



Effects of Mental Fatigue on Football Referee Decision Making

Yudi Nurcahya¹, Agus Rusdiana¹, Yusuf Hidayat¹, Dikdik Zafar Sidik¹, Muhamad Tafakur², Herdiansyah²

¹School of Postgraduate Studies, Universitas Pendidikan Indonesia, Bandung, Indonesia

²Sport Coaching Study Program, Universitas Pendidikan Indonesia, Bandung, Indonesia

*Correspondence: E-mail: udinurcahya@upi.edu

ABSTRACT

Referee is an important element in a football match. Just like an athlete, the mental aspect of a referee also greatly affects the performance of a football referee. This study aimed to determine the effect of mental fatigue on football referee decision making. The method used in this study was an experimental method with a pre-post-test design. Participants of this study consisted of 28 football referees selected using a purposive sampling technique. Participants consisted of male referees with amateur and professional background levels and having more than three years of experience. In this study, the FIFA Video test 2024 was used as a decision-making instrument. Based on the results of data processing and analysis using the paired sample T-Test, a significance value of 0.000 was obtained, indicating that there was a significant effect of mental fatigue on football referee decision making. This indicates that a referee ability to manage psychological aspects can help them overcome mental fatigue which could affect referees in making the right decisions in football matches.

ARTICLE INFO

Article History:

Submitted/Received March 2025

First Revised April 2025

Accepted April 2025

Publication Date April 2025

Keyword:

Decision Making, Mental Fatigue, Referees

INTRODUCTION

Fatigue poses a significant concern for athletes, sportsmen, coaches, and within the field of coaching science (Taylor, 2012). Declines in athletic performance are observed across various sports. In sports such as football, the effects of physical fatigue felt by athletes can reduce football passing performance and shooting skills although dribbling skills can still be maintained (M. Russell et al., 2011). Beyond physical strain, athletes frequently experience mental fatigue, a psychobiological state resulting from prolonged cognitively demanding activities, which has been shown to negatively impact physical performance (S. Russell et al., 2019). Mental fatigue can certainly also interfere with and even reduce the performance of athletes. Mental fatigue can disrupt and even diminish athletic performance, especially in endurance-based activities and tasks that require high levels of technical skill and decision-making (Smith et al., 2018). In football, mental fatigue among players has been linked to decreased technical performance, although its impact on physical performance remains less evident (Badin et al., 2018). Decreased attention to detail, altered concentration, and decreased discipline can also result from mental fatigue experienced by athletes (S. Russell et al., 2019). Mental fatigue experienced by athletes is often characterized by feelings of tiredness, lack of energy and decreased motivation and alertness (Dagama, 2018)

To date, numerous studies have examined mental fatigue in both elite and amateur athletes. Research shows that mental fatigue leads to lower decision-making accuracy (smith et al., 2018) and diminishes the ability to prepare and plan (boksem, 2006). However, there is limited research investigating the effects of mental fatigue on the performance of football referees. Studies related to fatigue in football referees have primarily focused on physical aspects. Over the past two decades, extensive research has documented the physiological demands on football referees, who typically cover 7.5 to 11.5 km per match with an average heart rate intensity of 85-95% of their maximum heart rate (a. J. Mallo et al., 2009). Even in modern football today, a referee can cover a distance of 10-12 km in one match (castillo et al., 2016). Furthermore, it has been recorded that they can cover over 3 km at high intensity during a single match (krusturp et al., 2009). High heart rates are common among referees towards the end of matches, where physical fatigue can decrease decision-making accuracy (j. Mallo et al., 2012). Fatigue due to physical activity has the potential to affect the decision making that will be taken by the referee (castagna, abt, & ottavio, 2007). Fatigue induced by high-intensity physical intervention can reduce the accuracy of football referee decision making (nurcahya et al., 2023). This highlights the influence of physical fatigue on the decision-making of professional football referees.

similar to athletes, the mental aspect significantly influences the performance of football referees. In every football match, the referee's role is crucial, particularly in professional football, where incorrect decisions can profoundly affect the match outcome (castagna, abt, & d'ottavio, 2007). Therefore, further research is necessary to understand the fatigue aspects that can impact football referees' decision-making. Yet, limited research explores how mental fatigue specifically affects referees. Therefore, this study aims to fill that gap by investigating the extent to which mental fatigue affects decision-making accuracy among football referees.

METHODS

This study employed an experimental method using a pretest-posttest one-group design to investigate the effect of mental fatigue on referees' decision-making accuracy.

Participants

The study involved 28 football referees selected through purposive sampling. Inclusion criteria were: possession of national certification, active duty in official PSSI competitions, and at least three years of refereeing experience. These criteria ensured consistency in participants' knowledge of the game's rules. All referees resided in West Java Province and included both professional (n=12) and amateur (n=16) referees. The average age was 33.74 years, ranging from 25 to 43.

Materials and Apparatus

To assess decision-making performance, the study used the FIFA Video Test for Referee and Assistant Referee (IFAB, 2024). In an effort to provide mental fatigue intervention, researchers used a computerized Stroop Task which has been shown to cause a state of mental fatigue (Filipas et al., 2021); (Habay et al., 2021). To assess participants' perceptions of mental fatigue and motivation, the Visual Analog Scale (VAS) was used to evaluate subjective feelings of fatigue, namely feelings of tiredness and lack of energy (Marcora et al., 2009), before and after the mental fatigue intervention. The VAS had been applied in recent studies (Filipas et al., 2021) and is considered a more sensitive measure to evaluate the state of mental fatigue (Smith et al., 2018).

Procedures

The data collection process began with a pretest of decision-making using the FIFA Video Test For Referee and Assistant Referee (Märtins, 2023). Each referee evaluated 20 video clips requiring decision-making. Following the pretest, the perception of mental fatigue was measured using a visual analog scale (VAS) before being given a mental fatigue intervention. After assessing their initial mental fatigue levels, the referees underwent a 60-minute computerized Stroop Task as the mental fatigue intervention. Subsequently, the referees again rated their perceived mental fatigue using the VAS after the Stroop task. Finally, the referees completed the FIFA Video Test again for the post-test.

Data Analysis

Data were analyzed using spss version 25. Normality and homogeneity of the data were assessed. A paired-samples t-test was used to determine the impact of mental fatigue on the decision-making of football referees.

RESULTS

After conducting the data collection process from each football referee, the researcher succeeded in obtaining the data needed to carry out the data processing process. After conducting the normality test, a value of 0.153 was obtained, which illustrates that the data is normally distributed and the homogeneity test obtained a value of 0.074. The pretest and posttest decision-making data for the football referees are presented in Table 1.

Table 1. Decision Making Data

Instrument	Mental Fatigue								
	Pretest				Posttest				Gain
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Decision Making	72.11	10.45	55.00	90.00	48.57	12.39	25.00	70.00	23.54

Table 1 shows that for the Mental Fatigue group, the mean pretest decision-making score was 72.11 (SD = 10.45), while the mean posttest score was 48.57 (SD = 12.39), resulting in a mean gain of 23.54. The highest pretest score was 90, and the lowest was 55. In the posttest, the highest score was 70, and the lowest was 25.

Next, a paired-samples t-test was conducted to examine the influence of mental fatigue on referee decision-making. The results are shown in Table 2.

Table 2. Paired Sample Test Results

	Mean	Std. Dev	Sig
Pretest- Posttest	23.54	7.78	.000

Table 2 reveals a mean difference of 23.54 between the pretest and posttest scores (SD = 7.78). The significance value ($p < 0.001$) indicates that mental fatigue experienced by football referees has a statistically significant influence on their decision-making.

DISCUSSION

Mental fatigue is a common experience for referees during football matches. The pressure experienced before and during matches can induce mental fatigue in referees. The findings of this study align with previous research indicating that mental fatigue can impair sports performance, leading to lower decision-making accuracy but increased response time (smith et al., 2016). Football referees often experience mental fatigue due to intense pre-match and in-game pressure, which can impair decision-making accuracy and elevate perceived effort, underscoring the critical need for sustained focus under stress (lopes et al., 2023; zhang et al., 2024; pizzera et al., 2022).

pressure from the audience, players, coaches, and team officials can affect the decisions made by the referee, so the referee must possess mental toughness (slack et al., 2013) to prevent or quickly recover from mental fatigue. Failure to manage stress during a match can lead referees to psychological fatigue, which impairs their decision-making accuracy, as supported by recent findings showing that both mental and physical stress negatively affect refereeing performance (pizzera et al., 2022; mcewan et al., 2024; lopes et al., 2024). Psychological demands on referees during matches include managing challenges, mental pressure, stress, and potential aggression. Mental toughness helps referees overcome on-field pressure, whereas mental disturbance and stress can result in inaccurate decisions (beltrán-esteve & picazo-tadeo, 2017). In other words, mental fatigue experienced by the referee is a very influential factor in reducing the referee's accuracy in making decisions.

Football is a dynamic sport with unpredictable on-field events; therefore, optimal on-field performance relies on cognitive functions such as attention, decision-making, and working memory (Walton et al., 2018). Referees are required to make accurate decisions about on-field events, demanding mental strength and a thorough understanding of the game's rules (Jones et al., 2012). These demands can increase stress and lead to mental fatigue, which interferes with a referee's ability to make appropriate decisions during a match. High match demands can lead to mental fatigue and stress in referees, impairing their decision-making accuracy, especially under physical and psychological pressure, even though their primary responsibility remains enforcing ifab rules (Pizzera et al., 2022; mcewan et al., 2024; Lopes et al., 2024). Understanding the rules of the game is one of the requirements that a football referee must have. The ability to comprehend and apply these rules is heavily influenced by a referee's experience. Recent studies indicate that work experience, particularly opportunities for leadership, positively affects job performance, with some research

suggesting a u-shaped relationship where both low and high levels of experience are more beneficial than moderate levels (Desai, 2023; Gao, Zhao, & Wang, 2023). This difference in experience often distinguishes professional and amateur referees. Professional referees tend to analyze incidents more quickly, exhibit more varied observations, and make faster decisions (Biemen et al., 2023). While amateur referees are typically younger, they are also susceptible to fatigue during matches. Referees from amateur leagues have been shown not to be free from fatigue (dagamaet al., 2018), indicating that the refereeing level influences the fatigue experienced during football matches. The more trained a referee is in managing his mentality, the better his performance in the match can be (Saputra et al., 2022).

Therefore, the results of this study demonstrate a significant influence between mental fatigue on the decision-making ability of football referees. However a limitation of this study is that the mental fatigue indicator is only assessed through subjective perception. Future research should incorporate technological assistance to objectively assess the level of factual fatigue of a person, for example by using a tool that can see the brain waves of each sample when performing the stroop test task. In addition, time variations can be added in completing the stroop test task, where in this study it was only carried out for 60 minutes, perhaps it can be varied up to 90 minutes to simulate the length of a football game. Integrating technological aids and varying the duration of mental fatigue interventions holds the potential to enhance the outcomes of subsequent research.

CONCLUSION

The findings of this study confirm that mental fatigue has a significant influence on the decision-making of football referees. Greater mental fatigue experienced by referees correlates with lower accuracy in their decision-making. A referee's ability to manage emotions during a match can help referee to mitigate excessive mental fatigue.

AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

REFERENCES

- Badin, O. O., Mitchell R. Smitha, B., Contec, D., & Couttsa, A. J. (2018). Note . This article will be published in a forthcoming issue of the International Journal of Sports Physiology and Performance . The article appears here in its peer-reviewed and accepted form ; it has not been copyedited , proofread , or formatted by the. International Journal, 14(2), 156-162.
- Beltrán-Esteve, M., & Picazo-Tadeo, A. J. (2017). Assessing environmental performance in the European Union: Eco-innovation versus catching-up. *Energy Policy*, 104(January), 240–252.
- Biemen, T. Van, Oudejans, R. R. D., Savelsbergh, G. J. P., Zwenk, F., & Mann, D. L. (2023). Into the eyes of the referee: A comparison of elite and sub-elite football referees' on-field visual search behaviour when making foul judgements. *International Journal of Sports Science & Coaching*, 18(1), 78-90.
- Boksem, M. A. S. (2006). Mental fatigue Boksem , Maarten Alex Sander Samenvatting. 1–3.
- Castagna, C., Abt, G., & D'Ottavio, S. (2007). Physiological aspects of soccer refereeing performance and training. *Sports Medicine*, 37(7), 625–646.

- Castagna, C., Abt, G., & Ottavio, S. D. (2007). Physiological Aspects of Soccer Refereeing Performance and Training. 37(7), 625–646.
- Castillo, D., Yanci, J., Cámara, J., & Weston, M. (2016). The influence of soccer match play on physiological and physical performance measures in soccer referees and assistant referees. *Journal of Sports Sciences*, 34(6), 557–563.
- Filipas, L., Borghi, S., La Torre, A., & Smith, M. R. (2021). Effects of mental fatigue on soccer-specific performance in young players. *Science and Medicine in Football*, 5(2), 150–157.
- DaGama, D. R. N., Nunes, R. D. A. M., Guimarães, G. L., Silva, L. D. L. E., De Castro, J. B. P., & Vale, R. G. D. S. (2018). Analysis of the burnout levels of soccer referees working at amateur and professional leagues of Rio de Janeiro, Brazil. *Journal of Physical Education and Sport*, 18, 1168-1174.
- Habay, J., Van Cutsem, J., Verschueren, J., De Bock, S., Proost, M., De Wachter, J., Tassignon, B., Meeusen, R., & Roelands, B. (2021). Mental Fatigue and Sport-Specific Psychomotor Performance: A Systematic Review. *Sports Medicine*, 51(7), 1527–1548.
- Jones, N., Cann, A., Almashhadi, S., & Popal, H. (2012). Assessment of soccer referee proficiency in time-sensitive decision-making. 2012 IEEE Systems and Information Engineering Design Symposium, SIEDS 2012, 68–73.
- Krustrup, P., Helsen, W., Randers, M. B., Christensen, J. F., Macdonald, C., Rebelo, A. N., & Bangsbo, J. (2009). Activity profile and physical demands of football referees and assistant referees in international games. *Journal of Sports Sciences*, 27(11), 1167–1176.
- Mallo, A. J., Navarro, E., Carda Aranda, J. M., & Helsen, W. (2009). Refereeing during High-standard Matches. *International Journal of Sports Medicine*, 1(30), 331–336.
- Mallo, J., Frutos, P. G., Juárez, D., & Navarro, E. (2012). Effect of positioning on the accuracy of decision making of association football top-class referees and assistant referees during competitive matches. *Journal of Sports Sciences*, 30(13), 1437–1445.
- Märtins, J., Westmattmann, D., & Schewe, G. (2023). Affected but not involved: Two-scenario based investigation of individuals' attitude towards decision support systems based on the example of the video assistant referee. *Journal of Decision Systems*, 32(2), 384-408.
- Marcora, S. M., Staiano, W., & Manning, V. (2009). Mental fatigue impairs physical performance in humans. *Journal of Applied Physiology*, 106(3), 857–864.
- Mascarenhas, D., O'Hare, D., & Plessner, H. (2006). The psychological and performance demands of association football refereeing. *International Journal of Sport Psychology*, 37(2–3), 99–120.
- Nurcahya, Y., Rusdiana, A., Hidayat, Y., Sidik, D. Z., Kusumah, W., Yamin, M., & Akbar, F. N. (2023). The Effect Of Physical Fatigue On Football Referee's Decision Making. *Physical Activity Journal (PAJU)*, 5(1), 91-98.
- Russell, M., Benton, D., & Kingsley, M. (2011). The effects of fatigue on soccer skills performed during a soccer match simulation. *International Journal of Sports Physiology and Performance*, 6(2), 221–233.
- Russell, S., Jenkins, D., Rynne, S., Halson, S. L., & Kelly, V. (2019). What is mental fatigue in elite sport? Perceptions from athletes and staff. *European Journal of Sport Science*, 19(10), 1367–1376.
- Saputra, M. Y., Subarjah, H., Komarudin, K., Hidayat, Y., & Nurcahya, Y. (2022). Psychological Skill Training Implementation to Improve Football Referee Decision-Making Skills. *Jurnal Pendidikan Jasmani Dan Olahraga*, 7(1), 81–89.
- Schmidt, F. L., & Hunter, J. (2004). General Mental Ability in the World of Work : Occupational Attainment and Job Performance. 86(1), 162–173.

- Slack, L. A., Maynard, I. W., Butt, J., & Olusoga, P. (2013). Factors underpinning football officiating excellence: Perceptions of English Premier League referees. *Journal of Applied Sport Psychology*, 25(3), 298-315.
- Smith, M. R., Coutts, A. J., Merlini, M., Deprez, D., Lenoir, M., & Marcora, S. M. (2016). Mental fatigue impairs soccer-specific physical and technical performance. *Medicine and Science in Sports and Exercise*, 48(2), 267–276.
- Smith, M. R., Thompson, C., Marcora, S. M., Skorski, S., Meyer, T., & Coutts, A. J. (2018). Mental Fatigue and Soccer: Current Knowledge and Future Directions. *Sports Medicine*, 48(7), 1525–1532.
- Taylor, K., Chapman, D., Cronin, J., Newton, M. J., & Gill, N. (2012). Fatigue monitoring in high performance sport: a survey of current trends. *J Aust Strength Cond*, 20(1), 12-23.
- Walton, C. C., Keegan, R. J., Martin, M., & Hallock, H. (2018). The potential role for cognitive training in sport: More research needed. *Frontiers in Psychology*, 9(JUL), 1–7.