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A Comparative Analysis of Reaction Time and Problem-Solving Abilities Between Action Video Game Players and Non-Players

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I. INTRODUCTION

Video gaming has become increasingly prevalent among university students, particularly action video games (AVGs) such as First-Person Shooter (FPS) and Multiplayer Online Battle Arena (MOBA). Action video games require rapid perceptual processing, selective attention, and quick motor responses, which may influence cognitive functioning [1]. Previous studies have consistently reported faster reaction times among gamers compared to non-gamers due to enhanced stimulus response efficiency and visual processing speed [1]. However, findings regarding higher-order executive functions such as problem-solving remain inconsistent. While some evidence suggests potential improvements in cognitive flexibility [2], other researchers argue that gaming benefits may be limited to perceptual domains rather than strategic planning abilities [3]. Therefore, this study aimed to compare reaction time and problem-solving ability between action video game players and non-gamers among Malaysian university students.

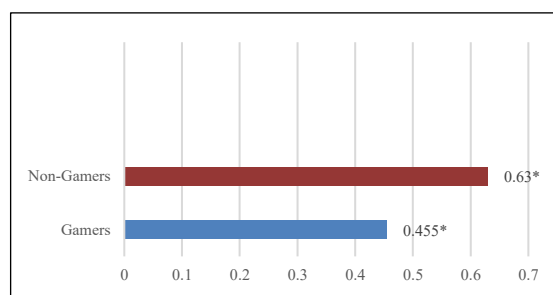
II. METHODS

This study included 42 male participants aged between 18 and 25 years, comprising 21 action video game players and 21 non-players. Participants were screened before enrolment using a video game experience questionnaire. Individuals were classified as gamers if they reported playing video games for at least 1 hour per day, 5 days per week, for a minimum of 1 year. Weekly gaming duration was further assessed using a self-report multiple-choice questionnaire with five response options ranging from none or less than 1 hour to 4 hours or more per day on weekdays. Participants who did not meet these criteria were assigned to the non-gamer group. All participants reported being free from cognitive and physical impairments. Reaction time was measured using the Multi-Operational Apparatus for Reaction Time, while problem-solving ability was assessed using a computerised Tower of Hanoi task. Each assessment was administered in two trials under standardised conditions. independent samples t-tests were conducted to compare reaction time and

problem-solving performance between gamers and non-gamers.

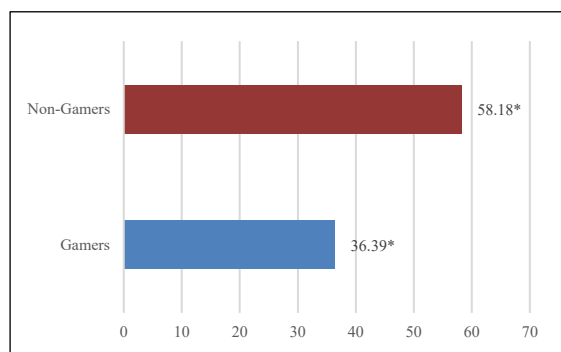
III. RESULTS AND DISCUSSION

The results showed that gamers exhibited a lower mean reaction time of 0.455 seconds compared with 0.630 seconds among non-gamers ($p < 0.05$). This finding indicates faster responses to visual stimuli among gamers, reflecting enhanced perceptual processing speed and response efficiency. In terms of problem-solving performance, gamers achieved a lower mean completion time of 36.39 seconds on the Tower of Hanoi task, whereas non-gamers required 58.18 seconds on average ($p < 0.05$). The longer completion time among non-gamers suggests reduced efficiency in strategic planning and sequential reasoning. These differences indicate superior cognitive processing and problem-solving performance among action video game players.



* $p < 0.05$

Fig. 1 Comparison between gamers and non-gamers in reaction time



* $p < 0.05$

Fig. 2 Comparison between gamers and non-gamers in problem-solving ability

The observed differences in cognitive performance between gamers and non-gamers highlight the domain-specific effects of action video game engagement. Gamers exhibited faster reaction times, which may be attributed to repeated exposure to fast-paced visual stimuli requiring rapid attentional shifts and immediate motor responses. Such gameplay continuously engages the perceptual and visuomotor systems, likely enhancing processing speed and stimulus-response efficiency over time [1]. Gamers also completed the problem-solving task more quickly than non-gamers, suggesting greater efficiency in strategic planning and sequential reasoning under the present task conditions. The Tower of Hanoi task requires deliberate strategy formulation and inhibition of impulsive responses, and the findings suggest that action video game experience may be associated with more efficient task completion in this sample [3]. Collectively, these findings indicate that cognitive benefits associated with action video games may extend to both speed-

based perceptual-motor processes and selected executive functions. This pattern underscores the importance of distinguishing between different cognitive domains when evaluating the effects of video game experience.

IV. CONCLUSIONS

In conclusion, action video game players demonstrated significantly faster reaction times and shorter problem-solving completion times compared with non-gamers. These findings indicate that action video game engagement is associated with enhanced speed-based perceptual-motor processing and more efficient performance on the Tower of Hanoi task. The results contribute to the growing body of literature highlighting the domain-specific cognitive effects of video gaming among university students. Future research should incorporate longitudinal designs and broader cognitive assessments to further clarify the causal mechanisms underlying these differences.

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