

There are potential long term impacts of poor sensory processing and of traumatic events on sensory processing

This section will include summaries of articles from the psychology literature on temperament, shyness, behavioral inhibition and what they term sensory processing sensitivity. Also will be included certain relevant abstracts regarding long term effects of childhood trauma if related to sensory processing in some way.

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Prior to 2009

Hohmeister J, Demirakça S, Zohsel K, Flor H, & Hermann C.(2008). Responses to pain in school-aged children with experience in a neonatal intensive care unit: Cognitive aspects and maternal influences. Eur J Pain.

Previously, it was shown that school-aged (9-14yr) preterm and fullterm children with neonatal pain exposure exhibit elevated heat pain thresholds and heightened perceptual sensitization to tonic painful heat when tested under standard conditions [Hermann C, Hohmeister J, Demirakca S, Zohsel K, Flor H. Long-term alteration of pain sensitivity in school-aged children with early pain experiences. Pain 2006;125:278-85]. Here, changes in the psychosocial context of pain responses in these children, who had been hospitalized 7 days after birth including 3 days of treatment in a neonatal intensive care unit (NICU), are reported. Nineteen preterm (31 weeks gestational age) and 20 fullterm children (37 weeks gestational age) with NICU experience, recruited retrospectively and selected based on strict exclusion criteria, and 20 fullterm control children participated. Preterm NICU children endorsed more pain catastrophizing as compared to controls. Mothers of preterm children, who had been more severely ill and had been hospitalized longer than fullterm NICU children, were more likely to engage in solicitous pain-related behavior. Maternal influence was also assessed by comparing heat pain thresholds and perceptual sensitization to tonic painful heat obtained in the presence versus absence (i.e. standard testing conditions) of the mother. In all three groups, maternal presence was associated with increased heat pain thresholds. Control children habituated significantly more to tonic heat when their mother was present. **The NICU children showed overall significantly less habituation than the controls; there was no modulating effect of maternal presence.** Especially in highly vulnerable children such as preterms, neonatal pain exposure and prolonged hospitalization may, aside from neuronal

plasticity, promote maladaptive pain-related cognitions and foster parental behavior that reinforces the child's pain response.

Atchison, B.J. (2007). Sensory Modulation Disorders Among Children With a History of Trauma: A Frame of Reference for Speech-Language Pathologists *Language, Speech, and Hearing Services in Schools*, 38, 109-116.

Purpose: The purpose of this article is to present definitions and concepts about sensory modulation, illustrate behavioral aspects of sensory modulation disorders, describe a framework for assessment and intervention, and present advances in research. **Method:** A review of descriptive and evidence-based literature related to the impact of exposure to both prenatal and postnatal trauma on sensory modulation is provided, with additional information gleaned from recent assessment data on children with a history of trauma who are served by the Southwest Michigan Children's Trauma Assessment Center (CTAC). **Clinical Implications:** The review of the literature indicates support for the presence of sensory modulation disorders among traumatized children. In addition, the emerging data now being gathered on children who have been assessed by CTAC indicate a significant prevalence of sensory modulation disorders among children with a history of trauma alone, and those with both trauma and a diagnosis of fetal alcohol spectrum disorder (FASD). Awareness, recognition, and identification of behaviors associated with this disorder, and referral to appropriate professionals, is essential to ensure effective preventive and intervention services.

Pole, N., Neylan, T.C., Otte, C., Metzler, T.J., Best, S.R., Henn-Haase, C., Marmar, C.R. (2007). Associations between childhood trauma and emotion-modulated psychophysiological responses to startling sounds: a study of police cadets. *Abnormal Psychology*, 116, 352-61.

Childhood trauma may confer risk for adult psychopathology by altering emotional and physiological responses to subsequent stressors. Few studies have distinguished effects of childhood trauma from effects of current Axis I psychopathology on adult psychophysiological reactivity. The authors exposed 90 psychiatrically healthy police cadets to startling

sounds under increasing threat of shock while assessing their eyeblink electromyogram (EMG), skin conductance (SC), and heart rate responses. When compared with those who did not endorse early trauma (n = 65), cadets reporting childhood trauma (n = 25) reported less positive emotion and showed greater SC responses across all threat levels. They also showed threat-dependent elevations in reported negative emotions and EMG responses. **Results suggest that childhood trauma may lead to long-lasting alterations in emotional and psychophysiological reactivity even in the absence of current Axis I psychopathology.**

Stefan G. Hofmann* and Stella Bitran (2007) Sensory-processing sensitivity in social anxiety disorder: Relationship to harm avoidance and diagnostic subtypes. *J Anxiety Disord*, 21, 944-54.

Sensory-processing sensitivity is assumed to be a heritable vulnerability factor for shyness. The present study is the first to examine sensory-processing sensitivity among individuals with social anxiety disorder. The results showed that the construct is separate from social anxiety, but it is highly correlated with harm avoidance and agoraphobic avoidance. Individuals with a generalized subtype of social anxiety disorder reported higher levels of sensory-processing sensitivity than individuals with a non-generalized subtype. These preliminary findings suggest that sensory-processing sensitivity is uniquely associated with the generalized subtype of social anxiety disorder.

Annatjie M. Smith, M.Sc., Saartjie Roux, D.Med.Sci.*, N. T. (Raj) Naidoo, Ph.D., Daniel J. L. Venter, B.Sc.Hons (2005). Food choices of tactile defensive children *Nutrition* 21, 14-19.

Objective: We explored whether tactile defensive children have picky eating habits because fussy or picky eaters are a general problem to parents and different health professionals. **Methods:** Children (n = 62) of both sexes, ages 3 to 10 y, were assigned to an experimental tactile defensive (TD) group (n = 29) or a control non-TD group (n = 33). A questionnaire on eating habits was compiled and given to parents for completion during personal interviews (children were screened with a checklist and evaluated for tactile defensiveness with the Winnie Dunn Caregiver profile questionnaire). **Results:** This research confirmed that

the eating habits and food choices of TD and non-TD children differ significantly. TD children had a fair to poor appetite. They hesitated to eat unfamiliar foods, did not eat at other people's houses, and refused certain foods because of the smell and temperature. They also had a problem eating vegetables. They often gagged and/or bit their inner lips and cheeks. The results showed a definite difference in the limited selection of foods that TD children chose and a pronounced aversion toward textures or consistencies, smells, and temperatures of food as compared with integrated children. **Conclusions:** Fussy or picky eaters should be evaluated more widely than to treat only the feeding problem. Tactile or oral defensiveness can be treated. This report underlines the team approach of health professionals. © 2005 Elsevier Inc. All rights reserved.

Aron, E.N., Aron, A., & Davies, K.M. (2005). Adult shyness: The interaction of temperamental sensitivity and an adverse childhood environment. *Personality and Social Psychology Bulletin*, 31, 181-97.

These authors investigate the relationship between childhood environmental variables and what they call sensory processing sensitivity with the development of adult shyness. These authors have created a tool to examine sensory processing sensitivity (see Aron, 1996, 1999 and Aron & Aron, 1997). They define sensory processing sensitivity as “an individual difference characteristic in which those who are high are particularly sensitive to subtle stimuli, easily over stimulated, prone to ‘pause to check’ in a novel situation, and prefer to reflect and revise their cognitive maps after an experience.” (pg. 181). They relate this concept to temperament literature on inhibitedness, reactivity, and threshold of response. They propose a model whereby sensitivity and adverse childhood experiences interact and lead to negative affect which later leads to shyness. This paper reports the results of 4 studies completed to investigate this model. The subjects were undergraduate level students in the state of NY. They had found previously that approximately 10-35% of students are rated as highly sensitive by their tool. Items on their tool include things like ‘Are you uncomfortable with loud noises?’ This is a lengthy and complex paper with many results reported but generally their results support their proposed model.

Becker K, Holtmann M, Laucht M, & Schmidt MH.(2004). Are regulatory problems in infancy precursors of later hyperkinetic symptoms? *Acta Paediatr.* 93, 1463-9.

AIM: To examine whether regulatory problems in infancy predict later hyperkinetic symptoms in childhood and pre-adolescence. **METHODS:** In a prospective longitudinal study of 319 children at risk of later developmental problems and psychopathology, hyperkinetic behaviour problems were assessed at the ages of 2, 4.5, 8 and 11 y by means of a standardized parent interview. Infant regulatory problems at the age of 3 mo were determined from multiple sources of information. An observational procedure was used to assess the quality of mother-infant interaction. **RESULTS:** At the age of 3 mo, 17% of the infants (n = 55; 27 boys, 28 girls) suffered from multiple regulatory problems. Compared to a control group (n = 264), these children presented more hyperkinetic symptoms throughout childhood. Negativity in the mother-infant interaction and early family adversity each contributed to later hyperkinetic symptoms. When controlling for family adversity, the association between infant multiple regulatory problems and later hyperkinetic problems was rendered insignificant. **CONCLUSIONS:** These findings suggest that multiple regulatory problems may not be a key variable for later hyperkinetic problems. The impact of early family adversity factors clearly outweighed that of infant psychopathology on later behaviour disorder.

Meyer, B., & Carver, C.S. (2000). Negative childhood accounts, sensitivity, and pessimism: a study of avoidant personality disorder features in college students. *Journal of Personality Disorders*, 14, 233-48.

These researchers examined a sample of 127 undergraduate students to investigate the relationships between their negative childhood memories, pessimism and also sensory processing sensitivity. These researchers cite the studies by Aron and colleagues mentioned above and also studies by Millon & Davis regarding hypersensitive temperamental disposition. They use Aron & Aron's (1997) tool (see above) to measure the student's sensory processing in relation to the other chosen scales for optimism/pessimism (The Life Orientation Test-Revised) and negative mood (The Profile of Mood States). The authors did find a relationship between the tools they used and the student's ratings of avoidant personality disorder (APD) based on DSM -IV criteria. The correlation reported between the measure of sensory processing and the rating of APD was .43 which was significant (p = .01). There was a significant negative relationship (r = -.26, p = .01) between sensory processing and the scale rating optimism/pessimism and a positive relationship between sensory processing and negative mood (r = .42, p=.01).

