



INJURY PATTERNS AMONG TURKISH ARCHERS

Dr. Hayari Ertan

Abstract:

The purpose of present study was to identify the injury patterns that are seen among Turkish Archers. A survey study was used to collect data from archers who were taking part the Turkish National Archery Championship. 88 archers (25 male, 13 female, 27 junior male, 23 junior female) who have taken part the Turkish Archery Championship (age: 12 - 48, x: 23.852 $\pm$ 5.719, height: 160 - 195 cm, x: 175.053 $\pm$ 8.986, body weight: 46 - 94, x: 66.013 $\pm$ 11.852, training age: 1 - 27, x: 5.060 $\pm$ 4.005) participated in this study. The archers have 4 or 5 days training sessions in a week, the duration of a single session is about 3 hours, the number of arrows they shoot ranges between 50 and 300 with the mean of 168.45, and their bow weight (drawing weight) is 18.063 kg. The most common injury among the archers is "Blisters on Drawing Fingers" with the percentage of 20. Drawing-arm shoulder also has a wide range with 11 injuries and 14.66 incidences. However, Drawing-arm elbow and achil tendon has the lowest incidence among the injury patterns. Archers have to pay attention especially to drawing - arm. Before injury; (1) they should do warming-up and stretching exercises before training session, (2) they should include strengthening weight-training programs, (3) and finally they should be careful about drawing weight of the bow and the number of arrow shot in a single session. During the injury, they should follow scientific instructions given by specialists. After injury period, the duration of any session and the intensity of training should be low.

1. Introduction

Skill in archery is defined as the ability to shoot an arrow at a target with accuracy (Leroyer, 1992). In the movement of shooting an arrow, there is a large amount of neuromuscular involvement in the "simple



act". Neurophysiologically, the movement of shooting an arrow is stable posture in a typical tonic neck reflex. To get a good record in an archery competition, one requires a well-balanced and highly reproducible release during the shooting (Nishizono, 1996; Ertan, 2003, 2005, 2006). Because both skilled and elite archers use equipment of same general quality, differences between their performances must be highly dependent upon their own controlled actions (Stuart, 1990). Archery can also be described as a static sport requiring strength and endurance of the upper body, in particular the shoulder girdle. Furthermore, it is characterized by the asymmetrical loads and forces placed on the body which contribute to the observed patterns of injury (Mann, 1994). During the course of international event, a male archer will pull a 45 lb bow 75 times a day for four days (FITA, 2000). This equals approximately 3400 lb (1546 kg) pulled in a single day, and represents an enormous strain on the bony, ligamentous and muscular structures of the shoulder girdle. The injury rate, structures involved, or causative factors in these shoulder injuries in elite archers are presently unknown (Mann, 1989).

To understand the injury patterns in archery, it is necessary to review the normal shooting patterns that are involved. It is traditionally thought that the feet should straddle the shooting line at 90° to the target. As the archer starts to draw the string back, the drawing arm is held at 90° or greater abduction and the shoulder is flexed across the body. During drawing phase the arm maintains 90° or greater abduction as



the arm unit extends across the body towards full draw. This action is referred to as horizontal extension (Pappas et al., 1985) and probably contributes to the shoulder injuries observed.

The force which is required to draw the bowstring back until full drawing position is termed the bow weight. When the archer has drawn the arrow back to his holding position, "full draw" has been reached. Full draw is maintained for several seconds while the archer aims on the target and then releases the string. Universally, in archery, this weight is measured in pounds (lb) (Mann, 1989).

Ideally the motion of drawing the string back starts with the shoulder abducted to 90° and horizontally flexed across the body to approximately 135° so that the fingers may grasp the string. As the string is drawn back, the shoulder should remain at about 90° of abduction until full draw is reached. This drawing movement has also called horizontal extension (Pappas et al., 1985).

The literature contains little information directly applicable to the static nature of archery. In Mann and Littke's (1989) study 21 elite archers were studied and their shoulder injuries documented; the injuries were correlated to anatomical dissections. Injuries to the drawing arm shoulder in female archers were found to be the most prevalent type of injury. It was suggested that this result is because of lack of specific rotator cuff training, coupled with overtraining and inappropriate technique (Mann, 1994).

The purpose of present study was to identify the injury patterns that are seen among Turkish Archers.



2. Methods

A survey study was used to collect data from archers who were participating in the Turkish National Archery Championship. A questionnaire that was designed by author was used to gather data throughout the championship.

2.1 Sample

88 archers (25 male, 13 female, 27 junior male, 23 junior female) who have taken part the Turkish Archery Championship, (age: 12 - 48, $x: 23.852 \pm 5.719$, height: 160 - 195 cm, $x: 175.053 \pm 8.986$, body weight: 46 - 94, $x: 66.013 \pm 11.852$, training age: 1 - 27, $x: 5.060 \pm 4.005$) volunteered in this study (Table 1).

Table 1:
The total numbers, ages, heights, body weights, and training years of the subjects.

	Male	Female	Junior Male	Junior Female	Total
Number	25	13	27	23	88
Age	28 ± 3.5	26.5 ± 5.2	16.7 ± 2.5	16.2 ± 2.8	23.8 ± 5.7
Height	182.5 ± 12.2	168.3 ± 15.7	179.2 ± 5.81	171.4 ± 6.2	175.0 ± 8.9
Body Weight	84.2 ± 13.7	72.4 ± 11.4	53.4 ± 10.8	55.3 ± 5.2	66.0 ± 11.8
Training Age	9	7	0.9	0.7	5.0 ± 4.0

2.2. Data Collection Instrument and Procedure

The prepared questionnaire was applied during the championship. There were descriptive questions in the questionnaire to gather information about the general characteristics (gender, age, height, body weight, and training years) of the sample. Besides, the



questionnaire involved some questions about training sessions, the number of arrows shot in a single session, and the drawing weight of their bows. The questionnaire was distributed to archers during the competition in appropriate during the break times to not to disturb competitors. There was no other instrument or clinical application in this study. All of the information was gathered by the questionnaire.

2.3. Data Analyze Procedure

To identify the general characteristics of sample, descriptive statistics (mean, standard deviation, minimum and maximum scores) were used. To analyze the injury patterns and their distributions among the whole subject group were used.

3. Results

The archers training sessions in a week, the duration of a training session, the number of arrows shot in a single session, and drawing weight of the bows in kilograms are given in the table 2.

Table 2:
General characteristics of archery training methods

	Mean	Std.	Min.	Max.	N
Training Sessions They have in a week	4.453	1.662	1	7	88
The Duration of a training session (hr)	2.763	0.826	1.5	5	88
Number of Arrows Shot in Session	168.45	60.58	50	300	88
Drawing weight in kg	18.063	2.719	12	26	88

The archers have 4 or 5 days training sessions in a week, the duration of a single session is about 3 hours, the number of arrows they shoot in a single session



ranges between 50 and 300 with the mean of 168.45, and their drawing weight is 18.063 kg. Multiplying the average number of arrows that are shot in a single session with again average drawing weight equals 3042.72 kg in a single session. Thus, they work out about 3 tones in a single session and 13.5 tones in a week.

Table 3:
The parts of body that injured during the last two years

	M		F		JM		JF		Total	
	N	%			N	%	N	%	N	%
Neck and Back I.	2	8.00	0	0	0	0	0	0	2	2.66
Drawing-arm Shoulder I.	6	24.00	4	30.70	0	0	1	4.34	11	14.66
Bow-arm Shoulder I.	0	0	1	7.69	1	3.70	2	8.69	4	5.33
Drawing-arm Wrist I.	1	4.00	1	7.69	3	11.11	4	17.39	9	12.00
Drawing-arm Hand I.	0	0	1	7.69	2	7.40	3	13.04	6	8.00
Blisters on Fingers	6	24.00	4	30.76	3	11.11	2	8.69	15	20.00
String Touch	0	0	0	0	3	11.11	5	21.73	8	10.69
Drawing-arm Elbow	1	4.00	0	0	0	0	0	0	1	1.33
Achilles Tendon	1	4.00	0	0	0	0	0	0	1	1.33

M: Male
F: Female

JF: Junior Female
N: Number of injuries

I: Injuries



JM: Junior Male **%:** Percentages of injuries in the given group

It has been shown that out of 88 subjects 38 had no complaint in terms of injuries. The number of archers who had any kind of injury, injury types, and the percentages of injury patterns for each group and for whole of the subject group are demonstrated in Table 3. It can be deduced from the Table 3 that the most common injury among the archers is “Blisters on Drawing-Hand Fingers” with the percentage of 20. As long as this injury pattern is almost equally distributed among the groups, male archers have the highest incidences. Drawing-arm shoulder has also wide range injuries with 11 and 14.66 incidences. It should be impressed here that drawing-arm shoulder injuries are very common in male and female subjects. However, Drawing-arm elbow and Achill tendon has the lowest incidences among the injury patterns. Some of archers had just an injury pattern. On the other hand, some of them had couple of injuries from different parts of their bodies

4. Discussion

The present study was designed to identify the frequency of injury patterns and evaluate their distribution in whole parts of the body among male, female and junior archers.

Mean training sessions of archers were found as 4.453, which meant that they have four or five days training sessions in a week. One of their training



sessions takes almost three hours ($x = 2.763$), and in this duration they shoot 168 arrows. If the bow weights are considered as 18.063 kg, archers carry about 3 tones in a single session, and it comes out that they carry 13.5 - 15 tones in a week. Because of having low intensity and high repetition numbers of the special movements, the sport archery can be classified as an aerobic type of exercise. There are intervals after 3 or 6 shots according to the distances for pulling out the arrows from the target (FITA, 2000). That also supports the idea of being aerobic type of exercise with some active rest periods in between the bouts of shots.

It can be said that the most prevalent injury pattern is blisters on fingers. This may be caused by drawing weight of the bow, and the number of arrows that are shot in a single session. Moreover, this injury type increases in accordance with the drawing weight of bows. It is the highest among the male archers, which has the highest drawing weight value.

Archers hold and draw the bowstring by three fingers: fore finger, middle finger, and ring finger. The thickness of the bowstring is a high load on these three fingers. Blisters are encountered with excessive shooting and are managed in the usual way. Mann (1994) advised that the solution is assuming proper hand position on the string, adding spacers between the fingers, using a longer bow and adding extra padding to the prospective tab.

The second most pervasive injury type was observed as being Drawing - arm shoulder injuries. This result is supported by Mann and Littke (1989). Archery



places asymmetrical stress on the shoulder structures especially on the Drawing - arm shoulder. On the average, two - thirds of the injuries are seen the parts of the drawing - arm. Thus, archers should pay more attention to drawing - arm by adjusting their drawing weight to an optimal value, adding warming up and cooling down exercises to their training programs and training for improvement of using their mechanical advantages in their shoulder girdle.

The total percentage of 10.69 for string touches may be resulted from the sample. As it can be observed from Table 3, string touches are seen among junior archers. They tend to have string touches more than elite archers. That result may be caused by the inappropriate arming and releasing techniques that may not be suitable for arrow release and archery shooting. The arming technique in drawing arm is supposed to turn the elbow parallel to the way that the string covers. Besides, the release technique is needed to not cause lateral deflection of the string. It is supported by the literature that incorrect release movement may cause lateral deflection on the string toward the bow handle (Ertan et al., 2005).

Archers should be very careful about injuries like all other sportsmen. They have to pay attention especially to drawing - arm. Before injury; (1) they should do warm-up and stretching exercises before training session, (2) they should include strengthening weight-training programs, (3) they should add cooling down exercises to their training programs, and (4) finally they should be careful about drawing weight of the bow and the number of arrow shot in a single



session. During the injury, they should follow scientific instructions given by specialists. After injury period, the duration of any session and the intensity of training should be lower than that of the usual training programs.



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