has remained greater for females than males for over 30 years (Mehta et al., 2016). Individuals who experience interpersonal violence victimization may be especially vulnerable to developing CVD (Dong et al., 2004; K. A. Kendall-Tackett, 2007). Childhood maltreatment has been associated with inflammation (Danese et al., 2009), hypertension (Stein et al., 2010), and diabetes (Rich-Edwards et al., 2010); and, intimate partner violence (IPV) has been associated with smoking (Crane, Hawes, & Weinberger, 2013), diabetes (Mason et al., 2013), increases in body mass index (BMI) (C. J. Clark, R. A. Spencer, et al., 2014) and hypertension (C. J. Clark, S. A. Everson-Rose, et al., 2014; Mason et al., 2012), all of which are health sequelae of CVD. Compared to males, females are disproportionately affected by violence victimization (Black et al., 2011) and may be at a greater risk for CVD after experiencing victimization (Batten, Aslan, Maciejewski, & Mazure, 2004). Females exposed to violence during childhood are at high risk of subsequent victimization (K. Kendall-Tackett, 2002), and the experience of polyvictimization (i.e., multiple victimizations of different kinds; (D. Finkelhor, R. K. Ormrod, & H. A. Turner, 2007a, 2007b) may render females especially vulnerable to CVD risk via chronic stress (Heim, Newport, Mletzko, Miller, & Nemeroff, 2008). Sexual abuse and severe physical abuse in childhood have been individually identified as risks for early-adult CVD in females (Rich-Edwards et al., 2012); however, to the best of our knowledge, no researchers have examined the potential link between polyvictimization and long-term CVD risk as would be done with a long-term risk prediction function. Understanding the relationship between polyvictimization and CVD risk could lead to earlier identification of females at increased risk of heart disease and enhance efforts to mitigate CVD risk in primary care settings.

Polyvictimization is relatively common in the United States. In nationally representative samples of children ages 2–17 years, 22% of participants experienced four or more types of victimization within the past year (David Finkelhor, Richard K Ormrod, & Heather A Turner, 2007; Turner, Finkelhor, & Ormrod, 2010). In the Adverse Childhood Experiences study of a large sample of Health Maintenance Organization participants in California, 13% of females reported exposure to two types of violence and almost 4% reported exposure to three different forms of violence in childhood (Whitfield, Anda, Dube, & Felitti, 2003). In the same study, being exposed to childhood violence increased females' risk of being a victim of IPV in adulthood (Whitfield et al., 2003).

Polyvictimization may relate to CVD risk via psycho-biological changes associated with chronic stress, including long-term changes in the hypothalamic-pituitary-adrenal (HPA) axis (Heim et al., 2008). HPA axis dysregulation has been linked to depression (Lopez-Duran, Kovacs, & George, 2009; Shea, Walsh, MacMillan, & Steiner, 2005), a known health

sequelae of violence victimization (Chen et al., 2010; Exner-Cortens, Eckenrode, & Rothman, 2012) and predictor of CVD risk (Van der Kooy et al., 2007). Although individuals with any experience of violence have been shown to have higher depressive symptoms compared to those with no history of violence, individuals who experience polyvictimization demonstrate even higher depressive scores (David Finkelhor et al., 2007; Messman-Moore, Long, & Siegfried, 2000) suggesting a potential for greater CVD risk. Individuals who experience polyvictimization may also be more vulnerable to chronic stress because the violence they experience occurs across multiple social settings (see (Turner et al., 2010)) which suggests that individuals who have been victimized may lack a safe space to cope with the cumulative effects of violence.

Despite increasing evidence of the health sequelae and potential pathways linking polyvictimization to poor health (David Finkelhor et al., 2007; Messman-Moore et al., 2000; K. Scott-Storey, 2011), few researchers have examined its link to CVD risk factors (Burke, Hellman, Scott, Weems, & Carrion, 2011; Schneiderman et al., 2013; K. A. Scott-Storey, 2013). In addition, existing studies are generally focused on the development of obesity (Burke et al., 2011; Schneiderman et al., 2013) to the exclusion of other relevant CVD risk factors (i.e., diabetes, smoking, and hypertension). To the best of our knowledge, no researchers examining polyvictimization have used a long-term CVD risk prediction function which accounts for the clustering of CVD risk factors and their differing strength in relation to CVD risk (Freedman, Dietz, Srinivasan, & Berenson, 1999). In this study, we expand the knowledge base of the physical health effects of severe polyvictimization in a population of female survivors of IPV by utilizing objective measures of CVD risk. Additionally, we offer a more comprehensive assessment of overall CVD risk—than could be done by CVD risk factors alone—by using a 30-year Framingham risk score.

Method

Sample

Study participants included female survivors of IPV who were seeking group psychotherapy at two participating community-based organizations that provide advocacy and therapeutic services to survivors of IPV. The two organizations are located in an urban city in a Midwestern state in the United States. Study participants were enrolled in a feasibility study of the impact of trauma-sensitive yoga as an adjunctive treatment for anxiety, depression, and Posttraumatic Stress Disorder (PTSD) (“Leave it on the Mat”; (Cari J Clark et al., 2014). The inclusion criteria for “Leave it on the Mat” were: 1) a female seeking group psychotherapy for her experiences of IPV at a participating site, 2) 18 years of age or older, 3) able to read and write in English, and 4) free from pregnancy and injury, heart disease, or other self-reported condition that would preclude her from participating in a mild exercise routine. The exclusion criteria were: 1) having a case opened with Child Protective Services within three weeks prior to recruitment, 2) concurrently receiving other ongoing therapeutic services deemed incompatible with consistent group therapy participation, and 3) recent (past 30 days) substance abuse (score of 2 or more on the CAGE-AID; (Brown & Rounds, 1995). Of the 40 participants across the two sites who were offered the opportunity to

participate in the biomarker portion of the study, 37 had non-missing biomarker data. The study sample was reduced to 34 without preexisting self-reported CVD.

Measures

Victimization history.—Prior history of child maltreatment and sexual assault was assessed with four self-report items assessed during the service-providing organization's intake process. The four items were: "Did you observe physical violence in your family?", "Were you physically abused in your family?", "Were you verbally or emotionally abused in your family?", and "Have you been sexually abused by anyone as a child or as an adult?" Because all of the participants were survivors of IPV in adulthood, having experienced any one additional form of violence would classify them as polyvictimized. In our analyses, however, severe polyvictimization (report of three or more prior violent experiences in addition to IPV) was modeled due to the high number victimization types reported among participants (91.2% reported at least one prior victimization beyond IPV, 76.5% reported two or more, 50.0% reported three or more, and 20.6% reported four prior victimizations).

30-year cardiovascular disease risk.—The 30-year Framingham CVD risk prediction function served as the outcome in this study. It predicts the risk of occurrence over a 30-year time span of 'general' CVD which is a composite indicator including coronary death, MI, coronary insufficiency, angina pectoris, stroke, transient ischemic attack, intermittent claudication, and congestive heart failure (Pencina, D'Agostino, Larson, Massaro, & Vasan, 2009). The prediction function uses information on age, sex, smoking status, BMI, systolic blood pressure, diabetic status, and hypertensive medication usage (described below).

Smoking status.—Smoking status was modeled as a dichotomous variable and assessed by items from the National Health Interview Survey. Participants were asked, "Have you smoked at least 100 cigarettes in your life?"; and, if the answer was yes, they were asked, "Do you now smoke cigarettes, every day, some days, not at all, or don't know?" Smoking status was considered positive if the participant currently smoked at least some days of the week.

Body mass index.—Participant's height and weight were measured by members of the research staff upon entrance to the study. Height was measured by a trained staff member holding a carpenter's square on top of the participant's head as she stood with her buttocks and heels against a wall with her head in the Frankfurt position. To collect weight, an electronic scale was placed on a hard, flat surface. The participant removed their shoes, but retained light clothing, while a staff member recorded the displayed weight in kilograms. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared.

Systolic blood pressure.—Participant's resting, seated systolic blood pressure (mmHg) was measured. Three serial measurements were performed, 30 seconds apart, and the average of these measures was recorded for blood pressure.

Diabetic status.—Diabetes mellitus was considered present if the study participant reported being diagnosed with diabetes or taking diabetic medication, as assessed with items from the National Health Interview Survey, or having a hemoglobin A1c (HbA1c) level higher than 6.5%. HbA1c was assayed from drops of blood from a finger prick, which were collected onto filter paper by a certified medical assistant using a standard protocol. The dried blood spots were stored in Ziploc bags with desiccant and packaged and shipped to a Clinical Laboratory Improvement Amendments (CLIA) certified laboratory (ZRT Laboratory, Beaverton, OR) where the assays were performed.

Hypertensive medication usage.—Hypertensive medication usage was modeled as a dichotomous variable. The use of hypertensive medication was self-reported using items from the National Health Interview Survey. Study participants first reported if they had ever been diagnosed with hypertension outside of pregnancy. If yes, they were asked their age at diagnosis and whether they had been prescribed medication for this condition. If they had been instructed to take prescribed medication, they were subsequently asked if they were now taking the prescribed medicine.

Socio-demographics.—Participants were queried as to their age, race, ethnicity, and level of education. Age was modeled as a linear variable. Race and ethnicity were self-reported, but due to the small number of females who identified as African American (n=3), Native American (n=2), Latina (n=2), or multiracial (n=4), the variable was modeled dichotomously as ‘non-Hispanic White’ and ‘other’. Total number of years of education was assessed and modeled dichotomously as ‘less than or 12 years’ or ‘greater than or equal to 12 years of education’ (i.e., high school graduate or above).

Family history of CVD.—Family history of CVD was assessed with a self-report item taken from the National Health Interview Survey: “Including living and deceased, were any of your close biological that is, blood relatives, including father, mother, sisters, or brothers ever told by a health professional that they had a heart attack before age 50.” Family history of CVD was modeled as a dichotomous variable.

Statistical Analysis

Differences in study variables by severe polyvictimization status were calculated with cross-tabulations and means. Differences in mean 30-year risk of CVD by individual prior victimization were examined by calculating predicted population margins adjusted for age using a general linear model with the LSMEANS statement. Age is a key component in the risk prediction algorithm and differences in CVD risk may be due to different age structures of the comparison groups. Therefore, age must be controlled for when examining differences in 30-year CVD risk across groups. A general linear model was subsequently used to examine differences in 30-year CVD risk based on experience of severe polyvictimization adjusting for age, race/ethnicity, education, and family history of CVD. All analyses were conducted using SAS software version 9.3.

Results

Table 1 indicates the descriptive statistics of the sample by severe polyvictimization status. The mean age of the sample was 38.6 years old. Approximately two-thirds (67.7%, $n = 23$) of females in the study identified as non-Hispanic White. Beyond IPV, 50.0% ($n = 17$) of the participants experienced three or more experiences of victimization (i.e., severe polyvictimization). The average 30-year Framingham risk score of the sample was 22.3.

Table 2 presents the mean predicted scores of the 30-year Framingham CVD by individual victimization experiences, adjusted for age. Across all prior victimization types, participants reporting a particular form of violence had higher 30-year risks of CVD compared to participants not experiencing that particular type of violence, although none of the differences reached traditional significance levels ($p < 0.05$). This mean group difference was marginally, statistically significant for individuals with a history of verbal or emotional abuse ($t = -1.94$, $p < .10$) compared to those who had not experienced verbal or emotional abuse in childhood.

The results of the linear model are shown in Table 3. Participants who experienced severe polyvictimization had higher 30-year CVD risk scores ($\beta = 9.25$, $p < .10$) compared to participants who did not report severe polyvictimization. Identifying as non-Hispanic White was negatively associated with 30-year CVD risk scores ($\beta = -8.62$, $p < .10$). Age was significantly positively associated with 30-year CVD risk scores ($\beta = 1.33$, $p < .001$), as would be expected given its presence in the algorithm.

Discussion

In this study, we found that polyvictimization, especially multiple forms of childhood maltreatment, is prevalent among IPV survivors. Although not the primary purpose of our study, this finding aligns with extant research that has documented a statistically significant graded relationship between the number of types of abuse in childhood and the risk of IPV in adulthood. For example, prior research has found that females who experienced childhood physical abuse, childhood sexual abuse and exposure to IPV during childhood had a 3.5-fold increased risk for IPV victimization in adulthood (Whitfield et al., 2003).

We also found that females who experienced physical, verbal or emotional abuse or exposure to IPV during childhood had clinically-meaningfully higher mean scores on the 30-year CVD risk model compared to females who did not experience each of those types of maltreatment; and, experiencing multiple forms of violence throughout one’s life course (i.e., severe polyvictimization) was associated with even higher CVD risk compared to females who experienced fewer victimizations in addition to IPV in adulthood. Our study findings are strengthened by the use of objective measures of CVD risk and the application of a 30-year Framingham risk prediction function. Our findings are also in-line with prior research linking IPV to CVD diagnoses (Breiding, Black, & Ryan, 2008; Coker, Smith, Bethea, King, & McKeown, 2000; Gass, Stein, Williams, & Seedat, 2010; Lown & Vega, 2001), individual CVD risk factors (e.g. smoking; (Crane et al., 2013), diabetes (Mason et al., 2013), hypertension (Gass et al., 2010; Mason et al., 2012), higher body mass index and

obesity (Cari Jo Clark et al., 2014; Garcia et al., 2014; Sato-DiLorenzo & Sharps, 2007; Yount & Li, 2011), and with recent evidence linking IPV over the life course to higher 30-year risk of CVD (Clark et al., 2016). Our findings also align with prior research linking child physical abuse with heart disease, even after controlling for established risk factors such as childhood and adulthood stressors, depression, and high blood pressure (Fuller-Thomson, Brennenstuhl, & Frank, 2010). Through our study, however, we expanded upon these prior findings by examining the potentially long-term physical health sequelae of polyvictimization—which has been associated with individual CVD risk factors but not CVD risk factors in the aggregate, as was done with a long-term risk prediction function in this study.

Implications for Practice and Policy

Given the mounting evidence that associates IPV with CVD, identifying victimization and providing appropriate interventions are imperative. The US Preventive Services Task Force (Moyer, 2013), the Institute of Medicine (Institute of Medicine, 2011), and numerous professional health organizations already recommend IPV screening and counseling for women of childbearing age (15–49 years old) in healthcare settings—services that are now covered without cost-sharing as part of the Patient Protection and Affordable Care Act (Health Resources and Services Administration, 2012). There are also numerous valid screening tools and evidenced-based primary care interventions for survivors of violence. Primary and specialty medical providers are encouraged to adopt routine IPV and screening, counseling, and referral practices so that females with histories of IPV may be identified as early as possible. Victimization in childhood should also be included in a patient's medical history. Gathering information on lifetime experiences of victimization is a key step to identifying women who are vulnerable to CVD risk in order to improve women's physical health and mitigate the effects of violence.

Limitations

As with all research, our findings must be viewed in light of the study limitations. Each study participants' abuse history was captured via self-reported data. However, verification of abuse history through court or hospital reports could lead to skewed results by only allowing entrance into the study for those who experienced the most severe abuse. Another potential limitation was how severe polyvictimization was measured, using a threshold of three or more types of victimization experiences. This decision was made due to the fact that the majority of participants in the study reported experiencing multiple forms of victimization. Due to a lack of variability and a small sample size, we were unable to examine differences in CVD risk among females who experienced fewer types of victimization. However, there is no standard threshold of number of victimization experiences for polyvictimization (David Finkelhor, Turner, Hamby, & Ormrod, 2014). Further, the assessment of prior victimization relied upon items present in the service-providing agency's intake assessment and not a valid instrument; and, not all types of victimization experiences during childhood and after childhood were assessed. However, highly prevalent forms of victimization for women were assessed (D. Finkelhor, Turner, Shattuck, & Hamby, 2015) and all clients experienced IPV, which is among the most prevalent form of victimization women experience worldwide (Garcia-Moreno, Jansen,

Ellsberg, Heise, & Watts, 2006), making the more narrow scope of inquiry less of a limitation. It is also not possible to determine whether one's CVD risk is due to childhood or adulthood victimization; however, disaggregating the impact of the separate forms of trauma is less relevant in adulthood than taking a lifespan approach as the accumulation of trauma over the lifespan has been shown to have a dose response in relation to poor health (K. Scott-Storey, 2011; K. A. Scott-Storey, 2013). Never-the-less, the study would have be strengthened by a broader assessment of trauma and it's more nuanced relationship to CVD (K. Scott-Storey, 2011).

Data on a participant's cholesterol level were not collected but we used the validated BMI-based prediction equation developed for such instances. Furthermore, all information used for the prediction score was based either on objectively-assessed biological measures or using validated instruments for the collection of typically self-reported CVD risk factors, which is a particular strength of the study. Living in poverty may also increase an individual's risk for CVD but this information was not collected; although, both agencies typically, but not exclusively, serve low-income clients. Finally, as is the nature of pilot studies, the sample size of our study was small. However, this is not uncommon in intensive biological studies and findings are biologically and empirically plausible. The majority of the sample identified as White, with other racial/ethnic identities being grouped in the analysis. In order to advance this line of inquiry, researchers should examine the generalizability of these conclusions with a larger sample that includes more diverse racial and community identities, especially since disproportionate rates of CVD and related risk factors are found among racial and ethnic minority populations (Ski, King-Shier, & Thompson, 2014).

Conclusion

Greater attention should be given to the physical health symptoms of females who experience IPV, especially those who have experienced other types of victimization. Given the extent of trauma in the population, and the growing body of literature of the cumulative effects of trauma, identification of abuse history in primary care and other medical settings with a life-course perspective could aid in the development of treatment plans to mitigate the health impact of interpersonal violence.

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Table 1.

Demographic characteristics of the study sample (*N*=34)

Variable	*M* (SD) or *n* (%)		
	Severe Polyvictimization		
	Yes 17 (50.0)	No 17 (50.0)	Total
Age	41.16 (12.82)	36.07 (8.90)	38.61 (11.17)
Race/Ethnicity			
Non-Hispanic White	11 (64.71)	12 (70.59)	23 (67.65)
Other	6 (35.29)	5 (29.41)	11 (32.35)
Education			
Less than high school	3 (17.65)	3 (17.65)	6 (17.65)
High school or above	14 (82.35)	14 (82.35)	28 (82.35)
30-year Framingham CVD Risk Score	31.47 (25.83)	13.18 (10.10)	22.32 (21.43)
Currently smoke			
Yes	6 (35.39)	6 (35.39)	12 (35.29)
No	11 (64.71)	11 (64.71)	22 (64.71)
Body mass index	29.35 (7.02)	24.85 (4.89)	27.10 (6.38)
Systolic blood pressure	126.11 (10.95)	116.94 (12.01)	121.53 (12.23)
Diabetic status			
Yes	5 (29.41)	0 (0.0)	5 (14.71)
No	12 (70.59)	17 (100.0)	29 (85.29)
Hypertensive medication usage			
Yes	4 (23.53)	1 (5.88)	5 (14.71))
No	13 (76.47)	16 (94.12)	29 (85.29)
Family history of CVD			
Yes	4 (23.53)	1 (5.88)	5 (14.71)
No	13 (76.47)	16 (94.12)	29 (85.29)

Table 2.

Age-adjusted mean scores for 30-year Framingham CVD Risk Score by individual victimization experiences (*N*=34)

	Yes		No			
	***N* (%)**	***M* (SE)**	***N* (%)**	***M* (SE)**	***t***	***p*-value**
Did you observe physical violence in your family?	19 (55.88)	25.84 (3.38)	15 (44.12)	17.87 (3.82)	−1.53	0.136
Were you physically abused in your family?	16 (47.06)	26.09 (3.64)	18 (52.94)	18.97 (3.43)	−1.43	0.164
Were you verbally or emotionally abused in your family?	19 (55.88)	26.62 (3.29)	15 (44.12)	16.88 (3.72)	−1.94	0.062
Have you been sexually abused by anyone as a child or as an adult?	27 (79.41)	22.75 (2.89)	7 (20.59)	20.69 (5.69)	−0.32	0.750

Table 3.

Differences in 30-year CVD risk based on experience of severe polyvictimization ($N = 34$)

Variable	30-year Framingham CVD Risk Score	
	Estimate (SE)	*p*-value
Severe polyvictimization	9.25 (4.90)	0.069
Age	1.34 (0.23)	0.000
Race/Ethnicity (ref: non-Hispanic White)	−8.62 (5.02)	0.097
Education (ref: high school or above)	−2.02 (6.39)	0.754
Family history of CVD	9.87 (6.79)	0.157