

# **Variation in pain threshold and tolerance in high-risk schoolchildren**

**Mahbuba Sumiya**

Benjamin Carson High School of Science and Medicine  
Detroit, Michigan 48212, USA

## **Abstract**

The present study examined variation in the physiologic stress response in 3<sup>rd</sup> and 4<sup>th</sup> grade schoolchildren. Students were drawn from the Oak Park School District, a largely lower income, minority district outside of Detroit, Michigan, with low state test scores. A total of 22 students (9 female, 8-10 yrs) completed the cold pressor task (CPT), a widely used and validated marker of physiologic stress. The CPT was adapted for children, and involves immersing the right hand up to the wrist in cold water ( $10\pm 1^{\circ}\text{C}$ ). The main outcome measure was pain threshold, measured in the time (in s) elapsed from when the child's hand is immersed in the water to the time that they reported first experiencing pain, and pain tolerance, measured as the time (in s) elapsed from when the child's hand is immersed in the water to the time it was voluntarily removed (maximum 180 s). Across the sample, there was substantial variation in pain threshold (range = 1-180 s, M = 58.2 s, SD = 70.3 s) and pain tolerance (range = 1-180 s, M = 88.9 s, SD = 79.1 s). Nine students kept their hand in the cold water for the maximum amount of time (180 s). Pain threshold was highly correlated with pain tolerance,  $p < 0.001$ . Female and male students did not differ in pain threshold or tolerance ( $p > 0.4$ ). Relative to younger students, older students demonstrated a higher pain threshold,  $p = 0.006$ . Age was not associated with pain threshold,  $p = 0.16$ . These results suggest substantial variation in pain threshold and tolerance among a sample of high-risk schoolchildren. Variation in stress response, as measured via pain threshold and tolerance, may be useful for identifying children at highest risk of stress and associated negative outcomes (e.g., anxiety, school underperformance, cardiovascular disease).

## **Keywords**

Pain, tolerance, minority, chronic illness, and underperformance

## **Biography**

Mahbuba Sumiya is a current high school student at Benjamin Carson High School of Science and Medicine. She has been working in labs around Detroit for almost her entire high school year. She hopes to go into the field of medicine in the future.