Child and Adolescent Stress Reactivity as a Function of Body Mass Index

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Background and Objective

- Adult studies have linked obesity with cardiovascular disease and Hypothalamic-Pituitary-Adrenal (HPA) axis dysregulation.
- There is an absence of pediatric literature investigating interactions between weight status, as defined by body mass index (BMI - kg/m^2), and stress reactivity.
- Existing pediatric research points to age and gender variations in stress reactivity.

- This study extends the literature by being the first to examine interactions between BMI and cortisol (stress hormone), heart rate, and blood pressure.
- Our overall aim was to examine whether overweight youth exhibit greater stress responses than lean youth.
- We hypothesize that compared to lean youth, overweight youth will exhibit 1) greater cortisol reactivity 2) greater heart rate reactivity 3) greater blood pressure reactivity.

Methods

Participants

- 27 lean (BMI: 19.7 2.7), 14 overweight (BMI: 26.2 5.4)
- Age Range: 8 to 17 year, Age Mean: 12.5 2.7
- 48.8% male, 53.7% White total sample
- Household Income Mean: $70,000 to $89,999

Exclusion Factors

- Usage of drug or alcohol, psychotropic medication, oral contraceptives, steroids, thyroid medication

Procedures

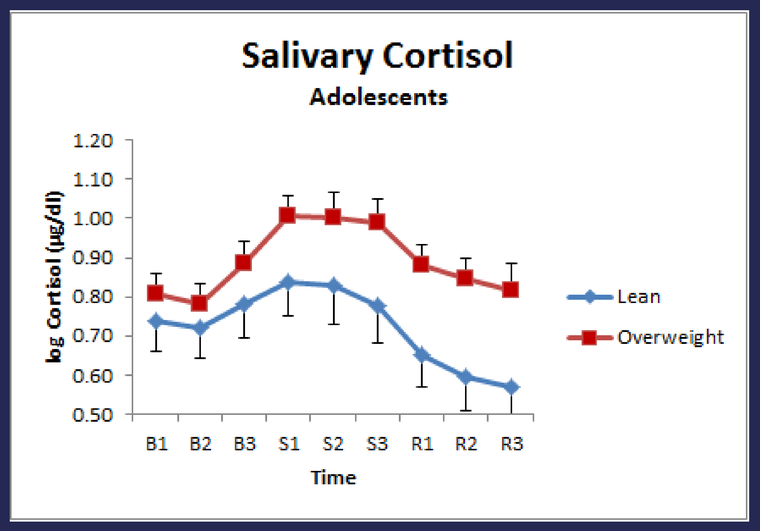
- Participants first habituated to the lab in a "rest" session.
- During the following stress session, participants performed a 10 minute speech, a mental arithmetic task, and a mirror tracing task (Trier Social Stress Test for children).
- 9 salivary cortisol samples were taken throughout the session (three at baseline (B), three during stress (S) and three during recovery (R)). Heart rate, systolic blood pressure, and diastolic blood pressure were taken every two minutes. Mean levels at each study interview were calculated.
- Following completion of the stress paradigm, participants were extensively debriefed.

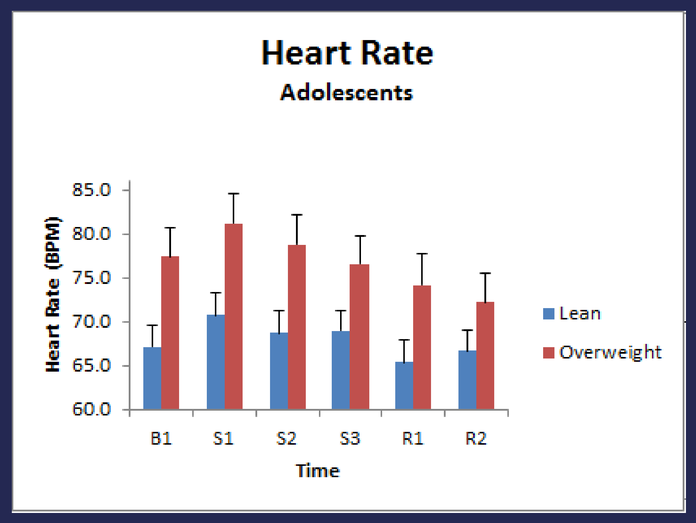
Statistical Analyses

- Analyses examined 1) Total Sample 2) Children (12 years and below) 3) Adolescents (13 years and above)
- BMI percentiles based on age and gender national norms defined overweight (≥85th percentile) and lean (<85th percentile).
- Logarithmic (base 10) transformations of cortisol values were used to account for positive skewness.
- Series of 2 (BMI) x 2 (Age) x 2 (Gender) x Time (Stress Reactivity) repeated measures ANOVAs were run for the total sample.
- Subsequent series of 2 (BMI) x 2 (Gender) x Time (Stress Reactivity) repeated measures ANOVAs were run for children only, and adolescents only.
- For all Time, 9 cortisol samples, and 6 heart rate and blood pressure means were utilized.
- For the purposes of this study, only analyses regarding BMI are currently reported.

Results

We found a significant BMI by Time interaction for cortisol in adolescents [F(4.169, 70.876) =2.480, p<.05], a significant BMI by Age by Time interaction for heart rate in the total sample [F(3.926,117.790) =2.488 , p<.05], and a significant BMI by Time interaction for heart rate in adolescents only [F(2.921,46.735) = 3.170, p<.05). We failed to find cortisol and heart rate interactions with regards to BMI in children only, or with blood pressure in any age group.





Summary and Conclusion

- Our first hypothesis was supported in adolescents only – overweight adolescents exhibited greater cortisol reactivity than lean adolescents.
- Our second hypothesis was supported in the total sample and adolescents – overweight subjects in these categories exhibited greater heart rate reactivity than lean subjects.
- Our third hypothesis was not supported in the total sample, children only, and adolescents only – we failed to detect differences in reactivity between lean or overweight subjects with regards to systolic and diastolic blood pressure
- Existing literature suggests that well-defined stress reactivity emerges later in development. The failure to detect differences in stress reactivity in children is in line with those findings.
- These results suggest that overweight adolescents show greater physiological stress reactivity than lean adolescents in laboratory stress induction paradigm.
- Future longitudinal studies are needed to better understand the potential role of physiological stress reactivity in the development and maintenance of pediatric obesity.

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