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## Early life adversity and/or posttraumatic stress disorder severity are associated with poor diet quality, including consumption of trans fatty acids, and fewer hours of resting or sleeping in a US middle-aged population: A cross-sectional and prospective study

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### ABSTRACT

**Background.** Early life adversity (ELA) and post-traumatic stress disorder (PTSD) are associated with poorer psychological and physical health. Potential underlying mechanisms and mediators remain to be elucidated, and the lifestyle habits and characteristics of individuals with ELA and/or PTSD have not been fully explored. We investigated whether the presence of ELA and/or PTSD are associated with nutrition, physical activity, resting and sleeping and smoking.

**Methods.** A cross-sectional sample of 151 males and females (age:  $45.6 \pm 3.5$  years, BMI:  $30.0 \pm 7.1$  kg/m<sup>2</sup>) underwent anthropometric measurements, as well as detailed questionnaires for dietary assessment, physical activity, resting and sleeping, smoking habits and psychosocial assessments. A prospective follow-up visit of 49 individuals was performed 2.5 years later and the same outcomes were assessed. ELA and PTSD were evaluated as predictors, in addition to a variable assessing the combined presence/severity of ELA–PTSD. Data were analyzed using analysis of covariance after adjusting for several socioeconomic, psychosocial and anthropometric characteristics.

**Results.** Individuals with higher ELA or PTSD severity were found to have a poorer diet quality (DASH score:  $p = 0.006$  and  $p = 0.003$ , respectively; aHEI-2010 score: ELA  $p = 0.009$ ),

**Abbreviations:** ELA, Early life adversity; PTSD, Post-traumatic stress disorder; BMI, Body mass index; SFA, Saturated fatty acids; CRC, Clinical Research Center; BIDMC, Beth Israel Deaconess Medical Center; JBCC, Judge Baker Children's Center; FFQ, Food frequency questionnaire; aHEI-2010, Alternate Healthy Eating Index-2010; DASH, Dietary Approach to Stop Hypertension; UCLA, University of California, Los Angeles; BDI, Beck Depression Inventory; ANOVA, Analysis of variance.

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including further consumption of trans fatty acids (ELA  $p = 0.003$ ); the differences were significantly attenuated null after adjusting mainly for education or income and/or race. Further, individuals with higher ELA severity reported less hours of resting and sleeping ( $p = 0.043$ ) compared to those with zero/lower ELA severity, and the difference remained significant in the fully adjusted model indicating independence from potential confounders. When ELA and PTSD were combined, an additive effect was observed on resting and sleeping ( $p = 0.001$ ); results remained significant in the fully adjusted model. They also consumed more energy from trans fatty acids ( $p = 0.017$ ) tended to smoke more ( $p = 0.008$ ), and have less physical activity (PTSD  $p = 0.024$ ) compared to those with no or lower ELA and PTSD severity. Adjustments for sociodemographic factors and/or BMI rendered results of the above lifestyle parameters non-significant. The analysis of the prospective data showed similar trends to the cross-sectional analysis, further supporting the conclusions, although statistical significance of results was lower due to the lower number of participants.

*Conclusion.* Fewer hours of resting and sleeping and poorer diet quality are linked to ELA and/or PTSD, indicating that these pathways might underlie the development of several metabolic abnormalities in individuals with ELA and/or PTSD. Differences in terms of diet quality are significantly attenuated by race and/or education and/or income, whereas differences in other lifestyle habits of individuals with and without ELA and/or PTSD, such as physical activity, are mostly explained by confounding sociodemographic variables and/or body mass index.

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## 1. Introduction

Early life adversity (ELA) and posttraumatic stress disorder (PTSD) are both triggered by traumatic and stressful events that can negatively impact adult mental and physical health [1,2]. ELA is associated with adverse childhood experiences including neglect, stressful living conditions, maltreatment and abuse [3]. An estimated one child out of every 58 experienced at least one type of adversity in the United States during the year of 2005–2006, although actual numbers of children impacted by ELA are probably underestimated [4]. PTSD, with a prevalence of 7.8% among the general US population [5], can be triggered by events such as physical assault and natural disasters or by traumatic experiences such as war or persistent sexual abuse at any age [6]. Recently, both ELA and PTSD have been linked to poor psychological health and have been associated with increased risk for cardiovascular and metabolic diseases and disorders such as coronary heart disease, hypertension, type 2 diabetes mellitus, and obesity [7–11].

Although accumulating evidence suggests adverse physical health consequences of these conditions, less is known about the lifestyle habits developed which may lead to or contribute to these negative health outcomes. Individuals with PTSD have been found to exercise less frequently, develop eating disorders more often, engage in smoking more frequently, and experience more sleep disturbances [12]. Few studies have explored how the diets of individuals with PTSD may differ, and they found that individuals with PTSD consume more soda and fast food [13] and less fruits [14] compared to individuals without PTSD. However, both of these studies assessed nutritional intake through a limited number of questions, instead of validated instruments designed for assessing dietary intake. Furthermore, a negative association between PTSD number of symptoms and alternative Healthy Eating Index (aHEI) has been

observed in the Nurses' Health Study II [15]. Since available data are very limited, further studies with more detailed information are needed.

Similar to PTSD, ELA shows behavioral impacts which may lead to adverse metabolic consequences. Maltreatment before the age of 18 years is associated with higher cigarette use during adolescence [16]. Adults reporting more adverse childhood experiences have poorer sleep quality and increased smoking rates compared to those having less or no adverse experiences [17]. Furthermore, an indication of a poorer diet quality, assessed with the alternate Healthy Eating Index-2010 (aHEI-2010), among people with ELA has also been suggested previously from our group but the analysis was limited to a simple correlation analysis instead of a multivariate analysis [18]. So far, data regarding certain behavioral health habits among people with ELA or PTSD are derived from a limited number of studies which have raised many questions. Thus, the purpose of the current study was to investigate in both cross-sectional and prospective manner associations between ELA and PTSD with lifestyle habits including nutrition, physical activity, resting and sleeping and smoking. We then focused on ELA types, i.e. neglect, abuse to explore the same questions. Since our study is the first to use validated questionnaires and a cross-sectional and prospective study design to answer these questions, we believe that our data provide clarification and validity to currently available knowledge.

## 2. Methods

This prospective study was designed to investigate psychosocial influences on physical and mental health in midlife. Please refer to prior publications for a detailed description of the study protocol [18,19].

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