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EXTENDED ABSTRACT

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RESILIENCE TO COGNITIVE FATIGUE BETWEEN ACTION GAMERS AND NON-GAMERS: INSIGHTS INTO FLEXIBILITY AND TASK SWITCHING

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I. Introduction

Cognitive fatigue can impair task performance, yet action video games may bolster resilience by enhancing cognitive flexibility and task-switching skills. This study investigates the cognitive flexibility and task-switching performance of gamers compared to non-gamers and explores the impact of prolonged cognitive tasks on these abilities. Findings align with [1] report that habitual action video game players demonstrate superior cognitive abilities, such as spatial working memory and task-switching performance, compared to non-gamers, despite both groups showing cognitive fatigue under challenging conditions.

II. Methods

Participants were categorized as action video game players (AVGPs, n = 18) or non-gamers (NGs, n = 18) based on self-reported gaming habits and questionnaires. To induce cognitive taxing, gamers were presented with a 45 minute Stroop Test while non-gamers observed a documentary entitled 'A NASA Cassini Mission'. Cognitive flexibility and task-switching abilities were assessed using the Trail Making Test (TMT) and the Number-Letters Test (NLT). The TMT, a well-established tool sensitive to impairments in multiple cognitive domains, involves two parts: Part A assesses basic cognitive processing. At the same time, Part B requires additional cognitive flexibility and the ability to maintain a complex response set, which remains a subject of ongoing debate.

The NLT, as described by [2], is a task-switching paradigm in which participants alternate between categorizing letters and numbers in a predictable sequence. Prolonged task sessions were conducted to measure changes in accuracy, reaction time, and errors, providing insights into the impact of cognitive fatigue and sustained effort and comparing how AVGPs and NGs maintained performance under extended cognitive demands.

III. Results and Discussion

A. Cognitive flexibility and task-switching performance among gamers vs non-gamers.

Based on current study, gamers showed an incremental pattern on both task compared to non-gamers, which only affected in cognitive flexibility rather than task-switching. It was expressed by an increment score between pre-and-post tasks by both groups excelled in cognitive flexibility and task-switching, showcasing quicker adaptation, fewer errors, and superior efficiency in dynamic scenarios. Non-gamers occasionally matched these outcomes, likely due to innate abilities, but overall, gamers consistently outperformed across metrics.

B. To compare the impact of prolonged cognitive task performance on cognitive flexibility between gamers and non-gamers.

Prolonged tasks revealed gamers' resilience to cognitive fatigue as they sustained adaptability and accuracy. In contrast, non-gamers exhibited marked declines, underscoring the potential of gaming to foster enduring mental agility. This has been shown by a slighter bigger amount of mean difference by non gamers (4.39) compared to gamers (1.44) after a cognitive taxing task being administered.

C. To compare the impact of prolonged cognitive task performance on task-switching between gamers and non-gamers.

Gamers exhibited stable task-switching efficiency over extended tasks, with minimal declines as presented in Table 1. In contrast, non-gamers showed significant deterioration in performance although not statistically significant. Results suggest that the gaming experience enhances cognitive endurance and multitasking under sustained cognitive demands.

TABLE I
Paired Samples Correlations Showing the Relationship Between Participants' Pre-test and Post-test TMT Performance for Tasks A, B, And Overall Time

		Mean	SD	t	Sig.
Pair 1	Pre-Post Task A Gamers	1.44	2.68	-2.283	0.036*
Pair 2	Pre-Post Task A Non-gamers	4.39	6.37	-2.922	0.010*
Pair 3	Pre-Post Task B Gamers	6.44	1.65	-16.542	0.001*
Pair 4	Pre-Post Task B Non-gamers	1.5	9.44	-0.674	0.509

IV. Conclusions

Action video game players demonstrated enhanced cognitive flexibility and task-switching skills compared to non-gamers, maintaining performance under prolonged

cognitive demands. These findings highlight gaming's potential in fostering resilience to cognitive fatigue and sustaining mental agility, offering insights into practical applications for improving cognitive performance in high-demand environments.

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