Project Proposal

Reaction Time and Working Memory in Gamers and Non-Gamers

Team Split-Second-Squad

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Topic Selection

With over 2.7 billion gamers worldwide, playing video games can be considered as one of today's favorite pastimes. As the popularity of video games grows, research interest in the effects of playing video games on human behavior and psychology increases as well. In the past few decades, researchers have examined the relationship between video games and aggression, depression, addiction, and cognitive processes—among them executive function, attention, reaction time (RT) , and working memory. It has been suggested that playing video games can have cognitive, motivational, emotional, and social benefits. The purpose of the current study was to examine whether asking participants about their gaming experience prior to participation in the study affects their performance.

Description

Our study aims to replicate and extend the findings of the pre-registered study by Ziv et al. 2022 regarding the impact of questionnaire timing on the performance of cognitive-motor tasks in gamers and non-gamers. Specifically, we seek to investigate whether administering a video game questionnaire before or after task completion influences reaction times (RTs) in a choice-RT task, a Simon task, an alternate task-switching task, and a digit span memory task. The hypotheses are as follows:

- Participants identifying as gamers, when questioned about their gaming experience before the study, would demonstrate improved performance in reaction time (RT)-based tasks compared to those questioned after the study
- Participants identifying as non-gamers, queried about their gaming experience before versus after the study, would exhibit no discernible differences in RT-based task performance
- No significant disparities would emerge b/w gamers & non-gamers in a digit-span memory task.

Data Collection (link)

We utilized the same dataset as the one provided by authors Ziv et al. 2022. The dataset consists of 187 participants randomly assigned to two subgroups, one completing the video game questionnaire before task performance and the other after. Key variables include participants' gaming status, timing of task performance, gaming behavior (hours spent on different game genres and years of gaming), beliefs about gaming and cognitive tasks, and media awareness of gaming benefits.

Methodology

Data Preparation

- ### Data Cleaning

  Check for and handle missing or outlier values in critical variables, especially those related to hours spent on different game genres, reaction times, correctness of tasks, and digit spans.

Data Analysis

- ### Controlling for Confounders

  Before proceeding with statistical analyses, it is imperative to address potential confounding variables such as age, gender, and gaming experience to enhance result validity. Employing techniques like stratification or statistical adjustment will help mitigate the influence of external factors on observed relationships.

- ### FPS vs. RPG on Reaction Time

  ANOVA or t-tests to compare mean reaction times between players who primarily play FPS games versus those who play RPG or strategy games. Group participants based on their primary game genre (FPS, RPG, strategy) based on fps_wk_hr, roleplay_wk_hr, and strategy_wk_hr.

- ### Effects of Awareness on Media Reports

  Performing regression analysis with media_reports as the independent variable and relevant measures (e.g., attitudes towards gaming) as dependent variables. Participants with awareness of media reports on the connection between video games and cognitive-motor tasks are expected to demonstrate better performance compared to those without such awareness.

- ### Beliefs of Gamers vs. Non-Gamers

  We hypothesize differences in perceptions between gamers and non-gamers regarding the correlation between video games and enhanced cognitive-motor and memory task performance. Furthermore, we aim to investigate whether these beliefs align with any observable distinctions in their reaction times. Use chi-square

tests for categorical comparisons and t-tests or ANOVA for continuous variables to explore differences in beliefs and attitudes

- ### Distribution Analysis of Reaction times

  Involves comparing the spread and central tendency of reaction times across these groups and time points. This can include using descriptive statistics, visualizations like histograms, box plots, violin plots, and statistical tests for distribution comparisons.

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Statistical Significance and Reporting

- ### Effect Size Calculation

  Calculate effect sizes to interpret the practical significance of findings, alongside statistical significance.

- ### Reporting

  Results will be reported with a focus on both confirming the original study's findings and exploring the new hypotheses. This includes detailed tables, charts, and narrative explanations of the statistical analyses and findings.

Expected Outcomes

This analysis aims to uncover how different video game genres impact cognitive-motor skills, particularly reaction time. If FPS games prove more effective in reducing reaction time, it could support theories suggesting their fast-paced nature enhances these skills. It also seeks to explore the correlation between belief in gaming benefits and actual cognitive-motor performance, potentially indicating improved performance with positive gaming beliefs. Furthermore, it examines how self-reflection prompted by questionnaires may affect subsequent task performance, particularly in gamers versus non-gamers. Additionally, it investigates whether strategic thinking in strategy games translates to higher accuracy in cognitive-motor tasks. By analyzing reaction time distribution and changes, it provides insights into cognitive-motor performance variations among populations, revealing patterns of improvement or deterioration and the impact of gaming and introspection.

Visualisations