Background

• Research has shown that stress can negatively affect cognitive abilities such as processing speed and working memory.
• Gin et al. (2009) examined acute induced stress effects on cognitive functioning. Inducing a minimal amount of stress resulted in decreased performance on working memory tasks. They also found that an increase in stress level significantly increased negative affect scores.
• Sliwinski, Smyth, Hofer, & Stawski (2006) assessed daily stress and cognitive performance on six occasions in 108 older adults and 68 young adults. Daily within-person (WP) variability in stress predicted WP variability in response times (RTs) on a 2-back working memory task in both younger and older adults (i.e., RTs were slower on high-stress days compared with low-stress days).
• These results are consistent with theories that postulate stress-related cognitive interference competes for attentional resources. Attention depletion may be related to stress-related intrusive thoughts.
• Stress can influence a multitude of changes within an individual. When our bodies become stressed, our bodies react in response to the direct or indirect stressor which creates a “fight or flight” response.
• This psychological response triggers feelings of frustration, anxiety and psychological discomfort that pull resources away from primary demands (i.e. cognitive processing), and instead devote these resources toward the stress induced response, thus impairing normal cognitive function (Staal, 2004).

Stress Response
(Activated by a perceived threat)

1) Stress hormones such as adrenaline and cortisol are released causing an increase in heart rate, blood flow and respiration.
2) Stored sugar and fats are released from it’s resources for energy to maintain the response.
3) Energy sources become depleted and the body attempts to return to homeostatic levels. (CMHA 2011)

Objectives

1. To evaluate the effect of number and severity of reported stressors on between-person differences within-person variation in cognition.
2. To examine reaction times (RTs) during a Multi-source interference task (MSIT) over a 7-session measurement burst looking at both interference and control conditions.
3. To examine accuracy in the Letter Memory (LM) task over a 7-session measurement burst.

Results

Figure 1: Shows a positive relationship between mean MSIT Interference Condition RTs and stress severity. As WP stress severity increases, mean MSIT RT increases, suggesting that greater severity ratings of reported stressors is related to slower MSIT RTs.

Figure 2: Shows a positive relationship between mean MSIT Interference Condition RTs and number of stressors reported. As the number of reported stressors increases, mean MSIT RTs increase, suggesting participants perform more poorly on MSIT tasks when they report more stress.

Figure 3: Shows Letter Memory accuracy increasing across sessions, suggesting restet effects have an influence on the increase in accuracy with asymptote reached later in the measurement burst.

Figures 4 and 5: Shows MSIT control (Fig. 4) and interference (Fig.5) RTs across sessions, suggesting RTs decrease (showing improvement) over time, with greatest decreases early in the burst.

Table 1. We found significant results for the effect of WP DISE and WP DISE Severity on the residualized MSIT interference condition only. This indicates slower reaction time on days when more stressors and increased stress severity are reported.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Residual (WP)</th>
<th>Intercept (BP)</th>
<th>ICC (BP-WP)</th>
<th>Residual (WP)</th>
<th>Intercept (BP)</th>
<th>ICC (BP-WP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISE Num. Stressors</td>
<td>0.48</td>
<td>1.11</td>
<td>0.30</td>
<td>0.48</td>
<td>1.11</td>
<td>0.30</td>
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<tr>
<td>DISE Severity</td>
<td>2.43</td>
<td>5.88</td>
<td>0.29</td>
<td>2.43</td>
<td>5.88</td>
<td>0.29</td>
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<tr>
<td>Cogn. Interference</td>
<td>17.96</td>
<td>22.11</td>
<td>0.45</td>
<td>17.96</td>
<td>22.11</td>
<td>0.45</td>
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<td>MSIT Control</td>
<td>4999.31</td>
<td>3011.91</td>
<td>0.62</td>
<td>4999.31</td>
<td>3011.91</td>
<td>0.62</td>
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<tr>
<td>MSIT Interference</td>
<td>10525.37</td>
<td>6709.06</td>
<td>0.61</td>
<td>10525.37</td>
<td>6709.06</td>
<td>0.61</td>
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<tr>
<td>Letter Memory</td>
<td>39.76</td>
<td>23.48</td>
<td>0.63</td>
<td>39.76</td>
<td>23.48</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Note. * p < .05; BP=Between Person; WP=Within Person.

Discussion

• Significant between-person differences and day-to-day variations in stress, processing speed, and cognition were observed in undergraduate students at the University of Victoria.
• This study provides evidence that stress is associated with daily variation in cognitive performance such that at heightened levels, there is a decrease of performance in cognition. However, we see this only on our most sensitive cognitive test, the MSIT interference condition.

Limitations

• Because this study relies on naturally occurring stressors, the shorter time-sampling period limited the amount of information for examining within person variability of the effects of daily stressors on cognitive functioning.

Future Research

• In future studies it would be useful to look at cognitive motor responses as an alternative outcome of stress and cognitive interference.
• In order to understand individual differences in the stress-cognition link, it may be useful to experimentally induce stress and measure cortisol during performance of cognitive tasks. This would allow us to more directly measure the amount of stress each person is experiencing and relate it to their cognitive abilities rather than asking for self-reports.

References


References