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Original Article

Evaluating of the effects of ramadan fasting on ankle proprioception performance

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Abstract

Aim: Human body has an unmatched capacity to keep the correct posture against gravity. Balance is the most important factor for the stability of ankle joint. Ramadan is a special religious month of Muslim calendar (The Hegira calendar) which includes an integrated life style change in dietary habits, sleep pattern, daily life and social activities. The objective of this study was to examine the effect of fasting on ankle proprioception sense.

Material and Methods: This study was attended by 30 of the first year students of the Faculty of Medicine of Inonu University. Ankle proprioception sense was measured at 10º dorsiflexion (DF), 11º plantarflexion (PF) and 25º PF angles in eyes open position (EOP) and eyes closed position (ECP) by using active reproduction test. Deviations from these angles were recorded as proprioception score. The measurements were made two weeks before Ramadan started and 2 weeks after Ramadan started when the students were fasting. Ankle proprioception measurement was conducted separately for right and left foot with digital inclinometer.

Results: According to the results of Wilcoxon paired samples test, statistically significant difference was found between pre-fasting and fasting period in ECP 10º DF and 11º PF angles of the right foot and ECP 11º PF angle of the left foot ($p<0.05$).

Conclusion: As a conclusion, we believe that fasting has an effect on proprioceptive sense, even though partly. Considering the difficulty of finding out the angles measured, associating the results with only fasting period is open to dispute.

INTRODUCTION

Human body has an unmatched capacity to keep the correct posture against gravity. This complex interaction is attained by central nervous system and coordinately working lower extremity muscle activity (1). Balance is the most important factor for the stability of ankle joint (2,3). Balance and keeping postural control are possible through sensual information coming from visual, vestibular and somotosensorial systems (1). This function occurs as a result of the integration of proprioceptive sensory signals by the nervous system (4,5). Proprioception is the postural, positional or kinetic information sent to central nervous system by the sensual receptors in the muscle, tendon, joint or the skin (1). Loudon defined proprioception as joint position sense and joint movement sense (6).

Ellenbecker and Bleacher defined proprioception as joint position sense, kinesthesia, sense of resistance and neuromuscular control (1). Ankle proprioceptive sense perception is used to regulate and form muscle contractions in order to protect the vertical balance of the body (3,5,7,8).

Ramadan is a special religious month of Muslim calendar (The Hegira calendar) which includes an integrated life style change in dietary habits, sleep pattern, daily life and social activities (9). These changes in dietary habits and life style can affect day activities and performance in mental, physical and social areas (10). The change in circadian rhythm plays a role in the basis of many physiological changes that occur in this month (11,12). The clearest indicator of human circadian rhythm is sleep-wake cycle (13). Postural balance is formed by the integration of visual, vestibular and proprioception sense (1). There are no studies in literature about the effect of fasting on ankle proprioception sense. The objective of this study was to examine the effect of fasting on ankle proprioception sense.

MATERIAL and METHODS

This study was conducted with the 2017/64 numbered

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permission of Malatya Clinical Researches Ethical Board. This study was attended by 30 of the first year students of the faculty of medicine with an average age of 20.14±1.57 participated.

The students who were physically healthy and who did not have any resistance exercises at least six months before the study, the students who did not have any medical obstacles to participate in the study and who did not use any medication or food supplements such as keratin during the study, the students who did not have any diseases and who did not have orthopedic surgeries previously were included in the study. All the subjects were informed about the study; consent forms were read and signed. Experimental protocols were conducted in line with Helsinki declaration.

There are special devices developed to measure kinesthesia and joint position sense in proprioception measurement. Isokinetic dynamometers, goniometer, inclinometer are some of these (14). Proprioception measurement test was conducted on the students 2 weeks before Ramadan when they were continuing with their normal lives. Measurements were performed by using specially designed digital inclinometer device (producted by Baseline at Nailsea, Somerset UK) while the subject was in sitting position extending his legs in a quiet environment at normal room temperature.

Ankle proprioception measurement was conducted separately for right and left foot with inclinometer. Ankle proprioception sense was measured at 10º DF, 11º PF and 25º PF angles in eyes open position and eyes closed position (EOP, ECP) by using active reproduction test.

Joint position sense is defined as repeating positioning actively or passively. At first, the extremity which was connected to inclinometer was brought to the targeted angle and minimum 10 seconds passed waiting for the subject to remember this position. Later, extremity was taken to start position. The subject was asked to bring the extremity back to the target position actively or to indicate when he reached the pre-determined angle passively. Deviation from the target angle (angular error) was recorded. Active positioning (the ability to bring the extremity back to the target position actively) measures the ability of muscle and capsular receptors, while passive positioning primarily measures the ability of capsular receptors (15,16). The method used in this study is in line with the literature. After a trial test, the subjects were told to move their ankles to target angles, and the best value that represented the nearest distance to the target angle was recorded throughout three repetitions. All the evaluation methods were performed in the left and right sides (17). The same measurements were repeated with students who fasted for two weeks at the second week of Ramadan. The measurements were performed before noon between 10:30 and 12:00. Thus, the ankle proprioception association between the pre-fasting and fasting period was shown.

Statistical Analysis

The results of the Shapiro-Wilk test to find out whether the data were normally distributed showed that the data were not normally distributed. Wilcoxon paired samples test was used for data analysis. $p<0.05$ was considered as statistically significant. IBM SPSS Statistics 22.0 for Windows package program was used.

RESULTS

In right foot measurements; EOP 10° DF, EOP 11° PF measurements were reduced in the fasting period, while EOP 25° PF, ECP 10° DF, ECP 11° PF and ECP 25° PF showed that these mean values were higher in the fasting period than in the pre-fasting period. In the pre-fasting period, the greatest deviation from the proprioception scores was determined as 10.20° in the EOP 25° PF. In the fasting period, the greatest deviation from the proprioception scores was determined as 12.00° in the ECP 11° PF.

According to the results of Wilcoxon paired samples test for the right foot, statistically significant difference was found between pre-fasting and fasting period in ECP 10º DF and 11º PF angles ($p<0.05$). In EOP, no statistically significant difference was found between pre-fasting and fasting period in all measurements and ECP 25° PF measurement ($p>0.05$), (Table 1), (Figure 1).

Table 1. X±ss, Min and Max values of right foot pre-fasting and fasting period proprioception measurements and Wilcoxon paired samples test results

Proprioception		pre-fasting period			fasting period			P
		X±ss	Min	Max	X±ss	Min	Max	
EOP	10° DF	2.09±1.52	.00	5.60	1.98±1.30	.30	5.20	.681
	11° PF	2.39±1.92	.10	6.90	2.11±1.77	.10	7.40	.565
	25° PF	2.54±2.54	.00	10.20	3.64±2.53	.00	9.40	.072
ECP	10° DF	2.17±1.70	.00	5.90	4.25±1.87	.80	8.60	.000
	11° PF	2.82±2.48	.20	8.80	3.60±2.74	.00	12.00	.025
	25° PF	4.23±2.57	.50	9.70	5.27±3.24	.40	11.40	.360

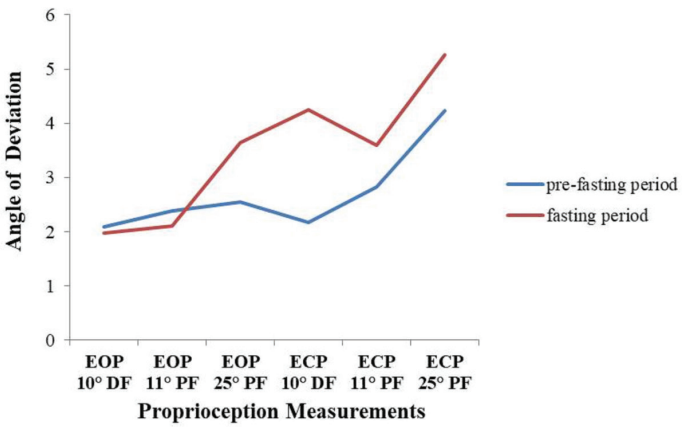

Figure 1. Right foot pre-fasting and fasting period proprioception measurements

In left foot measurements; EOP 10° DF, EOP 25° PF and ECP 25° PF decreased in the fasting period, while EOP 11° PF, ECP 10° DF and ECP 25° PF showed that these mean values

increased in the fasting period compared to the pre-fasting period. In the pre-fasting period, the greatest deviation from the proprioception scores was determined as EOP 25° PF 11.80°. In the fasting period, the greatest deviation from the proprioception scores was determined as 13,60° at the ECP 25° PF.

According to the results of Wilcoxon paired samples test for the left foot, statistically significant difference was found between pre-fasting and fasting period in EOP 10° DF and ECP 11° PF measurements ($p<0.05$). In EOP, no statistically significant difference was found between pre-fasting and fasting period in all measurements and ECP 25° PF measurement ($p>0.05$), (Table 2), (Figure 2).

Table 2. X±ss, Min and Max values of left foot pre-fasting and fasting period proprioception measurements and Wilcoxon paired samples test results

Proprioception		pre-fasting period			fasting period			P
		X±ss	Min	Max	X±ss	Min	Max	
EOP	10° DF	2.14±1.54	.20	6.30	1.37±0.85	.00	3.20	.106
	11° PF	2.54±1.64	.20	6.30	2.62±2.06	.30	8.20	.593
	25° PF	2.88±2.87	.00	11.80	2.46±2.30	.20	10.80	.480
ECP	10° DF	3.12±2.53	.00	10.20	3.39±2.11	.00	8.20	.114
	11° PF	2.78±2.10	.10	8.30	3.52±2.08	.40	9.20	.018
	25° PF	5.15±2.66	.00	10.00	4.39±3.17	.00	13.60	.214

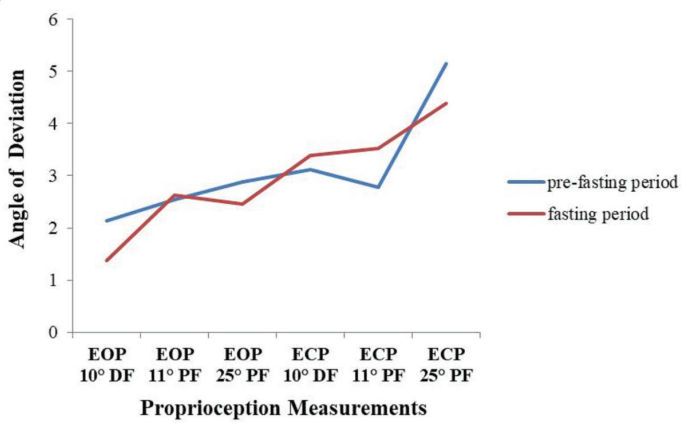

Figure 2. Left foot pre-fasting and fasting period proprioception measurements

These results indicates that either being fast or being eyes closed are both causes deviation of proprioception scores.

DISCUSSION

In our daily lives, the position and proprioception of lower extremity and thus ankle is very important while standing and walking in forming and keeping balance.

More than one billion people worldwide fast in Ramadan (18,19). The effects of fasting on static and dynamic balance have not been fully explained yet.

During Ramadan, healthy young people, adults and old people are deprived of food, drink, smoking and medication from sunrise to sunset. For a month, eating habits of 3 courses a day become a dinner and a late night meal (13). On the other hand, postural control changes according to levels of sleep and wake (20-22). Sleep deprivation causes postural control to decrease (23). Psychomotor and cognitive performances are suggested to be affected by Ramadan fasting (12,24).

Souissi et al. made a total of 3 measurements - one week before Ramadan, in the second week of Ramadan and three weeks after Ramadan in 11 young judoists who had an average age of 22.5±2.8 years. They found that Ramadan fasting affected postural balance negatively. In the measurement three weeks after Ramadan, they found that the negative effect had recovered (10). In another study by Souissi et al., a total of 2 measurements - one week before Ramadan and in the second week of Ramadan- were conducted on 11 young judoists who had an average age of 22.5±2.8 years. Measurements were conducted in eyes open and eyes closed position. They found that Ramadan fasting affected postural balance negatively both eyes open and eyes closed (25). These changes were thought to occur because partial sleep deprivation that occurred in Ramadan disrupted sleep-wake cycle and thus postural balance was disrupted (26-29). Memari et al. conducted 4 measurements with 12 female taekwondo athletes between the ages 15 and 27 years one week before Ramadan, in the second week of Ramadan, in the fourth week of Ramadan and three weeks after Ramadan. They found that balance did not change significantly during Ramadan (9). The measurements of 30 students in our study who had an average age of 20.14±1.57 years were taken two weeks before Ramadan and in the second week of Ramadan, in line with the literature. The measurements were made both eyes open and eyes closed. No significant differences were found in the right foot measurements of the subjects who fasted in Ramadan as a result of the measurements conducted eyes open. However, statistically significant difference was found in 10° DF angle of the left foot between pre-Ramadan and Ramadan measurements. On the other hand, statistically significant difference was found in both right foot and left foot eyes closed 10° DF and 11° PF measurements. Similar to the results in literature, our results show that fasting period affects proprioceptive sense of the fasting period, even though partly. In addition, considering the difficulty of finding out 10° DF and 11° PF, associating the results with only fasting period is open to dispute.

CONCLUSION

This is the first study to present the effect of fasting on proprioceptive sense. As a conclusion, we think that fasting can affect proprioceptive sense, even though partly. Considering the difficulty of finding out the angles measured, associating the results with only fasting period is open to dispute. We believe that more extensive studies in the future will give more effective results.

Ethics Committee Approval: Ethics committee approval was received for this study from local ethics committee.

Informed Consent: Informed consent was obtained from patients who participated in this study.
Conflict of Interest: No conflict of interest was declared by the authors.
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