LOCATION AND PAIN PREVALENCE AMONG CROATIAN MALE TAEKWONDO COMPETITORS

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Original scientific paper

Abstract

The aim of this study was to identify characteristic pain prevalence in Croatian taekwondo athletes in order to indirectly decrease the number of injuries and organize a safer training process. The subject sample of 58 taekwondo athletes with international competitive experience was divided into four subsamples according to their body weight and competition category. Self-Estimated Functional Inability because of Pain questionnaire was used for data collection and neck, shoulders, elbows, upper arms, forearms, wrists, fingers, upper back, lower back, hips, thighs (front), thighs (back), knees, shins, calves, ankles/feet, and toes regions were analysed in accordance with the aim of the research. The most common pain reported by Croatian TKD athletes in total was in the knees (39.6%), lower back (31%), thighs/back (29.3%), ankles/feet (27.6%), and shoulders (20.7%) region. Early detection of lower intensity of pain can help in preventing the occurrence of injuries as well as improve professional guidance and appropriate safety requirements for taekwondo athletes.

Keywords*: health care, competitive athletes, anatomical region*

Introduction

Taekwondo (TKD) is a full contact Olympic kicking combat sport characterized by explosive movements such as punching, kicking and blocking. Popularity of TKD is growing all over the world and during the last decade, TKD has become the most commonly practiced martial art in the world.

TKD involves multiple physical fighting skills and requires agility, strength, speed, balance, flexibility, coordination, and stamina for taekwondo athletes to be able to execute the highly demanding kicking combinations. Due to its combat character, special attention in taekwondo should be paid to injury prevention and athletes' health care. Thus, it is recommended that the monitoring of musculoskeletal pain incidence becomes a part of TKD training. Possible risk factors for injuries for TKD athletes may also include training habits (Covarrubias, et al., 2015), body weight, level of competition (Beis, et al. 2001; Schluter-Brust et al., 2011), as well as sex and age (Pieter et al., 1997; Lystad et al., 2009).

Determining the critical points of injury could help injury prevention in both training and competition. Even though protective gear is mandatory during competition, it is seldom used during training, therefore the incidence of injury during training is not negligible. Kazemi (2005) reported that 54% of injuries in TKD occurred during matches, whereas 36% were related to training incidents. These injuries were more frequent in the lower extremities (46.5%) than in the upper ones (18%). The rest of the injuries occurred in the back (10%) and head region (3.6%). According to previous studies, incidence of injury has been analysed most frequently on national samples and within national TKD federations. For instance, Greek TKD athletes (Beis et al., 2001) had lower incidence of injury in comparison to the Canadian (Kazemi et al., 2004), Australian (Lystad, et al., 2013.), Turkish (Unveren, 2013), and Spanish TKD athletes (Altarriba-Bartes, et al. 2017). Such studies have not been conducted on Croatian TKD athletes to date, even though TKD is one of the most successful sports in Croatia in terms of medals won, therefore, taking care of injury prevention and athletes' health is a priority goal.

Differences in injury incidence and pain prevalence which can be seen in TKD athletes in different countries are caused by different training levels and therefore by the level of demanding conditions of training and competition (Ziaee, et al., 2010; Pieter, et al., 1998), different level of physical fitness (Ziaee, et al., 2010), and performance level (Kazemi & Pieter, 2004), as well as the use of protective gear, which is related to changes of propositions in TKD competitions (Varkiani, et al., 2013.; Alizadeh, et al. 2012.) stated that injury incidence in TKD athletes decreased after 2004 when the rules were changed and electronic Hugo was introduced in competition so TKD athletes do not need to strike the opponent powerfully any more, they just have to impact the opponent with adequate rate of force for obtaining points. Most authors still confirm that the risk factor of topology and injury type may include the weight categories of TKD athletes (Altarriba-Bartes, et al., 2017), and athletes' age (Beis, et al. 2001; Zetaruk, et al. 2001; Kazemi. et al., 2009; Altarriba-Bartes, et al.,

2017), which is related to their years of training, as well as progression in the weight categories.

Identification of the most frequent locations of pain in TKD athletes is the first step in planning and programming a safer training process in terms of protecting athletes from the most likely injuries. According to The Orchard Sports Injury Classification System (OSICS) and the Sport Medicine Diagnostic Coding System (SMDCS) (Lystad, et al., 2009; Altarriba-Bartes, et al., 2014), injuries in TKD athletes can be classified according to location or topology (anatomical region), or injury type or pathology. Moreover, Lystad et al. (2009) classified injuries in TKD according to the injury mechanism. In this study, the incidence of pain in TKD athletes was analysed according to location or anatomical regions. Concerning injury's location, most of the studies in TKD (Kazemi & Pieter, 2004; Lystad et al., 2009; Shirani et al., 2010; Altarriba-Bartes, et al., 2014; Pieter, et al., 2013.) have shown that lower limbs are the most frequent region injured.

Determining competition weight categories according to athletes' body weight creates specific problems in health prevention and protection of athletes in combat sports as there is a danger of using inappropriate methods of weight reduction. Such attempts in weight reduction do not necessarily have to be controlled by the coach, or be under medical supervision. They can be undertaken by an athlete himself, without the knowledge of his coach or physician, in order to change his competition category. This is risk behaviour which can become dangerous and increase the risk for injury in training or competition. Rapid weight loss before competition is common in combat sports. Boxers can lose averagely 5.61% of their body weight in the week before competition (Hall & Lane, 2001). Alderman et al. (2004) mention headache and dizziness as direct symptoms of rapid weight loss before competition in wrestlers. Kazemi et al. (2005) state that more than half of Canadian TKD competitors go on a diet before competition to achieve their target weight category, and 33% of them go on a rigorous diet which implies not consuming any food or fluids. Therefore, in combat sports it is important to monitor body weight and pain prevalence in order to prevent injuries, protect athletes' health and prolong their careers.

Occurrence of pain and injury prior to and during competition usually does not make the competitor stop the fight and exclude himself from further competition (Feehan & Waler, 1995), therefore, the risk of acute injuries becoming chronic or more severe is even greater. This is yet another reason to monitor pain prevalence in training, as has been done in this study, because in competition, the desire for competitive success will put athletes in temptation to hide the actual occurrence of pain as well as the severity of injury.

It is assumed that athletes' body weight, as well as their power and competition category, increases with age. In parallel, it is likely that the risk of occurrence of musculoskeletal pain in training and competition will also increase, as well as the incidence of characteristic TKD injuries which can transform from acute to chronic and thus permanently endanger TKD athletes' careers.

The purpose of this study was to identify pain experience among male TKD athletes by defining the proportions of pain status of seventeen body regions and compare pain prevalence frequency with TKD competition categories defined by body weight. Accordingly, the results of four groups of male TKD athletes defined by weight categories were analysed and compared.

The practical goal of this study was to encourage TKD athletes not to ignore the appearance of musculoskeletal pain, warning them of possible critical injury points that are frequent among TKD athletes and of the importance of seeking medical help.

Furthermore, the importance of such study is in the development of a prevention strategy and recommendations to athletes on how to reduce the incidence of injury during competition and training.

Methods

Study population

Subject sample of 58 Croatian male taekwondo athletes with international competitive experience was divided into four subsamples according to their body weight and competition categories on: less than 58 kg (N=23), between 58 and 68 kg (N=13), between 68 and 80 kg (N=18), and over 80 kg (N=4). Study groups were defined according to the competition weight categories and Olympic standards. Other descriptive indicators of TKD athletes (hours of training per week, years of training, age, body height, body weight and BMI) are presented in Table 1, separately for each study group.

Survey

The survey consisted of questions concerning: (1) basic data questionnaire; (2) SEFIP - Self-Estimated Functional Inability because of Pain questionnaire primarily designed for dancers (Ramel, et al., 1999; Miletić, et al., 2015), and applied on TKD athletes in the current study.

In the basic data questionnaire, the subjects were asked to complete a questionnaire through which the details of their current and previous training experience and sport status were collected (regarding hours of training per week, number of years of training, participation, and level of TKD competition).

The SEFIP questionnaire is a simple and valuable tool for defining the pain status in certain regions. In the questionnaire, the subjects were asked to assess their current pain on a 5-point scale (with 0

being no pain and 4 being pain so severe they are unable to practice), regarding different topological body regions: neck, shoulders, elbows, upper arms, forearms, wrists, fingers, back, hips, thighs (front), thighs (back), knees, shins, calves, ankles/feet, and toes.

Data collection was conducted in the period between 1st June 2016 and 1st January 2017 as part of the scientific project *Anaerobic capacities in kicking combat sports*, financed by the Croatian Science Foundation (project number 6524). The purpose of this study and its practical and scientific importance was presented to national TKD federations, coaches and athletes. The athletes were asked to answer the questions of the questionnaire sincerely, based on their own observations and experience.

Methods of data analysis

Basic parameters of variable distribution were calculated and presented in Table 1 (mean value and standard deviation) for all four investigated groups, separately regarding hours of training per week, number of years of training, body height, body weight, and BMI.

Pearson's χ^2 test was applied to compare the proportions of pain experience in the 17 body regions (neck, shoulders, elbows, upper arms, forearms, wrists, fingers, upper back, lower back, hips, thighs (front), thighs (back), knees, shins, calves, ankles/feet, and toes) between the groups of TKD athletes. Statistical level of significance of 95% ($p<0.05$) was applied.

Table 1. Descriptive statistics for groups of TKD athletes defined by body weight and competition category

Taekwondo competition categories (kg)	N 58	Hours of training week (mean/sd)	Years of training (mean/sd)	AGE (mean/sd)	Body height cm (mean/sd)	Body weight kg (mean/sd)	BMI (mean/sd)
Less than 58	23	10.09±4.73	8.26±2.26	15.09±1.38	164.30±10.08	48.57±6.44	17.95±1.32
Between 58 to 68	13	10.77±3.81	10.77±2.42	16.85±.2.19	177.85±3.93	63.23±3.00	20.00±1.05
Between 68 to 80	18	9.06±3.83	12.00±5.50	19.06±4.68	184.11±5.04	74.61±3.53	22.05±1.47
Over 80	4	12.00±5.89	18.00±4.69	25.00±4.24	191.50±4.65	90.75±5.91	24.72±0.50

Results

Table 2. Differences between weight and competition category of TKD athletes: number of athletes that reported any pain (1, 2, 3 or 4) and their percentages in each body weight group, Chi square test results (χ^2) for each body region regarding all four groups and degrees of freedom (df).

	Less than 58 kg (*N*=23)	Between 58 - 68 kg (*N*=13)	Between 68 - 80 kg (*N*= 18)	Over 80 kg (*N*=4)	TOTAL (*N*=58)	χ^2	df
Neck	2 8.7 %	0 0 %	2 11.1 %	1 25 %	5 8.6 %	2.7	3
Shoulders	4 17.4 %	4 30.8 %	3 16.7 %	1 25 %	12 20.7 %	5.8	9
Elbows	1 4.3 %	0 0 %	1 5.5 %	0 0 %	2 3.4 %	.9	3
Upper arms	0 0 %	0 0 %	1 5.5 %	0 0 %	1 1.72 %	2.3	3
Forearms	1 4.3 %	0 %	1 5.5 %	1 25 %	3 5.17 %	17.4*	9
Wrists	3 13 %	0 0 %	1 5.5 %	2 50 %	6 10.3 %	30.4**	9
Fingers	2 8.7 %	3 23.1 %	1 5.5 %	1 25 %	7 12.1 %	10.1	9
Upper back	3 8.7 %	2 15.4 %	4 22.2 %	2 50 %	11 19 %	6.9	6
Lower back	5 21.7 %	4 30.8%	6 33.3 %	3 75 %	18 31 %	5.4	6
Hips	4 17.4 %	1 7.7 %	3 16.7 %	2 50 %	10 17.2 %	9.4	6
Thighs (front)	4 17.4 %	3 23.1 %	4 22.2 %	1 25 %	12 20.7 %	9.1	6
Thighs (back)	4 17.4 %	5 38.5 %	6 33.3 %	2 50 %	17 29.3 %	5.7	6
Knees	9 39.1 %	4 30.8 %	7 38.9 %	3 75 %	23 39.6 %	9.2	9
Shins	2 8.7 %	1 7.7 %	2 11.1 %	2 50 %	7 12.1 %	9.1	6
Calves	2 8.7 %	2 15.4 %	5 27.8 %	0 0 %	9 15.5 %	3.6	3
Ankels/feet	7 30.4 %	4 30.8 %	3 16.7 %	2 50 %	16 27.6 %	7.2	9
Toes	4 17.4 %	2 15.4 %	2 11.1 %	2 50 %	10 %	19.7**	6

*Denotes significant coefficients on the level $p<0.05$;
**Denotes significant coefficients on the level $p<0.01$;

The frequency of musculoskeletal pain occurrence in 17 topological regions registered with SEFIP questionnaire for each study group defined by body weight and competition category separately, and for the overall sample (TOTAL) was presented in Table 2. The most common pain reported by TKD athletes in total was in the knees (39.6%), lower back (31%), thighs/back (29.3%), ankles/feet (27.6%), and shoulders (20.7%) region. However, some differences in pain prevalence exist in the investigated groups.

In the lowest weight category, which also includes the youngest athletes (average age of 15 years) and those with the shortest training experience (averagely 8.2 years), the pain was most frequently reported in the knees (39.1%), ankles/feet (30.4%), and lower back regions (21.7%).

In the second weight category (from 58 to 68 kg), the dominance of pain prevalence according to topological regions was distributed differently, even though there were no significant differences in age (average age of 16.8 years) and training experience (10.7 years).

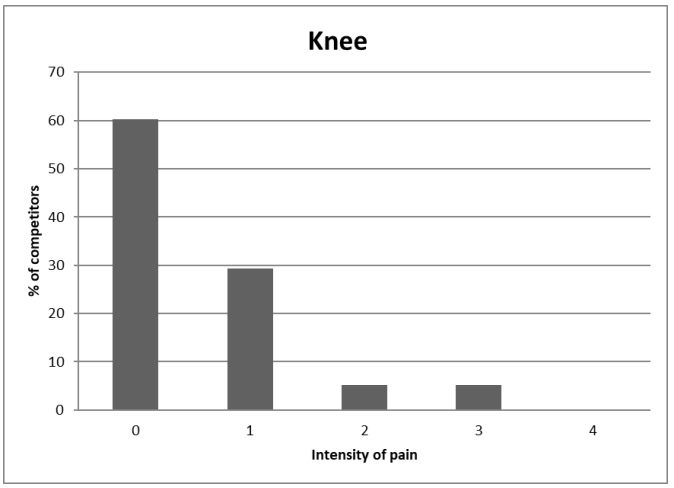
Athletes in the category from 58 to 68 kg most frequently reported pain in the thighs/back area (38.5%), followed by the lower back, shoulders, knees, and ankles/feet area (30.8%). Furthermore, athletes in this group had the highest weekly training load (10.7 hours of training per week).

Athletes in the third weight category (from 68 to 80 kg) were older (average age of 19 years) and had more training experience (averagely 12 years), as compared to the previous two study groups. They reported pain most frequently in the knees (38.9%), lower back (33.3%), and thighs/back area (33.3%).

The fourth weight category (over 80 kg) included only four athletes and the obtained data expressed in percentages in relation to the population are negligible, even though it is evident they also reported pain in the knees and lower back area.

Graph 1

Intensity of pain prevalence among groups of TKD athletes in the knees region: (0) *No pain*; (1) *Some pain but not much problem*; (2) *Pretty much pain but can handle it*; (3) *Much pain, must avoid some movements*; (4) *Cannot practice because of pain*



The intensity of musculoskeletal pain registered by the SEFIP questionnaire is presented only for most frequently reported region (knees) among TKD athletes (Graph 1). Most of the participants reported the occurrence of musculoskeletal pain at the first level (some pain): 29.3%. Only 5.2% athletes reported a higher levels of pain intensity with: *Pretty much pain but can handle it* and *Much pain, must avoid some movements*. Nobody reported pain at the highest level (pain so severe that they *Cannot practice because of pain).*

According to the results of the χ^2 test (Table 2), there was a significant difference between study groups defined by body weight and competition category in frequency of pain prevalence in the region of forearms, wrists and toes.

Discussion

This study confirmed that lower extremities are critical points for occurrence of pain and injuries in TKD athletes, which is congruent with previous studies (Kazemi et al., 2005; Lystad et al., 2009; Pieter et al., 1998; Altarriba-Bartes et al., 2017). Critical points for injury in Croatian TKD athletes are the lower extremities, especially the knees and the ankles, but this study also points to the critical topological region of the lower back, which had respectable incidence in all weight categories.
The highest incidence of pain in the knees area is congruent with a study including the Spanish national team (Altarriba-Bartes et al., 2017), in which the topological region with the highest injury incidence in TKD athletes was the knee (21.3%), followed by the foot (17.0%), and the ankle region (12.2%). The high prevalence of knee pain among Croatian TKD athletes is not surprising because of the use of the lower limb as the primary striking

weapon. High incidence of pain in the ankle/feet area obtained in this study (27.6%) is also related to the kicking techniques in TKD. Kazemi et al. (2006, 2009) report that 98 out of 100 kicking techniques are executed with the foot.

Puberty is an especially sensitive period for injury in the back area in TKD athletes. Even though the back is not directly related to direct strikes and blocks, as the extremities are in TKD attack and defence techniques, the phase of rapid growth and insufficient power of back muscles, in addition to strenuous training, leads to more prominent pain incidence in TKD population in the lower back area. Therefore, special attention should be paid to power training, with emphasis on back muscles, to indirectly enable correct performance of basic TKD techniques in which the back is not necessarily involved directly.

Substantial incidence of pain in the shoulders area must also be mentioned, especially in the weight group from 58 to 68 kg, which also has the highest weekly training extensity. Shoulder pain could be the result of extended training and the use of protective gear in defence techniques, when muscle fatigue occurs precisely in the shoulders and lower back area. To confirm this assumption, future studies should include analysis of the contents, duration and intensity of training in the phases during which the incidence of pain is increased in young athletes.

In the topological regions of forearms, wrists, and toes, significant differences were found in the frequency of reported pain between the study groups. However, in all three topological regions, the incidence of pain was lower in relation to the highlighted critical points (10.3% and less in overall population), and at the lowest intensity level (*Some pain but not much problem*), and are therefore not considered critical regions for occurrence of injury in TKD athletes.

The results of this investigation are descriptive, with the aim of warning TKD athletes and coaches about the risk of injuries by pointing to topological critical points, most frequently reported by TKD athletes. When even the lowest pain level and topological critical points are detected, it is possible to organize the training process so as not to increase the frequency of pain. Monitoring of pain prevalence during the training process is the first step in prevention of injuries among TKD athletes.

Occurrence of pain and injury prior to and during competition usually does not make the competitor stop the fight and exclude himself from further competition (Feehan & Waler, 1995). Therefore, the risk for acute injuries to become chronic is higher. This is the main reason why monitoring of pain prevalence should be provided during training process.

A specific problem has been detected in combat sports because of the importance of weight in determining competition categories (Alderman, et al. 2004; Hall & Lane, 2001). It could lead to errors in performance and future investigations are necessary to analyse their correlation with musculoskeletal injuries. The problem is that athletes would probably not agree to participate in a study investigating injuries before competitions. Therefore, monitoring of pain prevalence in the TKD training process with the SEFIP questionnaire is the only available and suitable source of information necessary for prevention and health care of competitive athletes.

Conclusion

According to the obtained data, approximately 40% of Croatian TKD athletes reported pain experience in the knees and 30% in the lower back and thighs/back region. Early detection of the lower intensity of pain in critical topological points can help prevent the occurrence of injuries, as well as improve professional guidance and appropriate safety requirements for taekwondo athletes. The problem of pain endurance requires not only a multidisciplinary approach, but also education of athletes and coaches with the aim of long-term health protection and prolongation of athletes' careers. Coaches, referees and athletes should receive special education on the possible injuries in TKD, related to characteristic topology of pain incidence, mechanisms of the occurrence of injuries and their treatment. Recent studies, which have been conducted with the aim of health protection and prolongation of TKD athletes' careers and which reflect the actual state related to pain and injury incidence in TKD athletes, will play an important role in this education.

This study has been supported by the Croatian Science Foundation (project number 6524).

References

1. Alderman, B. L., Landers, D. M., Carlson, J., & Scott, J. R. (2004). Factors related to rapid weight loss practices among international – style wrestlers. *Medicine & Science in Sport & exercise;* 36(2), 249-52.
2. Alizadeh, M. H., Shirzad, E., & Sedaghati, P. (2012). Epidemiology of head, neck and torso injuries in taekwondo, karate and judo. *Feyz* 16, 368-385.
3. Altarriba-Bartes, A., Drobnic, F., Til, L., Malliaropoulos, N., & Montoro, J.B., et al. (2014). Epidemiology of injuries in elite taekwondo athletes: two Olympic periods cross-sectional retrospective study. *BMJ Open* 4, 004605
4. Beis, K., Tsaklis, P., Pieter, W., & Abatzides, G. (2001). Taekwondo competition injuries in Greek young and adult athletes. *Eur J Sports Traumatol Relat Res* 23, 130-136.

5. Covarubias, N., Bhatia, S., Campos, L. F., Nguyen, D. V., & Chang, E. Y., (2015). The relationship between Taekwondo training habits and injury: a survey of a collegiate Taekwondo population. *Open Access Journal of Sports Medicine*, (6), 121-127.
6. Feehan, M. & A. E. Waller (1995). Precompetition injury and subsequent tournament performance in full- contact taekwondo. *British Journal of Sports Medicine*; 29 (4), 258-62.
7. Hall, C. J. & A. M. Lane (2001). Effects of rapid weight loss on mood and performance among amateur boxers. *British Journal of Sports Medicine*,35, 390-5.
8. Kazemi, M. & W. Pieter (2004). Injuries at the Ca an National Tae Kwon Do Championships: a prospective study. *BMC Musculoskelet Disord* 5, 22.
9. Kazemi, M., Shearer, H., & Choung, Y.S. (2005). Pre-competition habits and injuries in Taekwondo athletes. *BMC Musculoskelet Disord* 6, 26.
10. Kazemi, M., Chudolinski, A., & Turgeon, M., et al. (2009). Nine year longitudinal retrospective study of taekwondo injuries. *J Can Chiropr Assoc*, 53, 272–81. 37.
11. Lystad, R.P., Pollard, H., & Graham, P.L. (2009). Epidemiology of injuries in competition taekwondo: a meta-analysis of observational studies. *J Sci Med Sport* 12, 614-621.
12. Lystad, R.P., Graham, P.L., & Poulos, R.G. (2013) Exposure-adjusted incidence rates and severity of competition injuries in Australian amateur taekwondo athletes: a 2-year prospective study. *Br J Sports Med* 47,441-446.
13. Miletić, Đ., A. Miletić, Milavić, B. (2015). Age-related progressive increase of lower back pain among male dance sport competitors. *Journal of Back and Musculoskeletal Rehabilitation,* 28: 551–560.
14. Pieter, W., Bercades, L.T., Heijmans, J. (1998). Injuries in young and adult Taekwondo athletes. *Kines* 30: 22-30.
15. Ramel, E. M., Moritz, U., Jarnlo, G.B. (1999). Validation of a pain questionnaire (SEFIP) for dancers with a special created test battery. *Medical Problem of Performing Artist*;14(4):196-203.
16. Schluter-Brust, K., Leistenschneider, P., Dargel, J. Springorum, H. P., Eysel P., Michael, J. W. (2011). Acute injuries in Taekwondo. *Int J Sports Med 32* (8): 629-634.
17. Shirani, G., Kalantar., Motamedi, M.H., Ashuri, A., Eshkevari, P.S. (2010). Prevalence and patterns of combat sport related maxillofacial injuries. *J Emerg Trauma Shock* 3: 314-317.
18. Ünveren, A. (2013). The research of Turkish national taekwondo athletes' injury states and their reasons. *European Journal of Experimental Biology* 3: 224-228.
19. Varkiani, M.E., Alizadeh, M.H., Kazemi, M., Nazari, H., Ghafoorian, A. (2013). Taekwondo Competition Injuries in Iranian Premier League: A Prospective Study. *International Journal of Sport Studies* 3: 542-548.
20. Zetaruk, M.N., Violan, M.A., Zurakowski, D., et al. (2005). Injuries in martial arts: A comparison of five styles. *Br J* Sports Med; 39:29–33. 36.
21. Ziaee, V., Rahmani, S.H., Rostami, M. (2010. Injury rates in Iranian taekwondo athletes: a prospective study. *Asian J Sports Med* 1: 23-28.

LOKACIJA I POJAVNOST BOLA KOD HRVATSKIH NATJECATELJA U TAEKWONDOU

Sažetak

Cilj istraživanja je identifikacija karakterističnih toploških točaka pojave boli kod hrvatskih natjecatelja u TKD kako bi se posredno smanjio broj ozljeda i organizirao sigurniji trenažni proces. Uzorak ispitanika kojeg čini 58 hrvatskih natjecatelja u TKD muškog spola koji imaju međunarodno natjecateljsko iskustvo podijeljen je na četiri subuzorka prema tjelesnoj težini i natjecateljskoj kategoriji. Korišten je SEFIP upitnik kako bi se prikupili podaci o pojavi boli prema topološkim regijama u vratu, ramenima, laktima, nadlakticama, podlakticama, šakama, prstima, gornjem dijelu leđa, donjem dijelu leđa, stražnjem dijelu natkoljenice, prednjem dijelu natkoljenice, koljenima, potkoljenicama, skočnim zglobovima i nožnim prstima. Sportaši su bol najčešće prijavljivali u području koljena (39.6%), donjih leđa (31%), stražnjem dijelu atkoljenice (29.3%), skočnim zglobovima (27.6%), i ramenima (20.7%). Rana detekcija čak i najmanjeg intenzitieta pojave boli može pomoći u prevenciji pojavnosti ozljeda kao i unaprijediti upravljanje treningom i poduzimanjem drugih mjera vezanih za prevenciju od ozljeda.

***Ključne riječi*:** briga o zdravlju, natjecatelji, anatomska regija

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Received: 27 October 2017
Accepted: 20 April 2018

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