Impact of Visual and Audio Interruptions On The Tetris Gameplay Performance: An Experimental Analysis

ANJALI RAJARAM NAYAK
24207319

Abstract:
This research investigates the effects of visual and audio interruptions on performance in Tetris. Sixty-four regular players were randomly assigned to either a visual interruption condition, with flashing banners, or an audio interruption condition, with advertisements and siren sounds. Interruptions lasted 20 seconds each, occurring every three minutes during a 15-minute session. Game performance was ranked between 0 and 100 points. Data analysis was done in R and included descriptive statistics, visualizations, and inferential testing. Findings shed light on the differential effects of interruption modalities on task performance in interactive environments.

Hypothesis

Null Hypothesis(H0): There is no difference in the effect of visual interruptions and the effect of audio interruptions on participant's Tetris gameplay performance.

Research Hypothesis(H1): There is a statistically significant difference in the effect of visual interruptions and the effect of audio interruptions on participant's Tetris gameplay performance.

Analysis

Data was cleaned after which it was imported into R for analysis, and descriptive statistics computed as shown in **Table 1.** Histograms showed the frequencies of the scores for each condition. Also, boxplots were made in pursuit of outliers, but there were no outliers. Due to the between-subjects design, an independent samples t-test was carried out for investigating the effect of interruptions on the scores. **Shapiro-Wilk** and **Levene's** tests were applied to check for normality and homogeneity of variance, respectively. Then a **Welch two-sample** t-test was done. Data were plotted as a bar plot with error bars **(Figure 1**)..

	AUDITORY	VISUAL	Overall
MEAN	67.93	46.62	57.28
STANDARD DEVIATION	11.053	11.801	15.62

Table 1

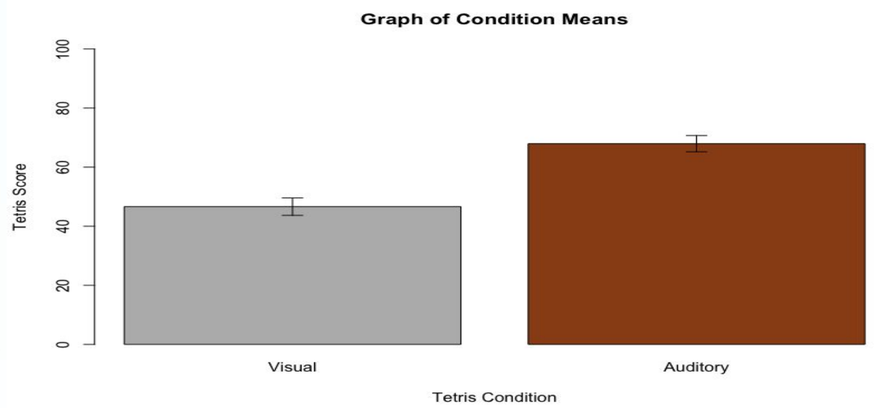

Figure 1

Results & Discussions

According to the study's findings, visual disruptions cause more disruptions to Tetris gaming than auditory ones. **Hanusz, Z., & TarasiNska, J. (2014)** state that the **Shapiro-Wilk** test verified that the data had a normal distribution **(p>0.05)** where **p=0.16(auditory)** & **p=0.35(visual)**, while **Gastwirth, J., et al. (2009)** state that Levene's test showed homogeneity of variance **(p>0.05)i.e p=0.542**. A **Welch two-sample** t-test revealed a statistically significant difference between the conditions, where **p<0.001**, **df=61.7 (df=degree of freedom)i.e (p=3.564e-10)**, and auditory interruptions had higher mean scores **(M=67.94)** than visual interruptions **(M=46.63) (Edwards et al., 2021)**. These findings support the assertion that visual disruptions have a more serious negative effect on performance than auditory ones.

These results are consistent with **Boyer and Printz (2002),** who found that visual interruptions had a greater negative effect on cognitive tasks requiring visual processing, such as gameplay. Similarly, **Johnson et al. (2007)** demonstrated that visual distractions disrupted Tetris performance more than auditory distractions, likely due to the game's reliance on rapid visual processing and spatial reasoning. **Verhaeghen and Lam (2009**) further confirmed that visual distractions impose a higher cognitive load on tasks requiring frequent task-switching compared to auditory distractions.

Conclusion

The auditory and visual interruption types significantly affect game results, as shown by the very small p-value of **<0.001 Edwards et al., 2021.** There is a significant difference in means between participants scores with the auditory and visual interruptions. One can say that participants scores are more likely to be influenced or affected by visual disruptions than their audio counterparts. Therefore, this supports the hypothesis of the study that the effect of auditory and visual disturbances on the performance of players playing Tetris is statistically different.

Limitations & Future Work

- The experiment's short duration and context-specific setup (Tetris as a low-risk task with non-urgent interruptions) limit generalizability to scenarios with higher stakes or prolonged tasks.
- Conducted as a cross-sectional study with automatic scoring, it lacks longitudinal insights and alternative scoring validations for broader application.
- Tetris was chosen as a low-risk, non-urgent task, so the results may differ in scenarios with higher stakes or urgency, like driving or emergency situations, Zhao et al. (2013).

- ❖ Such studies can replicate the experiment in high-risk environments, like driving simulations or emergency response tasks, to evaluate the impact of interruptions in critical real-world contexts.
- ❖ Incorporating various scoring systems and more dynamic interruptions-for example, of variable frequency and duration-may be useful in providing greater insight into performance and adaptation.
- ❖ Examine how combined visual and auditory interruptions affect performance, providing a holistic understanding of multitasking and cognitive load management.

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