Stress, Anxiety and its Effects on Brain, Behavior and the Family

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What is stress?

- Any shift from homeostasis (optimal balance) (Cannon, 1932)

- Psychological and physical effects of events or states that challenge coping abilities (Selye, 1946)

- Stress can also be thought of as a motivational state
Sources of Stress

- Physical things
- Social/Environmental
- Happy, joyful experiences
- Loss of control
- Incentive / disincentive issues
Examples of Stressors

- Physical things
  - Confrontation with predators
  - Blood loss, bladder pressure, temperature, sleep deprivation, thirst, hunger, pain, etc.

- Social/Environmental
  - Dealing with dominant members of the troupe or group
  - Competing for resources (e.g. food, water, mates, jobs)
  - Change in the environment that is not defined by it’s physical property
  - Isolation (in social species like humans)
  - Novelty

- Happy, joyful experiences (weddings, births, promotions)
- Loss of control in a previously instrumental situation
- Incentive / disincentive issues
  - Earning a smaller reward than expected
  - Job loss or performance
  - Cognitive challenges that fail to lead to a solution
Is anxiety and stress the same thing?

- They are related and can share symptoms but not exactly the same
- Anxiety can be specific or generalized
- Doesn’t always disappear with a reduction in obvious stressors
- Anxiety can also elicit a strong physiological stress response.
What about anxiety and depression?

- Not the same thing but share some similar symptoms (e.g. irritability, problems sleeping or concentrating)

- A person with a mood disorder is sometimes diagnosed with an anxiety disorder (and vice versa)

- Chronic stress and anxiety that seems uncontrollable and unchangeable + self-blame may lead to depression (Seligman, 1992)
Coping and Resilience

- Coping with stress takes effort, energy and assistance from many sources.

- People differ in coping ability and resources.

- In a way, coping is like borrowing to get through a hard time in anticipation of better days.
The way it’s supposed to go:

- Stressor
- Effective Response
- Recovery

[Diagram with a cycle indicating the process]
Why study stress in children with 22q11.2DS?
Kids with 22qDS and their families have a lot to cope with!

- Early major medical interventions and ongoing health and development issues
- Socioemotional impairments
- Cognitive impairments that complicate education
- Co-morbid for other Dx (ADHD, OCD)
- Problems become more prominent with increasing social and academic demands.
Kids with 22q11.2DS may be more or less susceptible to stress...

- Type and severity of early/ongoing trauma
- Degree of intellectual impairment
- Atypical development of brain structures associated with emotional regulation (e.g. PFC, limbic system, cerebellum)
- Genetic variation within and outside deleted region
- Epigenetic factors related to maternal stress during pregnancy and/or early experience
- Quality of social and family support, access to medical and psychiatric treatment, insurance and financial ability, parental mental health and rearing style
Elevated anxiety in 22q11.2DS vs. TD kids

The graph compares MASC scores between 22q (n = 51) and TD (n = 41) kids across various anxiety dimensions. The dimensions include Physical Symptoms, Tense/Restless, Somatic/Autonomic, Harm Avoidance, Perfectionism, Anxious Coping, Social Anxiety, Humiliation Rejection, Performance Fears, Separation/Panic, Anxiety Disorder Index, and MASC Total. The scores are indicated by bars in red for 22q and blue for TD.
Elevated depression in 22q11.2DS vs. TD kids

![Bar chart showing comparison between 22q (n = 47) and TD (n = 39) groups in depression scores. The chart includes categories such as Total CDI, Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia, and Negative Self-Esteem. The bars indicate higher scores in the 22q group for most categories, except for Negative Self-Esteem where the TD group has a slightly higher score.]
Separation anxiety does not abate in 22q

Beaton et al. (ongoing study)
• Passive drool saliva collection

• Pre and post mock scanner training procedure

• Novel experience + mild ‘restraint’ stress in should elicit a mild stress response

• Stress should dissipate quickly as the child acclimates to the environment
Elevated CORT in 22qDS vs. TD

![Graph showing mean (+/- SEM) salivary CORT (ng/ml) for 22q (n = 20) and TD (n = 22) groups.](image)

- Pre-Mock MRI: p = 0.005
- Post-Mock MRI: p = 0.043
- Total Cort: p = 0.016

Beaton et al. (Invited to revise and resubmit)
Depression predicts attenuated CORT in 22qDS

Beaton et al. (Invited to revise and resubmit)
Allostatic load

Repeated "hits"

Lack of adaptation

Physiologic Response over time

Normal response repeated over time

Normal adaptation

Prolonged response

Inadequate response

No recovery

From McEwen, 1998
Anhedonic depression predicts blunted CORT in 22qDS

- High negative and low positive affect predictive of psychosis in high-risk Ss w/out 22q (Horan et al. 2008)

- Blunted CORT is marker of allostatic load, PTSD, and life history of shyness (Yehuda, 1990; McEwen, 1998; Gunnar & Vasquez, 2001; Beaton et al. 2006; Badanes et al., 2011)

- TD preschoolers with anhedonic depression had more severe Sx and blunted CORT vs. kids w/ hedonic depression (Luby et al., 2004)
Understanding the child’s ecology...

- Socioeconomics
- School environment and community supports
- Environmental health
- Community factors (safety and crime, access to health care, social support, urbanization)
- Cultural factors, language, and racism
- Parental stress and mental health
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Maternal Depression (BDI)

Beaton et al. (ongoing study)
Maternal Positive/Negative Affect (PANAS)

Beaton et al. (ongoing study)
Maternal Quality-of-Life Scale

Beaton et al. (ongoing study)
Negative and Positive Life Events Over the Past Year

Beaton et al. (ongoing study)
Maternal Depression, Anxiety, and Stress

Beaton et al. (ongoing study)
Maternal Depression, Anxiety, and Stress

Beaton et al. (ongoing study)
Multidimensional Anxiety Scale for Children

- Ss 001
- 22q (n = 51 no Ss 001)
- TD (n = 41)
Multidimensional Anxiety Scale for Children

- Ss 001
- 22q (n = 51 no Ss 001)
- TD (n = 41)
Children’s Depression Scale

- Ss 001
- 22q (n = 47)
- TD (n = 39)

CDI t-scores

- Total CDI
- Negative Mood
- Interpersonal Problems
- Ineffectiveness
- Anhedonia
- Negative Self-Esteem
Treatment Possibilities

- Interventions could be tailored to potentially “bump” developmental trajectories in a positive direction.
- We can treat anxiety, mood, and teach coping/social skills (eg. “Coping Cat” program).
- Improve quality of life in the short term
- Family- and community- focused perspective (eg. parental mental health)
Thank you.

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