Induced stress during dual task improved secondary task performance at the sacrifice of primary task performance

Farahnaz Fallahtafti and Jennifer M Yentes
Department of Biomechanics, University of Nebraska at Omaha, Omaha, NE 68182

INTRODUCTION

• Completing a simultaneous secondary task while standing or walking, i.e. a high cognitive load situations, may disrupt one’s postural control [1,2].
• Several factors such as pathology, aging, and stress may have an effect on the performance of each task being completed [3].

PURPOSE:

• We aimed to investigate the effect of induced stress on the performance of each task during a high cognitive load situations. The high cognitive load situations S included standing while completing a secondary motor task (wire maze).

METHODS

• Participants (Tab. 1) were asked to randomly stand 1) quietly, or while completing the wire maze 2) with or 3) without a loud buzzer noise (Fig. 1). Stress was induced through a loud buzzer when the ring contacted the maze.

RESULTS

ABOVE: Posture was more irregular during quiet standing (ST) compared to standing while doing wire maze (DT) with and without the buzzer in both the AP and ML directions (p=0.02, p=0.001, respectively in AP) & (p=0.004, p<0.0001, respectively in ML). (NOTE: GRF=Ground Reaction Force, SampEn=Sample Entropy).

LEFT: Perceived stress was significantly lower during quiet standing (single task: ST) compared to standing while completing the wire maze (dual task: DT) with (p=0.001) and without buzzer (p=0.007) conditions.

LEFT: Wire maze errors were significantly higher during standing while doing wire maze (DT) without the buzzer compared to the buzzer DT condition (p<0.0001).

DISCUSSION and CONCLUSIONS

• During the most stressful high cognitive load situations, the high level of perceived stress coincided with less wire maze errors.
• The addition of a secondary task increased the regularity of the ground reaction force in both directions, which might be due to more automatic and less flexible postural control.
• Induced stress during high cognitive load situations caused a cost for postural control, yet a benefit for wire maze performance, indicating task prioritization under stress.
• Identifying the strategies underlying task prioritization can help clinicians design appropriate interventions to challenge patients appropriately to improve performance during high cognitive load situations

ACKNOWLEDGMENTS

This research was funded by Graduate Research and Creative Activity grant from Office of Research and Creativity Activity, UNO (2018).

Table 1. Demographic data

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Age (years)</th>
<th>Body mass (kg)</th>
<th>Height (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Young</td>
<td>18</td>
<td>24.76±3.56</td>
<td>68.85 ±11.85</td>
<td>1.72±0.07</td>
</tr>
</tbody>
</table>