

ORIGINAL ARTICLE



The Effects of Ramadan Fasting on Mood and Performance of Male Adolescent Archers

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ABSTRACT

Background. Muslim archers need to fast during Ramadan, starting from sunrise to sunset, adhering to their religious calling while still needing to continue their training or competition. This situation is very challenging as archery is a sport that requires high concentration and focuses. The available evidence indicates that physical and non-physical aspects of sporting performance were impacted in a small magnitude by fasting. Thus, understanding the impact fasting has specifically on archers' moods, and performance is crucial. **Objectives.** This study compares archers' shooting performance and mood during fasting and non-fasting periods. **Methods.** Participants were male adolescent archers from the Terengganu State Sports Council and Malaysia Pahang Sports School (n=13; Mean age: 16.0±1.53 years). Participants were recruited through the purposive sampling method. This study was conducted a month before and during the Ramadan fasting month. The mood was evaluated using the 24-item Brunel Mood Scale Questionnaire before the scoring session. The total score of 36 arrows assessed the archery shooting performance. **Results.** The Mann-Whitney test showed that shooting performance and mood did not show any significant difference except for the tension which showed a significant difference (p<0.05). **Conclusion.** The results showed that fasting did not affect the shooting performance and mood of the archers. Moreover, fasting helps in reducing the tension of the archers.

KEYWORDS: Archery, Mood, Performance, Ramadan Fasting.

INTRODUCTION

Each year during Ramadan, it is mandatory for Muslims to fast from dawn to sunset daily for 30 consecutive days. The fast typically takes between 13 to 14 hours daily in the equatorial region. Typically, Muslims consume the majority of their daily nutrient intake at two sittings, the Sahur, just before the day's fast, and the Iftar, at the breaking of the day's fast. Adherence to this socio-religious activity can cause changes in the daily routine, including meal schedules and sleep patterns, and may affect an individual's physiology, biochemistry, and lifestyle (1, 2).

Over the past 15 years, research published related to Ramadan fasting and athletic performance has gained much attention (3-16). In the sporting context, performance can be known as the comprehensive competition ability displayed by individuals and teams in and out of the tournament arena (17) and is affected by the combination of psychological, physiological, mechanical, and physical factors (18, 19). A few studies have found that fasting will cause a decrement in sports performance (3-7). It has been shown that anaerobic power (8, 9) and short-

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term maximal performance (5, 7, 10, 11) tend to be impaired during Ramadan. Besides, athletes tend to have an earlier onset of fatigue due to a decrease in physical function (10). Decrements in moods and motivation were also found to be factors that cause a reduction in physical performance (7). Contrary to these studies, some other studies did not observe the negative impacts of Ramadan fasting on sports performance (14, 15). Interestingly, one study examined the effect of dehydration on archery performance and found that archery performance was not affected (16).

Apart from affecting sports performance and physical fitness, researchers have also explored the effects of fasting on mood states. A mood state is a psychological response to an environmental stimulus that is situation-specific and transient (20). The mood is also known as a collection of temporary feelings that vary in duration and intensity and frequently involve multiple emotions (21). A study examined that Ramadan fasting did not significantly influence youngsters' moods compared to the non-fasting group (22). Another study concluded that throughout the Ramadan fasting, the anxiety and depression of the young male and female participants improved from the start to the end of the Ramadan month (23).

Meanwhile, in a sports context, Chtourou and colleagues (2011) found that Ramadan did not affect the mood state of young football players with an average age of 17 years old, except for their fatigue (3). Another study also showed that Ramadan only increases Kung Fu athletes' fatigue (24). It is widely acknowledged that athletes need to be in their optimal mood states for maximal performance (25).

All over the world, elite Muslim athletes face a common difficulty: training and competitions that are sometimes scheduled during Ramadan (e.g., Summer Olympic Games 2012 and Summer Youth Olympic Games 2010). Thus, it is essential to determine whether fasting impacts performance, especially for archers, where one needs concentration, focus, and positive mood states (25). Most of the studies focused on healthy non-athletes (23, 26) and athletes from different sports such as swimming (8), football (3), and Kung-Fu (24). After an extensive literature search, there is a scarcity of literature that examines the relationship between Ramadan fasting, shooting performance, and mood changes in archery, especially among adolescent archers. In light of the above considerations, the present study aims to compare the mood state of

archers during the fasting and non-fasting months and the impact on performance.

MATERIALS AND METHODS

Ethical Consideration. Ethical approval was obtained from the Human Research Ethics Committee of University Sains Malaysia (USM/JEPeM/18070335). Also, official permission has been granted by the Director of Terengganu State Sports Council, the Principal of Malaysia Pahang Sports School, and all the coaches. Informed consent forms were given to all the participants after the briefing sessions. Only those participants who agreed and signed the consent form were recruited. Participants under 18 years old have their state-approved and co-signed by their parents. All the protocols of this study conform to the ethical guidelines of the Declaration of Helsinki 1975.

Participants. The sample size was calculated using the software G*power (27) based on procedures suggested by Beck (2013) (28). Values for α were set at 0.05 and control at 0.80. Based on previous literature (29) and discussions between the authors, effect sizes were estimated at 0.80. It resulted in having at least 13 participants. Considering that 20% of the participants dropped out, 16 participants were recruited.

Sixteen male archers volunteered to participate in the study. However, only 13 participants completed the study. They were all state-level archers undergoing training programs from the Terengganu State Sports Council and Malaysia Pahang Sports School. The age, height, weight, and year of experience in the state team are presented in Table 1. Purposive sampling was chosen to recruit the participants in this study. The inclusion criteria of this study were: 1) the participants adhere to Ramadan fasting, and 2) have competitive experience at the national level competition.

Meanwhile, the exclusion criteria of this study were the participants failed to fulfill the requirements of Ramadan fasting. Participants were recruited through their respective coaches. Before administering the survey, they were briefed regarding the purpose of the study.

Study Procedure. This study was divided into two parts: (1) part 1 involved the evaluation of the mood states of participants using the Brunel Mood Scale, and (2) part 2 involved the assessment of archery shooting performance. These procedures were repeated twice, which

consisted of a month before Ramadan and during Ramadan. All the operations were conducted during the evening training sessions.

Part 1: Brunel Mood Scale Questionnaire.

Participants completed the 24-item Brunel Mood Scale questionnaire (BRUMS) (30) alone before progressing to the scoring session (part 2). The questionnaire measures six mood states: anger (annoyed, bitter, angry, bad-tempered), confusion (confused, mixed up, muddled, uncertain), depression (depressed, downhearted, unhappy, miserable), fatigue (worn out, exhausted, sleepy, tired), tension (panicky, anxious, worried, nervous) and vigor (lively, energetic, active, alert). The definitions of each factor are listed in Table 2. Items are attached to a five-point Likert scale that ranges from 0 (not at all) to 4 (extremely). This questionnaire was validated by Hashim et al. (2010) in adolescent sports athletes with the alpha coefficients of 0.72, 0.64, 0.73, 0.69, 0.5, and 0.58 for tension, depression, anger, vigor, fatigue, and confusion subscales respectively (31).

Part 2: Archery Shooting Performance. After completing the questionnaire, the shooting performance evaluation was conducted. The archery shooting session was performed according to the World Archery format. The archery shooting performance was evaluated by the total score of 36 arrows shot from a 70 meters distance. The score of each arrow ranged from a miss (0) to the center area or 'x' (10) points, and the maximum achievable score is 360 points. All the scores were recorded on a score sheet.

Statistical Analysis. Statistical analyses were conducted using Statistical Package for the Social Science (SPSS) version 26.0 (SPSS Inc., Chicago, ILL, USA), with significance set at a p-value <0.05. Since the variables were not normally distributed, thus the Mann-Whitney test was conducted to compare the differences between

mood state and archery shooting performance during non-fasting and fasting months.

RESULTS

Descriptive Statistics of Mood State and Archery Shooting Performance. Table 3 presents the descriptive statistics of the mood states and shooting scores before and during Ramadan.

Comparison of Mood State and Archery Shooting Performance. Based on the result of the Mann-Whitney test, the archery shooting score of participants did not show any significant difference between fasting and non-fasting month (Table 4). However, for mood, tension is the only subscale that offers a substantial difference between the non-fasting and fasting months ($P < 0.05$). It can be observed from Table 4 that anger and depression were maintained throughout the non-fasting and fasting months. There are increments in the score, fatigue, and vigor from the non-fasting month to the fasting month, while confusion and tension decrease during the Ramadan fasting month. Figure 1 reveals the profile of mood states during the non-fasting month and fasting month. Both profiles showed that the "iceberg profile" with the positive subscale was higher than the negative subscales.

DISCUSSION

The objective of this study was to investigate the differences in mood states and archery shooting performance during non-fasting and fasting months. This study shows that the fasting month did not significantly impact the performance of archers. The archers reported significantly fewer tension levels during the fasting month than during the non-fasting month. Besides, the positive mood state is higher than the negative mood states throughout the study, as shown in Figure 1.

Table 1. Participants' Characteristics and Year of Experience in State Team

	Participants (n=13)
Age (year)	16.0±1.53
Height (m)	1.68±0.07
Weight (kg)	73.39±15.42
Experience in-state team (year)	2.75±1.92

Table 2. The Definitions of Each Factor in the Brunel Mood Scale

Factors	Definition
Tension	State of musculoskeletal stress and worry
Depression	The emotional state of despair, sadness, unhappiness
Anger	State of hostility toward others
Vigour	State of energy, physical force
Fatigue	State of tiredness, low energy
Confusion	State of feeling stunned, instability in emotions

Reference: Brandt et al., (2016) (32)

Table 3. Descriptive Statistics of the Score and the mood states during Non-Fasting Month and Ramadan Fasting Month

	MEAN	STD	MIN	MAX
Non-fasting month				
Score	281.3	28.1	212	314
Anger	2.5	3.8	0	13
Confusion	4.2	3.1	1	11
Depression	4.0	2.8	0	10
Fatigue	4.6	3.7	0	11
Tension	4.7	3.8	1	12
Vigour	10.7	3.0	6	16
Ramadan fasting month				
Score	285.9	30.9	208	326
Anger	2.2	3.0	0	9
Confusion	3.8	2.1	0	11
Depression	4.2	3.1	1	12
Fatigue	6.1	4.3	0	12
Tension	2.5	3.3	0	10
Vigour	10.0	2.5	6	13

STD, standard deviation; MIN, minimum value; MAX, the maximum value

Table 4. Comparison of Score and Mood during Non-Fasting Month and Ramadan Fasting Month.

	Median (IQR)		P-Value
	Non-Fasting (N=12)	Ramadan Fasting (N=12)	
Score	288.5(34.5)	290.0(36.8)	0.388
Anger	1.0 (3.8)	1.0 (4.5)	0.812
Confusion	3.5 (4.8)	3.0 (3.0)	0.752
Depression	4.0 (4.3)	4.0 (4.5)	1.000
Fatigue	3.5 (6.8)	5.5 (7.0)	0.385
Tension	4.0 (3.8)	1.0 (3.8)	0.044*
Vigour	10.0 (5.3)	11.0 (4.0)	0.303

IQR, interquartile range. * P<0.05

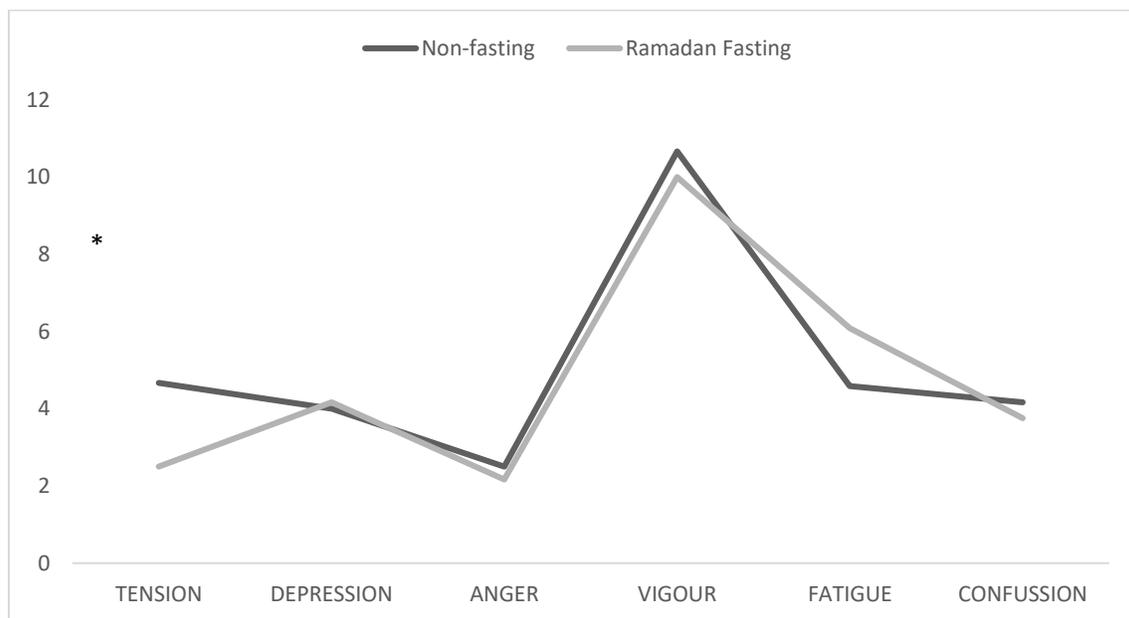


Figure 1. Comparison of Mood States between Non-Fasting and Ramadan Fasting Month

Note: * p<0.05

We found no significant differences when comparing the shooting score between the non-fasting and fasting months in the current study. Yet,

there is a small increment in the score during Ramadan. This finding is consistent with the previous studies, which inferred that Ramadan does

not affect the physical performance of athletes (15, 33). Relatively fittest individuals are less likely to be impacted by Ramadan fasting as they are more capable of resisting physiological and psychological perturbations (34). Conversely, Singh and colleagues (2011) discovered that Ramadan had a slightly negative influence on skilled-based sports as fasting can negatively influence athletes' arousal, attention, alertness, focus, and motivation (35). Besides, cognitive and perceptual activities such as reaction time, movement reaction time, visual perception, and even short-term memory can decline during fasting (36-38).

The current study's findings revealed that fasting did not affect mood except for tension, which is significantly lower during the fasting month. This result is unique from other studies. One potential explanation is that, since all participants in this study were Muslims, thus they realized that performing fasting during Ramadan is an act of obedience towards God and could lead them to be more disciplined, patient, and calm (39). Besides, Erdem's (2018) study revealed that Ramadan fasting could reduce the stress, anxiety, and depression levels of healthy persons (26). Contrastingly, other scholars found different outcomes in which tension, depression, anger, vigor, and confusion were not significantly different except for fatigue scores (3, 24, 40, 41). The athletes commonly report fatigue during the early phase of fasting; however, in the later stage, athletes tend to get used to the condition, and less fatigue was reported (23, 42, 43). Meanwhile, Kaarud et al. (2016) observed no significant changes in the mood of university students after exercising before, during, and after Ramadan fasting. But, the vigor decreases while the fatigue increases during the fasting month (44).

In this study, the mood profiles of athletes showed an "iceberg-shaped profile" in both the non-fasting and fasting periods. According to Morgan (1980), elite-level athletes will have above-average vigor scores and below-average scores for tension, depression, anger, fatigue, and confusion, which reflect positive mental health (45). Researchers claimed that positive moods such as vigor, happiness, and calmness correlate with different results, while negative attitudes such as confusion, depression, and fatigue will lead to poor performance. Athletes who can maintain their positive mental health during the fasting month can cope with their psychological and physical changes

by adapting and/or modifying their training program, dietary habits, and daily routine (43).

In this study, there were a few limitations acknowledged. Firstly, the food intake was not monitored as the meals were prepared by the nutritionist and cafeteria of the teams. It would be essential to monitor the calorie and fluid intake as it may differ during the Ramadan fasting month (46). Secondly, the training program was not recorded. The training volume and intensity might be different between fasting and non-fasting month. Finally, this study mainly focused on adolescent male archers. It is highly recommended for future studies recruit other age groups and genders for comparison as the effect of fasting could be different.

In conclusion, the current study found that Ramadan does not cause impairment in archery performance and the mood of archers. It helps in reducing the tension of archers. However, the archers and coaches need to plan the training program and daily routine during the fasting month well. It is highly recommended that coaches change the training intensity and load while the archers should adequately manage their dietary habits to maintain their sports performance (43).

CONCLUSION

This study aimed to compare archers' shooting performance and mood during Ramadan fasting month and non-Ramadan fasting month. In conclusion, this study has successfully demonstrated that fasting has no impact on the archery shooting performance of male adolescent archers. In addition, fasting also does not impair archers psychologically. To improve our study, we suggest that future studies consider adding other parameters such as monitoring nutritional intake and expenditure, charting training program volume and intensity, physical fitness profiles, and fatigue levels to provide more information for the coaches.

APPLICABLE REMARKS

- According to the Brunel Mood Scale result, the subscale of fatigue increased in the fasting month. Thus, the coaches must design a proper training program and daily routine during the fasting month to reduce the fatigue level by manipulating the training volume and intensity.
- The archery shooting score improved in the fasting month according to the performance result. Hence, the result showed that fasting did not impair the archery techniques, and it is

suitable for the athletes to continue their training programs during the fasting month.

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AUTHORS' CONTRIBUTION

Study concept and design: Lau Jiun Sien, Rosniwati Ghafar, Erie Zuraide Zulkifli, Hairul Anuar Hashim. *Acquisition of data:* Lau Jiun Sien. *Analysis and interpretation of data:* Lau Jiun Sien, Rosniwati Ghafar. *Drafting of the manuscript:* Lau Jiun Sien, Rosniwati Ghafar, Erie Zuraidee. *Critical revision of the manuscript*

for important intellectual content: Rosniwati Ghafar. *Statistical analysis:* Lau Jiun Sien, Rosniwati Ghafar. *Administrative, technical, and material support:* Lau Jiun Sien, Rosniwati Ghafar, Hairul Anuar Hashim. *Study supervision:* Lau Jiun Sien, Rosniwati Ghafar, Hairul Anuar Hashim, Erie Zuraidee Zulkifli.

CONFLICT OF INTEREST

There is no conflict of interest reported between the authors.

FINANCIAL DISCLOSURE

Research grants were received to support the research activity. All the authors have no financial interests related to the material in this manuscript.

ROLE OF THE SPONSOR

The funding organizations are public institutions and had no role in the design and conduct of the study, collection, management, and analysis of the data, or preparation, review, and approval of the manuscript.

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