

Abstract

Objective: This study investigates the role of home environment and working memory on sympathetic nervous system (SNS) reactivity in preschool children.

Methods: Children 48-60 months of age were administered the Wechsler Preschool and Primary Scale of Intelligence (WPPSI), a test measuring cognitive functioning, including working memory (WM). The Home Observation of Environment (HOME) measured quality of parental interaction and home environmental factors in the child's living arrangement. Electrodermal activity (EDA), a measure of SNS activity was recorded as participants watched a video with 6 startling 90dB stimuli.

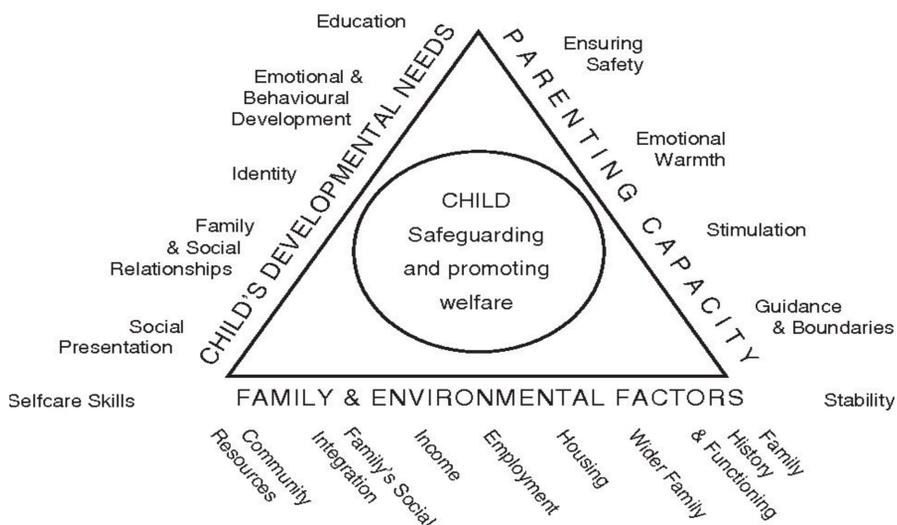
Results: A general linear model revealed a significant effect such that SNS reactivity was lowest in children with both low WM and low HOME scores as compared with all other children $F(3,44) = 2.878, p = 0.47$.

Conclusion: Children with both low WM and a poor home environment were significantly less reactive than children with high WM and/or a positive home environment.

Background

Electrodermal activity (EDA) is most widely studied through skin conductance levels and responses (SCR), which measures electrical potential between two points of skin contact and the resulting current flow between them in response to certain stimuli (Braithwaite, Watson, Jones & Rowe 2015). These measures reflect SNS activity and are used to assess cognitive states, arousal, and emotion responses that indicate anxiety and emotional instability. Working memory (WM) is a cognitive state associated with the part of short-term memory is concerned with immediate conscious perceptual processing. The Home Observation of Environment (HOME) Inventory assesses certain aspects of the quality and quantity of emotional, social, and cognitive support available to 3-6 yr olds within their homes (Bradley & Caldwell 1979). Research has shown that various aspects of home environment such as socioeconomic status, language encouragement and family dynamic correlate with control inhibition and working memory trends in young children (Sarsour, Sheridan, Jutte & Nuru-Jetter 2011). In this current study it was hypothesized that the combination of (WM) and home environment is an effective predictor of SNS reactivity in preschool aged children.

Health Basic Care



The Assessment Framework developed by the Department of Health (2000)

Methods

Sample Population: The participants of this experiment consisted of 53 preschool children between the ages of 4 and 5 who are active participants in the Stress in Pregnancy (SIP) Study at Queens College. Each participant was recruited from New York Presbyterian Queens Hospital or Mount Sinai Hospital. Participants were included in this sample if they had completed either their 48 month WPPSI assessment or 60 month WPPSI assessment and had completed the (HOME) Inventory questionnaire.

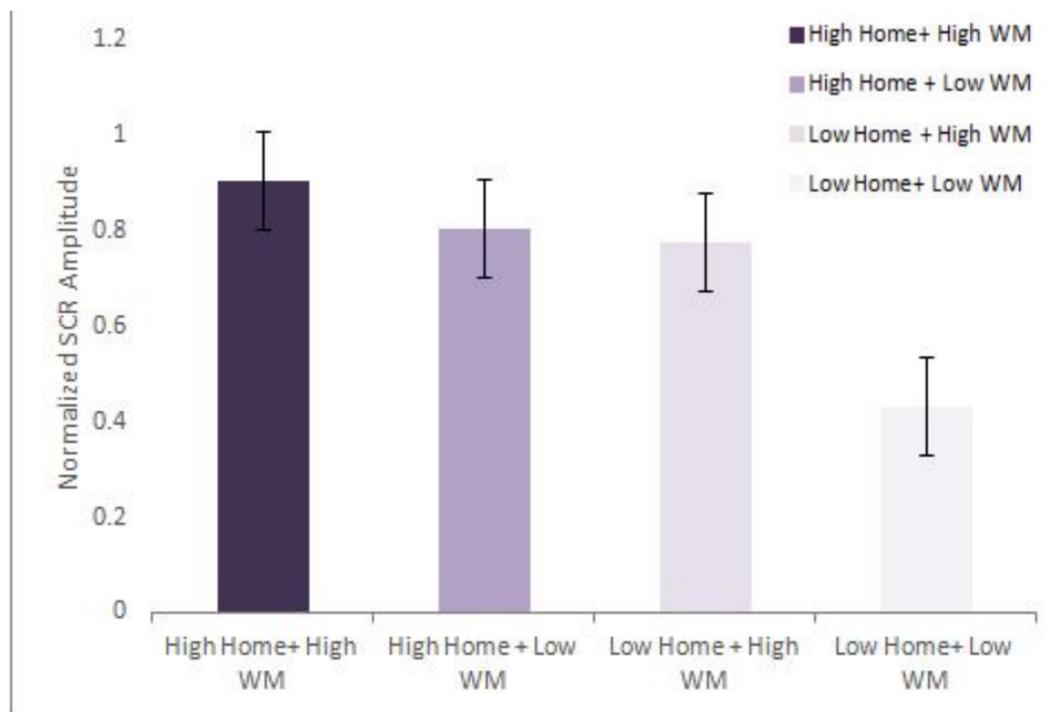
Procedure: The (HOME) is a self report questionnaire that mothers complete during their follow-up visits. Children from 48 months to 60 months of age were administered the Wechsler Preschool and Primary Scale of Intelligence (WPPSI), an intelligence test designed to specifically measure visual spatial abilities, fluid reasoning, verbal skills, working memory, as well as a measure of full scale IQ. Electrodermal activity (EDA), a measure of sympathetic nervous system activity was measured as participants watched a video with a series of 6 startling 90dB stimuli.

Results

Data Analysis: A general linear model was run to see if there was a main effect or interaction of working memory and home environment on sympathetic nervous system reactivity before and after adjusting for covariates including age, ethnicity, parity, maternal marital status and maternal education. A pairwise analysis was used to compare the effects of the combinations of high WM or low WM with positive home environment or negative home environment on skin conductance. The analysis showed a significant effect such that SCR reactivity was lowest in children with both low WM and low HOME scores, as compared with all other children $F(3,44) = 2.878, p = 0.47$.

Children with both low WM and a poor home environment were significantly less reactive than children with high WM and/or a positive home environment.

Home Environment and Working Memory on SCR



Discussion

Research across multiple studies has revealed that low sympathetic activation has been linked to externalizing, aggressive, or disruptive behaviors in children whereas internalizing (anxious) behaviors have been associated with high sympathetic activation in children (Bauer, Quas & Boyce 2002). It has also been seen that heightened emotional reactivity in early adulthood is associated with both adverse childhood home environments and elevated risk for developing mood and anxiety disorders in adulthood (Mclaughlin, Kubuzunsky, Dunn, Waldinger, Vailant & Koenen 2010). Studies have shown that when people experience high levels of anxiety, their working memory capacity suffers due to more cognitive energy being devoted to managing the anxiety, causing executive response disruption on elements of the working memory (Sorg & Whitney, 1992). Despite all of these findings showing effects of these various factors on reactivity, **there has been very limited research focusing on how these factors (home environment and working memory) combined effect sympathetic reactivity.** The importance of such research could produce more of a practical understanding of how multiple external environmental/ sociological factors and psychological factors in cohesion can influence sympathetic reactivity as experienced day to day. The presented research findings may help inform a **screening method for early detection of mood and emotional disorders.** Future research should investigate the specific components of home environment that contribute the most to high or low sympathetic reactivity.

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