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DETERMINING THE HEALTH PROBLEMS OF ELECTRONIC ATHLETES

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ABSTRACT

Objective: Electronic sports (esports) are worldwide phenomenon with its rapidly growing popularity and followers of the young generation. Esport, which is attracting great attention, also entails some health risks and problems. It is needed to determine these problems and risks. The aim of this study was to identify health problems of esport athletes.

Methods: Qualitative and Quantitative analyses were applied to data collected from self-reported electronic questionnaire to capture important health outcomes, injuries and environmental factors. From the results of questionnaire, statistical analysis was performed on physical activity, time spent sitting in front of the screen, health education received, pain, fatigue, correct posture and musculoskeletal complaints.

Findings: Evaluation was made of 47 esport athletes with a mean age of 20.98±1.39 years and BMI of 24.47±4.73 kg/m2. The time spent per day in front of the screen was 8.1±2.77 hours, during esport matches and training. Pain levels according to Visual Analogue Scale (VAS) and fatigue according to Modified Borg Scale (MBS) were severe. Low back pain was the most common health problem. A moderate level positive correlation was determined between pain and screen time. The positive relationship between pain and fatigue severity was related to sitting posture..

Keywords: *Electronic sports, Athlete, Health, Healthcare professionals*

JEL Codes: *J41, L42, J49*

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Research Article

1. INTRODUCTION

Today, millions of players play electronic games competitively in a virtual environment (Hutchins, 2008). Some of these are professional players of electronic sports (esport), which have been accepted as sports, with ever-increasing popularity(Taylor, 2012). Although authorities argue that esport is not sport compared to traditional sports, it is developing faster than many sports and attracting great attention from young people and adults (Hutchins, 2008; Schwartz, 2014; Witkowski, 2009). Hamari and Sjöblom provided this definition: "*Esport, where the first aspects of traditional sports are facilitated by digital systems, directing the output of the system formed by human-computer interfaces other than players and teams*"(Hamari & Sjöblom, 2017). According to the definition made by the International Esports Federation, "*it is a sport based on competition using computers, screens and parts, internet network etc. devices and information and communication tools*" (ie-sf.org, 2017). Esport is described as the professional play of digital games in a competitive environment, considering all the definitions made in the literature.

Esport, which attracts great attention in the media and social networks, also entails health problems and some risks depending on the attractiveness of the games and the time spent in the digital world (Hilvoorde & Pot, 2016). The addictive effect of the games, the development of various psycho-social problems, long periods spent sitting in front of the screen, and the lack of physical activity in esport affect the health of the players (Bányai, Griffiths, Király, & Demetrovics, 2019; Hilvoorde & Pot, 2016; Mehroof & Griffiths, 2010). Lengthy incorrect computer use causes overuse injuries in the wrist, elbow and shoulder joints, impaired spinal health and posture disorders (Joanne DiFrancisco-Donoghue, Balentine, Schmidt, & Zwibel, 2019; J. DiFrancisco-Donoghue & Balentine, 2018). Another situation in respect of the health of athletes is that the athletes themselves, their coaches, their families and health professionals do not have the necessary information and methods to deal with problems in the field of esport, and healthcare management guidelines have not been sufficiently developed (Joanne DiFrancisco-Donoghue et al., 2019). Athletes earn money from competitions, sponsors and fans and have contracts. However, there are no rules in the contracts regarding health insurance and healthcare costs that can maintain both physical and mental well-being and health quality (Yükçü & Kaplanoğlu, 2018). In addition, there are few healthcare personnel dedicated to esports, the education and economic conditions of athletes are insufficient and there are other personal and environmental problems (Joanne DiFrancisco-Donoghue et al., 2019; Ecevit, Tunçe, Karaoğlu, Şahin & Özer, 2018; Taylor, 2012).

The results obtained from the evaluation of health conditions are of practical value in healthcare disciplines and facilitate patient care in sports. Various health problems seen in esport athletes have the potential to affect many vital aspects, including physical, mental and emotional well-being (Vela & Denegar, 2010). The disorders and limitations caused by these problems may vary depending on the specific situations and the athletes (Marshall & Bibby, 2011; Vela & Denegar, 2010). The problems of

esports athletes have not been sufficiently explained in the literature. Therefore, the aims of this study were to identify the health problems of esport athletes.

2. METHOD AND MATERIALS

This study included 47 professional and semi-professional athletes aged 18-24 years from various esport clubs. The study design and questionnaire was developed to identify the problems seen in esport athletes after the Esport Workshop held at the Bandirma Onyedi Eylul University Esport Application and Research Centre. Informed consents were obtained for the study before each questionnaire before data collection started. It was aimed to capture important health outcomes, injuries and environmental factors. A questionnaire was designed to elicit demographic information, physical activity, time spent sitting in front of a screen, health education received, pain, fatigue, correct posture and musculoskeletal complaints. In accordance with the research objectives, the descriptive research model was used to explain the experiences and responses of the participants. The data were collected through an anonymous and self-reported electronic questionnaire in Turkish language. After determining that the participant met the inclusion criteria, information was given about the questionnaire. The inclusion criteria were taking part in professional matches for at least a year, holding an esport license, volunteering, aged over 18 years and not retired. The questionnaire included a wide variety of open-ended questions for examining general health problems and injuries among E-sport Athlethes with the phenomenological qualitative approach (Bingöl et al., 2019). When each questionnaire was completed, the data were recorded. VAS was used for pain assessment and MBS was used to evaluate fatigue. The questionnaire included pictures to identify which sitting posture they were most likely to adopt. Correct and incorrect posture was determined as a percentage. The participants were instructed to answer the questions by giving various examples. The responses to items about health problems were multiple choice questions with the possibility of more than one response.

2.1. Statistical analysis

Data obtained in the study were analysed statistically using SPSS 23.0 software. Descriptive statistics were presented as mean ± standard deviation (mean ±SD), minimum (min), maximum (max) values and percentage (%) for nominal variables. The binary comparisons were compared using the Student's t-test and groups of 3 or more were applied with the One-way ANOVA test, and the Chi-square (Fisher) test, depending on whether there was a difference between the groups. Spearman correlation and linear regression were used to evaluate the relationships between variables. A value of $p<0.05$ was accepted as statistically significant.

3. RESULTS

Evaluation was made of the responses to the questionnaire of 47 esport athletes, comprising 1 female and 46 males with a mean age of 20.98 ± 1.39 years and mean Body Mass Index of 24.47 ± 4.73

(16.79-40.40) kg / m2. The mean duration of using the computer or game devices was reported as 8.45 ± 2.57 years, with daily screen time of 8.1 ± 2.77 hours. During the most recent Esport matches and training, the levels of pain according to VAS and fatigue according to MBS were severe (Table 1). While 19 of the athletes (40.4%) reported their health condition negatively, 2 athletes had chronic disease and 90% stated that they did not have regular health checks. The rates of athletes who had not received any health education, who did not exercise regularly and did not undertake adequate physical activity before and after training and competitions, are shown in Figure 1. Low back pain was the most common health problem and others are given in Figure 1. It was observed that the majority of athletes did not have the correct sitting posture in which physiological lordosis is preserved and were not satisfied with the seating (Figure 1).

The variables in the questionnaire were compared and correlations were examined. Pain was significantly lower in athletes who performed physical activity ($p<0.047$). The pain of athletes with poor health status was high, but not at a statistically significant level ($p=0.052$). According to the Chi-Square test, athletes doing physical activity were better than those who do not ($p <0.05$). According to the Fisher's Exact test, it was observed that the athletes who had not received any health education did not perform physical activity ($p<0.05$). There was a positive moderate correlation between pain and screen time (Table 3). A low-moderate significant correlation was observed between fatigue and pain (Table 3). A moderately significant positive correlation was determined between duration of computer use and pain (Table 3). There was a low-level significant negative correlation between pain and physical activity (Table 3), and a low correlation between receiving health education and physical activity ($r=0.32$, $p<0.05$). A low-level significant positive correlation was determined between physical activity and health status ($r=0.31$, $p<0.05$). Simple linear regression was calculated to predict pain based on screen time, and a significant regression equation was found ($F (1, 45) = 6.552$), $p=0.014$) with an $R2$ of 0.127. Pain was predicted at 1.281+ 0.233 hours when screen time was measured according to the VAS scores.

Table 1: The questionnaire results of the 47 esport athletes

N=47	**Mean ±SD**	**Min-max**
Age (years)	20.98 ±1.39	18-24
BMI (kg/m2)	24.47± 4.73	16.79- 40.40
Fatigue (MBS score)	4.38±1.87	1-8
Pain (VAS score)	3.17±1.81	0-7.6
Daily screen time (hours)	8.1± 2,77	1-12
Duration of using computer or any devices (years)	8.45± 2.57	4-12

SD: Standard Deviation, Min: Minimum, Max: Maximum, MBS, VAS.

Table 2: Comparison Results of statistical analysis of esport athletes health outcomes.

Comparisons	Mean±SD Do PA	Mean±SD Not Do PA	P value
Fatigue	4,12 ±2,21	4,68 ±1,39	P=0,06
Pain	2,68±1,52	3,73±1,98	P<0,05
Daily screen time	7,2± 2,94	9,14 ±2,19	P<0,05
Health education x PAa	-		P<0,05
Health condition x PAb	X2=4,62		P<0,05

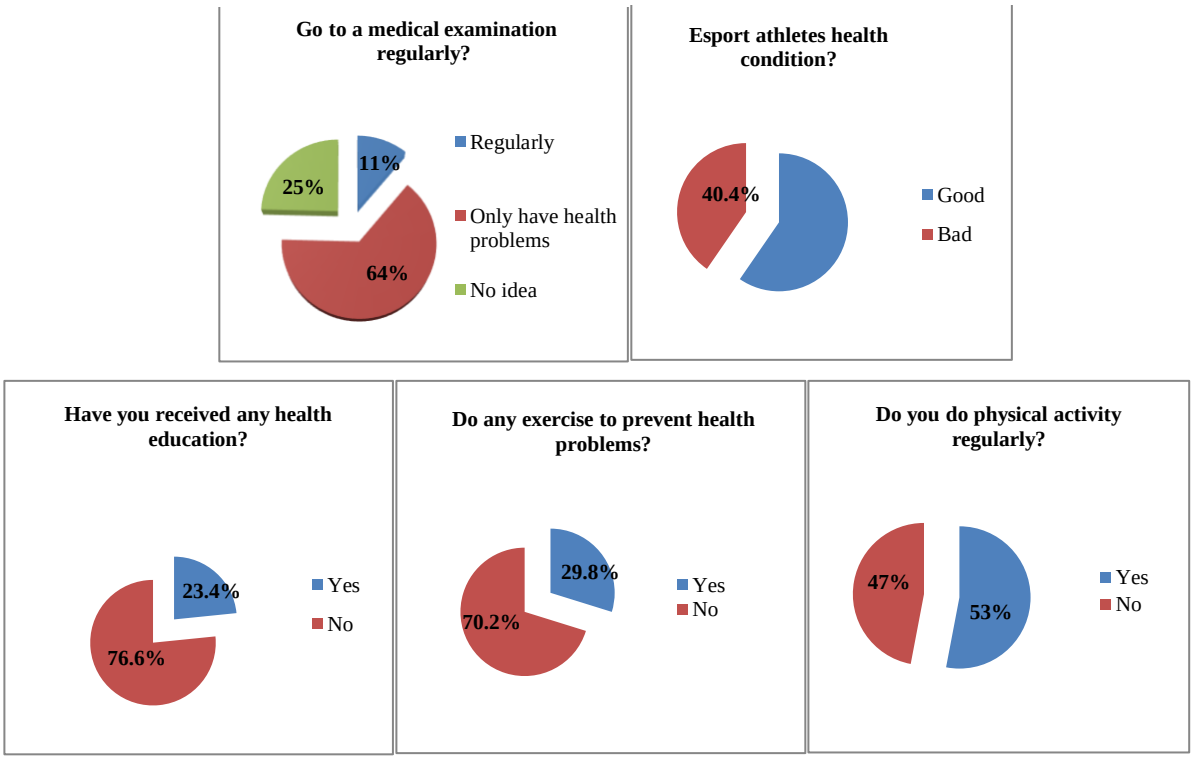
a =Fisher's exact test result, b= Chi-Square test result; PA: Physical Activity; SD= standard deviation

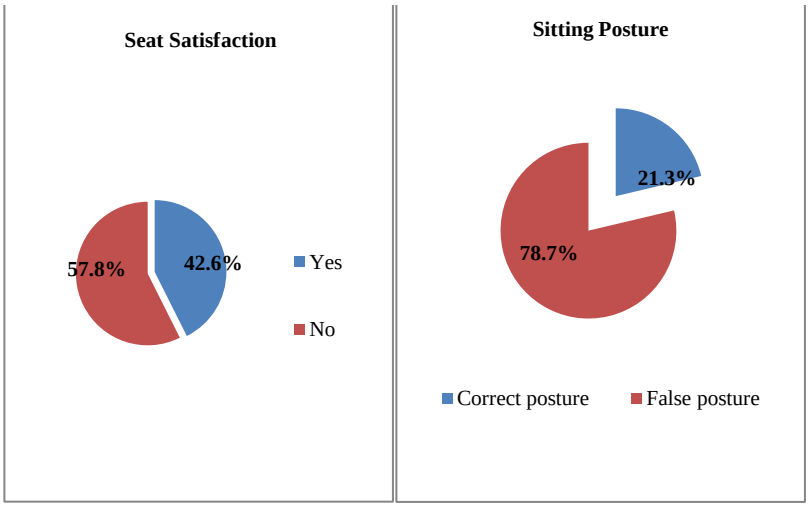
Table 3: Correlation Results of statistical analysis of esport athletes health outcomes.

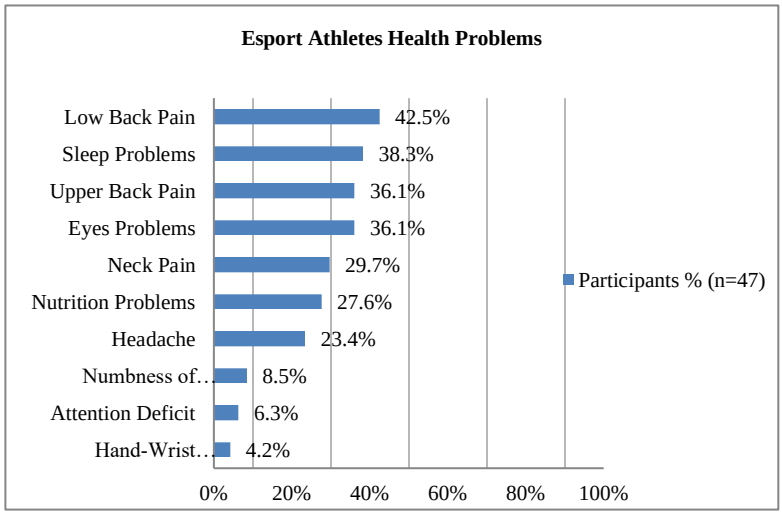
Correlations	Pain (r)	P value
Fatigue	0,3	P<0,05
Daily screen time	0.367	p<0.05
Computer use	0.35	p<0.05
Health status	0.31	p<0.05
PA	-0.29	p<0.05

PA: Physical Activity

Figure 1: The health problems results of the questionnaire of the 47 esport athletes







4. DISCUSSION

Esport athletes experience various health problems like other traditional athletes, but the injuries more resemble those of office workers than of classic sports people (Joanne DiFrancisco-Donoghue et al., 2019). In competitions and training, esport athletes achieve their goals, especially by using small joints and muscles of the hand and wrist and generally they sit to play games. In competitions, eye tracking, focus, communication and strategic movement and small motor movements are the priority rather than massive body movements (Taylor, 2012; Wagner, 2006). The athlete may be sitting for prolonged periods, moving characters and objects (avatar, character, legend etc.) in digital media rather than their own bodies (Pluss et al., 2019). Compared to traditional sports, physical activity and exercise levels are low (Joanne DiFrancisco-Donoghue et al., 2019; Jenny, Manning, Keiper & Olrich, 2017). In this study, 47% of esport athletes reported that they did not do enough physical activity and 70% stated that they did not exercise (calisthenics, stretching or strengthening exercises, etc.) to prevent health problems before or after training and competitions. According to the World Health Organization, 80% of young people worldwide are not physically active enough. It is recommended that young people perform moderate to high intensity physical activity for at least 60 minutes each day (WHO, 2019).

Exercises, which are the subgroup of physical activity, are an important element that should be performed to protect against sports injuries in youth (Rossler et al., 2014). According to the current study findings, the esport athletes who did regular physical activity had better health and less pain and fatigue. If regular physical activity and exercise-specific exercise programs for athletes are prepared, many health problems can be dealt with, from acute-overuse injuries to spinal problems, from cardiovascular problems to obesity (Landry & Driscoll, 2012; Rossler et al., 2014; Saunders et al., 2010; Soomro et al., 2016). In adolescents and young adults, a sedentary lifestyle, with little physical activity and prolonged screen time provide a basis for cardiovascular diseases and other related health problems (S. J. Biddle et al., 2016; Shiyovich, Shlyakhover & Katz, 2013). In recent studies, it has been stated that the level of physical activity is associated with prolonged sitting (<6 hours) and sleep disorders, and the risk is increased in various major chronic diseases (Patterson et al., 2018; Werneck, Vancampfort, Oyeyemi, Stubbs, & Silva, 2018).

A sedentary lifestyle and insufficient physical activity affect the body composition (Ekelund, Hildebrand, & Collings, 2014). According to the current study results, the BMI level of the athletes appears to be at the upper limit of the normal level (overweight) for adults (Garrow & Webster, 1985). Overweight and obesity are associated with type 2 diabetes, cardiovascular diseases, cancer, stroke, many other diseases, and ultimately, death (McGuire, 2016; Reports, 2000; Romero-Corral et al., 2008; World Health Organization, 2000). The BMI values of the esport athletes between 16.79 kg/m2 (extremely weak) and 40.4 kg/m2 (morbid obesity) show that body compositions are extremely variable in the esport population. Age, nutritional behaviour, physical activity, stress level, sleep patterns and socio-economic status can be factors that affect this variability (Ball & Crawford, 2005; Dunton, Berrigan, Ballard-Barbash, Graubard & Atienza, 2009; Grandner, Chakravorty, Perlis, Oliver & Gurubhagavatula, 2014).

According to the results of this study, which are similar to previous findings in literature, an average 22-year-old athlete may have been playing video games on a screen for up to 8 hours a day since the age of 13-14 years (Carson, Staiano & Katzmarzyk, 2015; Han, Lyoo & Renshaw, 2012). Prolonged screen time in adolescence and changes in obesity and adipose tissue may have negative effects in adulthood (S. J. H. Biddle et al., 2017; Hancox, Milne & Poulton, 2004). In the current study, when the esport athletes' own sitting posture was questioned through various images, approximately 80% did not choose the correct sitting posture (Harrison, Harrison, Croft, Harrison & Troyanovich, 1999; Szczygiel, Zielonka, Metel & Golec, 2017). These results may indicate that the sitting posture is not suitable for the athletes and that they have probably not adopted the ergonomic sitting posture from an early age (Drza-Grabiec, Snela, Rykala, Podgorska & Rachwal, 2015; Szczygiel et al., 2017). When the most common health problems were questioned, it was observed that spinal injuries were especially high. In addition, 57% of the respondents were not satisfied with the seat they were using. The

for the occurrence of lower back, neck and back pain may be that the athletes continue to use unsuitable seating mechanics for a long time or the posture they adopt is not suitable for the floor or seat on which they are sitting (Jia & Nussbaum, 2018; Makhsous et al., 2009; Szczygiel et al., 2017; Zwibel, DiFrancisco-Donoghue, DeFeo & Yao, 2019). Maintaining a static sitting posture in an incorrect position from an early age affects esport athletes in many ways (Wilkes, Kydd, Sagar & Broadbent, 2017). These mechanical changes can be reflected negatively in the body and form the basis of a health-damaging chronic process (Brink & Louw, 2013; Zwibel et al., 2019).

It was observed in this study that athletes suffered from moderate to severe pain. The intensity of pain seen in various parts of the body, especially the trunk, was variable. This indicates different levels of interrelated injuries of the musculoskeletal system (Silva, Sa-Couto, Queiros, Neto & Rocha, 2017). In developing and growing children, the alignment when sitting is constantly changing (Kamaci, Yucekul, Demirkiran, Berktas & Yazici, 2015). The alignment between the body segments should be natural and dynamic to maintain stability and balance when sitting, to reduce energy expenditure, and to ensure proper loading in the spinal ligaments and joints (Brink, Louw & Grimmer, 2018; Hey et al., 2017). Incorrect alignment, long periods spent sitting and pain in the sitting posture that will occur from an early age can affect the performance, vitality and presenteeism of the athletes (Brown, Ryde, Gilson, Burton & Brown, 2013; Morl & Bradl, 2013; Munir et al., 2015).

The athletes in this study reported moderate levels of fatigue and that they did not have good quality or regular sleep. The cause of fatigue may be related to the increased mood and cognitive activity that they experienced before and during competitions rather than intense physical activity (Bonnar, Castine, Kakoschke & Sharp, 2019). Mental-emotional fatigue (possibly burnout syndrome) can affect speed and correct decision-making mechanisms and decrease physical performance (Le Mansec, Pageaux, Nordez, Dorel & Jubeau, 2018; Smith et al., 2016; Van Cutsem et al., 2017). In addition, the fact that these esport athletes spend most of their time in front of a screen, less physical activity and poor quality sleep can cause chronic fatigue (Aerenhouts et al., 2015; Bonnar et al., 2019; Cvejic et al., 2017). Chronic fatigue, pain, and sleep disorders can be linked to psychosocial stress (Aili et al., 2018; Hartvigsen, Lings, Leboeuf-Yde & Bakketeig, 2004). Psychosocial stress occurs independently of the physical dimensions of work, such as time pressure, the importance of the given job, instant decision-making, following the flow of information, conflict of interests, and discrete goals. Although there are studies in the literature showing that video games reduce or manage the individual's stress, it should be considered that psychosocial stress will increase due to factors such as the use of time, in-game information flow and communication, competition, pressure of coaches and others, fear of losing, financial gains and end of career (Aliyari et al., 2018; Hartvigsen et al., 2004; Hasan, Bègue & Bushman, 2013; Lobel, Granic & Engels, 2013; Roy & Ferguson, 2016). With an increase in the level of stress due to environmental and personal factors, the body creates a physiological response to stress. In this

response, the central and autonomic nervous systems, and immune and endocrine regulatory systems play an active role in ensuring physiological stability and adapting to excessive stress (Sterling & Eyer, 1988). Stress hormones released as a result of activation of the sympathetic nervous system increase blood circulation with acute effect and change cardiovascular functions, blood pressure increases, heart rate increases, vagal tone decreases, and breathing becomes more rapid (Hjortskov et al., 2004). Given that athletes are constantly competing, chronic stress and cardiovascular changes can trigger health problems (Porter & Goolkasian, 2019; Steptoe & Kivimaki, 2012). The stress response may not occur if the athlete manages stress and sees the stress source as a potential resource for his goals and personal development (Aliyari et al., 2015). To be able to do this, esport athlete must have internal and external resources such as experience, skills, self-efficacy, social support and financial security, as well as basic needs such as sleep, nutrition and shelter (Blascovich & Tomaka, 1996; Lazarus & Folkman, 1984).

In order to be successful, a professional athlete needs an effective, special and purposeful training program. Programs created to improve mental and physical situations should include rest, a training program and clinical evaluations (Schneider et al., 2017). Clinical assessment should include injury prevention approaches, health status and performance assessment, and return to sports protocols (Joanne DiFrancisco-Donoghue et al., 2019; J. DiFrancisco-Donoghue & Balentine, 2018; Speed, 2013). With clinical controls, athletes will learn about acute and chronic injuries, be able to take precautions against injury and return to sports in a short time after injury (Laratta, Caldwell, Lombardi, Levine & Ahmad, 2017; Schut et al., 2017). Therefore, with an inventory developed specifically for esport, esport athletes can be monitored regularly, their health status can be monitored and they will be able to take precaution against possible injuries (Kraus, Schutz, Taylor & Doyscher, 2014; Malina, Rogol, Cumming, Coelho e Silva, & Figueiredo, 2015). Special practitioners (esport coaches, trainers, esport physiotherapists, esport doctor, etc.) should take part in maintaining the in-game performance for a long time, applying health and performance assessments, and improving the mental and physical well-being in esport (Joanne DiFrancisco-Donoghue et al., 2019; Fu, Tjoumakaris & Buoncristiani, 2007). DiFrancisco-Donoghue et al. (2019) defined a health management model for esport athletes and made explanations for healthcare professionals involved in esport. There can be seen to be a need for private practitioners, assessment inventories, methods of dealing with health problems, and a viable health management model in esport. This health management model should have a holistic approach, including not only physical aspects but also psychological, and should include the athlete before, during and after the competition.

5. CONCLUSION

The aims of this study were to clarify health injuries in esport athletes, to examine the athlete's health from various aspects from the results obtained. It was observed that the esport athletes had prolonged screen time, spinal health and sitting posture were adversely affected, there were sleep and

nutritional problems, eye disorders, severe pain and fatigue. It was also understood that esport athletes have various injuries like traditional sports athletes. The lack of knowledge of the athletes about their health problems and the lack of a healthcare team to make the necessary evaluations and interventions in esports, the lack of training and interventions for a healthy lifestyle, and the lack of implementation indicate that a health guide is needed in this sport. There is also a clear way to identify and document the results of athletes and trainers working in esports. It is essential that healthcare personnel with current or future involvement in esport accept the overall care of esport athletes.

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Author's contributions

TB, YNC and HY formulated of the article ideas and design; interviewed athletes and prepared raw data. TB drafted, revised, and edited the manuscript; YNC and HY assisted in revising and editing the manuscript. Both authors have confirmed the final version of the manuscript, and agree with order of the presentation of the authors.

Competing interests

The authors declare that they have no competing interests.

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