Hypothesis

Serotonin Transporter Gene (HTTLPR) is of increasing clinical interest. The heritability of resilience is .38 - .52 among US adults. Most people are exposed to potentially traumatic events at some point in their lives, but many are surprisingly resilient. Resilience is a complex multi-dimensional construct. The heritability of resilience is .38 - .52 among US adults. Most people are exposed to potentially traumatic events at some point in their lives, but many are surprisingly resilient. Resilience is a complex multi-dimensional construct. The heritability of resilience is .38 - .52 among US adults. Most people are exposed to potentially traumatic events at some point in their lives, but many are surprisingly resilient. Resilience is a complex multi-dimensional construct.

Role of the Serotonin Transporter Gene in Resilience to Stress and Trauma: An Integrative Review

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Results

- 26 articles met all criteria
- 17 of 26 (65%) studies found that the individuals who carry the S allele of 5-HTTLPR were less resilient to stress and trauma
- 4 of 26 (15%) studies found those who carry the S allele of 5-HTTLPR were more resilient
- The remaining 5 publications (20%) did not find any differences in resilience between those with L or S alleles

Discussion & Conclusion

The hypothesis is partially supported by the analysis because the majority of the studies (17/26, 65%) found that S allele carriers are less resilient. Nevertheless, 4/26 (15%) of the studies found that S allele carriers are more resilient and 5/26 (20%) found no statistically significant association between 5-HTTLPR and resilience. 3 dimensions of the articles may explain the inconsistent results.

(1) Definition of resilience

- No single agreed-upon definition of resilience
- Emergent resilience represents trajectories of positive adjustment in the context of chronically stressful circumstances
- Minimal-impact resilience is applied in the context an isolated potentially traumatic event

- 5-HTTLPR maps to 17q11.1-17q12 (on the long arm of chromosome 17)
- 5-HTTLPR contains a 43 base pair insertion or deletion in the 5’ regulatory region of the gene
- The short (S) 5-HTTLPR variant (purple) produces significantly less 5-HTT mRNA and proteins than the long (L) variant (red)
- Individuals who carry the S allele of 5-HTTLPR have increased characteristics of fear conditioning, auditory startle, sympathetic reactivity, HPA axis reactivity, etc.

Hypothesis

Little is known about whether individuals who carry the S allele of 5-HTTLPR are less resilient to stress and trauma compared to L allele carriers. Because evidence indicates that S allele carriers are at increased risk of psychopathology such as PTSD, it is hypothesized that S allele carriers are less resilient to stress and trauma compared to L allele carriers.

Methods

PubMed, EMBASE, PsychINFO, and CINAHL databases were searched. Keywords: “serotonin transporter gene”, “5-HTTLPR”, “resilience”.
Inclusion criteria for the articles reviewed: (1) human subjects approved research, (2) published in English, (3) peer-reviewed research articles, (4) both 5-HTTLPR and resilience measured.
The results of the literature search were analyzed and summarized in Table

![Image of a Table with columns for Stressor / Trauma Measure, Serotonin Measure, Sample, Finding (Less resilient), rs25531, Authors (Year)]

<table>
<thead>
<tr>
<th>Stressor / Trauma Measure</th>
<th>Serotonin Measure</th>
<th>Sample</th>
<th>Finding (Less resilient)</th>
<th>rs25531</th>
<th>Authors (Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Childhood maltreatment</td>
<td>Children’s Depression Inventory</td>
<td>Multinomial &amp; normal children</td>
<td>L</td>
<td>No</td>
<td>Barry et al. (2012)</td>
</tr>
<tr>
<td>Maladjustment Classification System</td>
<td>Resilient functioning</td>
<td>Multinomial &amp; normal children</td>
<td>S</td>
<td>No</td>
<td>Cicchetti &amp; Rogosch (2012)</td>
</tr>
<tr>
<td>Childhood Trauma Questionnaire</td>
<td>Connor-Davidson Resilience Scale (CD-RISC)</td>
<td>Male prisoners</td>
<td>L</td>
<td>No</td>
<td>Carl et al. (2011)</td>
</tr>
<tr>
<td>Childhood adversity</td>
<td>Early Adolescent Temperament Questionnaire-Revised (self-report)</td>
<td>Dutch adolescents</td>
<td>S</td>
<td>Yes</td>
<td>Nederhof et al. (2012)</td>
</tr>
<tr>
<td>Distal (Adverse Childhood Events) and proximal (Recent Life Stressors) stressful life events</td>
<td>Zung Self-Rating Depression Scale; CD-RISC as “buffer”</td>
<td>General population</td>
<td>S</td>
<td>No</td>
<td>Sharpley et al. (2013)</td>
</tr>
<tr>
<td>Childhood Trauma Questionnaire</td>
<td>CD-RISC-10</td>
<td>Undergraduate students</td>
<td>S</td>
<td>Yes</td>
<td>Stein et al. (2009)</td>
</tr>
<tr>
<td>Childhood Trauma Questionnaire</td>
<td>CD-RISC-10</td>
<td>African adults exposed to trauma</td>
<td>L</td>
<td>No</td>
<td>Hermings et al. (2013)</td>
</tr>
<tr>
<td>Life Events Checklist</td>
<td>CD-RISC-10</td>
<td>Individuals from the Detroit Neighborhood Health Study</td>
<td>Not Significant (NS)</td>
<td>No</td>
<td>Koenen et al. (2011)</td>
</tr>
<tr>
<td>Number of traumatic events</td>
<td>PTSD Checklist</td>
<td>African American youths</td>
<td>S</td>
<td>No</td>
<td>Brady et al. (2011)</td>
</tr>
<tr>
<td>Stressor / Trauma Measure</td>
<td>Conduct problems</td>
<td>African American adults</td>
<td>S</td>
<td>No</td>
<td>Gidions et al. (2012)</td>
</tr>
<tr>
<td>Medical Trauma</td>
<td>Physical health, mental health, trouble with the law, &amp; social relationships</td>
<td>African American adults</td>
<td>S</td>
<td>No</td>
<td>Gidions et al. (2012)</td>
</tr>
<tr>
<td>Severe obesity treated by bariatric surgery</td>
<td>Resilience Scale</td>
<td>Women 1 – 5 years after bariatric surgery</td>
<td>S</td>
<td>No</td>
<td>DeFrisco et al. (2013)</td>
</tr>
<tr>
<td>Diagnosis of cancer within 6 months</td>
<td>Hospital Anxiety Depression Scale</td>
<td>Breast cancer patients</td>
<td>NS</td>
<td>No</td>
<td>Greer et al. (2010)</td>
</tr>
<tr>
<td>Childhood Trauma Questionnaire</td>
<td>BDI</td>
<td>African American patients with type 1 diabetes</td>
<td>NS</td>
<td>Yes</td>
<td>Roy et al. (2010)</td>
</tr>
<tr>
<td>Traumatic Brain Injury, Perceived Limitation</td>
<td>CES-D</td>
<td>Veterans with and without TBI</td>
<td>L</td>
<td>Yes</td>
<td>Graham et al. (2013)</td>
</tr>
<tr>
<td>Mental Health</td>
<td>CES-D</td>
<td>Children and adolescents with ODD and ADHD</td>
<td>S</td>
<td>No</td>
<td>Merrell et al. (2012)</td>
</tr>
</tbody>
</table>

| Ageing                     | CES-D | Community dwelling Caucasian adults | NS | Yes | Olswang et al. (2012) |

Isolated Potentially Traumatic Event

Natural Disaster

Hurricane Related Traumatic Experiences-Revised

PTSD Re-exposure to Children-Released

Children exposed to Hurricane Ike | NS | No | La Graca et al. (2013) |

Medications

Distress intolerance

Behavioral Indicator of Resilience to Distress

Youth from Washington, D.C. | S | No | Amsterdam et al. (2012) |

A trajectories (school time examination)

Reward responsiveness

Bulgarian high school students | S | Yes | Nikolova et al. (2012) |

Affective pictures

Biased attention for emotional stimuli

General population | S | No | Fox et al. (2009) |

Emotional faces

Biased attention for emotional stimuli

European volunteers | S | Yes | Hermann et al. (2012) |

Visual stimuli, emotional stimulation

Skin conductance responses & neural responses

General population | S | Yes | Hermann et al. (2012) |

Sensory word

Biased attention for emotional stimuli

Unmedicated, young adults with low current depression and anxiety symptoms | S | No | Kwing et al. (2010) |

2-minute serial subtraction sessions and cold-pressure exposures

Positive and Negative Affect Scale, & Negative Affect Priming

University students | S | Yes | Markus & De Raad et al. (2011) |

Trier Social Stress Test (free speech, mental arithmetic)

Profile of Mood States

Undergraduate students | S | Yes | Verschoor & Markus (2011) |