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Stress Hormone Cortisol Relates to Emotion Expression for Young Children facing Economic Hardship

Corinne Yost, Jessa Malatesta, Alyssa Allen, Zachary Weaver, Keara Hennesey, Kaytlin Landis-Rotondi, & Mallory Garnett

Faculty Mentor: Eleanor Brown

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Background

Around 40% of children in the US face economic hardship

Related stressors influence physiological functioning and brain development

The hormone cortisol indicates stress

In general, higher cortisol indicates more stress, but repeated exposure to stress can eventually lead to depressed cortisol (desensitization to stress)

Given the complexities, we don't know for sure how children's cortisol levels relate to their emotional experience

This study focuses on how cortisol levels relate to expressed emotion for children attending Head Start preschools

Impact of Poverty

Stressors related to poverty include:

- Financial hardship
- Neighborhood violence
- Inadequate material resources
- Instability in where and with whom children live

Effects include:

- Problems in cognitive, social-emotional, and physical health

HPA Functioning

Hypothalamic-pituitary-adrenal or HPA axis

- Physiological stress response system
- Activity measured by end-product stress hormone cortisol
- Cortisol follows diurnal pattern
- Levels contribute to functioning of metabolism, immune support, learning, and memory
- Facilitates effective response to challenging environments

HPA dysregulation

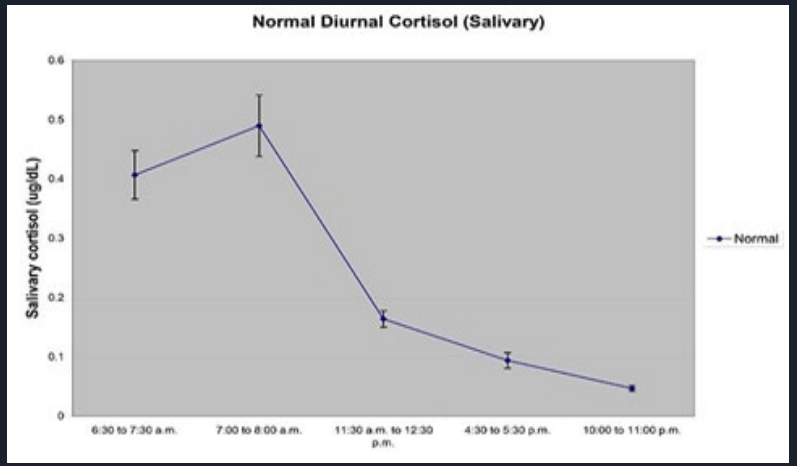
- Over exposure to stress leads to overtaxing physiological systems and specific brain areas such as the prefrontal cortex
- Effects are particularly important in early childhood when there is rapid brain growth and development

Diurnal Cortisol and Stress Response

Diurnal Pattern

- Peak in morning
- Steep decline in mid morning
- Gradual decline rest of day

Follows sleep-wake circadian rhythm



Salimetrics LLC

How Cortisol Dysregulation May Help to Explain Impact of Poverty on Child Development

- Cumulative impact of poverty cofactors
  - Neighborhood violence
  - Inadequate material resources
  - Instability in where and with whom children live
- Allostatic load
  - Tax on physiological systems, including the HPA
  - Includes cortisol dysregulation
- Birth-6 years
  - Critical period
    - Rapid growth and development of prefrontal cortex, which has to do with learning and self-regulation
    - Cortisol dysregulation can interfere with development

Complexities about Dysregulation

Dysregulation due to poverty-related stress can disrupt the normal diurnal pattern of cortisol functioning

- Hypercortisolism:
  - This is the most common pattern for children facing economic hardship in the United States and represents sensitization to stress
    - Elevated baseline cortisol levels
    - Over-reactivity to stressors, and inefficient return to baseline
- Hypocortisolism
  - This pattern may emerge with severe or chronic stress or trauma, and represents attenuation or desensitization
    - Depressed baseline cortisol levels
    - Under-reactivity to stressors

- We know that both of these patterns of dysregulation are linked to negative child emotional and behavioral outcomes

- Given diurnal variation and dynamic nature of stress-response systems, we don't know for sure what particular cortisol levels mean for children's emotional experience and behavior

Importance of Child Emotion Expression

According to Differential Emotions Theory (DET; Izard et al.):

- Discrete emotion systems play an important role in explaining behavior
- Emotions are activated in response to environmental experiences, giving rise to characteristic patterns of emotions, cognitions, and actions
- Emotions have adaptive functions
  - e.g., interest: sustaining engagement and attention
- High frequency and intensity is maladaptive
- Observed emotion expression offers excellent snapshot of children's preschool experience

Present Study

Extension of broad investigation of Brown et al.

Focus on preschool children facing economic hardship

Examines relations between cortisol and emotion expression and behavior

Utilizes HPA end factor cortisol as physiological marker of function and development as well as parent demographic interview and well validated observational coding system for child emotion expression and behavior

Participants

70 children attending a Head Start preschool in Philadelphia, PA
Mean age = 4 years and 1 month
52.3% female, and 47.7% male
54.5% Black/ African American, 15.2% Latino/ Hispanic American, 10.3% Asian American, and 20.0% White/ European American

Procedure

All procedures approved by WCU IRB

Study included:

- Parent demographic interviews at start of school year
- Measurement of child cortisol levels via salivary assay 4 times a day on 6 different days throughout school year
- Coding of children's emotion expression within classes prior to cortisol measurement using AFFEX (Izard, Dougherty, & Hembree, 1989)

AFFEX coding system:

- Grounded in DET
- Provides a sufficiently reliable and time-efficient affect expression identification system
- Based on cross-cultural research, and developmental studies of infants and young children

Descriptive Statistics and Zero-order Correlations

Pearson Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. LogCort	-	-.003	.015	-.094**	-.003	.080**	.b	-.001	.012	.085**	.014	-.097**	-.081**	-.047*	-.008
2. Happy	-.003	-	-.027	-.167**	-.046*	.024	.b	-.020	.311**	-.026	-.025	-.002	.087**	.055**	.057**-
3. Proud	.015	-.027	-	.005	-.009	-.011	.b	-.006	-.022	-.010	-.004	.025	.017	-.006	-.006
4. Interested	-.094**	-.167**	.005	-	-.035	-.056**	.b	-.027	.028	-.020	-.012	.928**	.943**	-.003	.008
5. Sad	-.003	-.046*	-.009	-.035	-	.071**	.b	.473**	-.024	.130**	-.008	.007	.015	.148**	-.011
6. Angry	.080**	.024	-.011	-.056**	.071**	-	.b	.135**	-.047*	.605**	.380**	-.011	.039	.001	-.001
7. Anxious	.b	.b	.b	.b	.b	.b	.b	.b	.b	.b	.b	.b	.b	.b	.b
8. Crying	-.001	-.020	-.006	-.027	.473**	.135**	.b	-	.012	.062**	-.005	-.022	.016	.051*	-.008
9. Laughter	.012	.311**	-.022	.028	-.024	-.047*	.b	.012	-	-.045*	-.026	-.230**	.082**	.051*	.150**
10. Defiance	.085**	-.026	-.010	-.020	.130**	.605**	.b	.062**	-.045*	-	-.009	-.039	.028	.021	.031
11. Trembling	.014	-.025	-.004	-.012	-.008	.380**	.b	-.005	-.026	-.009	-	.007	.015	-.005	-.005
12. None	-.097**	-.002	.025	.928**	.007	-.011	.b	-.022	-.230**	-.039	.007	-	.929**	-.002	-.033
13. Behavior W	-.081**	.087**	.017	.943**	.015	.039	.b	.016	.082**	.028	.015	.929**	-	-.130**	-.137**
14. Behavior O	-.047*	.055**	-.006	-.003	.148**	.001	.b	.051*	.051*	.021	-.005	-.002	-.130**	-	.316**
15. Behavior U	-.008	.057**	-.006	.008	-.011	-.001	.b	-.008	.150**	.031	-.005	-.033	-.137**	.316**	-

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

b. Cannot be computed because at least one of the variables is constant.

Means and standard deviations

	N (2330)
LogCort	-.69815198 (.426294506)
Happy	.40 (.928)
Proud	.06 (.882)
Interested	13.70 (3.427)
Sad	.03 (.232)
Angry	.05 (.301)
Anxious	.00 (.000)
Crying	.01 (.115)
Laughter	.53 (1.175)
Defiance	.04 (.299)
Trembling	.00 (.059)
None	13.60 (3.469)
Behavior W	14.12 (3.439)
Behavior O	.03 (.384)
Behavior U	.04 (.422)

Results

Zero-order correlations: Preliminary zero-order correlational analyses indicated that the lower cortisol related significantly to the emotion of interest and to behavior that was coded as within normal limits or overcontrolled as opposed to hyperactive. Higher cortisol related significantly to the emotion of anger and behavioral expression of defiance.

We are in the process of acquiring statistical software that will allow us to carry out more sophisticated analyses that will appropriately account for the nested structure of these data, with observations of cortisol nested within children, nested within preschool classes.

Summary and Implications

This is the first study we know of to examine relations between child cortisol levels and their observationally coded emotion expression and behavior

Preliminary results indicate that lower cortisol relates to the emotion of interest, and to behavior that is within normal limits or overcontrolled as opposed to hyperactive

Preliminary results further indicate that higher cortisol relates to the emotion of anger and to expressions of defiance

These results add uniquely to the current knowledge base and suggest that:

- For children facing economic hardship, cortisol levels often are already elevated due to poverty-related stress and thus, those with higher cortisol in comparison to their peers may be at particular risk for difficulties
- Interventions that aim to lower stress levels for children facing economic hardship may be linked to positive changes in children's emotions and behavior