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HEALTHY LIVING

Effect of outdoor recreation activity on mental toughness of taekwondo athletes in competition period

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Manuscript Preparation
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Abstract

Background & Study Aim: Taekwondo mixes mental and physical training into a helpful leisure activity. The research focusing on the impact of taekwondo on psychological health, although limited, suggests it is associated with several positive outcomes. These include increased cognitive and affective self-regulation and prosocial behaviour in children and reduced aggressive behaviour in the youth and teenager population. The aim of this study is knowledge about the effect of outdoor recreation activity (walking in nature) on mental toughness components (confidence, control, and constancy) of taekwondo athletes during the competition period.

Material & Methods: The participants of this study were 12 Latvian taekwondo athletes, including males (n = 6) and females (n = 6), aged 17-23. The experiment was held four weeks before the International Sweden Taekwondo Competition (2022). The participants had twelve sessions, including 40 minutes of outdoor recreation (walking in nature), in zones 1 and 2 (HR 101-141 bpm). The Sport Mental Toughness Questionnaire (SMTQ) measured the mental toughness components (confidence, constancy, and control). The data was analyzed using the mean, standard deviations, the Shapiro-Wilk test, and paired sample t-test.

Results: The outdoor recreation activity (walking in nature) did not significantly affect the component of mental toughness (confidence t (11) = 0.451 as the p-value 0.837 >0.05, for constancy t (11) = −0.233; as the p-value 0.820 >0.05 and control t (11) = 0.117; as the p-value 0.909 >0.05) at the 5% level.

Conclusions: Gender disparities exist in the mental toughness components of confidence, constancy, and control among Latvian taekwondo athletes. In particular, male athletes revealed higher average scores in confidence and constancy, with control scores remaining consistent across both male and female athletes. Furthermore, male athletes showed less variability in their confidence and constancy scores when compared to their female counterparts.

Keywords: combat sport • innovative agonology • Likert scale • marital arts • self-confidence

Conflict of interest: Authors have declared that no competing interest exists

Ethical approval: The study was approved by the Ethical Committee of the Latvian Academy of Sport Education (LSPA, protocol no 4, code no 51813)

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INTRODUCTION

As an Olympic sport, taekwondo is a combat sport involving scientific and technological aspects. Taekwondo mixes mental and physical training into a helpful leisure activity. The research focusing on the impact of taekwondo on psychological health, although limited, suggests it is associated with several positive outcomes. These include increased cognitive and affective self-regulation and prosocial behaviour in children and reduced aggressive behaviour in the youth and teenager population [1]. Studies have also shown improvements in mood in taekwondo athletes [2]. However, taekwondo has not been widely examined in psychological research.

Recreation is generally considered an evaluation of leisure time with various activities. Some sources describe outdoor recreation as an activity or experience that includes games or other activities in an individual's free time for pleasure, physical, mental, and emotional well-being [3]. According to the biophilia theory [4], an innate connection occurs between an individual and the natural world, and we might get an advantage from exposure to nature. Another study defines nature mainly as the physical elements and processes created by non-human entities that people can understand, such as the plants and animals, the air and climate, and the surrounding landscapes that incorporate these elements [5].

The relationship between nature and adolescents in recent years got a great deal of attention and shows that adolescents have a declining relationship with nature [6]. On the other hand, the time they spend indoors increases. According to the study [7], if the athlete's physical, technical, and tactical training is at the same level, these mental factors play a crucial role in victory or loss. Mental toughness refers to an individual's capacity to endure and excel in challenging situations, maintaining focus, resilience, and determination. It involves having a strong mind-set that enables one to confront adversity, stress, and setbacks with confidence and resolve, ultimately leading to successful outcomes. By increasing their mental toughness, athletes with good physical qualities and the skills necessary for their sport can increase their chance of achieving stable success in competitions.

Mental toughness in sports is explained as a factor contributing to the optimal functioning of a person [8]. In this study, mental toughness consists of several components: 1) **confidence** is closely related to athletes' ability to interpret stressful situations as a positive opportunity to achieve higher results [9]; 2) **constancy** is the ability to overcome failure, return after a loss, continue the fight, learn from one's mistakes, and improve [10]; and 3) **control** is the ability to focus one's attention on the performance of a task, successfully resist temptations, follow one's goals, and work productively in high-stress situations [11].

Another study shows the effect of short-term outdoor taekwondo training on taekwondo athletes' attention and mood states. Eighteen taekwondo athletes were divided into indoor and outdoor taekwondo groups. Mood state, concentration, and subjective exercise intensity were measured initially and after the training intervention. The results showed that taekwondo training in the natural environment improved the athletes' concentration more effectively than indoor taekwondo training. The outdoor taekwondo group showed positive changes compared to the indoor taekwondo group [12]. The study by Song et al. [13] also showed that combining wood visits with other relaxation activities (e.g., focusing on an object and breathing) supported individuals with mental illness in dealing with stress and sped up their recovery. In the study [14], it was found out that participants who viewed the natural surroundings before being subjected to a mental stressor demonstrated more excellent recovery than those with a view of the built surroundings.

Combat sport – *noun* a sport in which one person fights another, e.g., wrestling, boxing and the martial arts [55].

Martial arts – *plural noun* any of various systems of combat and self-defence, e.g., judo or karate, developed especially in Japan and Korea and now usually practised as a sport [55].

Mental toughness – is *a measure of individual resilience and confidence that may predict success in* sport, education, and the workplace [56].

Self-confidence – is the expected probability that a person will achieve a goal in a certain situation [57].

Likert scale – is a psychometric scale commonly involved in research that employs questionnaires. It is the most widely used approach to scaling responses in survey research, such that the term (or more accurately the Likert-type scale) is often used interchangeably with rating scale, even though the two are not synonymous [58].

INNOAGON – acronym 'innovative agonology' [44].

Innovative agonology – is an applied science dedicated to promotion, prevention and therapy related to all dimensions of health and regarding the optimization of activities that increase the ability to survive from micro to macro scales [42, p. 274].

To investigate the relationship between mental toughness and self-compassion in elite taekwondo athletes participating in league competitions (Premier and Super League) and non-elite, the Sports Mental Toughness Questionnaire (SMTQ) [15] was completed by 150 taekwondo athletes age14-18 years old. The results showed a significant relationship between mental toughness and self-compassion and dimensions of mental toughness (confidence, consistency, and control). According to the results of this study, it seems that mental toughness has an effective role in the self-compassion strategies of adolescent taekwondo athletes. Improving these strategies can help conduct interventions and training programs for mental toughness in taekwondo athletes [16].

Zarei et al. [17] studied the relationship between mental toughness and mental skills of non-elite taekwondo athletes. The subjects were 80 athletes with an average age of 20 ±4.50 and who completed SMTQ. According to the findings, dimensions of mental toughness have an essential role in selecting mental skills, and the levels of skills that every taekwondo athlete uses correlate with mental toughness. A study was carried out to find out the relationship between elite male and female athletes' (in individual and team disciplines) mental toughness and self-confidence. The sample was 145 elite athletes (15 to 40 years old) in different disciplines (martial arts and various team sports). The SMTQ was used to measure confidence. The study's results revealed a positive and significant relationship between mental toughness and confidence, and this relationship is stronger both in women than men and individuals than in team athletes. Feeling confident about self-confidence and high self-confidence, self-regulation, and self-efficacy in athletes arises and seems to be one of the most essential characteristics of people with high mental toughness [18]. Boobani et al. [19] investigated the mental toughness components of taekwondo athletes in Latvia. The SMTQ was given to (n = 40) taekwondo athletes. The comparison of the research results showed that for confidence, the p-value was lower than 5%, with a p-value of 0.045 < 0.05 at a 5% significance level for females, which means that there is a statistically significant difference between females and males in terms of confidence. However, the p-value was higher than 5% for constancy and control, which means no difference between males and females. Based on the results of the toughness range, most of the Latvian taekwondo athletes had moderate mental toughness.

Mental toughness is one of sports psychology's most widely used but least understood terms. It is still a novel in the field of martial arts. Truelove [20] mentioned that only 5-10% of athletes' training time is for developing essential psychological skills such as mental toughness. Also, mental toughness has been considered very important, but studies regarding taekwondo athletes' mental toughness are insufficient. When sports results are not successful regarding the competition and performance, many athletes and their coaches plan to work more on the physical or technical fitness routine. They neglect the psychological aspect as less critical. Taekwondo is an indoor sport, and athletes prefer to do all kinds of training inside the club. For example, if there is cardio training, they like to do it on the treadmill inside the club but not go outdoors for jogging or walking. With more than half the global population living in urban areas [21], individuals generally spend less time outdoors. Nevertheless, no research has studied the effect of outdoor recreation activity on taekwondo athletes' mental toughness in the competition period.

The aim of this study is knowledge about the effect of outdoor recreation activity (walking in nature) on mental toughness components (confidence, control, and constancy) of taekwondo athletes during the competition period.

MATERIAL AND METHODS

Participants

The participants were 12 Latvian taekwondo athletes, including males (n = 6) and females (n = 6), aged 17-23. The sample was selected according to the following criteria: represented Latvia in international competitions and had at least ten years of experience in taekwondo. These criteria were selected to minimize the impact of other factors on the research results.

Procedure

The experiment was held four weeks before the International Sweden Taekwondo Competition (2022). The experiment included twelve sessions, with 40 minutes of outdoor recreation (walking in nature), in zones [22] 1 and 2 (HR 101-141

bpm). Before and after the experiment, the participants filled in the Sports Mental Toughness Questionnaire (SMTQ).

Sports Mental Toughness Questionnaire

The Latvian version of SMTQ [23] was completed by taekwondo athletes (n = 12). The questionnaire consists of 14 statements about three components of mental toughness-confidence, constancy, and control. The answer options are ranked on a Likert scale from A to D. The A scale stands for 'Very true', and the D stands for 'Not at all'. Items 1-6 measure confidence; 7-10 measure constancy; 11-14 measure control. Confidence scores range from 6-24; constancy and control scores from 4 – 16. Items 1-8 are positively scored (i.e., A = 4, B = 3, C = 2, D = 1). Items 9-14 are negatively scored (i.e., A = 1, B = 2, C = 3, D = 4).

Statistical analysis

The analyses were conducted using IBM SPSS ver. 26. Data are presented as the mean (M) and standard deviations (±). The normality of data was verified using the Shapiro-Wilk test and a paired t-test to analyse the data.

Ethical approval

This study was approved by the Ethical Committee of the Latvian Academy of Sport Education (LSPA, Protocol Nr. 4, Code Nr. 51813). Informed consent was obtained from all participants involved in the study. All procedures followed the ethical standards of the Declaration of Helsinki.

RESULTS

The results of the sample for taekwondo athletes (n = 12) show the mean for confidence before the walking activities was M = 16.833, indicating that the athletes in this sample have a confidence level in their abilities with the standard deviation of SD ±3.614 (Figure 1).

The standard deviation before the walking for confidence was relatively high. After four weeks of outdoor recreation activity (walking in nature), the mean was M = 16.417, with the standard deviation of ±2.937. The paired sample t-test results indicate that t (11) = 0.451. The difference is insignificant as the p-value 0.837 is >0.05 at the 5% level. The confidence results for male and female athletes differed in walking (before and after the experiment), the results show that the mean for confidence before the walking program for male and female athletes was M = 17.500, with the standard deviation of ±3.564, and the mean for female athletes M = 16.167, with the standard deviation ± 03.869. The paired sample t-test indicates that for male athletes, t (5) = 1.083, and

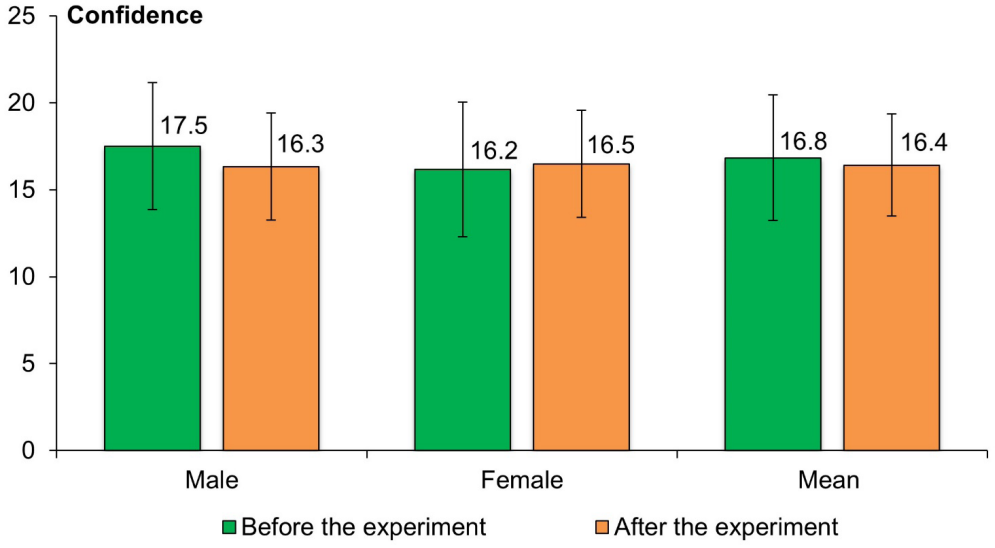

Figure 1. Confidence for taekwondo athletes (n = 12) before and after the experiment.

females, *t* (5) = −0.216, showing that the difference is not significant as p-value 0.328 and p-value 0.837 are >0.05 at the 5% level.

The sample results for taekwondo athletes (n = 12), provided in figure 2, showed that the mean for constancy before the walking program was M = 13.083. The standard deviation ±1.379 for constancy is low, indicating that the scores for this component of mental toughness are relatively consistent among the athletes. After four weeks of outdoor recreation activity (walking in nature), the mean was M = 13.167, with the standard deviation of ±0.937. The paired sample t-test results indicate that *t* (11) = −0.233, the difference is insignificant as the p-value 0.820 is >0.05 at the 5% level (Figure 2).

The results of constancy for male and female athletes differ regarding walking (before and after the experiment), the results show that the mean constancy score is higher for male athletes (M = 13.5) than for female athletes (M = 12.667). The standard deviation ±1.761 for male athletes is lower than for female athletes SD ±0.816. This suggests that male athletes have a more considerable difference in constancy scores than female athletes. After four weeks, the mean for males decreased slightly to M = 13.000, with a lower standard deviation of SD ±0.894. The mean for female athletes increased slightly to M = 13.333, with a slightly higher standard deviation of ±1.033. The paired sample t-test indicates that for male athletes *t* (5) = 0.889, and females *t* (5) = −2.000, indicating that the difference is not significant as the p-value 0.415 is >0.05 at the 5% level for males and the p-value for females 0.102 is >0.05 at the 5% level.

The sample results for taekwondo athletes (n = 12) showed that the mean for control before the walking activities was M = 11.167 with the standard deviation of ±1.801, indicating that the athletes do not have a high level of control over their emotions and thoughts during the training and competition (Figure 3). After four weeks of outdoor recreation activity (walking in nature), the mean was M = 11.083, with the standard deviation of ±2.234. While there is a slight decrease in the mean score and an increase in the standard deviation, the result of the paired sample t-test indicates that *t* (11) = 0.117, the difference is insignificant as the p-value 0.909 is >0.05 at the 5% level. The results of the control component for male and female athletes did not differ in walking (before and after the experiment), the results showed that the mean before the walking was similar for male and female athletes, M = 11.333 for males and M = 11 for females. The standard deviation for male athletes ±2.066

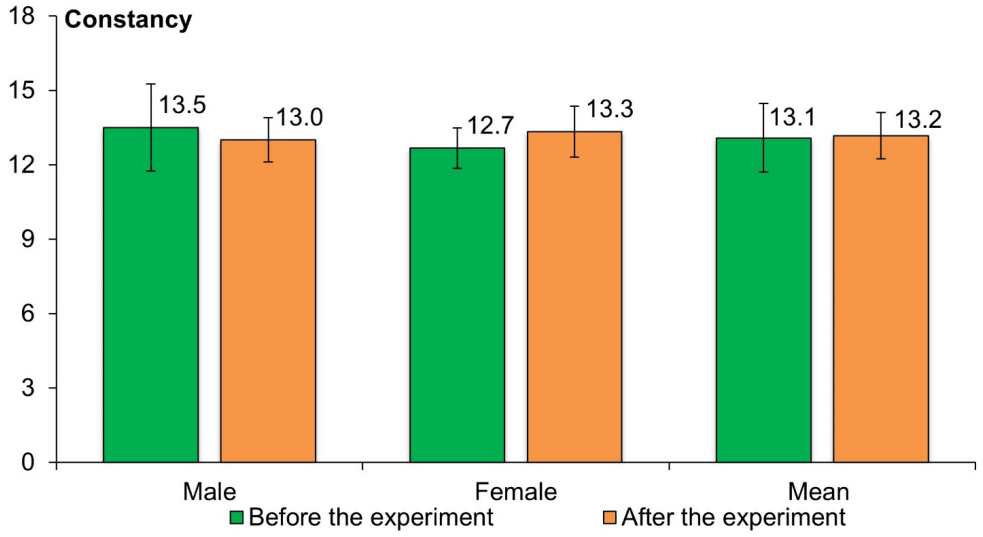

Figure 2. Constancy for taekwondo athletes (n = 12) before and after the experiment.

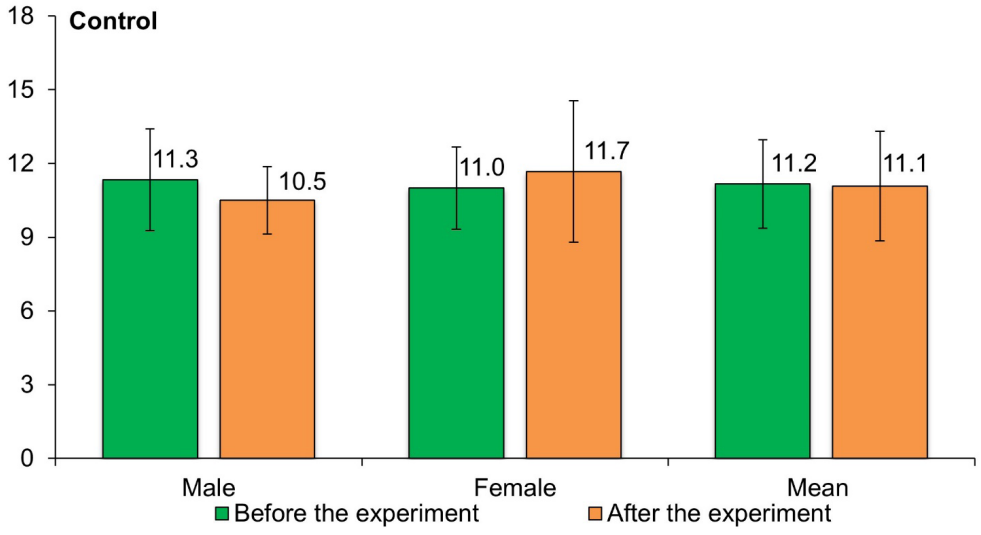

Figure 3. Control for taekwondo athletes (n = 12) before and after the experiment.

was higher than for female athletes ±1.673, suggesting more variation among male athletes than female athletes.

The mean stress score after the experiment for male athletes was M = 10.500, with the standard deviation of ±1.378. After the experiment for female athletes, the mean score was M = 11.667, with the standard deviation of ±2.875. Although there is a change in the mean scores, these changes are not statistically significant as the paired sample t-test indicates that, for male athletes, t (5) = 0.916, and for females shows that t (5) = −0.614, indicating that the difference is not significant as the p-value for male is 0.402 >0.05 and p-value for the female is 0.566 >0.05 at the 5% level.

DISCUSSION

The result of outdoor recreation activity on mental toughness components was not significant. A study [24] reported different kinds of mental toughness, not only one applicable to everyone and every sport. For example, sports like golf and car racing require different skills. There could be absolute control in a critical moment versus being mentally tough enough to take risks; as it was also mentioned, not only the discipline of sports matters. Another difference could be, for example, sport or athlete level with one peak performance (Olympics) and, in contrast, an athlete with a season full of important competitions. In terms of enduring the normal pressure during the training, different skills may be needed. Therefore, it was suggested to examine further mental toughness not only as a general construct but also as a specific one for the kind of sport or athlete. According to this assumption, there is nothing like one suitable type of mental toughness.

Bowler et al. [25] have commented that most research on restorative environments only examines relatively short-term effects, and this was also the case in our studies. The respondents walked only briefly, and more prolonged environmental exposure was needed to study. Organized group walks help individuals to visit a natural environment they may not have visited [26]. The results [14] showed that the participants who viewed the natural environment before being subjected to a mental stressor demonstrated more remarkable recovery than those with a view of the built environment. A study revealed that walking in nature, incredibly meditative walking, significantly affects certain psychological aspects, such as happiness and self-esteem, than walking in the gym [27].

In scientific literature, mental toughness is described as one of the most widely used but

least understood terms in sports psychology. Congenital or established psychological dominance over one's opponent helps maintain perseverance and self-confidence and act effectively in high-stress situations during the most responsible moments of competitions [28]. The researchers [29] accordingly appeal for further research on mental toughness in martial arts and the inclusion of mental toughness training into the workouts. Since 2013, the mainstream in researching mental toughness has gone in different directions. A study [30] stated that positive relationship exists between time (years of training, hours of training per week), the desire to achieve, attentional control, and mental toughness attributes.

Mental toughness may be even more crucial in martial arts, not only if the pressure of competitions and performance is assumed, like many other sports [31]. More importantly, contact fighting (or even complete contact), sometimes long-term fighting, and negative energy control during the fight when the focus is critical may be very demanding. The aspects of full contact practice, body to body, and dealing with violence and negative energy make martial arts a fruitful area for testing mental toughness and its development and exploring the application and influences of mental skills training. Our environment (coaches) can affect our mental and physical health and health-related behaviours [32, 33]. Some places can promote good health and well-being, while others may have the opposite effect. Therefore, both motor and mental analyses should be performed by experts to prevent various types of injuries [34-40].

The discussion of our research results is dominated by the theme of combining mental toughness training with the competitive activities of professional taekwondo athletes. Some references to the specificity of other combat sports and martial arts in this discussion are, however, saturated with activities for the purposes of sport. This is the standard of most interdisciplinary analyses in scientific works on psychophysical activity with a common origin of hand-to-hand combat. We deliberately avoided the term 'martial arts' to emphasize that we identify with a new applied science – INNOAGON, whose basic method is an interdisciplinary approach [41-46]. This activity, which has its roots in the traditions of various eras, continents, regions [47-51], unfortunately, is promoted on the Internet and electronic media mainly as a bloody spectacle. These two words 'martial' and 'arts' supplemented with the third 'mixed' are a camouflage of neo gladiatorship [52, 53, 44], which cannot be eliminated in the way that was initiated by the decree of Emperor Constantine the Great in 326 and even so the precedent lasted for almost 350 years – until 681 [54].

CONCLUSIONS

Mental toughness and its components (confidence, constancy, and control) are crucial in martial arts. Contact fighting sometimes extends life-term learning, and negative energy control during the fight when the focus is critical may be very demanding. The aspects of full contact practice, body to body, and dealing with violence and negative energy make martial arts a fruitful area for testing mental toughness and its development. It can be concluded that there are some differences in the mental toughness components of confidence, constancy, and control between male and female Latvian taekwondo athletes. Male athletes have higher mean scores for confidence and constancy, while scores for control are similar for both male and female athletes. Male athletes have less variation in confidence and constancy scores than female athletes. However, there is more variation in the control scores among male athletes. These findings provide a starting point for further investigation into Latvian taekwondo athletes' mental toughness and how it relates to their performance in competition.

The study has several limitations, such as having no control group and a small sample size. Thus, we suggest that future studies should be conducted on larger samples, preferably selected by random sampling, and involving other age groups.

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