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Mutual Learning Transfer Between Wrestling and Sumo as Similar Combat Sports Activities: Impact on Youth's Technical Performance and Intrinsic Motivation

Hassan Melki[1,2ABCDE], Jordan Hernandez-Martinez[3ABCD], Tomas Herrera-Valenzuela[4ABD], Izham Cid-Calfucura[5ABCD], Braulio Henrique Magnani Branco[6ABCD] and Pablo Valdés-Badilla[7,8ABCDE]

[1]Higher Institute of Sport and Physical Education of Ksar Saïd
[2]Virtual University of Tunis
[3]Universidad de Los Lagos
[4]Universidad de Santiago de Chile
[5]Universidad Santo Tomás
[6]Cesumar University
[7]Universidad Católica del Maule
[8]Universidad Viña del Mar

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Corresponding Author: Pablo Valdés-Badilla, E-mail: valdesbadilla@gmail.com
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Abstract

Objectives. This study aimed to compare the effects of wrestling and sumo wrestling as similar combat sports activities in a training program on technical wrestling scores, wrestling performance indexes, and intrinsic motivation in youth practitioners.

Materials and methods. A randomized controlled trial using a single-blinded design, and repeated measures of parallel groups (sumo-based group: EG, n = 19, aged = 12.42 ± 0.87 years; and only wrestling group: CG, n = 19, aged = 12.41 ± 0.78 years) was conducted. Three 65-minute weekly sessions for four weeks were dedicated to the interventions. A two-factor mixed analysis of variance (ANOVA) model with repeated measures was performed to assess the group vs. time impact analysis.

Results. The findings revealed a significant interaction between the variables, whereby higher values were observed for technical wrestling scores on the attempted head and arm throw test ($F_{1;18}$ = 356.2; $p < 0.001$; ES = 0.60), wrestling performance indexes on the pushing opponent test ($F_{1;18}$ = 8.31; $p = 0.009$; ES = 0.08), intrinsic motivation for effort/importance item ($F_{1;18}$ = 12.24; $p = 0.003$; ES = 0.82) and intrinsic motivation item ($F_{1;18}$ = 19.36; $p = 0.000$; ES = 0.24) in favor of EG.

Conclusions. In conclusion, the sumo-based training program produces significantly greater responses on technical performance, and intrinsic motivation, specifically regarding wrestling training.

Keywords: motivation, combat sports, transfer learning, martial arts, technical performance.

Introduction

Learning should be a pleasure (Mak & Fancourt, 2020), discovering new concepts to understand the world better. Pleasure may seem incompatible with school-based learning and a waste of time for some people (Nailer et al., 2023). According to Ryan and Deci (2021), motivation is a dynamic state relative to each student. For this reason, Wijnia (2020) showed that motivation should be generated in learning so that each student wants to learn. Motivation has been identified as a critical factor influencing student learning outcomes (Lo et al., 2022). Creating an environment conducive to learning seems necessary so that students feel comfortable in it and thus reduce their fear of academic

achievement (Quansah et al., 2022). From this perspective, Ramlan et al. (2023) stated that transfer involves using previous performance and learning experiences in a particular context and then adapting these experiences to similar or different contexts. The area of affective learning, which aims to promote feelings, attitudes, emotions, and social behavior, has been an educational objective of physical education for almost a century (Testers et al., 2020).

In this sense, a systematic review by Teraoka et al. (2020) shows that physical education classes promote affective learning based on feelings, attitudes, emotions, and social behaviors. Including combat sports in physical education classes stimulates affective learning and the development of motor skills (Pereira et al., 2022). The different modalities of combat sports through continuous, intermittent and object-mediated physical contact are capable of developing multiple motor skills, allowing balanced motor development in children and adolescents (Pereira et al., 2022).

Within combat sports, we find wrestling, which can stimulate discipline in children and youth (Biletic et al., 2023). In this perspective, Melki et al. (2019) have pointed out that wrestling can be fun and safe for children and adolescents. Besides, it allows children to develop physical skills such as speed, agility, and muscular endurance (Genç, 2020), carrying out activities such as pulling, pushing, bending, squeezing, and twisting (Balushka et al., 2020). The critical factor of success in wrestling is technical rather than strength, given that a certain level of strength has been developed to achieve mastery of the technique (Cieśliński et al., 2021). There are two styles of wrestling in competitions, i.e., the Freestyle and the Greco-Roman (Cieśliński et al., 2021). The Freestyle includes the upper and lower body and is characterized by intermittent short-duration and high-intensity efforts (Chaabene et al., 2017). On the other hand, the Greco-Roman style only permitted upper body movements and presented a combat time of 6 min (2 rounds x 3 min) (Chaabene et al., 2017). Besides that, Chaabene et al. (2017) state that wrestling offers various moral development experiences, such as mature self-concept, decision-making, self-control, and sportsmanship. More specifically, for Destani et al. (2014) to use the concept of fair play, students can learn to obey rules and develop personal and social responsibility for their behavior.

Conversely, sumo is a traditional Japanese sport in which two wrestlers fight to push their opponent out of the circle or make any part of their body touch the ground (Nakagawa & Nakagawa, 2022). In this regard, Reicher (2020) indicated the similarity between wrestling and sumo in terms of their technical and physical characteristics. Therefore, sumo wrestlers must develop power, agility, balance, and aerobic capacity (Nakagawa & Nakagawa, 2022). In a study conducted by Beekley et al. (2006) on trained adult sumo wrestlers, they observed that they had higher body weight, body fat percentage, skeletal muscle mass, and maximum oxygen consumption (VO_2max) absolute compared to untrained wrestlers; these differences being significant ($p < 0.05$). However, this may be different according to the age range of the wrestlers, which is indicated by Arakawa et al. (2020) in Japanese elite wrestlers, showing that wrestlers younger than 12 years old show a significant decrease ($p < 0.05$) in body fat percentage compared to wrestlers older than 20 years old.

There is evidence of the effects of wrestling, such as sumo, on anthropometric variables, such as developing technical and tactical skills and affective learning (Beekley et al., 2006; Destani et al., 2014; Melki et al., 2019). So far, the effects on intrinsic motivation, as well as technical and tactical skill development, are unknown when comparing wrestling with sumo as an intervention.

The purpose of the study is to compare the effects of wrestling and sumo wrestling as similar combat sports activities in a training program on technical wrestling scores, wrestling performance indexes, and intrinsic motivation in youth.

Materials and Methods

Participants

According to a previous study in combat sports (Brasil et al., 2020), the ideal number of participants per group was 17 subjects. For this calculation, an average difference of 1.2 % in body fat percentage was used as the minimum difference required for substantial clinical relevance, with a standard deviation of 0.22, considering an alpha level of 0.05 was considered with a power of 80 % and an expected loss of 15 %. GPower software (version 3.1.9.6, Franz Faul, University of Kiel, Germany) was used to calculate statistical power.

The inclusion criteria were: (i) enrolled in a wrestling promotion center in Manouba (It is located in the north of Tunisia, near the coast of the Gulf of Tunis [Mediterranean Sea], the capital of the country, the city of Tunis, and the Mejerda River), that agrees to participate in the intervention; (ii) age range between 10 and 12 years old; (iii) have been practicing for more than 6 months; (iv) attend ≥ 85 % of the sessions scheduled for the training session. Exclusion criteria were the following: (i) any musculoskeletal injuries or medical contraindications (i.e., congenital heart disease, fever, diarrhea, or general malaise) that would prevent their average performance in the assessments and intervention; and (ii) novice practitioners without any prior knowledge of combat sports. This requirement was applied to prevent post-transfer effects between sports (Smeeton et al., 2004). Eligibility was verified for 50 youth: 5 refused participation, 4 were ineligible, and 3 were excluded. A total of 38 participants (22 boys and 16 girls) were randomly assigned to either the EG (n = 19; mean age = 12.42 ± 0.87 years old) or the CG (n = 19; mean age = 12.41 ± 0.78 years old). The youth did not present pain before the assessments or during the training sessions, without presenting injuries during the intervention.

All participants had to accept the criteria for using and handling the data by signing an informed consent and assent form their parents or guardians because they were minors, authorizing the use of the information for scientific purposes. The research protocol was approved by the research of of Universidad Autónoma de Chile (approval number: N° 18-2018) and developed following the Declaration of Helsinki with human beings.

Procedure

We conducted a randomized controlled trial, single-blinded (evaluators), repeated measures of parallel groups with equal distribution of youth in a wrestling promotion

center in Manouba, Tunisia, distributed in experimental group (EG; participated in a training program center on sumo-based as a preparatory phase combined with technical training in wrestling) and a control group (CG; followed only a wrestling technical training). The randomization was performed using the randomizer internet site[1]. The methodology followed was the Consolidated Standards of Reporting Trials (CONSORT) guidelines (Turner et al., 2012). The interventions were conducted over four weeks, comprising 12 sessions. These sessions occurred thrice weekly (on Mondays, Wednesdays, and Fridays) for 65 minutes each. The assessments included anthropometric variables, technical wrestling scores, performance indexes, and intrinsic motivation. All assessments were conducted in the afternoon (between 17:00 and 19:00 h) and in the exact location (wrestling promotion center, with the control of variables, temperature, and investigators that applied the procedures in pre- and post-assessments).

Following the International Society for the Advancement of Kinanthropometry (ISAK), all assessments were performed according to the ISAK guidelines (Marfell-Jones et al., 2012). A digital scale (Seca 769, Germany; accuracy of 0.1 kg) was used to measure body weight, and a stadiometer (Seca 220, Germany; accuracy of 0.1 cm) was used to measure height. Each participant's body mass index (BMI) was calculated by dividing weight in kilograms by the square of height in meters.

An individual assessment grid has been specially designed to assess wrestlers' technical skill during the bouts, covering the following elements (Melki & Bouzid, 2023): (i) number of successful holds by head and arm throws, which is defined by Stordopoulos et al. (2016), as any hold awarding 4 points to a wrestler in a standing position that causes his opponent to lose all contact with the ground, moving him in the air and bringing him to the ground in a position of direct danger, (ii) number of unsuccessful head and arm throws, when the wrestler does not complete the execution of the hold and the referee does not award points and, (iii) number of attempted head and arm throws.

During bouts conducted for both groups at the end of training sessions, a total score of "1" or "4" was awarded to each student who met the two technical performance criteria (United World Wrestling, 2017): (i) pushing the opponent outside the playing area by lifting and controlling him. The referee stops the bout and awards 1 point and, (ii) performing a throw using the head and arm to place the opponent on his back by losing any contact with the mat.

Youth's intrinsic motivation was calculated using an adapted version of Ryan (1982) Intrinsic Motivation Inventory (IMI, in Supplementary Material), the IMI was conducted with students who can speak and understand English (the evaluators tried to explain the inventory both collectively and individually). It comprises fourteen items suitably reworded for the specific context for use in sports settings by McAuley et al. (1989). The IMI contains four subscales: interest/enjoyment, effort/importance, perceived competence, and tension/ pressure. Sample items were: "I enjoyed wrestling very much," "I think I am pretty good at wrestling training," "I put much effort into wrestling training," and "I felt tense while doing wrestling." Students rated their answers on a 7-point scale (1 strongly disagree and 7 strongly agree). These subscales have been used in previous physical education-based studies in which adequate validity and acceptable internal reliability (between 0.68 and 0.84) were demonstrated (McAuley et al., 1989; Wang et al., 2017).

[1] https://www.randomizer.org

Training program

The training program is based on a previous study (Melki & Bouzid, 2023) regarding wrestling techniques and sumo exercises. For both groups (EG and CG), a single session of both programs lasted up to 65 minutes: 10 min of standardized general warm-up, 10 min of specific warm-up based on oppositional skills, followed by 35 min of basic training, followed by individual reference bouts (this bout takes place with a change of time with an objective determined in advance by the coach, for example, only the head and arm throw technique is applied for the duration of the bout) and concluded by a 5-min of wrestling bouts and 5-min recovery period using dynamic and static flexibility exercises. One session was devoted at the end of the training program to assess each participant's morphological variables, technical wrestling scores, wrestling performance indexes, and intrinsic motivation. Both group's (EG and CG) training programs were based on technical wrestling sessions, including learning head and arm throws. For the EG, sumo was used as an associated preparatory phase to the same technical wrestling program. At the end of each training session, all participants participated in one-on-one reference bouts.

The central part of the training program for the EG (sumo-based) consisted of exercises centered on sumo as a preparatory phase combined with technical training for wrestling. The exercises were divided into 15 minutes of sumo varieties: taking the opponent out of a circle, marking the wrestling area, or knocking him down, and 20 minutes of wrestling techniques.

For the CG, the central part consists of 35 min of technical training in wrestling. Lessons included learning the arm and head throwing technique, followed by a series of progressive and complex learning situations. The throwing techniques taught during the 12 lessons were similar to the combined approach: the attacking body positions, arms 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. After the intervention program, all participants assessed morphological variables, technical wrestling scores, wrestling performance indexes, and intrinsic motivation.

Statistical Analysis

Firstly, the Shapiro-Wilk test was used to determine the data normality. The values were reported as mean and standard deviation after the normality confirmation ($p > 0.05$). The t-test for independent samples was used to assess differences in youth anthropometric variables, technical wrestling scores, wrestling performance indexes, and intrinsic motivation between the whole sample of the EG and CG. A two-factor repeated measures of analysis of variance (ANOVA) were used to measure the group vs. time

effect of all variables. When the group vs. time interaction was significant, the Bonferroni post-hoc test was applied to establish possible intragroup differences (pre vs. post), while intergroup differences (EG vs. CG) were determined with the Mann-Whitney U test. The effect size (ES) was determined through Cohen's d, considering a small (0.20-0.49), moderate (0.50-0.79), or large (> 0.80) effect (Cohen, 1992). A significant difference was established for all analyses at 5 %. Data were analyzed with SPSS 25.0 statistical software (SPSS 25.0 for Windows, SPSS Inc., Chicago, IL, USA).

Results

The mean differences in anthropometric variables between the EG and CG are presented in Table 1. Indeed, the mixed ANOVA revealed no significant group vs. time interactions for anthropometric variables.

For the Technical Wrestling Score, the group vs. time repeated measures ANOVA with Bonferroni post-hoc test revealed a significant interaction for attempted head and arm throw ($F_{1;18}$ = 356.2; p < 0.001; ES = 0.60. Figure 3, Panel A) in favor of the EG, but without significant interaction for unsuccessful head and arm throw ($F_{1;18}$ = 2.67; p = 0.120; ES = -0.23. Figure 3, Panel B), and successful head and arm throw ($F_{1;18}$ = 0.88; p = 0.360; ES = 0.41. Figure 1, Panel C).

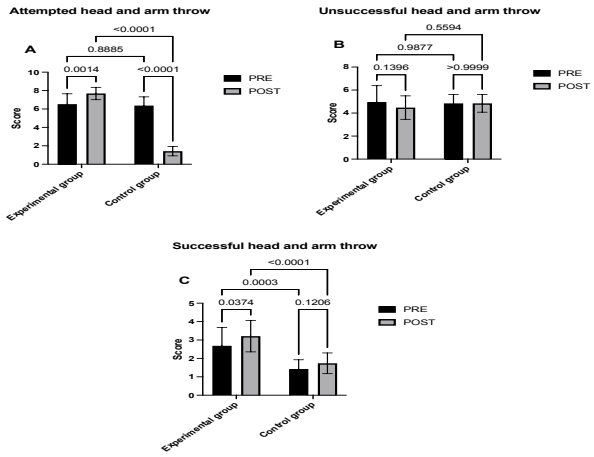

Fig. 1. Intra and intergroup multiple comparisons on technical wrestling score in youth

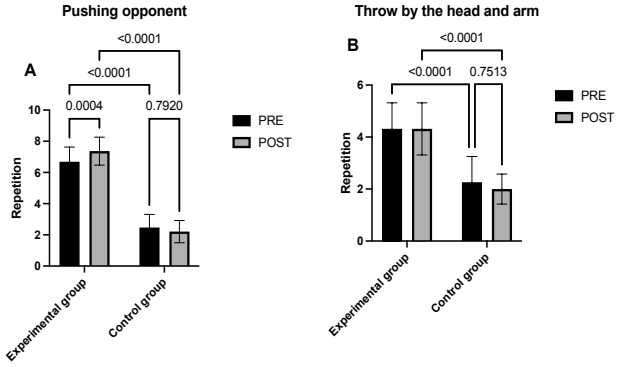

Fig. 2. Intra and intergroup multiple comparisons on wrestling performance index in youth

For the wrestling performance index, the group vs. time repeated measures ANOVA with Bonferroni post-hoc test revealed a significant interaction for pushing opponent ($F_{1;18}$ = 8.31; p = 0.009; ES = 0.08. Figure 4, Panel A) in favor of the EG, but without significant interaction for throw by the head and arm ($F_{1;18}$ = 1.00; p = 0.331; ES = -0.09. Figure 2, Panel B).

Concerning the intrinsic motivation, the group vs. time repeated measures ANOVA with Bonferroni post-hoc test revealed a significant interaction for effort/importance ($F_{1;18}$ = 12.24; p = 0.003; ES = 0.82. Figure 5, Panel C) and intrinsic motivation ($F_{1;18}$ = 19.36; p = 0.000; ES = 0.24. Figure 5, Panel D) in favor of the EG, but without significant interaction for interest/enjoyment ($F_{1;18}$ = 0.10; p = 0.761; ES = 0.21. Figure 2, Panel A), and perceived competence ($F_{1;18}$ = 1.70; p = 0.209; ES = 0.03. Figure 3, Panel B).

Discussion

This study aimed to compare the effects of wrestling and sumo wrestling as similar combat sports activities in a training program on technical wrestling scores, wrestling performance indexes, and intrinsic motivation in youth. The training program lasted four weeks and was based

Table 1. Baseline Characteristics of the sample

Assessment	Group	(Mean ± SD)	p-value	95% CI	η^2
Age (years)	EG (n = 19)	12.42 ± 0.87	0.957	0.59 to 0.56	8.05
	CG (n = 19)	12.41 ± 0.78			
Height (cm)	EG (n = 19)	148.50 ± 3.01	<0.001	2.74 to 7.47	0.35
	CG (n = 19)	153.60 ± 4.10			
Body weight (kg)	EG (n = 19)	48.89 ± 2.98	<0.001	-5.11 to -2.04	0.38
	CG (n = 19)	45.32 ± 1.42			
BMI (kg/m^2)	EG (n = 19)	22.17 ± 1.24	<0.001	-3.74 to -2.12	0.60
	CG (n = 19)	19.24 ± 1.22			

SD: Standard deviation. CI: confidence interval. BMI: body mass index. EG: experimental group. CG: control group. p-value: significant value

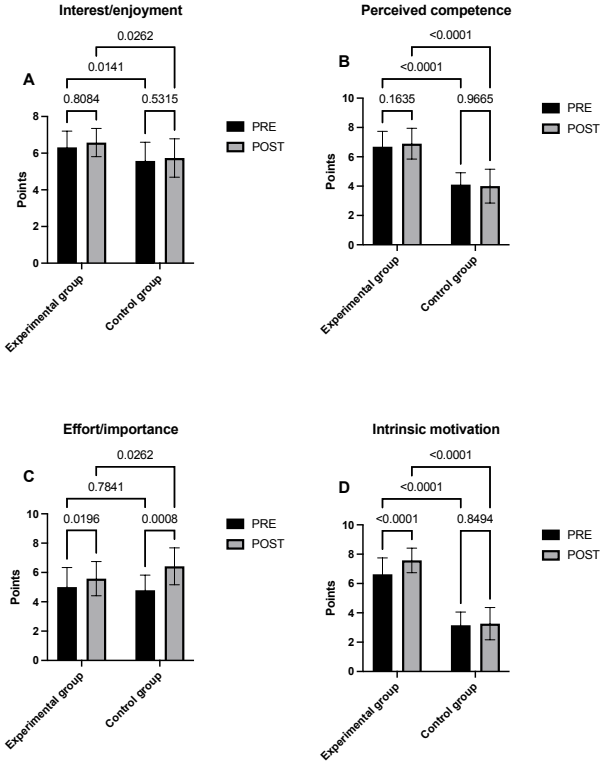

Fig. 3. Intra and intergroup multiple comparisons on intrinsic motivation in youth

on three 65-minute weekly sessions, as stipulated in the wrestling centers' schedule. The primary outcomes indicated the following: (i) for the indices of technical wrestling performance, it was observed that the EG that used the sumo method had a better performance in the test of head and arm throwing attempts with a significant interaction compared to the CG; (ii) the EG had a better wrestling performance index as a result of improvements in the pushing the opponent test, with a significant interaction compared to the CG. Although the throwing and displacement techniques taught during the 12 sessions were similar in both groups, the improvements in the EG that used the sumo method may be due to a positive transfer of motor skills (Soderstrom & Bjork, 2015). The comparison between the technical performances of the two intervention groups showed that the motor learning skills practiced by the participants in this study were more valuable than traditional play and wrestling. In that sense, we must understand motor learning as a set of internal processes associated with practice and experience, which are capable of generating changes in the ability to produce motor activities through a specific skill (Cano-de-la-Cuerda et al., 2015; Torres-Moreno et al., 2022), favoring synaptic neuronal connections, having multiple benefits, such as the coordinated work of the cerebral hemispheres based on their differences and functional specialties (Robinson et al., 2017). Specifically, learning can produce a change in the physical and biochemical structure of the brain, resulting in a brain reorganization that impacts the expression of skills and behaviors (Drews et al., 2013; Tompsett et al., 2017). Furthermore, these adaptations can be expressed globally in forming new synapses or modifying already established synaptic connections (Cano-de-la-Cuerda et al., 2015; Torres-Moreno et al., 2022). In addition, according to Cole et al. (2018), motor learning would not only be generated in the short term, as could be identified in this four-week intervention, but through brain stimulation, it would be shown as an enhancer with long-term retained effects in the primary motor cortex, essential structure to develop motor learning.

Based on the above, our results agree with the specific literature, which supports the positive effects of training programs of different durations on technical performance (Wulf & Lewthwaite, 2016). In contrast, the sumo training sessions influenced the average scores of the EG and showed a higher level of intrinsic motivation than those of the CG, specifically for the effort/importance and intrinsic motivation item. With everything mentioned up to this point, our findings also agree with Parlebas and Dugas (2005), who reported an interspecific learning transfer between similar activities. Also, sumo has been described as a preparatory activity for other sports (Beekley et al., 2006; Nakagawa & Nakagawa, 2022). Our results coincide in regrouping similar activities in the same family. In this sense, Bengué (2000) states that this physical taxonomy confirmed that these activities, whether sports or not, have common characteristics that allow them to be grouped. This positive effect of the sumo approach (i.e., EG) on children's motivation could be because playing is more enjoyable than practicing the technique (Vansteenkiste et al., 2010). Indeed, we noticed that the CG quickly lost their motivation to practice the technique with exercises; in this sense, it is essential to know that the maturation of certain functions accompanies the capacity for sustained and self-directed attention, so it is necessary to seek synchronization of the vestibular, perceptual and visual processes of each child, regardless of their abilities to execute of a program with motor interventions (Emami Kashfi et al., 2019; Torres-Moreno et al., 2022). Our results agree with White et al. (2021), who noted that this finding could be considered a central element in the extent to which physical education teachers should promote an active physical life and showed that sumo-based training could improve children's intentions to become physically active. Apparently, the sumo-based method can be a source of positive transfer, supports intrinsic motivation, and can develop positive attitudes in children and adolescents (González et al., 2018).

Instead, it has been reported that learning training styles affect skill acquisition and transfer, which has posed a significant problem for coaches and trainers seeking to develop the most effective teaching skills (Práxedes et al., 2022). For motor control learning to be effective, Renshaw et al. (2022) confirmed that skill practice must be adaptable to new situations the learner encounters (task-to-task transfer) and that the skill must also be retained over time once acquired. In this sense, wrestling and sumo seem to be physical activity strategies that can be adapted to the needs of children and contribute to their development, which requires further research.

This study's potential limitations include a lack of control over food intake and a failure to complete a food record (to understand the youth's dietary profiles, including their protein, carbohydrate, lipid, and micronutrient intake), both of which could affect the children' technical wrestling scores and wrestling performance indexes. The training program

was four weeks and included only twelve training sessions; thus, our findings should be interpreted cautiously, given that long-term interventions are required to verify them. Finally, only one psychological result has been evaluated: intrinsic motivation. Among the study's main strengths, we could mention the inclusion of an active control group and the randomization of the participants, which improves the internal consistency of the study and increases external validity through protocolized and validated evaluations and a scientifically based training design. We suggest conducting future studies in larger groups that explore other forms of mental power in gaming contexts.

Conclusions

As a preparation activity for wrestling, the sumo-based training program produces significantly greater responses on technical wrestling scores, wrestling performance indexes, and intrinsic motivation regarding only wrestling training in youth. Likewise, the EG (sumo-based) offered significant changes in technical wrestling scores related to the number of attempted head and arm throws and repetitions that pushed the opponent out of the combat area. In addition, it was associated with higher levels of intrinsic motivation and the need to be physically active. The presence of an inter-sport learning transfer related to technical skills in wrestlers' performances should encourage coaches and trainers to develop and optimize training programs that consider technical and physical similarities between certain sports, such as combat sports.

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Conflict of Interest

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

References

Mak, H. W., & Fancourt, D. (2020). Reading for pleasure in childhood and adolescent healthy behaviours: Longitudinal associations using the Millennium Cohort Study. *Preventive medicine,* 130, 105889. https://doi.org/10.1016/j.ypmed.2019.105889

Nailer, J., Robinson, C., & O'Connor, D. (2023). The school culture of reading for pleasure: Perspectives of educators and students in years 3-6. *Issues in Educational Research, 33*(4), 1495-1512. http://www.iier.org.au/iier33/nailer.pdf

Ryan, R. M., & Deci, E. L. (2021). Self-determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness. *Rajagiri Management Journal, 15*(1), 88-90. https://doi.org/10.1108/RAMJ-04-2021-071

Wijnia, L. (2020). Students' motivation in secondary and post-secondary education. *Educational Psychology, 40*(8), 913-916. https://doi.org/10.1080/01443410.2020.1813404

Lo, K. W., Ngai, G., Chan, S. C., & Kwan, K.-p. (2022). How students' motivation and learning experience affect their service-learning outcomes: A structural equation modeling analysis. *Frontiers in Psychology,* 13, 825902. https://doi.org/10.3389/fpsyg.2022.825902

Quansah, F., Hagan Jr, J. E., Sambah, F., Frimpong, J. B., Ankomah, F., Srem-Sai, M., . . . Schack, T. (2022). Perceived safety of learning environment and associated anxiety factors during COVID-19 in Ghana: Evidence from physical education practical-oriented program. *European Journal of Investigation in Health, Psychology Education, 12*(1), 28-41. https://doi.org/10.3390/ejihpe12010003

Ramlan, S. A., Isa, I. S., Jiad, N. N. A., Ismail, A. P., Osman, M. K., & Soh, Z. H. C. (2023). Comparison of Deep Learning Model Performance for Handwritten Character Recognition of Schoolchildren. *In Intelligent Multimedia Signal Processing for Smart Ecosystems* (pp. 327-350). https://doi.org/10.1007/978-3-031-34873-0_14

Testers, L., Gegenfurtner, A., & Brand-Gruwel, S. (2020). Taking affective learning in digital education one step further: Trainees' affective characteristics predicting multicontextual pre-training transfer intention. *Frontiers in Psychology,* 11, 2189. https://doi.org/10.3389/fpsyg.2020.02189

Teraoka, E., Ferreira, H. J., Kirk, D., & Bardid, F. (2020). Affective learning in physical education: A systematic review. *Journal of Teaching in Physical Education, 40*(3), 460-473. https://doi.org/10.1123/jtpe.2019-0164

Pereira, M. P., Folle, A., Floriano, L. T., Souza, F. G., Wiggers, L. L., & Farias, G. O. (2022). Teaching Combat Sports in School Physical Education: Development of Specific Motor Skills. IDO Movement for Culture. *Journal of Martial Arts Anthropology, 22*(4), 58-63. https://doi.org/10.14589/ido.22.4.7

Biletic, I., Karnincic, H., & Baic, M. (2023). Effects of Age and Popularity of Sport on Differences among Wrestlers' Parental Support: An Exploratory Study. *Journal of Functional Morphology Kinesiology 8*(2), 65. https://doi.org/10.3390/jfmk8020065

Melki, H., Bouzid, M. S., & Fadhloun, M. (2019). Correlation between Morphological and Functional Variables during a Specific Wrestling Test for Tunisian Cadet Greco-Roman Wrestlers. *Journal of Physical Education Sport,* 19, 1282-1287. https://doi.org/10.7752/jpes.2019.s4186

Genç, A. (2020). The Effect of Wrestling Education on Some Physical and Motoric Parameters in High School Students. *International Education Studies, 13*(4), 100-105. https://doi.org/10.5539/ies.v13n4p100

Balushka, L., Khimenes, K., Okopnyy, A., Pityn, M., & Verbovyi, V. (2020). Application of wrestling strength and speed exercises during the physical education of military students. *Journal of Physical Education Sport,* 20, 2068-2075. https://doi.org/10.7752/jpes.2020.s3279

Cieśliński, I., Gierczuk, D., & Sadowski, J. (2021). Identification of success factors in elite wrestlers—An exploratory study. *PLoS One, 16*(3), e0247565. https://doi.org/10.1371/journal.pone.0247565

Chaabene, H., Negra, Y., Bouguezzi, R., Mkaouer, B., Franchini, E., Julio, U., & Hachana, Y. (2017). Physical and physiological attributes of wrestlers: an update. *The Journal of Strength Conditioning Research, 31*(5), 1411-1442. https://doi.org/10.1519/JSC.0000000000001738

Destani, F., Hannon, J. C., Podlog, L., & Brusseau, T. A. (2014). Promoting character development through teaching wrestling in physical education. *Journal of Physical*

Education, Recreation and Dance, 85(5), 23-29. https://doi.org/10.1080/07303084.2014.897570

Nakagawa, T. R., & Nakagawa, A. (2022). Sumo as Combat Sports. *Himalayan Journal of Humanities Cultural Studies 3*(1). https://doi.org/10.47310/Hjhcs.2022.v03i01.003

Reicher, D. (2020). Nationalistic German Gymnastic Movements and Modern Sports. Culture Between Identity and Habitus. *Historical Social Research/ Historische Sozialforschung,* 45,1 (171), 207-225. https://www.jstor.org/stable/26873886

Beekley, M. D., Abe, T., Kondo, M., Midorikawa, T., & Yamauchi, T. (2006). Comparison of normalized maximum aerobic capacity and body composition of sumo wrestlers to athletes in combat and other sports. *Journal of Sports Science Medicine, 5*(CSSI), 13. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3863922/

Arakawa, H., Yamashita, D., Arimitsu, T., Kawano, T., Wada, T., & Shimizu, S. (2020). Body composition and physical fitness profiles of elite female Japanese wrestlers aged< 12 years until> 20 years. *Sports, 8*(6), 81. https://doi.org/10.3390/sports8060081

Brasil, I., Monteiro, W., Lima, T., Seabra, A., & Farinatti, P. (2020). Effects of judo training upon body composition, autonomic function, and cardiorespiratory fitness in overweight or obese children aged 8-to 13 years. *Journal of Sports Sciences, 38*(21), 2508-2516. https://doi.org/10.1080/02640414.2020.1792189

Smeeton, N. J., Ward, P., & Williams, A. M. (2004). Do pattern recognition skills transfer across sports? A preliminary analysis. *Journal of Sports Sciences, 22*(2), 205-213. https://doi.org/10.1080/02640410310001641494

Turner, L., Shamseer, L., Altman, D. G., Weeks, L., Peters, J., Kober, T., . . . Moher, D. (2012). Consolidated standards of reporting trials (CONSORT) and the completeness of reporting of randomised controlled trials (RCTs) published in medical journals. *Cochrane Database of Systematic Reviews,* (11). https://doi.org/10.1002/14651858.MR000030.pub2

Marfell-Jones, M. J., Stewart, A., & de Ridder, J. (2012). *International standards for anthropometric assessment.* (I. S. f. t. A. o. Kinanthropometry., Ed.). https://repository.openpolytechnic.ac.nz/handle/11072/1510

Melki, H., & Bouzid, M. S. (2023). Teaching wrestling at school: proposal of a new pedagogical approach based on games for learning of technical moves. *Pedagogy of Physical Culture Sports, 27*(2), 123-130. https://doi.org/10.15561/26649837.2023.0204

Stordopoulos, D., Giannakou, E., Manaveli, P., Barbas, I., Gourgoulis, V., & Aggeloussis, N. (2016). Reliability of lower limb kinematics during the arm-throw wrestling technique. *International Journal of Wrestling Science, 6*(2), 67-73.

United World Wrestling. (2017). *International Wrestling Rules: Values assigned to the Actions and Holds.* Retrieved from https://uww.org/sites/default/files/media/document/wrestling_rules_7.pdf

Ryan, R. M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of personality Social Psichology, 43*(3), 450. https://doi.org/10.1037/0022-3514.43.3.450

McAuley, E., Duncan, T., & Tammen, V. V. (1989). Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. *Research quarterly for exercise sport, 60*(1), 48-58. https://doi.org/10.1080/02701367.1989.10607413

Wang, J., Liu, R.-D., Ding, Y., Xu, L., Liu, Y., & Zhen, R. (2017). Teacher's autonomy support and engagement in math: Multiple mediating roles of self-efficacy, intrinsic value, and boredom. *Frontiers in Psychology,* 8, 1006. https://doi.org/10.3389/fpsyg.2017.01006

Cohen, J. (1992). A power primer. *Psychological bulletin, 112*(1), 155-159. https://doi.org/10.1037/0033-2909.112.1.155

Soderstrom, N. C., & Bjork, R. A. (2015). Learning versus performance: An integrative review. *Perspectives on Psychological Science, 10*(2), 176-199. https://doi.org/10.1177/1745691615569000

Cano-de-la-Cuerda, R., Molero-Sánchez, A., Carratalá-Tejada, M., Alguacil-Diego, I. M., Molina-Rueda, F., Miangolarra-Page, J. C., & Torricelli, D. (2015). Teorías y modelos de control y aprendizaje motor. Aplicaciones clínicas en neurorrehabilitación. *Neurología, 30*(1), 32-41. https://doi.org/10.1016/j.nrl.2011.12.010

Torres-Moreno, M.-J., Aedo-Muñoz, E., Hernández-Wimmer, C., Brito, C. J., & Miarka, B. (2022). Fundamental contributions of neuroscience to motor learning in children: a systematic review. *Motricidade, 18*(2), 312-322. https://doi.org/10.6063/motricidade.25216

Robinson, L. E., Palmer, K. K., & Meehan, S. K. (2017). Dose–response relationship: the effect of motor skill intervention duration on motor performance. *Journal of Motor Learning Development,* 5(2), 280-290. https://doi.org/10.1123/jmld.2016-0004

Drews, R., Chiviacowsky, S., & Wulf, G. (2013). Children's motor skill learning is influenced by their conceptions of ability. *Journal of Motor Learning Development, 1*(2), 38-44. https://doi.org/10.1123/jmld.1.2.38

Tompsett, C., Sanders, R., Taylor, C., & Cobley, S. (2017). Pedagogical approaches to and effects of fundamental movement skill interventions on health outcomes: A systematic review. *Sports Medicine,* 47, 1795-1819. https://doi.org/10.1007/s40279-017-0697-z

Cole, L., Giuffre, A., Ciechanski, P., Carlson, H. L., Zewdie, E., Kuo, H.-C., & Kirton, A. (2018). Effects of high-definition and conventional transcranial direct-current stimulation on motor learning in children. *Frontiers in neuroscience,* 12, 787. https://doi.org/10.3389/fnins.2018.00787

Wulf, G., & Lewthwaite, R. (2016). Optimizing performance through intrinsic motivation and attention for learning: The OPTIMAL theory of motor learning. *Psychonomic bulletin review,* 23, 1382-1414. https://doi.org/10.3758/s13423-015-0999-9

Parlebas, P., & Dugas, E. (2005). Le transfert d'apprentissage dans les activités physiques et sportives. *Carrefours de l'éducation,* (2), 27-43. https://doi.org/10.3917/cdle.020.0027

Bengué, L. (2000). *Enseigner les sports collectifs: les fondamentaux transversaux.* Amphora.

Vansteenkiste, M., Niemiec, C. P., & Soenens, B. (2010). The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions. *The decade ahead: Theoretical perspectives on motivation achievement,* 105-165. https://doi.org/10.1108/S0749-7423(2010)000016A007

Emami Kashfi, T., Sohrabi, M., Saberi Kakhki, A., Mashhadi, A., & Jabbari Nooghabi, M. (2019). Effects of a motor intervention program on motor skills and executive functions in children with learning disabilities. *Perceptual and Motor Skills, 126*(3), 477-498. https://doi.org/10.1177/0031512519836811

White, R. L., Bennie, A., Vasconcellos, D., Cinelli, R., Hilland, T., Owen, K. B., & Lonsdale, C. (2021). Self-determination theory in physical education: A systematic review of qualitative studies. *Teaching Teacher Education,* 99, 103247. https://doi.org/10.1016/j.tate.2020.103247

González, C. S. G., del Río, N. G., & Adelantado, V. N. (2018). 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, 5*(2), 46-52. https://doi.org/10.9781/ijimai.2018.03.005

Práxedes, A., Pizarro, D., Travassos, B., Domínguez, M., & Moreno, A. (2022). Level of opposition constrains offensive performance in consecutive game situations. An analysis according to game principles. *Physical Education Sport Pedagogy, 27*(3), 291-303. https://doi.org/10.1080/17408989.2021.1877269

Renshaw, I., Davids, K., O'Sullivan, M., Maloney, M. A., Crowther, R., & McCosker, C. (2022). An ecological dynamics approach to motor learning in practice: Reframing the learning and performing relationship in high performance sport. *Journal Asian Journal of Sport Exercise Psychology, 2*(1), 18-26. https://doi.org/10.1016/j.ajsep.2022.04.003

Взаємообмін методикою навчання у спортивній боротьбі та сумо як споріднених видів єдиноборств: Вплив на технічну результативність та внутрішню мотивацію юних спортсменів

Хассан Мелкі[1,2ABCDE], Джордан Ернандес-Мартінес[3ABCD], Томас Еррера-Валенсуела[4ABD], Іжам Сід-Кальфукура[5ABCD], Брауліо Енріке Маньяні Бранко[6ABCD], Пабло Вальдес-Баділья[7,8ABCDE]

[1]Вищий інститут спорту та фізичного виховання Ксар Саїд
[2]Туніський віртуальний університет
[3]Університет Лос-Лагоса
[4]Університет Сантьяго-де-Чилі
[5]Університет Санто-Томас
[6]Університет Чезумар
[7]Католицький університет в Мауле
[8]Університет Вінья-дель-Мар

Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 7 с., 1 табл., 3 рис., 41 джерел.

Мета дослідження. Метою цього дослідження було здійснити порівняльний аналіз впливу спортивної боротьби та боротьби сумо як споріднених видів єдиноборств в рамках тренувальної програми на результати виконання технічних дій у боротьбі, показники результативності боротьби та внутрішню мотивацію молоді, яка займається зазначеними видами спорту.

Матеріали та методи. Проведено рандомізоване контрольоване дослідження із застосуванням одинарного сліпого методу та повторних вимірювань у паралельних групах (група, що займається сумо: ЕГ, n = 19, вік = 12,42 ± 0,87 років; і група, що займається виключно боротьбою: КГ, n = 19, вік = 12,41 ± 0,78 років). Для проведення інтервенцій було передбачено три 65-хвилинних щотижневих сесії протягом чотирьох тижнів. З метою оцінки групового та часового ефекту було проведено двофакторний змішаний дисперсійний аналіз (ANOVA) з повторними вимірюваннями.

Результати. За отриманими даними встановлено значущий взаємозв'язок між змінними, відповідно до якого вищі значення спостерігалися у результатах технічних дій у боротьбі під час тестових випробувань на виконання кидків через голову та за допомогою рук ($F_{1;18}$ = 356,2; p = < 0,001; ES = 0,60), показників результативності боротьби за тестом на відштовхування супротивника ($F_{1;18}$ = 8,31; p = 0,009; ES = 0,08), внутрішньої мотивації за параметром «зусилля/значущість» ($F_{1;18}$ = 12,24; p = 0,003; ES = 0,82) та показником внутрішньої мотивації ($F_{1;18}$ = 19,36; p = 0,000; ES = 0,24) на користь ЕГ.

Висновки. Отже, впровадження тренувальної програми на основі сумо, забезпечує значно вищі показники технічної результативності та внутрішньої мотивації, зокрема, щодо тренувань з боротьби.

Ключові слова: мотивація, єдиноборства, передавальне навчання, бойові мистецтва, технічна результативність.

Information about the authors

Melki, Hassan: hmelki@yahoo.fr; https://orcid.org/0000-0001-5387-4279; Higher Institute of Sport and Physical Education of Ksar Saïd, 20 Rue des Travailleurs, Manouba, Tunisia; Virtual University of Tunis, 13 Rue Ibn Nadim, 1073 Montplaisir, Tunisia.

Hernandez-Martinez, Jordan: jordan.hernandez@ulagos.cl; https://orcid.org/0000-0002-9373-8236; Research Program in Sport, Society and Good Living, Department of Physical Activity Sciences, Universidad de Los Lagos, Lord Cochrane 1046, 5290000 Osorno, Los Lagos, Chile.

Herrera-Valenzuela, Tomas: tomas.herrera@usach.cl; https://orcid.org/0000-0002-5219-5896; Department of Physical Activity, Sports and Health Sciences, Faculty of Medical Sciences, Universidad de Santiago de Chile, Av. Libertador Bernardo O'Higgins, 9170022 Estación Central, Región Metropolitana, Chile.

Cid-Calfucura, Izham: Izham.cid@gmail.com; https://orcid.org/0000-0002-2172-867X; Department of Physical Activity Sciences, Universidad Santo Tomás, Av. Ejército Libertador 146, 8370003 Santiago, Región Metropolitana, Chile.

Magnani Branco, Braulio Henrique: braulio.branco@unicesumar.edu.br; https://orcid.org/0000-0002-4625-9128; Graduate Program in Health Promotion, Cesumar University, Av. Guedner, 1610 - Jardim Aclimacao, Maringá - PR, 87050-900, Brazil.

Valdés-Badilla, Pablo: valdesbadilla@gmail.com; https://orcid.org/0000-0002-3948-8280; Department of Physical Activity Sciences, Faculty of Education Sciences, Universidad Católica del Maule, Av. San Miguel 3605, 3460000 Talca, Maule, Chile; School of Education, Universidad Viña del Mar, Diego Portales 90, 2580022 Viña del Mar, Valparaíso, Chile.

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