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EFFECTS OF MENTAL FATIGUE ON VISUAL SCANNING SPEED IN FIRST-PERSON SHOOTER ESPORTS ATHLETES

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Abstract

Esports competitions in Indonesia have become increasingly popular, various prestigious tournaments both on the national and international levels have increased competition among athletes. Cognitive ability has a big enough role in the success of an esports athlete, so the fatigue factor that can reduce this ability needs to be considered. The purpose of this study was to identify whether the effects of mental fatigue can reduce the speed of athletes in visual scanning in esports athletes, especially athletes in the first-person shooter genre. Forty UPI esports athletes voluntarily carried out this research, ten each from Valorant, CS-GO, Overwatch and, Point Blank. In the first session 20 people will do a Visual Scanning Speed test after being given mental fatigue intervention and 20 people will take a Visual Scanning Speed test after watching TV as a control group, and they will switch groups in the next session. The data shows that mental fatigue in the experimental group significantly reduces the ability of Visual Scanning Speed. The results show that mental fatigue can significantly reduce cognitive performance, so the mental state of esports athletes needs to be considered to optimize their performance.

Keyword: *Mental Fatigue, Esports, & FPS*

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1. INTRODUCTION

One of the most popular past activities for adults, kids, and teenagers alike is playing video games (Entertainment Software Association, 2019). Over the past 50 years, video games have developed, moving from early stand-alone titles like Space Marines (1962) and Pong (1972) to massively multiplayer online settings with millions of people competing at once. A cooperative and competitive game has developed from it. several players. In the extremely competitive gaming industry, playing video games has recently become a profession and a career choice for some players (Faust et al., 2013; Griffiths, 2017). Esports is the name given to this emerging genre of competitive video gaming (electronic sports). A recent development in game culture, esports has become one of the most significant especially among teenagers and adults, are well-liked elements of the video gaming community.

With industry revenues reaching $ 350 million in 2016 and $ 696 million in 2017 (Funk et al., 2018), 2018 is a year of exponential growth and recognition for mainstream esports. A recent decision by the Olympic Council of Asia (OCA) to incorporate esports in the 2022 Asian Games in China is an illustration of this awareness. This marks a turning point in the acceptance of esports as a "new sport" (Hallmann & Giel, 2018) The 2017 DOTA 2 International 7 competition in Seattle, which introduced a new Guinness, demonstrated the significance and recent rise of esports. It's obvious, establish a global record for the largest prize pool in a single esports competition. Esports attract an astounding number of people, with estimates of 100 to 200 million monthly active gamers across a range of titles. All of this advances our knowledge of sport in general and the evolving characteristics that characterize contemporary sport. Wagner (2006) defines esports as "an area of sporting activity in which people build and exercise mental or physical skills in the use of information and communication technology" in an effort to categorize them among other traditional sports. defined and highlighted various perceptions physical and mental skills' contributions to athletic success.

First-person shooters (FPS), real-time strategy games (RTS), and massively multiplayer online role-playing games (MMORPG) are becoming increasingly popular. South Korea is where the highly competitive video game community first emerged. No. not just in Asia, but also in some western nations and areas (Taylor, 2013; Wagner, 2006). There are currently 4,444,000 video gamers worldwide, including 4,444 professional players (so-called esports players and pro gamers). Popular action video game players in particular enjoy first-person shooter (FPSG) games. The player sees the game world through the eyes of the main character in this action video game, which features a first-person perspective. Characters or avatars in the game that the player controls can carry out many tasks concurrently. Due to this, multiple moving images, spatial cognition, and split attention are all affected (Green & Bavelier, 2006). (Greenfield et al., 1994). The mouse, keyboard, or joystick must be used by the player to respond. As a result, reflex actions and hand-eye coordination are more rapid (Griffith et al., 1983). The fact that video games are multi-sensory is significant, because first-person shooters and other action games have appropriate behavioural reactions even when tactile inputs are present via tactile devices (such as joysticks). often be accompanied by audio and visual cues. Some instances (Archambault et al., 2007).

It is evident from the foregoing description that the goal of esports is cognitive capacity. Athletes undoubtedly experience exhaustion differently than participants in other traditional sports. The term "mental fatigue" has historically been used to describe exhaustion brought on by mental or cognitive efforts in the literature of exercise science (Marcora et al., 2009). A decline in cognitive resources brought on by ongoing cognitive demands is known as mental or cognitive malaise (Kimura et al., 2022). We think that esports competitors experience mental exhaustion. This is evident from how much time professionals spend training each week (45 hours on average). Thus, we work for around six hours each day (Bonny et al., 2016). The impact of mental weariness on visual scan speed performance is evaluated in this study (one of the cognitive performances). It is anticipated that mental weariness will have an impact on e-sports competitors' performance in first-person shooters.

2. METHODS

The The method used in this study is the crossover method, which is used to compare continuous and alternating treatments with experimental units.

Participant

A total of 40 male esports athletes (mean SD; age: 20.9 1.9 years, height: 168.9 5.7 cm, weight: 58.2 11.3 kg, training volume: 6.6 1.7 h. W-1) were a part of this research. I agreed to take part voluntarily, ten players from Point Blank, Counter Strike: GO, and Valorant. Prior to the research, every athlete submitted signed, fully informed consent.

Population and Sample

The population in this study were all UPI Esports UKM members, numbering up to 233 individuals. The sample chosen was made up of athletes who play first-person shooter video games like Valorant, Counter Strike: GO, Overwatch, and Point Blank. This study employed a random sample strategy as its sampling method.

Instrument

1. Recognition of work

Measure perceived movements, which are described as "a conscious sensation of how many hard, demanding, and intense physical tasks there are," at the conclusion of performance, log, and control tests before and after tiredness. Did. We were able to evaluate the negative effects of mental exhaustion on the movements necessary to complete a visual scan speed test by monitoring the perceived movements before and after the fatigue treatment. Participants were instructed to rate their exertion in relation to recent physical tasks using the Effort Rating Scale (RPE) (Borg, 1982).

2. Feelings of subjective exhaustion

We subjectively evaluated exhaustion (i.e., fatigue and lack of energy) before and after fatigue protocols and control tasks using the Visual Analog Scale (VAS). At the conclusion of the VAS, participants were asked to express general exhaustion and lack of energy. We were able to verify that the experimental procedure was effective by evaluating the perception of log fatigue before to and following exhaustion. To indicate their present mood, participants were instructed to mark a bipolar end anchor (0mm = not at all weary, 100mm = very tired) on the 100mm line. The VAS score is calculated by counting the milli meters (mm) between the participant's mark and the left edge of the line.

3. Mental exhaustion

The modified Stroop colour word test produced a 30-minute period of mental drowsiness. The Stroop task has been demonstrated to generate mental fatigue since it necessitates long-term suppression of reaction and concentration. The Android version of the Stroop task was employed in this investigation. A random display of four words (red, blue, green, and yellow) is used. Participants were instructed to select the response that matched the colour of the word's ink, not the term's definition, for each word (red, blue, green, yellow). Consequently, the right response is "blue" if the word "green" is written in blue ink. The right response, however, refers to the meaning of the word, not the colour of the written material, if the word's ink is red. So, if the word "green" is written in red ink, "green" is the right response.

Watching the film for 30 minutes served as the control protocol. In front of the television, participants were seated in comfortably seats. Such control circumstances are frequently employed in the literature to explore the impact of mental weariness on performance yet this movie does not cause fatigue.

4. Visual assessment of scanning rate

Numbers from 1 to 100 are shown in the grid. For each number on the grid, you must choose one. This will compute the visual scan's speed performance over a minute and display how many numbers the athlete has completed.

Procedure

We performed two sessions (with a week break in between) at the end of the season (April–May) to assess the effects of different fatigue regimens on the speed performance of visual scans. For this experimental design, there must be experimental conditions. With 20 players in the experimental group and 20 players in the control group, a crossover design was adopted for this study. They will alternate in groups throughout the following session. At the start of the first session, every player is familiar with every step. The day before every training session, all players were told to get at least 7 hours of sleep, abstain from alcohol, caffeine, and nicotine, and avoid engaging in severe physical activity. Participants were required to finish a pre-test checklist prior to each time we visited the lab to make sure they were adhering to the guidelines. To limit the detrimental effects of everyday job-related weariness on performance, all sessions were held during breaks (weekends, holidays), or at the same time as the participants' shifts at work.

Data Analysis

As a result, the normal distribution and consistency of the data assumptions made by statistical tests were verified. Mean, standard deviation, and 95% confidence interval are used to represent the values (CI). Using the paired t-test, we evaluated any differences between the groups. The visual performance characteristics of fatigue are examined using a mixed design ANOVA (4 conditions: control, mental fatigue, -x 2 times-control protocol / task before and after fatigue), in accordance with our design (partial crossover design; see "Experimental Protocol"). scan rate For all analyses, significance was fixed at P 0.05 (both sides). The Social Science Statistics Package was used to conduct the statistical analysis (SPSS v.25, IBM, New York, USA).

3. RESULT

There was a significant state x time interaction for subjective weariness (p = 0.001, p2 = 0.431). Only after the exhaustion protocol did subjective weariness rise. Then, there was a significant difference between the intellectual demand and accomplishment subscale conditions (P 0.001, p2 = 0.622 and P = 0.002, p2 = 0.269, respectively). For further details, see Figures 1 and 2.

Table 1. Mental and Performance before and after fatigue

No	Items	Control		Experiment	
		pre	post	pre	post
1	VAS	21,3 ± 17.7	21,3 ± 16.1	18,7 ± 15.6	56,3 ± 11.5*
2	VSS	19,5 ± 3.3	19,1 ± 4.2	20,2 ± 1.6	17,3 ± 8.1*

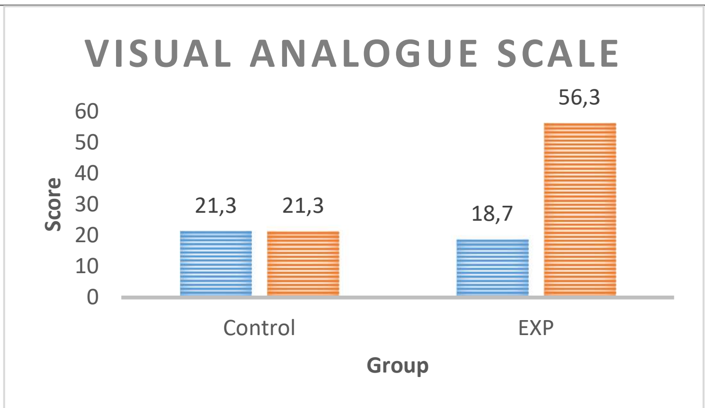

Fig 1. Markers of Fatigue

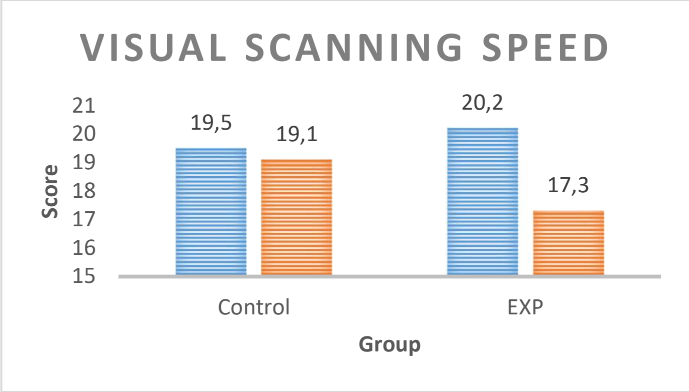

Fig 2. Visual Scanning Speed Performance

4. DISCUSSION

1. Fatigue indicator

Our findings highlight the exhaustion protocol's significant perceived burden when compared to control activities. The rise in self-reported exhaustion following earlier mental or physical exertion demonstrates that our fatigue regimen is to blame for the current state of fatigue. We can infer that we were successful in making the participants tired.

2. The impact of mental exhaustion on visual scan speed

Our findings demonstrate that doing a particularly mentally taxing work for only 30 minutes leads to subpar visual scan performance. These findings are in line with other research that shown the detrimental effects of mental weariness on cognitive ability, such as those of Smith et al. (2016) Someone who claimed that soccer players' decision-making had declined. In a subsequent research by (Jaydari Fard et al., 2019), the findings revealed that mental weariness delayed response times in both athletes and non-athletes, but that the latter group was more affected.

5. CONCLUSION

This study demonstrates that mental weariness has a detrimental effect by contrasting its effects on the visual scan speed performance of eSports participants. Our findings also imply that, in order to maximize performance, esports coaches should take the athlete's mental exhaustion into account. A higher influence has been felt by non-athletes.

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