Investigating the Distinct Effects of Visual and Auditory Interruptions on TETRIS Gameplay: Uncovering Distractions

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Introduction

Interruptions are ubiquitous in our digital lives, impacting cognitive processes and task performance. In this study, we want to decipher the specific effects of visual and auditory distractions on Tetris gameplay performance. Our findings will have implications beyond the gaming realm, namely for user experience and interface design.

Background

Drawing inspiration from a study by David Warnock et al., which investigates the impact of different modalities on disruptiveness and effectiveness, and another study by Christopher D. Wickens et al., delving into the interplay between auditory and visual modalities in interruption management, this poster aims to contribute insights into the effects of visual and auditory interruptions on cognitive performance. Based on these studies' experimental methods and findings, the analysis will examine participants' Tetris game scores after visual or auditory interruptions. This approach lets us apply knowledge from multiple studies to a specific setting, illuminating modality dynamics in game interruptions.

Unpacking Data

The dataset comprised 64 participants engaged in Tetris gameplay under either visual or auditory interruption conditions. Descriptive statistics revealed a mean score of 57.28 (SD = 15.62), with auditory interruption (M = 67.94, SD = 11.05) demonstrating a higher mean than visual interruption (M = 46.63, SD = 11.80). The Shapiro-Wilk tests for normality revealed non-significant p-values for both auditory (W = 0.95218, p = 0.1662) and visual (W = 0.9638, p = 0.3477) data, indicating normal distribution. Levene's test for homogeneity of variance also showed non-significance (F = 0.3748, p = 0.5426), suggesting no significant difference in variance between auditory and visual groups which meets the assumptions for running a t-test

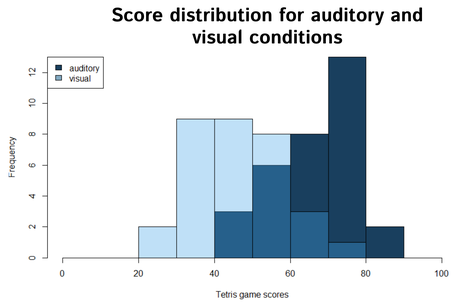


Fig. 1, Distribution of score data for auditory and visual interruptions.

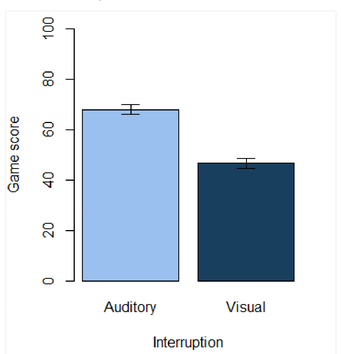


Fig. 2, Bar plot for comparing mean of auditory and visual interrupted score.

Results / Findings

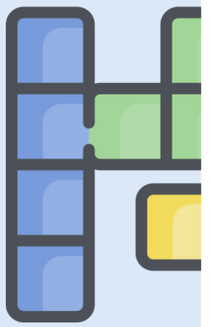
Since this is a between-group study, we conducted an unpaired t-test to determine if there is a difference in the means of the two groups. The test indicated a statistically significant difference in the effect of visual interruptions and the effect of audio interruptions on participants' Tetris gameplay performance. **(t(61.74) = 7.456, p < .001)**. Participants in the auditory interruption condition outperformed their visual interruption counterparts, supporting H1. The mean Tetris score during auditory interruptions **(M = 67.94)** was significantly greater than during visual interruptions **(M = 46.63)**, suggesting that visual interruptions may have a more pronounced impact on gameplay performance. This outcome aligns with the findings of Michael A. Nees and Natalie G. Sampsell (2021), who explored the impact of simple alerts on an ongoing visual task, suggesting that auditory alerts may be less disruptive and potentially reduce perceived workload.

Contrary to the findings of David Warnock, Marilyn McGee-Lennon, and Stephen Brewster (2011), which focused on the role of modality in notification performance, our results show a departure from their study. Their investigation, focused on various notification modalities, suggested no significant differences, implying equal disruptiveness across modalities. This discrepancy emphasizes the nuanced nature of interruptions, revealing that the specific context, task, and modalities at play contribute to divergent outcomes in cognitive performance.

Limitations and Future work

The study's limitations include a small group of 64 participants, which might limit how much we can apply the findings to a larger population. Also, the interruptions created, like fake ads and sirens, might not represent how people react to real interruptions, making the study less applicable to everyday situations. Extending the gameplay time beyond 15 minutes could help us understand better how people adapt to interruptions. Using the same gaming device for everyone is important to avoid confusion from different devices affecting the results.

In order to enhance the authenticity of our study, we might draw insights from David Warnock et al.'s research. Similar to their approach with tactile and olfactory factors in addition to visual and acoustic interruptions we might further expand the range of characteristics to establish a group that functions without any interruptions. To expand the scope of our experiment, we can consider substituting fake adverts with alternative activities, ensuring interruptions are distributed equitably, and utilizing the statistical test called ANOVA to validate our hypothesis. By doing this, we can improve our understanding of how interruptions affect gameplay in various situations.



Conclusion

In conclusion, this study sheds light on the distinct effects of auditory and visual interruptions on Tetris gameplay performance, with a statistically significant difference between the two conditions **(t(61.74) = 7.456, p < .001).** Participants experiencing auditory interruptions outperformed those facing visual interruptions, emphasizing the nuanced impact of different interruption modalities on cognitive tasks. A number of disciplines stand to benefit from the results, including advertising, UX design, interruption management, and human-computer interaction. Beyond the immediate context of gaming, these insights provide valuable considerations for optimizing user experiences and designing interfaces that minimize cognitive load and interruptions across diverse domains. Although the study did have certain flaws like limited sample size and artificial interruptions, the insights it provided were useful in real-life situations and the field of human-computer interaction as a whole.

References

- Edwards, J., Janssen, C., Gould, S., & Cowan, B. R. (2021). Eliciting spoken interruptions to inform proactive speech agent design. In CUI 2021-3rd Conference on Conversational User Interfaces (pp. 1-12).
- Wickens, C. D., Dixon, S. R., & Seppelt, B. (2005). Auditory preemption versus multiple resources: Who wins in interruption management?. In Proceedings of the Human Factors and Ergonomics Society Annual Meeting (Vol. 49, No. 3, pp. 463-466). Sage CA: Los Angeles, CA: SAGE Publications.
- Warnock, D., McGee-Lennon, M., & Brewster, S. (2011). The role of modality in notification performance. In IFIP Conference on Human-Computer Interaction (pp. 572-588). Springer, Berlin, Heidelberg.
- Nees, M. A., & Sampsell, N. G. (2021). Simple auditory and visual interruptions of a continuous visual tracking task: modality effects and time course of interference. Ergonomics, 64(7), 879-890. https://doi.org/10.1080/00140139.2021.1873424