

Anxiety as a Mediating Variable Between Urban Versus Nature Walks and Executive Functioning

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Introduction

- Nature walks have a positive impact on affect and general health and wellbeing, while urban walks can have negative effects (Schutte et al., 2017, and Barton and Pretty, 2010)
- Exposure to nature also restores attention capacity, selective attention abilities, and overall executive functioning (Bratman et al., 2015, McAllister et al., 2017, and Laumann et al., 2003)
- Anxiety may be associated with decreased executive functioning (Fujii et al., 2013; Han et al., 2016; Ursache & Raver, 2014; Yochim et al., 2013)
- Little research has been done on the relationship between urban and nature walks, state anxiety, and executive functioning. Furthermore, no one has directly induced anxiety to study this relationship
- It was hypothesized that nature walks reduce state anxiety, leading to improved executive functioning, and that urban walks increase anxiety and therefore decrease executive functioning

Methods

- The flanker task was used to measure executive functioning (Kopp et al., 1996) and the State-Trait Anxiety Inventory measured state anxiety, or stress (Spielberger et al., 1968)
- 19 Alma College students completed a series of tasks in the following order:
 1. State Trait Anxiety Inventory- Time 1
 2. Flanker Task- Time 1
 3. Stress-inducing task or control task
 4. State Trait Anxiety Inventory- Time 2
 5. Flanker Task- Time 2
 6. Urban or Nature walk (approximately 15 minutes)
 7. State Trait Anxiety Inventory- Time 3
 8. Flanker Task- Time 3
- The mild stress-inducing task consisted of reading aloud from a list of difficult words while the number of mistakes was visibly recorded. Each participant was told they made 40 errors and that the average was 20. The control task included a list of very easy words, and participants were told they made 0 errors and that the average was 2 errors

Results

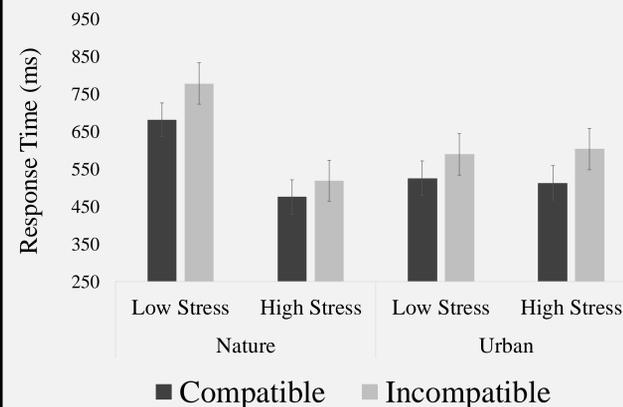


Fig. 1. Mean response time (ms) in each flanker (compatible, incompatible), walk (nature, urban), and stress (low, high) condition.

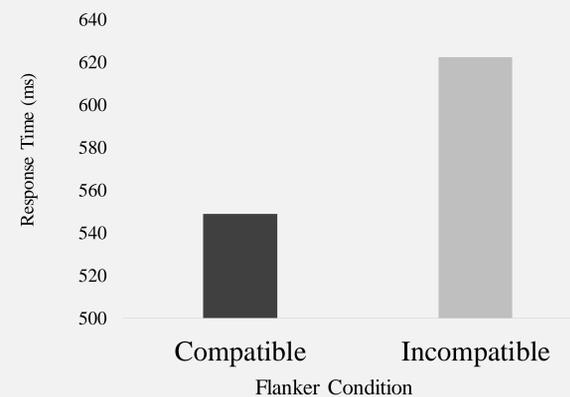


Fig. 2. Mean response time (ms) in each flanker condition. Overall, there was significant flanker interference ($p < .001$).

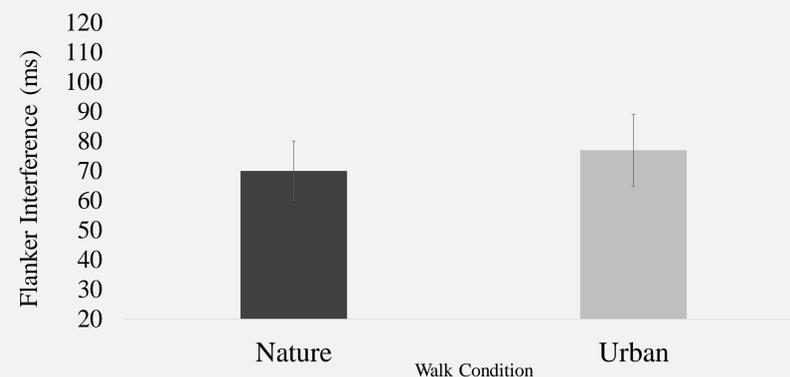


Fig. 3. Mean flanker interference (ms) in each walk condition. There was significant flanker interference in both the nature and urban walk conditions, though the difference was not significant ($p = .66$).

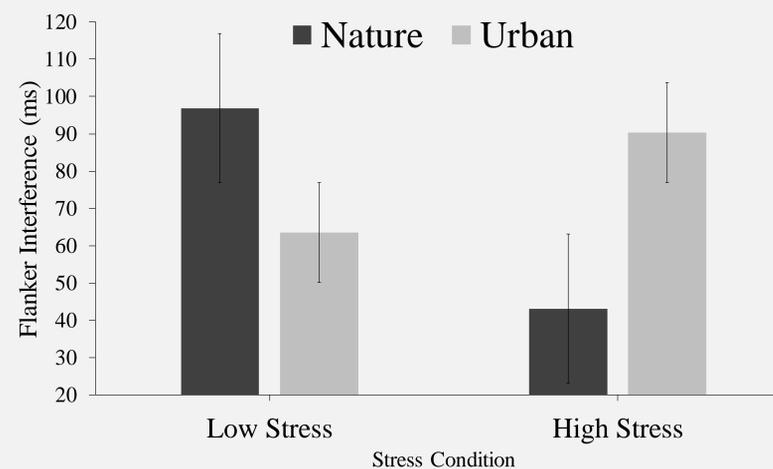


Fig 4. Mean flanker interference (ms) in each walk and stress condition. The nature effect (i.e., reduced flanker interference for nature versus urban walk) is significantly different between low and high stress conditions ($p = .01$), such that it is larger in the high stress than low stress conditions. Interestingly, the nature effect is reversed in the low stress condition (i.e., reduced flanker interference for urban walk). This may be due to differences between low and high stress-inducing tasks in their cognitive load and differences between urban and nature walks in their perceptual load.

Discussion

- The Flanker task did produce a flanker effect, which was significant in every condition
- Flanker interference was numerically greater for the urban walk condition than the nature walk condition, which was expected, but the difference was not significant
- There was a significant interaction between flanker interference, walk condition, and stress condition during time 3. As predicted, the high stress condition showed significantly greater flanker interference for the urban walk condition than the nature walk condition. However, the low stress condition surprisingly showed the opposite effect
- This unexpected finding is likely due to the interaction of low perceptual load and low cognitive load found in the low stress x nature walk condition
 - E.g., If you are thinking of harder things and there is a lot going on in your head, you are going to be less distractable. However, in the low stress condition, your mind is not working as hard (low cognitive load). Additionally, in the nature setting, there are fewer objects competing for your attention (low perceptual load). Therefore, flanker interference may increase because you are more distractable

Conclusions

- According to the findings for the high stress condition, nature walks may indeed reduce stress/anxiety and improve executive functioning in comparison to urban walks
- Cognitive and perceptual load may also be at play in the relationship between urban vs. nature walks and executive functioning, which is seen in the findings for the low stress condition
- Future research should include a greater sample size and a more diverse population, as this study mostly focused on a small amount of white, young adult students at Alma College
- This research may contribute to the knowledge of effective treatments or interventions for people with anxiety or improve our understanding of how cognitive processes interact with environmental factors and executive functioning. Future studies show look further into the influences of these cognitive factors