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Investigation factors that effect shooting performance in the menstrual period of female archery athletes

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Abstract

The purpose of this study was to investigate effects of the shooting performance of the female archery athletes on the menstrual period. A total of 10 licensed female archery athletes from 18 to 30 years of age participated voluntarily. Measurements were taken by using empirical research and survey method on menstrual period and normal period during the 3 months For statically analysis of the measured shooting scores' according to the independent variables (menstrual period waiting time, heart rate, air humidity, air temperature, State-Trait Anxiety, static balance, body temperature, right and left handgrip strength, back muscle strength, leg muscle strength), Pearson Correlation data analysis method were used. In addition, Wilcoxon sign test were used to analyze the data in this study. The results, relation between menstrual period blood, hormone value and shooting score wasn't found statistically significant ($p>0.05$). There was a statistically insignificant correlation between shooting scores and environmental variables ($p>0.05$). There was a statistically nonsense correlation/ relation between shooting scores and physical variables ($p>0.05$) also. There was not statistically meaningful correlation/relation between shooting scores and state-trait anxiety variables ($p>0.05$). There was a statistically significant difference between menstrual period and normal period balance, body temperature, air temperature, air humidity, right handgrip strength, left handgrip strength, back muscle strength, leg muscle strength on $p<0.05$ data level. There was a statistically significant difference between menstrual period's total testosterone and normal periods' total testosterone ($p>0.05$) As a result, there was not found negative effects of physical, physiological, environmental and psychological variables on the menstrual period's performance.

Keywords: Menstrual period, shooting performance, archery performance, female archery athletes

1. Introduction

Recent developments in technology and changing point of views not only affect every aspect of society but contribute to sport, sportsmen's performances and enhance competition as well. Changing trends which are occurring in every aspect of society lead to the need of neo scientific studies and scientific searches for performances of sportsmen. These neo scientific studies which are intended to help development of sport are also seen in archery branch. Archery is the oldest sport art of ancient times which is still protecting its popularity [18]. Archery is a static sport branch which requires power, endurance, fine motor skills and balance of upper body [13]. "Majority of the factors have important roles on the result in sportive performance complicated structure. In general, we can separate positive and negative factors into two as intrinsic and extrinsic factors [2, 6]. "Internal Factors: Training Level, Age, Gender Physical suitability, Racial factors, Level of stress, Motivation Condition, Diet, Ergogenic Aids, Health condition, Use of medication; Extrinsic Factors, Altitude, Humidity, Temperature, Condition of ground. Physical conditions of the sportsmen affect their performances according to the branch they perform in" (Kunter akt. [23]. Another factor affecting sportsman performance is psychology. "There are a lot of psychological facts affecting sportsman's performance. One of most important of them is anxiety" (Morgan akt [4, 20]. High anxiety, can not only make sportsmen forget some movements which sportsmen know very well and train numerously in training but also do some negative movements by creating complexity in their minds [15]. State anxiety; is the ongoing subjective fear that the individual feel because of situation s/he involves in [17, 24]. Technical men are thought to give importance both development of physical skills and development of psychological skills. At the same time, optimal anxiety level is regarded as the key to the expected performance of the

sportsmen [4, 25]. Menstruation is a crucial fact involving in women's breeding processes. Activeness of the breeding process is determined via menstrual cycles. Menstrual cycles generally starts after 21 days. However, this duration can change or be seen irregularities according to the stress or type of exercise. Start of Menstrual cycles are generally seen at the age of 9-16. Women who do sports and women who are thinner than their peers, menstrual cycles start at later ages. Menstrual cycles have certain effects on women's life. In these periods, uneasiness and unwillingness to participate to physical actions can occur in women. Start age and features of menstrual cycle can change according to environment they live, climate and features of organism. Besides, menstruation cycle is not an illness but a natural fact which organism perform routinely [8]. While the effect of menstrual period on performance is still being argued, world and Europe records have been witnessed to be broken in this period. It is known that women have some certain physiological differences when women's conditions are considered in sport. Because of physiological differences, women and men have differences in sport in terms of limits of branches, successes, techniques. These divergences have always become lead to scientific studies especially menstruation cycles research [10]. The purpose of this study is to investigate the factors affecting the shooting performances of women archery sportsmen in menstrual period.

2. Materials and methods

2.1. Research Model: Experimental research method was used in the study.

2.2. Research Group

Population of the study are composed of 18-30 aged women archers settled in Mugla, Sample of the study are composed of volunteer 10 licensed sportsmen registered to Mugla Youth Sport Province Headquarter Club.

2.3. Data Collection Tools and Measurements

Measurements were taken by using empirical research and survey method on menstrual period and normal period during the 3 months. There were presumed that in the healthy of athlete before the measurement by the required information is given. They were presumed as healthy and the required information is given to before the measurement. Measurements of menstrual period were gathered on the third day. Both the period measurements were taken at the Mugla Atatürk Stadium between at 3 p.m. and 5 p.m. Normal period measurements were taken from sportsmen of Mugla Province Youth and Sport Headquarter at the time of training between 15:00-17:00 p.m. After that menstrual period measurements were taken at the third day of the menstrual period. While determining the factors which affect the shooting performances of women archers, physical, physiological, psychological and environmental facts were measured. Research datum; to measure heart beat POLAR RS400 branded watch and to determine waiting durations Sport line 2832 Chronometer were used.

2.3.1 Pulse Measurement: It was done by RS400 pulse timer which is composed of a chest plaster and a watch. At the time of measurements Wear link chest plaster was placed to sportsman and pulse rate was followed at the time of shooting.

2.3.2 Duration Measure: Sport line 2832 branded chronometer was used to determine the duration from pulling to release of the bow.

2.3.3 Hand Grip Power Measurement: Takei branded digital Hand Grip Dynamometer measured the hand grip power. Takei Hand dynamometer is used in a lot of scientific research has also feature of calculating average of ordinal three measures. Measure range: 5.0 - 100 kgf [22].

2.3.4 Back and Leg Power Measurement: Takei back and leg dynamometer was used to measure back and leg power. Back and Leg power measure gadget. Measure range: 20 - 300 kgf, Minimum measure value: 0.5 kgf [22].

2.3.5 Body Temperature Measurement: A Sportsmen's body temperatures were measured by Acura AC-0270 branded thermometer. Working without touch, easy use, automatic turn off, measuring body and surface temperature, fast and precise result, lighted LCD screen, working infrared and measures body temperature infrared

2.3.6 Balance Measurement: Standing on beam blank with one leg in balance. To determine sportsmen's static balances Flamingo Balance Test was applied. The material is 50 cm length 4 cm height and 3cm wide wood or metal beam blank. There are two supports required with a height of 15 cm and 2cm wide to enable stability [7].

2.3.7 Shooting Score Measure: In the shootings Contender Elite compound bow with a pulling range of 40-50 pound (18-22 kg) and it is regarded as the Standard compound bow by the federation. Shootings were performed from 50 meters as the official race distance.

2.3.8 State Permanent Anxiety Measure: It is a Likert type of measure which measures state permanent anxiety levels by 20 separate questions. High scores mean high anxiety; low scores mean low anxiety. It was composed of 20 itemed state anxiety scale after having been translated into Turkish and having been done of validity and reliability. Total scores obtained from scale can change between 20-80. High score means high anxiety; low score means low anxiety [17].

2.3.9 Air Temperature and Air Humidity: Air temperature and humidity of the day when sportsmen performed their shootings were taken from Mugla Meteorological Headquarters official papers.

2.3.10 Blood Measures: Blood and hormones measure of the sportsmen were taken by experts in Mugla Education and Research Hospital's laboratory.

2.4. Data Analysis

For statistical analysis of the measured shooting scores' according to the independent variables (waiting time heart rate, air humidity, air temperature, state-trait anxiety, static balance body temperature right and left handgrip strength, back muscle strength, leg muscle strength), Pearson correlation data analysis method were used. In addition, Wilcoxon sign test were used to analyze the data in this study.

3. Results & Discussion

3.1. Findings (The tables at the end)

In this stage, analysis results of environmental facts, physical facts, psychological facts in and out of the menstrual period affecting the shooting performances of 10 sportsmen who are creating the sample of the study were explained. Primarily, meaningful relation of the variables was examined and transferred to appropriate statistical analysis.

Table 1: Pearson Correlation Test Analysis of Shooting Scores in Menstrual Period and Physiological Variables in Archers

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1.Shoot Score	-	0.26	0.09	-0.19	0.54	0.27	0.02	0.24	0.43	0.13	0.25	0.44
2.Body temp		-	0.003	-0.12	0.59	0.29	0.10	0.17	0.13	0.21	0.40	0.25
3.Heartbeat			-	0.001	0.38	0.06	0.38	0.23	0.19	0.51	0.15	0.06
4.Hgb				-	0.07	0.31	0.76*	0.13	0.22	0.05	0.70*	0.18
5.Wbc					-	0.11	0.25	0.36	0.27	0.62	0.07	0.17
6.Rbc						-	0.22	0.10	0.14	0.06	0.38	0.21
7.Htc							-	0.03	0.24	0.31	0.50	0.50
8.T3								-	0.46	0.45	-0.5	0.46
9.T4									-	0.51	0.47	0.13
10.Tsh										-	0.15	0.08
11.Estradiol											-	0.25
12.Totalteste												-

*p<0.05

Examining Relation between variables; There is a statistically positive meaningful relation between hemoglobin and Heatocrit (r= 0.76, P<0.05). Besides there is a negative

correlation between Hemoglobin and estradiol (r = -.705, n = 10, P<0.05 (Table 1). Among the other variables, there wasn't any statistically meaningful relation (p>0.05).

Table 2: Pearson Correlation Test Analysis of Shooting Score in Menstrual Period and Environmental facts in Archers

Variables	1	2	3
1.Shooting Score	-	0.56	-0.31
2.Air Temperature		-	-0.64*
3.Air Humidity			-

*p<0.05

In spite of the fact that there is negative statistical correlation between shooting score and environmental facts, between air temperature and air humidity there is a negative meaningful correlation (r - .646*, n =10, P<0.05).

facts, there is a statistically meaningful correlation between balance and back power (r = 0.70*, n =10, P<0.05). There is a statistically positive meaningful correlation between Back power and Leg power (r = 0.801*, n =10, P<0.05). Besides there is a statistically positive meaningful correlation between Right hand grasping and back power (r = 0.890, n =10, P<0.05) (Table 3).

Table 3: Pearson correlations Test Analysis of Shooting Score in Menstrual Period and Physical Facts in Archers

Variables	1	2	3	4	5	6	7
1.Shooting Score	-	0.59	-0.19	-0.25	-0.32	-0.07	0.13
2.Balance		-	0.55	0.39	0.70*	0.53	-0.15
3.Right Hand Grasp			-	0.74*	0.89**	0.49	0.16
4.Left Hand Grasp				-	0.58	0.19	-0.16
5.Back Power					-	0.80**	0.21
6.Leg Power						-	0.20
7. Waiting Dur.							-

*p<0.05

Statistically correlation between Shooting Score and Physical

Table 4: Pearson Correlation Test Analysis of Shooting Score in menstrual Period and Psychological Facts in Archers

Variables	1	2
1.Shooting Score	-	-0.47
2.Anxiety		-

*p<0.05

Examining relation between variables, there isn't statistically meaningful correlation between shooting score and anxiety score (r=-0.47, P<.05).

Table 5: Pearson Correlation Test Analysis of Shooting Score in Normal Period and Physiological Facts in Archers

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1.Shooting S.	-	0.21	-0.40	-0.16	0.17	-0.37	-0.08	0.07	-0.32	0.74*	0.02	-0.02
2.B.Temp		-	-0.35	0.29	0.22	0.24	0.10	0.35	0.45	0.08	-0.48	0.23
3.Heart Beat			-	-0.08	-0.07	-0.12	0.12	0.07	0.22	0.14	0.15	-0.31
4.Hgb				-	0.03	-0.26	0.60	-0.27	0.20	-0.37	-0.45	0.32
5.Wbc					-	0.02	-0.20	0.41	-0.10	0.49	0.05	-0.02
6.Rbc						-	-0.16	0.30	0.59	-0.30	-0.22	0.17
7.Htc							-	-0.02	0.02	-0.19	-0.16	0.33
8.T3								-	-0.12	0.30	-0.43	-0.46
9.T4									-	-0.19	-0.24	0.34
10.Tsh										-	0.23	-0.26
11.Estra											-	0.33
12.TotalTest												-

*p<0.05

Examining relations among variables, there is a statistically meaningful positive correlation between Shooting score and

Tsh (r= 0.74, P<0.05). Among the other variables there isn't a statistically meaningful correlation (Table 5).

Table 6: Pearson Correlation Test Analysis of Shooting Score in Normal Period and Environmental Facts in Archers

Variables	1	2	3
1. Shooting Score	-	0.43	0.15
2. Air Temperature		-	-0.48
3. Air Humidity			-

* $p < 0.05$

Examining relations of variables; there isn't a statistically meaningful correlation between Shooting score and environmental facts (Table 6).

Table 7: Pearson Correlation Test Analysis of Shooting Score in Normal Period and Physical Facts in Archers

Variables	1	2	3	4	5	6	7
1. Shooting Score	-	-0.31	-0.06	-0.04	-0.01	0.25	-0.69*
2. Balance		-	0.11	0.28	-0.01	-0.10	0.20
3. Right H Grasp			-	0.71*	0.89**	0.58	0.20
4. Left H Grasp				-	0.51	0.14	0.002
5. Back Power					-	0.82**	0.24
6. Leg Power						-	-0.05
7. Waiting Duration.							-

* $p < 0.05$

Examining the relations among variables; there is statistically meaningful negative correlation between shooting score and waiting duration ($r = -0.69, P < 0.05$). There is a statistically meaningful positive correlation between Right Hand Grasp and Left Hand Grasp ($r = 0.71, P < 0.05$). Besides there is a statistically meaningful positive correlation between Right Hand Grasp and Back ($r = 0.894, P < 0.05$). Besides there is statistically meaningful positive correlations between back power and leg power. ($r = 0.824, P < 0.05$). Among the other variables there isn't statistically meaningful correlation (Table 7).

Table 8: Pearson correlations Test Analysis of Shooting Score in Normal Period and Psychological Facts in Archers

Variables	1	2
1. Shooting Score	-	-0.55
2. Anxiety		-

* $p < 0.05$

Examining correlation between variables there isn't a statistically meaningful correlation between shooting score and anxiety ($r = 0.55, P < 0.05$).

Table 9: Compare Analysis of Women Archers menstrual and normal period Physical, Psychological and Environmental Facts via Wilcoxon Test

Variables	Women Archers (Menstrual Period and After)			
	Menstrual Period	Normal Period	z	P
	$\bar{X} \pm SS$	$\bar{X} \pm SS$		
Balance	3.50±0.5	1.30±0.4	-2.87	0.004
Body Temperature	37.7±0.2	37.12±0.1	-2.70	0.007
Air Temperature	20.9±2.3	22.84±2.3	-2.07	0.038
Air Humidity	18.37±7.2	21.9±6.9	-2.09	0.037
Right Hand Grasp	28.27±3.3	30.34±3.5	-2.80	0.005
Left Hand Grasp	30.08±3.3	32.36±3.2	-2.80	0.005
Back Power	100.03±13.5	103.31±13.9	-2.80	0.005
Leg Power	95.42±12.9	98.00±13.1	-2.80	0.005
Waiting Duration	6.60±1.5	5.93±1.3	-1.47	0.139
Heart Beat Pace	116.54±12.9	101.45±12.4	-1.68	0.093
Anxiety	42.79±2.18	44.49±2.09	-1.68	0.093
Shooting Score	8.79±0.64	9.04±0.29	-1.07	0.285

* $p < 0.05$

Examining values of Menstrual period and normal period balance ($z = -2.87, p = 0.004$), body temperature ($z = -2.70, p = 0.007$), air temperature ($z = -2.07, p = 0.038$), air humidity ($z = -2.09, p = 0.037$), right hand grasp ($z = -2.80, p = 0.005$), left hand grasp ($z = -2.80, p = 0.005$), back power ($z = -2.80, p = 0.005$) and leg power ($z = -2.80, p = 0.005$) there is statistically meaningful $p < 0.05$ level of difference among variables. There isn't a statistically meaningful correlation among the other variables.

Table 10: Compare Analysis of Women Archers' Certain Blood and Hormones in menstrual and Normal Period via Wilcoxon Test

Variables	Women Archers (Menstrual Period and After)			
	Menstrual Period	Normal Period	z	P
	$\bar{X} \pm SS$	$\bar{X} \pm SS$		
Hgb	13.59±0.75	13.37±0.56	-1.17	0.241
Wbc	6.49±0.92	6.33±0.86	-1.22	0.221
Rbc	4.70±0.35	4.58±0.24	-1.27	0.203
Htc	39.45±1.83	40.99±6.99	-1.02	0.308
T3	4.83±0.59	4.69±0.46	-1.68	0.093
T4	12.15±0.77	11.94±1.18	-0.15	0.878
Tsh	2.82±0.52	2.98±0.52	-1.07	0.285
Estra	72.49±36.52	70.00±33.14	-0.94	0.343
Total test	0.43±0.05	0.49±0.04	-2.80	0.005

* $p < 0.05$

Examining testosterone values in normal and menstrual period, there is a statistically meaningful difference with a level of $p < 0.05$ ($z = -2.80, p = 0.005$). There isn't a statistically meaningful difference among the other variables.

4. Conclusion and Discussion

Examining correlations among variables in normal period, there is a meaningful positive correlation between shooting score and Tsh. Besides while there is a meaningful negative correlation between shooting score and waiting duration, there isn't a correlation between shooting score and physical variables. There isn't again a statistically meaningful correlation between anxiety and shooting score ($p > 0.05$).

In the result of the study, there haven't been significant difference between Menstrual and Normal Period's shooting scores. However, when compared there have been meaningful difference among balance, body temperature, right hand grasp, left hand grasp, back power, leg power in different times ($p < 0.05$). Besides examining values of testosterone in menstrual and normal period, there is a statistically meaningful difference with a level of ($p < 0.05$). Reviewing Literature;

In the result of the study "Comparison of Olympic, Compound and Traditional Turkish Archery Balance Skills" especially archer's pulling weight at the time of release can affect shooting performance because of the central body weight point change [21]. They have determined that there is a relation between aiming release and shooting performance of Elite Rifle Shooters [3]

In the studies they conducted they have found that menstruation and normal period anaerobic power results are similar and there haven't been found any negative findings. This study has a parallel structure compared to the study [9]. In the study they conducted, haven't been able to find a meaningful relation between participating to competitions in menstrual period and affecting performance's negatively. Menstruation affecting sportive action with a percentage of 49,2 and this has also parallel way to the study [11]. In the study they conducted, menstrual cycles have no negative effect on repetitive sprint performance and pace of

diminishing lactic acid in blood at the time of active resting. This study also has a parallel way to the study ^[16]. In the study they conducted; there is a meaningful difference between Vertical Leap and Period's measure days. Besides there is a meaningful difference between 2nd And 26th measure dates of free swim scores. This study has no parallel way to the study ^[14]. In the study he conducted, he accepted that as in shooting vibration of high rate of heart beat affects aiming negatively, in archery also aiming can be affected ^[23]. In the result of the study they conducted, there wasn't a meaningful difference between pace and endurance values at the time of 2nd day and 14th day (ovulation day) of menstrual period. This study has a parallel way to the study ^[19]. When compared Olympic archer group (RA) compound (CO) and traditional archer group (TA) lower Press Center values have been obtained ^[13]. As a result of the study they conducted cardiac cycle has no effect on short range shooting performance in Elite level of archers. This study has a parallel way to the study ^[1]. As a result of his study, found that state anxiety levels before and after competition can affect sportsmen's successes. This study has no parallel way to the study ^[5, 12].

As a result, there is no relation between shooting scores and physical variables of the sportsmen. There is no relation between anxiety and shooting scores of the sportsmen. There is no relation between menstrual and normal period's shooting scores of women archers. However, between these two periods there are meaningful correlations among balance, body temperature, right hand grasp, left hand grasp, back power and leg power. Besides when compared values of testosterone in normal and menstrual period, normal period level is higher.

Examining correlations among variables in normal period, there is a meaningful positive correlation between shooting score and Tsh. Besides while there is a meaningful negative correlation between shooting score and waiting duration, there isn't a correlation between shooting score and physical variables. There isn't again a statistically meaningful correlation between anxiety and shooting score ($p>0,05$).

In the result of the study, there haven't been significant difference between Menstrual and Normal Period's shooting scores. However, when compared there have been meaningful difference among balance, body temperature, right hand grasp, left hand grasp, back power, leg power in different times ($p<0,05$). Besides examining values of testosterone in menstrual and normal period, there is a statistically meaningful difference with a level of ($p<0,05$).

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