Perceptual load effect is not replicated online with letters or symbols

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Introduction

The perceptual load theory proposes that with more potentially task-relevant information available (i.e. higher perceptual load), distractor processing is reduced[1,2].

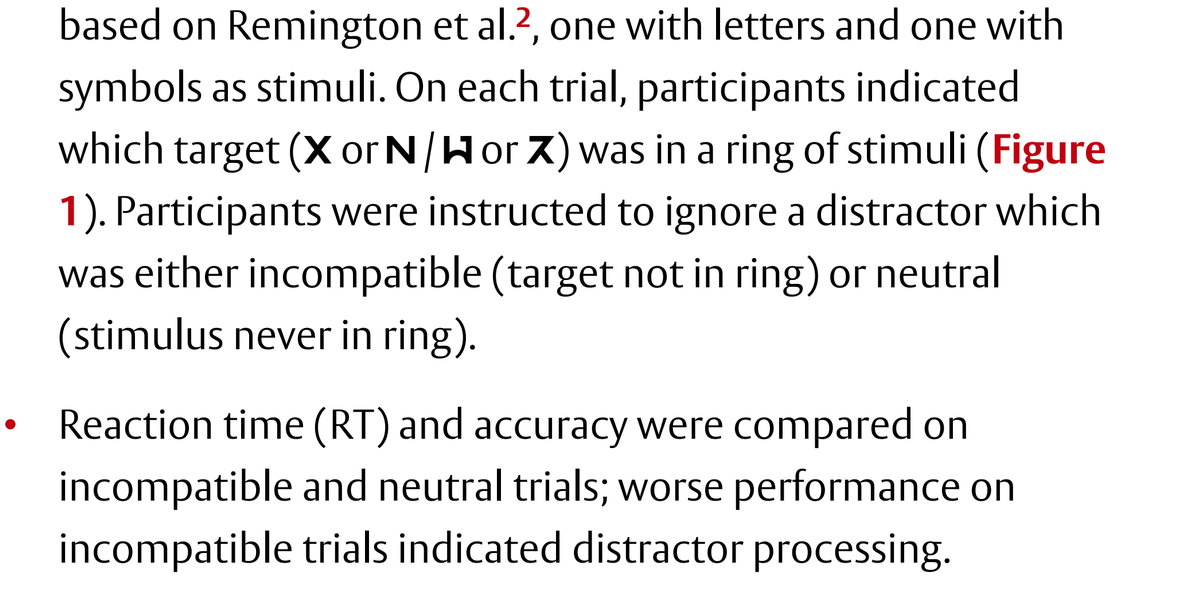
There is not yet supporting evidence for load theory from online tasks or tasks using symbols as stimuli instead of letters. This would allow recruitment of larger samples and novel investigation of dyslexic individuals' perceptual capacity. An online task using letter-like symbols did not replicate classic perceptual load effects[3]. However, this study was limited by its small sample and use of symbols without letters for comparison.

Aim: Address limitations of previous research, investigating whether perceptual load effects can be replicated online with letters and/or letter-like symbols.

Methods

- Pre-registration: **https://osf.io/t62pd**
- N = 42 following exclusions (mean age = 28.60, *SD* = 4.56; 25 females); sample size based on power analysis. Neurotypical participants completed the study online using Gorilla.
- Each participant completed two perceptual capacity tasks, based on Remington et al.[2], one with letters and one with symbols as stimuli. On each trial, participants indicated which target (**X** or **N**/**H** or **ϫ**) was in a ring of stimuli (**Figure 1**). Participants were instructed to ignore a distractor which was either incompatible (target not in ring) or neutral (stimulus never in ring).
- Reaction time (RT) and accuracy were compared on incompatible and neutral trials; worse performance on incompatible trials indicated distractor processing.
- Perceptual load was increased by increasing set size (1, 2, 4, or 6; numbers refer to number of non-dot stimuli in ring).

Figure 1 - *Trial procedure for Letters and Symbols tasks*

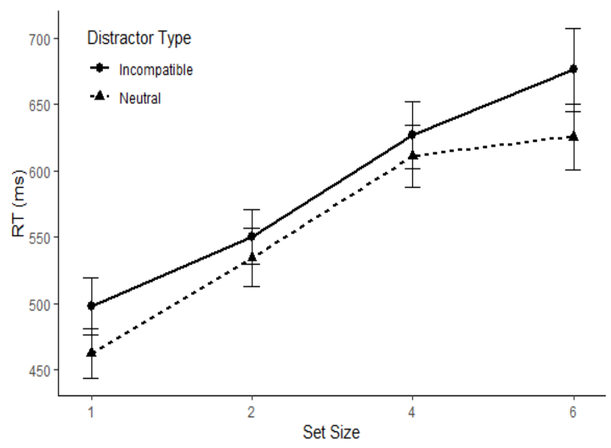


Results

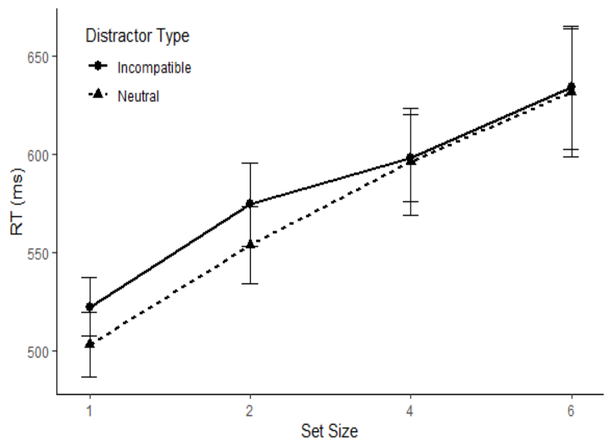
- Frequentist and Bayesian 2-way ANOVAs were conducted.
- There was insufficient evidence for or against interactions between set size and distractor type with dependent variable RT in both tasks (letters, BFincl = 2.73; symbols, BFincl = 0.46) – see **Figure 2 a-b**.
- There was substantial evidence against these interactions with dependent variable accuracy compared to evidence for them (letters, BFincl = 0.27; symbols, BFincl = 0.25) – see **Figure 2 c-d**.

Figure 2 – *Main and interaction effects of set size and distractor type*

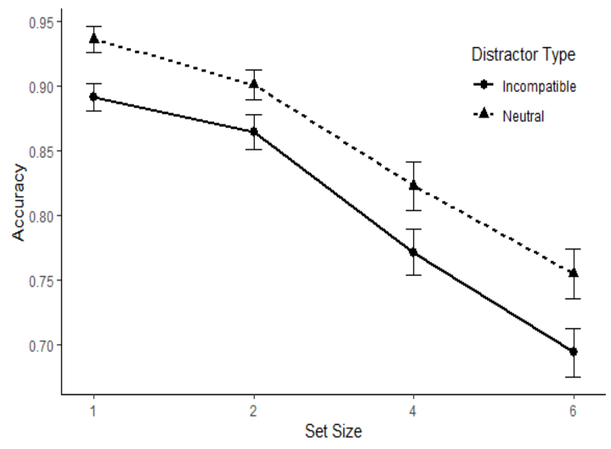
a – *Letters task, RT*



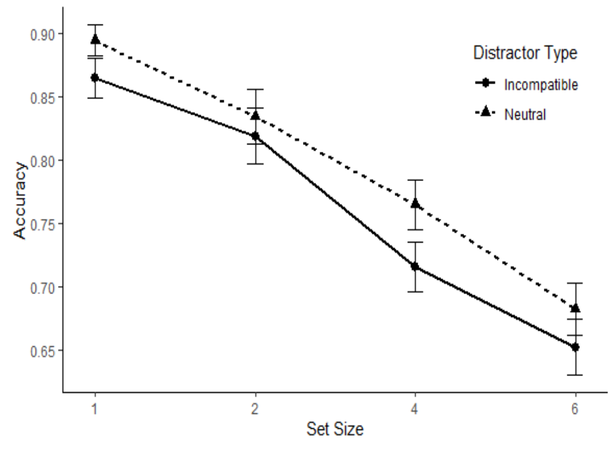
b – *Symbols task, RT*



c – *Letters task, accuracy*



d – *Symbols task, accuracy*



Conclusions

Classic perceptual load effect (reduced distractor processing at high load) was not detected online using letters or symbols.

Potentially due to:

- Limitations of online research (e.g. insensitive RT measures, lack of experimental control)
- Insufficient sample size (power analysis based on in-person study)

References

1. Lavie, N. (1995). Perceptual Load as a Necessary Condition for Selective Attention. *Journal of Experimental Psychology: Human Perception and Performance*, *21*(3), 451–468.
2. Remington, A. M., Swettenham, J. G., Campbell, R., & Coleman, M. (2009). Selective attention and perceptual load in autism spectrum disorder. *Psychological Science*, *20*(11), 1388–1393.
3. Clark, L. B. R. (2021). *Distractor interference effects are consistent across low and high perceptual loads in an online task* [Unpublished dissertation]. University of Oxford.

Acknowledgements

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