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Characteristics of Sports Injuries in Those Who Train for Police or Military Personnel Physical Proficiency Test

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Abstract

Objective: The purpose of this study was to evaluate the characteristics of injuries in those who train for the police or military personnel physical proficiency test.

Methods: All participants who applied to Balıkesir Atatürk City Hospital Sports Medicine Unit with injuries that occurred in police or military personnel proficiency tests between January 1, 2021, and January 1, 2022, were evaluated, and the mechanism, location, type, and severity of injuries were recorded.

Results: A total of 78 participants (age 23.5 ± 3.2) were evaluated during the study period. While 61.5% of injuries (n = 48) were overuse injuries, the most common injury type was bone stress injury (37.2%, n = 29), the most common injury location was leg (30.8%, n = 24), and 51.3% of injuries (n = 40) were severe. The most common injury locations were knee and leg for males and hip/groin for females ($P < .01$, effect size = 0.41).

Conclusion: Musculoskeletal complaints, in particular, in the lower extremities in those who train for the physical proficiency tests should be evaluated in detail, and professional health support should be provided when they get injured.

Keywords: Injury, lower extremity, bone stress, sports medicine

Introduction

There are diverse definitions of sedentary behavior in the research literature. The most commonly accepted definition is "*Sedentary behaviour is any waking behaviour characterized by an energy expenditure ≤1.5 metabolic equivalents, while in a sitting, reclining or lying posture.*"[1] Sedentary behavior has significant impacts on the number of critical physiological systems such as aerobic capacity, skeletal muscle metabolism and function, genetic stability, and cognitive function.[2] Moreover, sedentary behavior increases the risk of cardiovascular disease, metabolic syndrome, and so on.[3,4] Since regular physical activity and exercise have positive effects on almost all systems, World Health Organization recommends that all adults should undertake 150-300 minutes of moderate-intensity or 75-150 minutes of vigorous-intensity physical activity per week.[5]

Although regular exercise is essential in maintaining physical health, the workload of exercise is very important when determining the physical gains. While insufficient exercise intensity cannot provide sufficient adaptation, vigorous exercise can cause sports injuries.[6] In recent years, there is a growing interest in the relationship between training workload and sports injuries, with studies showing that the elevated acute/chronic workload ratio is related to injury risk.[7,8] Therefore, adjusting the training load applied to the athletes is important to prevent sports injuries.[9]

When the conditions of those who train for the police or military personnel physical proficiency test were evaluated, it can be argued that they have to face extra challenges beyond those experienced by athletes. For example, the fact that most of them do not have a history of regular exercise may facilitate the occurrence of sports injuries by making it difficult for them to provide training/rest balance.[6] Moreover, considering that the test batteries (for both police and military personnel), which is asked to be completed in less than 60 seconds, include sport-specific drills such as repetitive jumping, change of direction, and agility, it may be even more difficult for participants without a history of regular exercise to adapt to such sport-specific training. When added the potential difficulties in accessing and therefore working with expert trainers, they may more often suffer from sports injuries. Also, performance concerns and psychological pressure from close ones can cause overloading and therefore sports injury. Conversely, since females have some biomechanical, physiological, and psychological disadvantages, females may be more prone to, in particular, overuse injuries compared to males.[10]

In order to prevent sports injuries, firstly the etiology and mechanism of the injury should be investigated, and then evidence-based protective measures should be developed.[11] Although those who train for the police or military personnel physical proficiency test have to face extra challenges that can cause sports injuries as mentioned above, surprisingly, there is a paucity of research exploring their injury characteristics. Therefore, the objective of the present study was to evaluate the characteristics of injuries in those who train for the police or military personnel physical proficiency test.

Material and Method

Study Design and Participants

This cross-sectional study included all participants who applied to Balıkesir Atatürk City Hospital Sports Medicine Unit with injuries that occurred in police or military personnel proficiency tests

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between January 1, 2021, and January 1, 2022. The inclusion criteria were as follows: (1) being aged between 18 and 35 years and (2) attending at least 2 training sessions for physical proficiency tests per week. Before the examination, all participants were informed about the study and provided informed consent. This study was approved by the University ethics committee (approval number: 47; Date: 25.03.2022), and confidentiality of all participants' data was ensured.

Data Collection

All injuries were evaluated by the same physician. When a definitive diagnosis could not be made by physical examination, further examinations such as x-ray and magnetic resonance imaging was performed, and injury characteristics were recorded after a definitive diagnosis was established. The participants were checked at regular intervals according to their injury and time-loss days were recorded. Also, when the participant did not come to control, the participant was interviewed by telephone, and time-loss days were recorded.

Injury definitions and recording format for the data used in this study were implemented according to the principles recommended by the International Olympic Committee Injury and Illness Epidemiology Consensus Group.[12] For each injury, data regarding injury mechanism (traumatic, overuse, or reinjury), type (strain and sprain), and location (knee and leg) of injury and diagnosis were recorded. Injury severity was assessed according to the number of days of absence from full training (minimal <4 days, mild = 4-7 days, moderate = 8-28 days, and severe >28 days).[12]

Data Analysis

Descriptive data were reported as mean ± SD for quantitative variables and reported as frequencies and percentages for qualitative variables. IBM Statistical Package for Social Sciences (SPSS) Statistics 25.0 software (IBM SPSS Statistics for Windows, Version 25.0; IBM Corp., Armonk, NY, USA) was used for statistical analyses. For all analyses, a *P*-value less than .05 was considered statistically significant. The Chi-square test was applied to assess the association between qualitative variables. The adjusted residuals were used to determine which cells were responsible for a significant chi-square result on $r \times c$ tables. Effect sizes were calculated by G power and reported as X^2 family test (index *W*; small = 0.1-0.3; moderate = 0.3-0.5; and large > 0.5).[13]

Results

A total of 78 participants (44 police and 34 military personnel tests) (age 23.5 ± 3.2 years) were evaluated during the study period. Almost none of the participants had no history of regular exercise (96.1%, n = 75) and were mostly male (62.8%, n = 49). Characteristics of participants are given in Table 1.

A total of 78 injuries were recorded. In terms of injury mechanism, while 61.5% of injuries (n = 48) were overuse injuries, 29.5% (n = 23) were traumatic injuries. The most common injury type was bone stress injury (37.2%, n = 29), followed by strain (21.8%, n = 17) and tendon injury (15.3%, n = 12). For injury location, 30.8% of injuries (n = 24) occurred in the leg, followed by the knee (23.1%, n = 18) and hip/groin (17.9%, n = 14). While 51.3% of injuries (n = 40) were severe, 41% (n = 32) of the injuries were moderate (Table 2).

When we compared the characteristics of injuries according to sex, the distribution of injury locations was significantly different ($P < .01$, effect size = 0.41). The most common injury locations were knee (30.6%, n = 15) and leg (30.6%, n = 15) in males and hip/groin (34.5%, n = 10) and leg (31.1%, n = 9) in females. The mechanism, side, type, and severity of injuries were not significantly different between sex ($P > .05$) (Table 2). Bone stress injury in the leg was the most common injury subtype in both sexes (30.6%, n = 15 for males; 24.1%, n = 9 for females).

Table 1. Characteristics of Participants (n = 78)

Variables	Mean ± SD
Age (years)	23.5 ± 3.2
Height (cm)	173.4 ± 7.7
Weight (kg)	70.7 ± 11.1
BMI	23.3 ± 2.1
	Frequency (%)
Gender	
Male	29 (37.2)
Female	49 (62.8)
Sports history	
Yes	3 (3.8)
No	75 (96.2)

BMI, body mass index.

Discussion

To our knowledge, this is the first study evaluating the characteristics of injuries in those who train for the police or military personnel physical proficiency test. The main findings of the present study were that almost 3 in 5 injuries were overuse injuries, almost half of the injuries were severe, the most common injury location was leg, and the most common type of injury was bone stress injury. Also, the most common injury locations were knee and leg for males and hip/groin and leg for females.

Injury mechanism and type may differ according to sports disciplines. Whilst overuse injuries such as bone stress injury and tendinopathy are more common in sports disciplines where athletes are more exposed to repetitive micro-trauma, traumatic injuries such as strain and sprain are more common in sports disciplines where drills such as sudden change of direction or acceleration are more required.[14-16] Also, sex is an important variable that impacts injury characteristics. Females are more prone to sustain overuse injuries due to anatomical, functional, and (patho)physiological differences compared to males.[10,17,18] In addition to this, females suffer from menstrual disorder compared to males, and the fact that relative energy deficiency is more common in female athletes may increase the frequency of overuse injuries, in particular bone stress injury, in females athletes.[18] This is supported by a recent meta-analysis conducted on runners, with male athletes more often suffer from Achilles tendinopathy and females from bone stress injury.[19] It can be argued that the 2 main reasons why bone stress injury in the lower extremity is the most common injury subtype for both sexes in the present study are the relative energy deficit in sports and overloading.[10] Also, the fact that most of the participants do not have a job (and even if they have one, they are probably not satisfied with their jobs) may have increased their economic concerns. Therefore, they may have overtrained to pass the physical proficiency test. When added the possible psychological pressure from close ones, the occurrence

Table 2. Characteristics of Injuries (n = 78)

	Male n (%)	Female n (%)	Total n (%)	*P*/ES
Mechanism				.15/0.22
Traumatic	11 (22.4)	12 (41.4)	23 (29.5)	
Overuse	32 (65.3)	16 (55.2)	48 (61.5)	
Reinjury	6 (12.3)	1 (3.4)	7 (9)	
Total	49 (100)	29 (100)	78 (100)	
Type				.07/0.36
Strain	6 (12.2)	11 (37.9)	17 (21.8)	
Tendon	10 (20.4)	2 (6.9)	12 (15.3)	
Sprain	5 (10.2)	3 (10.3)	8 (10.3)	
Bone	18 (36.7)	11 (37.9)	29 (37.2)	
Cartilage	7 (14.3)	2 (6.9)	9 (11.5)	
Labrum/capsule	3 (6)	0	3 (3.9)	
Total	49 (100)	29 (100)	78 (100)	
Location				<.01/0.41
Head/neck	2 (4.1)	0	2 (2.6)	
Shoulder	4 (8.2)	0	4 (5.1)	
Arm/wrist	1 (2)	0	1 (1.3)	
Trunk	1 (2)	0	1 (1.3)	
Hip/groin	4 (8.2)	10 (34.5)	14 (17.9)	
Thigh	2 (4.1)	3 (10.3)	5 (6.4)	
Knee	15 (30.6)	3 (10.3)	18 (23.1)	
Leg	15 (30.6)	9 (31.1)	24 (30.8)	
Ankle	5 (10.2)	4 (13.8)	9 (11.5)	
Total	49 (100)	29 (100)	78 (100)	
Severity (day)				.59/0.16
Minimal (<4)	1 (2)	0	1 (1.3)	
Mild (4-7)	4 (8.2)	1 (3.4)	5 (6.4)	
Moderate (8-28)	18 (36.7)	14 (48.3)	32 (41)	
Severe (>28)	26 (53.1)	14 (48.3)	40 (51.3)	
Total	49 (100)	29 (100)	78 (100)	

The Chi-square test (Fisher's exact test) was performed to compare distribution of different injury characteristics between sex. ES was reported as X^2 family test.
ES, effect size.

of overuse injuries may have become easier, the occurrence of overuse injuries in participants may have facilitated.[20] Lastly, only less than 5% of participants in the present study had a history of regular exercise. The potential difficulties in accessing and working with expert trainers may have been facilitated the occurrence of overuse injuries. In order to minimize sports injuries in those who train for the physical proficiency tests, it is necessary to evaluate the underlying reasons that cause overuse injuries, and the elimination of these reasons is essential. In addition to this, professional health support should be provided when they get injured and are recovering from injury.

The majority of sports injuries occur in the lower extremities. While joint injuries such as knee and ankle are higher in sports disciplines such as basketball and volleyball where repetitive jumps are more often, muscle injuries are relatively higher in disciplines such as football where maximal speed or sudden changes of directions are also frequent.[15,16,21] The fact that almost 90% of the injuries in our study occurred in the lower extremity is consistent with the literature. Conversely, in our study, hip/groin injuries were more common in females compared to males, which were attributed to anatomical and functional differences.[22] Nevertheless, given that 1 in 3 injuries occurs in the leg and 1 in 4 in the knee in those who train for the police or military personnel physical proficiency test, those with musculoskeletal complaints in the lower extremity, in particular, in the knee and leg should not be neglected, and professional health support should be provided.

The majority of injuries in different sports disciplines are slight or mild severity, with a severe injury proportion ranging from 3.7% to 16%.[16,23,24] Given that almost half of the injuries in the present study led to time loss of more than 28 days, it is necessary to focus primarily on the prevention of these injuries. Also, the fact that 2 in 3 injuries were overuse injuries that are usually associated with risk factors reveals the importance of evaluating the predisposing factors in order to prevent injuries in those who train for the physical proficiency tests.

The present study has several limitations. Since the study was in a cross-sectional design, it does not provide information on risk factors and causes of injuries. Also, the number of injuries was small and some data were not suitable for statistical analysis. Not having detailed information about all participants who prepare for the tests does not allow compare the demographics of those who injured and did not injury. The strengths of the study were that all injuries were evaluated by the same physician, and participants were followed until they returned to full training.

Conclusion

The present findings demonstrated that 3 in 5 injuries were overuse injuries, almost half were severe, the most common injury location was the leg, and the most common injury type was bone stress injury. The distribution of injury locations was different according to sex. The most common injury locations were knee and leg in males and hip/groin in females. In light of these results, to prevent injuries in those who train for the physical proficiency tests, the underlying reasons that cause injuries should be evaluated and eliminated. Also, professional health support should be provided when they get injured.

Ethics Committee Approval: The study was approved by the Selcuk University, Faculty of Sports Science (25.03.2022-47).

Informed Consent: Written informed consent was obtained from participants who applied to Balıkesir Atatürk City Hospital Sports Medicine Unit with injuries that occurred in police or military personnel proficiency tests.

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References

1. Tremblay MS, Colley RC, Saunders TJ, Healy GN, Owen N. Physiological and health implications of a sedentary lifestyle. *Appl Physiol Nutr Metab*. 2010;35(6):725-740. [CrossRef]
2. Ogura Y, Parsons WH, Kamat SS, Cravatt BF. 乳鼠心肌提取 HHS Public Access. *Physiol Behav*. 2017;176(10):139-148. [CrossRef]
3. Warren TY, Barry V, Hooker SP, Sui X, Church TS, Blair SN. Sedentary behaviors increase risk of cardiovascular disease mortality in men. *Med Sci Sports Exerc*. 2010;42(5):879-885. [CrossRef]
4. Edwardson CL, Gorely T, Davies MJ, et al. Association of sedentary behaviour with metabolic syndrome: a meta-analysis. *PLoS One*. 2012;7(4):e34916. [CrossRef]
5. Bull FC, Al-Ansari SS, Biddle S, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med*. 2020;54(24):1451-1462. [CrossRef]
6. Drew MK, Finch CF. The relationship between training load and injury, illness and soreness: a systematic and literature review. *Sports Med*. 2016;46(6):861-883. [CrossRef]
7. Maupin D, Schram B, Canetti E, Orr R. The relationship between acute: chronic workload ratios and injury risk in sports: a systematic review. *Open Access J Sports Med*. 2020;11:51-75. [CrossRef]
8. Griffin A, Kenny IC, Comyns TM, Lyons M. The association between the acute: chronic workload ratio and injury and its application in team sports: a systematic review. *Sports Med*. 2020;50(3):561-580. [CrossRef]
9. Wang C, Vargas JT, Stokes T, Steele R, Shrier I. Analyzing activity and injury: lessons learned from the acute:chronic workload ratio. *Sports Med*. 2020;50(7):1243-1254. [CrossRef]
10. Carter CW, Ireland ML, Johnson AE, et al. Sex-based differences in common sports injuries. *J Am Acad Orthop Surg*. 2018;26(13):447-454. [CrossRef]
11. Van Mechelen W, Hlobil H, Kemper HCG. Incidence, severity, aetiology and prevention of sports injuries. A review of concepts. *Sports Med*. 1992;14(2):82-99. [CrossRef]
12. Bahr R, Clarsen B, Derman W, et al. International Olympic Committee consensus statement: methods for recording and reporting of epidemiological data on injury and illness in sports 2020 (including the STROBE extension for sports injury and illness surveillance (STROBE-SIIS)). *Orthop J Sports Med*. 2020;8(2):1-33. [CrossRef]
13. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. New York, NY: Routledge; 2013.
14. Aicale R, Tarantino D, Maffulli N. Overuse injuries in sport: a comprehensive overview. *J Orthop Surg Res*. 2018;13(1):309. [CrossRef]
15. Drakos MC, Domb B, Starkey C, Callahan L, Allen AA. Injury in the National Basketball Association: a 17-year overview. *Sports Health*. 2010;2(4):284-290. [CrossRef]
16. López-Valenciano A, Ruiz-Pérez I, Garcia-Gómez A, et al. Epidemiology of injuries in professional football: a systematic review and meta-analysis. *Br J Sports Med*. 2020;54(12):711-718. [CrossRef]
17. Boling MC, Nguyen AD, Padua DA, Cameron KL, Beutler A, Marshall SW. Gender-specific risk factor profiles for patellofemoral pain. *Clin J Sport Med*. 2021;31(1):49-56. [CrossRef]
18. Nattiv A, Loucks AB, Manore MM, et al. American College of Sports Medicine position stand. The female athlete triad. *Med Sci Sports Exerc*. 2007;39(10):1867-1882. [CrossRef]
19. Hollander K, Rahlf AL, Wilke J, et al. Sex-specific differences in running injuries: a systematic review with meta-analysis and meta-regression. *Sports Med*. 2021;51(5):1011-1039. [CrossRef]
20. Martin S, Johnson U, McCall A, Ivarsson A. Psychological risk profile for overuse injuries in sport: an exploratory study. *J Sports Sci*. 2021;39(17):1926-1935. [CrossRef]
21. Baugh CM, Weintraub GS, Gregory AJ, Djoko A, Dompier TP, Kerr ZY. Descriptive epidemiology of injuries sustained in National Collegiate Athletic Association men's and women's volleyball, 2013-2014 to 2014-2015. *Sports Health*. 2018;10(1):60-69. [CrossRef]
22. Borgstrom H, McInnis KC. Female athlete hip injuries: a narrative review. *Clin J Sport Med*. 2022;32(1):62-71. [CrossRef]
23. Ekstrand J, Hägglund M, Waldén M. Injury incidence and injury patterns in professional football: the UEFA injury study. *Br J Sports Med*. 2011;45(7):553-558. [CrossRef]
24. Lima Y, Bayraktar B. Injuries in elite level male beach soccer players: a prospective three year study. *Phys Sportsmed*. 2022;50(3):251-256. [CrossRef]