



# Effect of a Specific Warm-up based on Oppositional Wrestling Games on The Technical Performance and Mental Health of Physical Education Students

Hassan Melki<sup>12ABCDE</sup>, Mohamed Sami Bouzid<sup>12ABC</sup>, Youcef Rezgouani<sup>1ABD</sup>

<sup>1</sup>Higher Institute of Sport and Physical Education, ISSEP Ksar-Saïd, Tunisia

<sup>2</sup>Research unit ECOTIDI (UR16ES10). Virtual University, Tunisia

**Authors' Contribution:** A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

**Corresponding Author:** Hassan, Melki, hmelki@yahoo.fr

## Abstract

**Background and study aim.** This study explored the impact of two different specific warm-up protocols (consisting of either opposition games or classical exercises) on technical-tactical performance, intrinsic motivation and stress levels in wrestling schoolchildren.

**Materials and methods.** Sixty-three schoolchildren divided into two parallel groups (specific warm-up opposition game group: EG, n = 18, aged 12.42 ± 0.87 years; and classical specific warm-up group: CG, n = 18, aged 12.41 ± 0.78 years) who completed three 75-minute sessions over four weeks practicing different specific warm-up exercises.

Data was analyzed with IBM SPSS to find the normality, mean and standard deviation. A two-factor mixed analysis of variance (ANOVA) model with repeated measures was performed to measure differences in mental health and technical-tactical performance for both group.

**Results.** Several results emerged from this study; (i) EG who followed a specific warm-up program based on opposition games performed better in the wrestling test and were able to improve the number of successful leg attack skills, with a significant interaction compared to CG, (ii) EG obtained a better leg attack score due to their quality of execution and (iii) Compared with children in the CG group children in the EG group feel happy and motivated and their stress levels decrease.

**Conclusion.** Wrestling teaching and training specialists should be convinced of the beneficial effects of exercises based on opposition games on students' technical and mental skills.

**Keywords:** warm-up, game, motivation, wrestling, stress.

## Анотація

**Вплив специфічної розминки на основі ігор, пов'язаних із боротьбою, на технічну працездатність та психічне здоров'я школярів на заняттях фізичною культурою**

**Хасан Мелкі, Мохамед Самі Бузід, Юсеф Резгуані**

**Мета.** У цьому дослідженні вивчався вплив двох різних конкретних протоколів розминки (які складаються або з ігор з елементами боротьби, або з класичних вправ) на техніко-тактичні показники, внутрішню мотивацію та рівень стресу у школярів, які займаються боротьбою.

**Матеріал та методи.** Шістдесят три школярі, розділені на дві паралельні групи (група спеціальної, що базується на іграх з елементами боротьби: EG, n = 18, вік 12,42 ± 0,87 років; та група класичної спеціальної розминки: КГ, n = 18, вік 12,41 ± 0,78 років), які завершили три 75-хвилинні сеанси протягом чотирьох тижнів, практикуючи різні спеціальні вправи. Дані були проаналізовані за допомогою IBM SPSS для пошуку нормальності, середнього значення та стандартного відхилення. Двофакторна змішана дисперсійна модель аналізу (ANOVA) з повторними вимірами була виконана для вимірювання відмінностей у психічному здоров'ї та техніко-тактичних показниках для обох груп.

**Результати.** Внаслідок цього дослідження було отримано кілька результатів; (I) EG, які дотримувалися певної програми розминки, заснованої на іграх з елементами боротьби, показали кращі результати в тесті з боротьби та змогли покращити кількість успішних навичок атаки ногами, зі значною взаємодією у порівнянні з КГ; (II) EG отримали кращий результат атаки ногами через якість виконання та (III) порівняно з дітьми у





групі КГ діти у групі ЕГ почувалися щасливими та мотивованими, а рівень їх стресу знижувався.

**Висновок.** Фахівці з навчання та підготовки по боротьбі повинні бути переконані у сприятливому впливі вправ, заснованих на іграх з елементами боротьби, на технічні та розумові навички студентів.

**Ключові слова:** розминка, гра, мотивація, боротьба, стрес.

## Introduction

Sporting success requires progress in physical and technical performance, as well as the ability to mobilize psychologically [1]. Similarly, competitive success requires not only improved physical and technical level, but also an adequate mental health [2]. According to Tropin et al. [3] and Güven [4], wrestling is no exception, since high-level performance requires exhaustive training, including physical preparation, technical and tactical aspects, as well as mental health aspects. According to Chen and Lien [5], various studies seek to consolidate integration of the game-based method into wrestlers' training to multiply opportunities for success in competitions.

Wrestling is a dynamic, combative complex sport, combining various physical and technical components to succeed [6, 7]. In this line, a technical-tactical analysis of freestyle wrestling bouts conducted by Melki and Bouzid [8] showed that the most common technique used to score points was leg attack movements, and winners competing in international tournaments performed almost twice as many leg attack maneuvers as their opponents. In recent years, a concept known as "learning based games" has combined the elements of skill and conditioning in a coherent approach [9]. Indeed, a direct transition from training to the game environment is conditioned by the similarity between training and play. Games must reproduce real-life competitive events, phases in order to expose players to the intensity, decision-making, speed, and execution of skills required in competition [10]. In wrestling, the use of game-based methods as learning exercises simulates movement patterns in attack and defense, while at the same time maintaining a competitive environment where children are required to perform under stress and with effort [11]. Moreover, for Gabbett et al. [12], games are designed to stimulate children's motivation at the time of learning. Therefore, student motivation is supposed to be formed from the very start of learning activities, which is useful for consolidating their desire to learn in a serious way [13]. In the present study, we adopted in the training program various wrestling warm-up based opposition game. Games were used, as an approach to teaching skills and an important facilitator of children's cognitive and affective growth, as well as an important means of developing motor skills [14].

For Melki et al. [15], each sporting activity has a learning process involving various steps of training sessions, with the initial task based on general and specific warm-up exercises, designed to prepare each pupil's body progressively for the main activity of the session. Zois et al. [16], indicated that Warm-up activities are a regular part of exercise routine intended to prevent injury and improve athlete performance by raising body temperature and increasing blood supply to the muscles [17] and accelerated metabolic responses [18]. Garris [19], suggested that the warm-up should

be structured to attract more interest, in order to get students seriously involved. Some research [20] conducted on games in warm-up has concluded their use can reduce students' burnout. In the same line [21, 22], have stated that game-based warm-up maximizes students' learning enjoyment and self-confidence. In wrestling, assessing physical, physiological and psychological performance and supervising their progress are key to a wrestler's success [15]. Mirwald et al. [23], concluded that the correct motor, physical, technical and motivational characteristics of young wrestlers during competition are crucial factors in determining success in wrestling.

**The purpose of the study** is to investigate the associations between a specific warm-up based on oppositional wrestling games and the technical-tactical performance on schoolchildren's mental health, as well as their stress levels, intrinsic motivation and fundamental technical skills.

## Materials and Methods

### Participants

The participants of this study were 36 students (20 boys and 16 girls), aged 10-12 years (Mage = 11.42, SD = 0.9) in their first year of wrestling training from the same wrestling school located in Ariana, Tunisia. However, all the participating children were in good health and not suffering from any disability, musculo-articular, cardiological, neurological or respiratory disease or dysfunction. The exclusion criteria were as follows: (a) refusal of participation by child, (b) non-consent of the parents, (c) any physical problem temporarily or permanently preventing the student from undergoing the administration of the motor tests, and (d) Beginners to combat sports with no specific previous knowledge.

Participants and their parents were informed verbally and in writing of the procedures and possible risks before taking part in the study. At the same time, the study was also approved by the local ethics committee and was conducted in conformity with the Declaration of Helsinki.

### Procedure

The study was conducted on a quasi-experimental design with pre- and post-measurements. We conducted a randomized, single-blind, repeated-measures, parallel-group controlled trial with equal distribution, divided into an experimental group (EG; took part in a training program in which the specific warm-up was based on wrestling opposition games, n = 18; mean age = 11.42 ± 0.17 years) and control group (CG; followed the same technical program with a standard specific warm-up, n = 18; mean age = 11.40 ± 0.17 years).

The design of our training program was based on a previous study [8] that focused on wrestling techniques and opposition games as preparatory learning stages.



The program covered four weeks, with 12 sessions of 70 minutes each, taking place three times per week: Monday, Wednesday, and Friday. Training sessions in both groups (EG and CG) used a single 65-minute training session for both programs. The warm-up protocol included a combination of 08 minutes of general warm-up, 14 minutes of specific warm-up based on the wrestling opposition game, followed by 35 minutes of wrestling training, followed by 5 minutes of individual reference wrestling bouts and a 5-minute recovery period using dynamic and static flexibility exercises.

Both groups performed the same general warm-up, while the specific warm-up was different. For the EG, the specific warm-up protocol training program (oppositional wrestling games) based on cooperative games centered on touch games as an introductory phase. Players must touch and act on their partner, ensuring stability across various forms of garde. A second phase includes opposition games such as object defense and traditional wrestling games, mainly Sumo, with the aim of helping students learn the fundamental notion of combat, and bringing them into closer and more frequent contact. The control group (CG) participated in a specific warm-up protocol based on combined routine exercises and technical wrestling training.

In both groups, the central part of the training program was based on technical training in freestyle wrestling. Lessons included leg attack training, followed by a series of progressive and complex learning situations [8]. The leg techniques taught over the 12 lessons were similar to the combined approach, including body attack positions, arm control and head position. The complexity of the exercises increased progressively throughout the sessions. At the end of each training session, the participant played wrestling matches freely for 5 minutes. At the same time, the study was also approved by the local ethics committee and was conducted in conformity with the Declaration of Helsinki. After the intervention program, all participants assessed anthropometric variables, wrestling performance indices and psychological status.

For Anthropometric Variable Measurements, we followed the guidelines of Melki et al. [8], to determine the weight and height of the participating children. Body weight was measured in the standing position, wearing a T-shirt and shorts, without shoes, to the nearest 0.1 kilogram, using an electronic scale. Height was measured in a standing position, without shoes, to the nearest 0.5 cm, using a stadiometer (Seca, Hamburg, Germany). We calculated the body mass index (BMI) by using the following formula: body mass (kg)/height (m).

For the wrestling performance Indexes, a special individual assessment sheet was designed to evaluate the technical performance during a 2 x 2 min reference bouts regarding; (a) number of leg attacks attempted [24], (b) number of successful leg attacks, (c) number of unsuccessful leg attacks [7] and (d) leg attack score attributed to the attacker [25]. Each successful legs attack will be given a total score of "2 pts" or "4 pts" [26].

For the measurement of the stress level, students were asked to respond to the Perceived Stress Scale-14 [27]. The PSS-14 consists of 14 questions with a range of options (never, almost never, sometimes, often and

very often) on a Likert scale of 0 to 4 for each item. Items 4, 5, 6, 7, 9, 10 and 13 were given a positive statement. Consequently, their scores were calculated as inverted (0=4, 1=3, 2=2, 3=1, and 4=0). Final scores ranged from "0 to 56", with a high score indicating a high level of stress, and a low score indicating a lower level of stress. The PSS-14 scores were divided into different stratified quartile groups. The two upper quartiles and the two lower quartiles (28 being the operational cut-off value for the upper limit) were combined and qualified as severe, moderate, mild and no stress.

To determine student's intrinsic motivation, an adapted version of Ryan's [28] Intrinsic Motivation Inventory (IMI) was used. The IMI comprises nine items, suitably reformulated by McAuley et al. [29], for the specific context of use in sports settings. There are four subscales in the IMI: interest/pleasure, effort/importance, perceived competence and tension/pressure. A few sample items are: "I really enjoyed wrestling"; "I think I'm pretty good at wrestling training", "I put a lot of effort into training for wrestling" and "I felt tense while wrestling". A 7-point scale (1 strongly disagree and 7 strongly agree) was used to rate the participants' responses. These subscales have been used in previous physical education-based studies, which have shown adequate validity and acceptable internal reliability (between 0.68 and 0.84) [30, 31].

#### *Statistical analysis*

Normality was determined using the Shapiro-Wilk test. Values were presented as mean and standard deviation after confirmation of normality ( $p > 0.05$ ). The independent-samples t-test was used to assess differences in youth anthropometric variables, wrestling performance index, stress level and intrinsic motivation between the overall EG sample and the CG sample. Repeated measures two-factor analysis of variance (ANOVA) was used to measure the effect of group versus time for all variables. For significant interactions between group and time, the Bonferroni post-hoc test was applied to establish possible intragroup differences (pre vs. post), while intergroup differences (EG vs. CG) were determined using the Mann-Whitney U test. Effect size (ES) was determined using Cohen's d, considering a small (0.20-0.49), moderate (0.50-0.79) or large ( $> 0.80$ ) effect [32]. All analyses showed a significant difference at the 5% level. SPSS 25.0 statistical software (SPSS 25.0 for Windows, SPSS Inc., Chicago, IL, USA) was used to analyze data.

## **Results**

As shown in Table 1, the result of the normality test was normally distributed. As regards the results of descriptive statistical tests, the paired-samples t-test shows that specific warm-up based on the wrestling opposition game has a significant effect on the evolution of psychological state and fundamental wrestling movements, which improve in the EG group ( $p < 0.05$ ), but there is no significant effect in the control group ( $p > 0.05$ ).

Anthropometric measurements were intended to determine the initial fitness level of the participants at the beginning of the experiment and, consequently, the



**Table 1.** Normality test calculation on the effect of a specific warm-up based on the opposition game in wrestling on psychological state and leg attack performance

Variable	EG (sig)		CG (sig)		Distribution
	pre-test	post-test	pre-test	post-test	
Total of legs attacks attempted (NB)	0.103	0.125	0.122	0.136	Normal
Total of successful legs attacks (NB)	0.133	0.114	0.154	0.152	Normal
Total of unsuccessful legs attacks (NB)	0.124	0.155	0.148	0.144	Normal
Stress level (PSS-14 scale)	0.100	0.143	0.121	0.110	Normal
Intrinsic motivation (IMI scale)	0.129	0.121	0.133	0.107	Normal

**Note:** (Sig) significant value; (NB) Number; (IMI) Intrinsic Motivation Inventory; (PSS-14) Perceived Stress Scale-14.

formation of homogeneous groups with approximately similar fitness level to ensure the validity of the experiment. The mean differences in anthropometric variables between the EG and CG groups are presented in Table 2. The results of the mixed ANOVA test indicate that there were no significant interactions between group and time for anthropometric variables, ( $p > 0.05$ ).

**Table 2.** Baseline characteristics of the sample (n = 36)

Indicator	Group	(Mean ± SD)	p
Age (years)	EG	11.42±0.17	0.896
	CG	11.40±0.17	
Height (cm)	EG	148.5 ±3.01	0.123
	CG	153.6±4.10	
Body weight (kg)	EG	48.89±2.98	0.470
	CG	45.32±1.42	
BMI (kg/m <sup>2</sup> )	EG	22.17±1.24	0.39
	CG	19.24±1.22	

**Note:** (EG) Experimental Group; (CG) Control Group; (SD) Standard deviation; (p) significant value.

For the technical performance, the mean revealed a significant difference and the experimental group was performed better than the control group by the opposition game specific warm-up as shown in Table 3. However, there was a difference in the results for the unsuccessful leg attack variable. A significant improvement was observed in the control group. Specific warm-up based on opposition games had a significant effect on the decrease in unsuccessful leg attack performance ( $P = 0.055$ ). The technical performance of the experi-

mental group increased significantly ( $P = 0.001$ ). This means that the warm-up based on opposition games had a significant effect on leg attack skills.

For the wrestling performance index related to the scores attributed to the leg attack for the group vs. time, a repeated-measures ANOVA with Bonferroni's post-hoc test revealed a significant improvement in favor of the EG between pre-test and post-test in the leg attack score of 1 point (Figure 1, Panel A: M diff = 3.19; SE = 0.42;  $p < 0.001$ ;  $t = 7.65$ ). For the 4-point leg-attack score shown between pre- and post-test score indexes, the EG compared with the CG was significantly improved (Figure 1, Panel B: M diff = 1.81; SE = 0.21;  $p < 0.001$ ;  $t = 8.79$ ).

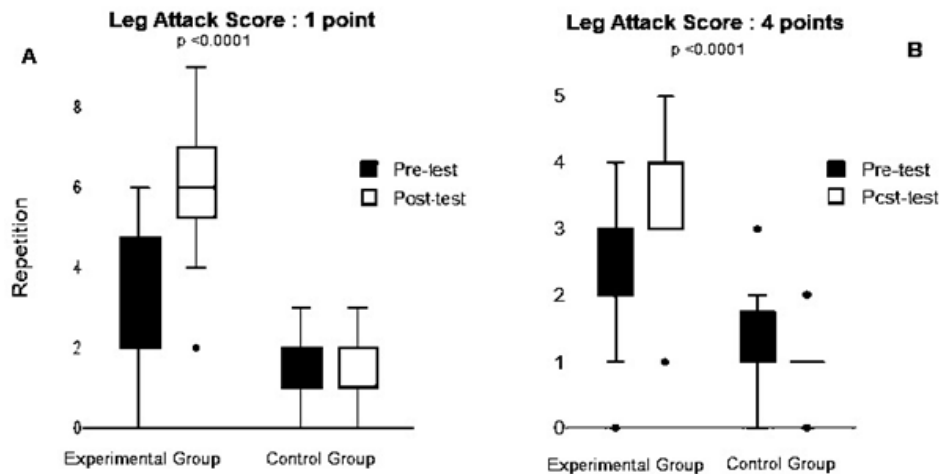
As shown in Table 4, findings of effect of two different specific warm-up methods (method 1 based on opposition games, method 2 based on classical exercises) on the mental health (stress level and intrinsic motivation) of youth was demonstrated. Concerning the intrinsic motivation, the group vs. time repeated measures ANOVA with Bonferroni post-hoc test revealed a significant interaction for effort/importance ( $F = 11.33$ ;  $p = 0.001$ ; ES = 0.70) and intrinsic motivation ( $F = 17.21$ ;  $p = 0.001$ ; ES = 0.32) in favor of the EG, but without significant interaction for interest/ enjoyment ( $F = 0.09$ ;  $p = 0.531$ ; ES = 0.19.), and perceived competence ( $F = 1.30$ ;  $p = 0.105$ ; ES = 0.01).

Concerning the stress level, the group vs. time repeated measures ANOVA with Bonferroni post-hoc test revealed a significant difference in the mean between the two training groups (Table 4). The EG Findings showed a lower stress scores ( $M^{±SD} = 04.87±1.5$ ;  $F = 15.33$ ;  $p = 0.001$ ), than the CG ( $M^{±SD} = 09.66±2.9$ ;  $F = 18.9$ ;  $p = 0.001$ ).

**Table 3.** Effect of two specific warm-up method on leg attack performance in a pre- and post-training test using wrestling bout (N = 36)

Group	Technical performance	Wrestling bout pre/post-training test					
		(M ±SD)		p	t		
		Pre-test	Post-test		Pre-test	Post-test	
Experimental Group	a) Nb of the attempted leg attack	4.57	6.88	0.001	0.001	4.36	3.06
	b) Nb of successful legs attack	1.00	4.00	0.004	0.004	2.5	1.5
	c) Nb of unsuccessful legs attack.	3.02	2.00	0.055	0.055	5.1	4.1
Control Group	a) Nb of the attempted leg attack	4.88	4.45	0.001	0.001	2.02	2.02
	b) Nb of successful leg attack	2.50	3.52	0.001	0.001	1.00	1.5
	c) Nb of unsuccessful leg attack.	4.11	4.00	0.001	0.001	3.02	4.02

**Note:** (Nb) Number; (M) Mean; (SD) Standard deviation; (t) Student's t-test; (p) significant value



**Figure 1.** Youth intra- and inter-group comparisons of leg attack performance scores

**Table 4.** Effect of two specific warm-up method on mental health of youth (N = 36)

Variable	Experimental group (n=18)				Control group (n=18)			
	(M ±SD)	F	p	ES	(M ±SD)	F	p	ES
Intrinsic Motivation	8.66±1.58	17.21	0.001	0.32	4.23±2.7	12.36	0.001	0.28
Effort /Importance	12.26±3.62	11.33	0.001	0.70	09.25±1.0	8.95	0.001	0.53
Interest/Enjoyment	3.56±3.40	0.009	0.531	0.19	6.84±2.9	5.87	0.50	0.19
Stress Level	04.87±1.5	15.33	0.001	0.28	09.66± 2.9	18.39	0.001	0.20

## Discussion

The aim of this study was to examine the effect of a specific warm-up based on oppositional wrestling games on children's mental health, as well as their stress levels, intrinsic motivation and fundamental technical skills.

Several results emerged from this study. The primary outcomes indicated the following: (a) According to the results of this study, the anthropometric characteristics of the two groups were similar. This is in line with previous studies that found no difference in anthropometric characteristics between the two research groups [33] and it was also the case for [26], whose study included children of the same age and skill level; (b) for technical performance scores in wrestling involving leg attack, participants who followed a specific warm-up program based on opposition games performed better in the combat test and were able to improve the number of successful leg attack skills, with a significant interaction compared to control group participants. Furthermore, these findings are in agreement with those of [34, 35], but contradict those of other studies [36], which may be due to the type of opposition game chosen. A previous study reported that in freestyle wrestling, wrestlers who tried a leg attack several times during bouts achieved a higher victory rate [3]; (c) for the wrestling performance score linked to the leg attack scores (1 point or 4 points), the EG had a better leg attack score of 4 points due to the quality of leg attack execution which was influenced by the opposition games used during the training program. There were improvements in the number of leg attack with a significant interaction compared to the CG. In the present study, the quality of movement during the leg attack was correlated with the distance

between the two leaguers during combat. However, according to Gabbett et al. [12], a shorter distance between opponents can be beneficial in terms of reaching the opponent's legs more quickly; (d) for the effect of a wrestling training program based on opposition games during the specific warm-up, the level of mental health improved in the experimental group. Indeed, according to [20] a specific warm-up based on opposition games can involve a variety of playful activities, so that children feel happy and motivated, and their stress levels decrease.

Concerning the intrinsic motivation, the results revealed a significant interaction for effort/importance, interest/enjoyment and intrinsic motivation in favor of GE, but no significant interaction for perceived competence. The result of this study was in line with a study conducted by Mujriah et al [1], which showed that game-based activities have a positive impact on affective and psychomotor changes. Moreover, according to [23], for physical activity to be interesting and fun, it must have a positive impact on the quality of mental health.

In the present study, we found a positive correlation between specific warm-up based on opposition games and stress levels in children. Our results are similar to those of Barbosa and De Avila Rodrigues [36], who mentioned that games include activation and motivation and have positive effects on learning by practice, which our results also highlighted.

## Conclusions

In the context of preparing children to learn to wrestle, the specific warm-up program based on opposition games can produce significantly greater effects on children's mental health, as well as on their stress



levels, intrinsic motivation and fundamental technical skills. Furthermore, wrestling teaching and training specialists should be convinced of the beneficial effects of exercises based on opposition games on students' technical and mental skills.

## References

1. Bohuslavskva V, Miroshnichenko V, Drachuk S, Yakovliv V, Chernyshenko T. Interactive tools for theoretical training of kayakers and canoeists aged 13-16. *Health, sport, rehabilitation*, 2022; 8(2): 31-41. <https://doi.org/10.34142/hsr.2022.08.02.03>
2. Brandt R, Bevilacqua GG, Crocetta TB, Monteiro CBdM, Guarnieri R, Hobold E, Flores LJF, Miarka B, Andrade A. Comparisons of mood states associated with outcomes achieved by female and male athletes in High-Level judo and Brazilian Jiu-jitsu championships: Psychological factors associated with the probability of success. *J Strength Cond Res*. 2021; 35(9):2518-24. <https://doi.org/10.1519/JSC.0000000000003218>
3. Tropin Y, Romanenko V, Korobeynikova L, Boychenko N, Podrihalo O. Special physical training of qualified wrestlers of individual styles of wrestling. *Slobozhanskyi Herald of Science and Sport*. 2023; 27(2): 56-63. <https://doi.org/10.15391/sns.v.2023-2.001>
4. Güven F. The effect of technical training on physical parameters of 11-14 years old freestyle wrestlers. *Turk J Kinesiol*. 2023; 9(2):115-24. <https://doi.org/10.31459/turkjkin.1282317>
5. Chen Y-C, Lu Y-L, Lien C-J. Learning environments with different levels of technological engagement: a comparison of game-based, video-based, and traditional instruction on students' learning. *Interactive Learning Environments*, 2021; 29(8): 1363-1379. <https://doi.org/10.1080/10494820.2019.1628781>
6. Cieśliński I, Gierczuk D, Sadowski J. Identification of success factors in elite wrestlers—an exploratory study. *PLoS One*. 2021; 16(3):e0247565. <https://doi.org/10.1371/journal.pone.0247565>
7. Kotaro F, Daichi Y, Shigeki N. Technical-tactical analysis of mens wrestling: a case study of the 72nd National Athletic Meet of 2017 in Japan. *Int J Wresl Sci*. 2019; 9:1-6.
8. Melki H, Bouzid MS. Teaching wrestling at school: proposal of a new pedagogical approach based on games for learning of technical moves. *Pedagogy of Physical Culture and Sports*. 2023; 27(2):123-30. <https://doi.org/10.15561/26649837.2023.0204>
9. Bissau C, Hastie P, Ramos A, Mesquita I. What Actually Differs between Traditional Teaching and Sport Education in Students' Learning Outcomes? A Critical Systematic Review *Journal of Sports Science and Medicine*. 2021; 20(1):110-25.
10. Dehnuu VV, Azadi S, Gahreman D, Doma K. The effect of a 4-week core strengthening program on determinants of wrestling performance in junior Greco-Roman wrestlers: A randomized controlled trial. *J Back Musculoskelet Rehabil*. 2020; 33(3):423-30. <https://doi.org/10.3233/bmr-181328>
11. Gierczuk D, Lyakh V, Sadowski J, Bujak Z. Speed of reaction and fighting effectiveness in elite Greco-Roman wrestlers. *Percept Mot Skills*. 2017; 124(1):200-13. <https://doi.org/10.1177/0031512516672126>
12. Gabbett T, Jenkins D, Abernethy B. Game-based training for improving skill and physical fitness in team sport athletes. *Int J Sports Sci Coach*. 2009; 4(2):273-83. <https://doi.org/10.1260/174795409788549553>
13. Eraoka E, Ferreira HJ, Kirk D, Bardid F. Affective learning in physical education: A systematic review. *Journal of Teaching in Physical Education*. 2020; 40(3):460-73.
14. Testers L, Gegenfurtner A, Brand-Gruwel S. Taking affective learning in digital education one step further: Trainees' affective characteristics predicting multicontextual pre-training transfer intention. *Front Psychol*. 2020; 11:2189. <https://doi.org/10.3389/fpsyg.2020.02189>
15. Hasan M, Mohamed B, Mourad F. Correlation between Morphological and Functional Variables during a Specific Wrestling Test for Tunisian Cadet Greco-Roman Wrestlers. *Journal of Physical Education and Sport*. 2019; 19:1282-7.
16. Zois J, Bishop DJ, Ball K, Aughey RJ. High-intensity warm-ups elicit superior performance to a current soccer warm-up routine. *J Sci Med Sport*. 2011; 14(6):522-8. <https://doi.org/10.1016/j.jsams.2011.03.012>
17. Demirhan B. The effect of two semester wrestling training on university students' body composition and some motoric characteristics. *Int Educ Stud*. 2020; 13(6):26. <https://doi.org/10.5539/ies.v13n6p26>
18. Müller E, Ben-Sira D, Shargal E. Morphological, physiological and technical characteristics of male and female wrestlers. *Int J Sports Med*. 2006; 27(4):307-15.
19. Garris R, Ahlers R, Driskell JE. Games, motivation, and learning: A research and practice model. *Simul Gaming*. 2002; 33(4):441-67. <https://doi.org/10.1177/1046878102238607>
20. Cocca A, Espino Verdugo F, Ródenas Cuenca LT, Cocca M. Effect of a game-based physical education program on physical fitness and mental health in elementary school children. *Int J Environ Res Public Health*. 2020; 17(13):4883. <https://doi.org/10.3390/ijerph17134883>
21. Utesch T, Dreiskämper D, Strauss B, Naul R. The development of the physical fitness construct across childhood. *Scand J Med Sci Sports*. 2018; 28(1):212-9. <https://doi.org/10.1111/sms.12889>
22. Gamble P. A skill-based conditioning games approach to metabolic conditioning for elite rugby football players. *J Strength Cond Res*. 2004; 18(3):491-7. <https://doi.org/10.1519/00124278-200408000-00017>
23. Deineko A, Cieslicka M, Krasova I, Bilenka I. Ukrainian folk outdoor games in the system of physical training facilities for gymnasts aged 6-7 years. *Slobozhanskyi Herald of Science and Sport*. 2022; 26(2): 52-57. <https://doi.org/10.15391/sns.v.2022-2.004>
24. Hsi-Po H, Chin-Lung F, Jui-Chen T, Shih-Ying W. Analysis of technical and physical abilities on the success of youth wrestlers. *J Exerc Sci Fit*. 2020; 18(4):204-9.
25. Ito S. High-intensity interval training for health benefits and care of cardiac diseases - The key to an efficient exercise protocol. *World J Cardiol*. 2019; 11(7):171-88. <https://doi.org/10.4330/wjcv.11.7.171>
26. Uww.org. [cited 2024 Mar 24]. Available from: [https://uww.org/sites/default/files/media/document/wrestling\\_rules\\_7.pdf](https://uww.org/sites/default/files/media/document/wrestling_rules_7.pdf)
27. Ryan RM, Edward L. Self-determination theory: basic psychological needs in motivation, development, and wellness. *Rajagiri Management Journal*. 2021; 15:88-90.
28. Ryan RM, Deci EL. Self-determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness. *Rajagiri Management Journal*. 2021; 15(1):88-90.
29. McAuley E, Duncan T, Tammen VV. Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: a confirmatory factor analysis. *Res Q Exerc Sport*. 1989; 60(1):48-58. <https://doi.org/10.1080/02701367.1989.10607413>
30. Wang J, Liu R-D, Ding Y, Xu L, Liu Y, Zhen R. Teacher's autonomy support and engagement in math: Multiple mediating roles of self-efficacy, intrinsic value, and boredom.



- Front Psychol. 2017; 8:1006. <https://doi.org/10.3389/fpsyg.2017.01006>
31. Thalheimer W, Cook S. How to calculate effect sizes from published research: A simplified methodology. *Work-Learning Research*. 2002; 1(9):1–9.
32. González CSG, Del Río NG, Adelantado VN. Exploring the benefits of using gamification and videogames for physical exercise: a review of state of art. *International Journal of Interactive Multimedia and Artificial Intelligence*. 2018; 5(2):46–52.
33. Gerodimos V, Karatrantou K, Dipla K, Zafeiridis A, Tsiakaras N, Sotiriadis S. Age related differences in peak handgrip strength between wrestlers and non athletes during the developmental years. *The Journal of Strength and Conditioning Research*. 2013; 27(3):616–23. <https://doi.org/10.1519/JSC.0b013e318257812e>
34. Acar S, Cumhuriyet University, Faculty of Letters, Department of Anthropology, Sivas, Turkey, Ozer BK, Ankara University, Faculty of Languages, History and Geography, Department of Anthropology, Ankara, Turkey. Assessment of the relationships between physical and motor features of young wrestlers from turkey. *J. Anthropol. Sport Phys. Educ.* 2020; 4(1):15–24. <https://doi.org/10.26773/jaspe.200103>
35. Wulf G, Lewthwaite R. Optimizing performance through intrinsic motivation and attention for learning: The OPTIMAL theory of motor learning. *Psychic Bull Rev.* 2016; 23(5):1382–414. <https://doi.org/10.3758/s13423-015-0999-9>
36. Barbosa MW, de Ávila Rodrigues C. Project Portfolio Management teaching: Contributions of a gamified approach. *Int J Manag Educ.* 2020;18(2):100388. <https://doi.org/10.1016/j.ijme.2020.100388>
- Higher Institute of Sport and Physical Education; Ksar Saïd 2010, Manouba, Tunisia.

## Supplementary Information

### Article details

The online version available at

<https://doi.org/10.15391/snsv.2024-3.007>

### Acknowledgements

The author Hassan Melki would like to express his gratitude to the researchers; MSB and YR who helped to realize all parts of this research.

### Conflict of interest

All authors confirm that there is no conflict of interest in this study.

**Received: July 24, 2024; Accepted: September 17, 2024**

**Published: September 30, 2024**

### Cite this article

Melki H, Bouzid MS, Rezguani Yo. Effect of a Specific Warm-up based on Oppositional Wrestling Games on The Technical Performance and Mental Health of Physical Education Students. *Slobozhanskyi Herald of Science and Sport*. 2024;28(3):157-163. <https://doi.org/10.15391/snsv.2024-3.007>

### Authors details

**Hassan Melki:** <https://orcid.org/0000-0001-5387-4279>,

hmelki@yahoo.fr

Higher Institute of Sport and Physical Education; Ksar Saïd 2010, Manouba, Tunisia.

**Mohamed Sami Bouzid:** <https://orcid.org/0000-0002-9226-2141>,

med.sami.bouzid@gmail.com

Higher Institute of Sport and Physical Education; Ksar Saïd 2010, Manouba, Tunisia.

**Youcef Rezguani:** <https://orcid.org/0009-0005-0282-4745>,

yourezg@gmail.com