THE IMPACT OF NOISE INTERFERENCE AND FATIGUE ON SIMPLE AND CHOICE RESPONSE TIMES

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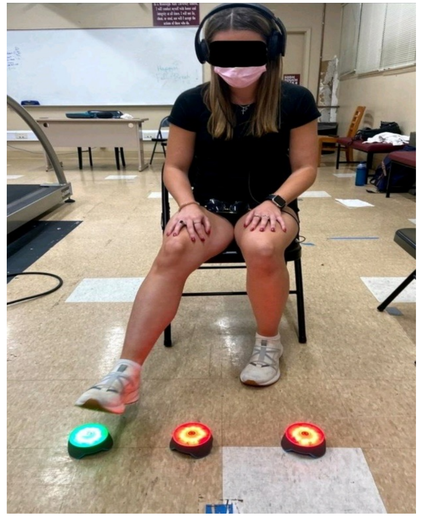
INTRODUCTION

Performance, vigilance, and efficiency of any task that involve cognition, concentration, and attention will be negatively affected with the presence of noise, which is seen as a distractor and a stressor, especially in hazardous occupational environments[1,2]. The addition of musculoskeletal fatigue, that commonly accompany occupational work, to noise interruption can further elevate risk and compromise the safety of the worker[3]. The purpose of the study was to investigate the impact of both individually and a combination of a noise interference and a physical workload on simple and choice response time tasks.

METHODS

Sixteen healthy male and female participants [age: 20 ± 1 years; height: 169.48 ± 8.2 cm; weight: 67.93 ± 12.7 kg] performed a simple (SRT) and choice response task (CRT) with three Blazepod™ light response time system by striking with the dominant lower extremity from a seated position (single-task), and while listening to noises from a construction site [65-85dB] (dual-task) through headphones. Participants then performed a low intensity musculoskeletal fatigue task and completed the above measures again. Response times (RT) (ms) from three trials of SRT and CRT, both without and with noise interference, before and after the workload were averaged and a 2 × 2 repeated measures ANOVA was performed using JASP at alpha level of 0.05.



RESULTS

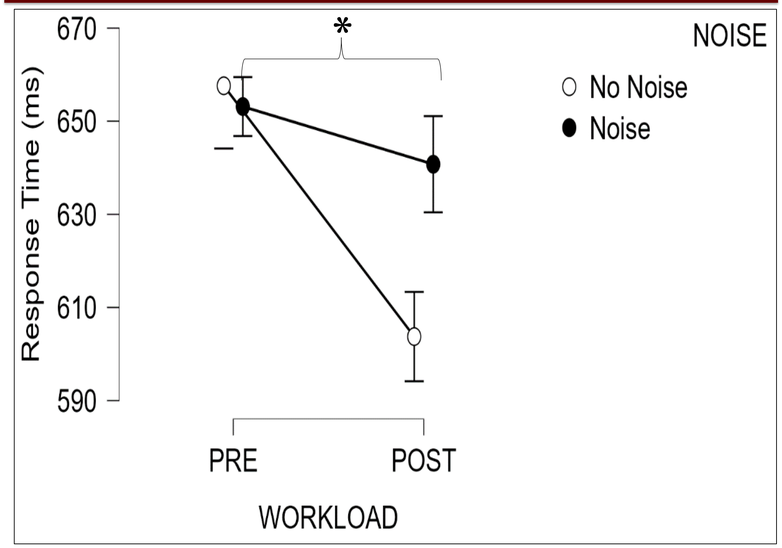


Figure 1. Response times (ms) during a simple response time (SRT) task, without (No Noise) and with noise (Noise), before (PRE) and after (POST) the workload. * represents significant difference at $p < 0.05$ and bars represent standard errors.

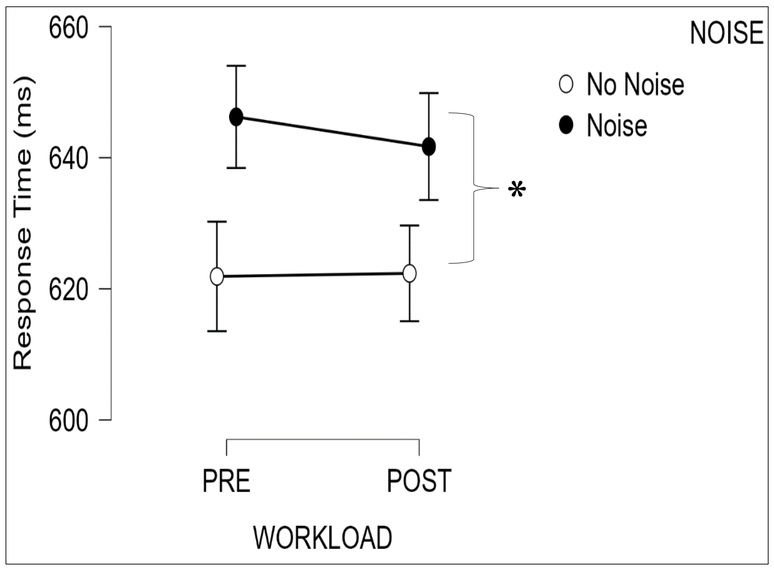


Figure 2. Response times (ms) during a choice response time (CRT) task, without (No Noise) and with noise (Noise), before (PRE) and after (POST) the workload. * represents significant difference at $p < 0.05$ and bars represent standard errors.

RESULTS

Results revealed significant difference in both SRT ($p = 0.009$) and CRT (0.002). In SRT, RT was significantly faster during post-fatigue measure, suggesting a learning effect improvement rather than a negative fatigue effect. In CRT, RT was significantly slower due to noise interruption, negatively impacting performance, especially in a more challenging CRT compared to SRT.

DISCUSSION

It was hypothesized that both noise and fatigue would have a negative effect on RT in both the SRT and CRT. However, fatigue did not play a significant role in either the SRT or CRT, likely due to an inadequate intensity and offset by a learning effect in SRT. However, while noise interruption did not significantly affect RT in the SRT, RT increased significantly in CRT. This implies that while one's performance on simple tasks may not be affected significantly by distractions, performance of complicated tasks that involve choice selection can be, demonstrating significantly slower response times and supporting previous literature[3]. These results are applicable to the safety of workers in potentially hazardous occupational environments. Future studies should focus on specific occupational tasks for different types of construction and manufacturing sectors, so appropriate safety measures that might help these employees avoid making potentially dangerous mistakes while at work can be implemented. Further studies should also prescribe a more intense or occupational task specific musculoskeletal fatiguing protocol to more accurately represent the occupational stress and assess the impact of fatigue and noise on SRT and CRT.

CONCLUSION

Findings from the current study suggest that noise interruption is significant when the complexity of the response task is greater and that learning effects persist that may influence response time performances, while a low intensity fatigue does not significantly impact response times in simple and choice response time tasks.

REFERENCES

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