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Theoretical and methodological foundations of the development of special endurance in freestyle wrestling among qualified student-athletes

Salamat Yernazarov*, Uanbayev Yerkin Kinayatovich, Almagul Ilyassova, Ruslan Kadyrbekov, Issa Kurmanali, Karima Seitbekova

Department of Physical Education and Sports, Abai Kazakh National Pedagogical University, Almaty, Kazakhstan.

* Correspondence: Salamat Yernazarov; Yernazarov.s@mail.ru

ABSTRACT

This study aimed to assess the effectiveness of a newly developed training program for freestyle wrestling athletes. The quantitative research was conducted with 48 student athletes of freestyle wrestling. The training program was divided into two main components: 1) Physical fitness training, tailored to address the specific needs of athletes across seven weight categories: 55 kg (121.25 lbs), 60 kg (132.25 lbs), 66 kg (145.5 lbs), 74 kg (163 lbs), 84 kg (185 lbs), 96 kg (211.5 lbs), and 120 kg (264.5 lbs). 2) Cognitive skills training, focused on enhancing motivation and self-confidence. The program was implemented over a three-month period, with performance measurements taken at two points: before (pre-training) and after (post-training) the intervention. The second phase of the program emphasized cognitive development, specifically targeting motivation and self-confidence. The results showed that there is a positive correlation between athletes' physical abilities, techniques, endurance, stamina, motivation, and self-confidence with their overall performance ($p<0.05$). Furthermore, a significant improvement was observed in athlete performance following the completion of the training program ($p<0.05$). In conclusion, both physical fitness and cognitive skills are critical for improving the performance of freestyle wrestling athletes.

KEYWORDS

Endurance; Freestyle Wrestling; Training; Motivation; Self-confidence

1. INTRODUCTION

The initial traces of the wrestling can be dated back to the times of the Sumerians (Riccio et al., 2022). Their homeland in Mesopotamia, called Sumer, emerged roughly 6,000 years ago (Chen, 2022). Sumer was an ancient civilization founded in the Mesopotamia region of the Fertile Crescent situated between the Tigris and Euphrates rivers. The Sumerians drawings showing about 400 wrestling matches (Akinci, 2020). The wrestling was considered as the divine art and associated with most important factor of men's bravery and adulthood in ancient world (Türkmen & Arstanbekov, 2020). In Middle Ages and Renaissance, wrestling was sports of elites from castles and palaces (McClelland, 2007). This sport was added into the Olympic Games in 1908 held at London (Kaya, 2015). In 1912, was taken out from Stockholm Olympic Games (Hough-Snee, 2020).

Freestyle wrestling is a challenging sport that requires athlete's strength, agility, endurance and skills (Abdushukurovich & Abdulaziz, 2022). Moreover, dedication, discipline and focus are essential factors in the sport. In freestyle wrestling the player need to pin down opponent's shoulder onto the mat. Freestyle wrestling is one of the six main forms of amateur wrestling (Vardar et al., 2007).

Different training methods are used in free wrestling that ensures the athletes physical fitness; Such as technical trainings are used to develop the technical skills whereas, weight management training is used to manage weight of athletes for superior performance (Koral & Dosseville, 2009). In freestyle wrestling the bending abilities of the athletes are consider a match wining factor (Brownell, 2014), then freestyle wrestling requires a balance between physical and mental fitness (Andreea & Bianca, 2019). It also requires effective techniques, skills, tactics and strategy to beat the opponent (Korobeynikov et al., 2016).

It seems that free wrestling among highly qualified student-athletes needs a detailed model and approach that addresses the physical, mental and technical aspect of the athletes. Numerous Researches were conducted into the free style wrestling in terms of training methods, performance of athletes, strategy, and psychological factors (Uli, 2024). Along with physical fitness the role of technical and strategic development for athletes are match winning factors, especially in wrestling (Chaabene et al., 2017). The increase in sporting competitions and advances in technology has put stress on athletes' performance and training.

Therefore, the demand of effectiveness training methodologies and extraction of performance from every rule requires effective understanding of theoretical foundations of the wrestling sport. The

training program developers needs to understand and draw clear hard lines at the edge of every rule so as not to across the rule yet still gain competitive advantage. This study is designed to address the problem and challenges faced by the freestyle wrestling among highly qualified student-athletes. In Kazakhstan the sports require effective and well-developed training methodologies to address the challenges that is being faced by the sports athletes. The training program was developed considering the rules and regulations of the sports set by the international governing body. The training approach was developed considering the physical and mental aspect of the sports. The study hypothesis are as follows:

Hypothesis 1: Physical training program has a direct association with athletes' performance (skills and techniques development)

Hypothesis 2: Physical training program has a direct association with athletes' endurance and stamina

Hypothesis 3: Athletes cognitive development has a direct association with motivation to deliver maximum performance.

Hypothesis 4: Athletes cognitive development has a direct association with self-confidence of athletes.

2. METHODS

This quantitative study was conducted with 48 student athletes of freestyle wrestling. The training program was divided into two categories, first category consists of trainings that was designed to address physical fitness of students' athlete and it consists of 7 categories (55kg (121.25lbs), 60kg (132.25lbs), 66kg (145.5lbs), 74kg (163lbs), 84kg (185lbs), 96kg (211.5lbs), and 120 kg (264.5lbs). Second category consists of training that was directed towards cognitive skills (Motivation and self-confidence). The training program was developed for three months and the measurement was taken in two stages, pre-training and post-training. The results were than compared to identify the effectiveness of the training program. Students were given training using Fit N' Flex, Sweat Society, Iron Jungle, Better Bodies, Muscle Masters, Endurance Elite, Burn Brigade, and Fitness Fusion. Each training session was developed to address one specific factor.

In second set of training the focus was cognitive development and through cognitive development the aspect of motivation and self-confidence was address. Six psychological sessions were developed in which psychologist was taken role of training. The psychological sessions were designed based on motivational and self-confidence factors of the athletes. Over the period of three

months six sessions taken place with each session lasting for 3 hours in groups and individual approaches was applied.

2.1. Conceptual Model 1: Physical and Cognitive Training Programs

Physical training consists of two parts, the first part was associated with the skills and techniques regarding freestyle wrestling and second part consist of endurance and stamina. Stamina refers to the amount of time a muscle or muscle group can perform at or near maximum capacity, whereas, endurance refers to the amount of time a muscle group can perform a certain action. The second part of the training consists of cognitive skills building that include athlete motivational and self-confidence abilities (Figure 1 and 2).

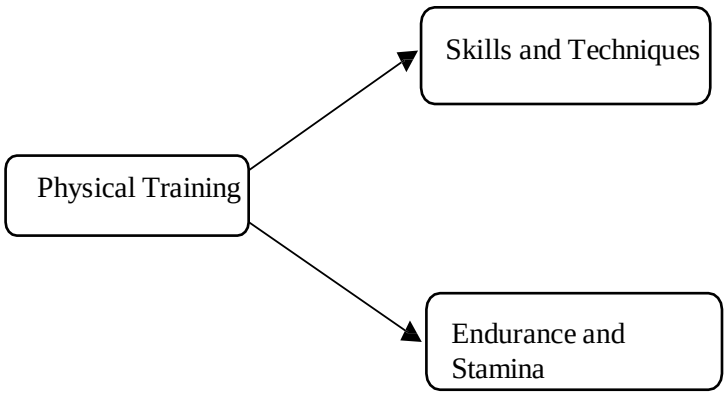

Figure 1. Physical training

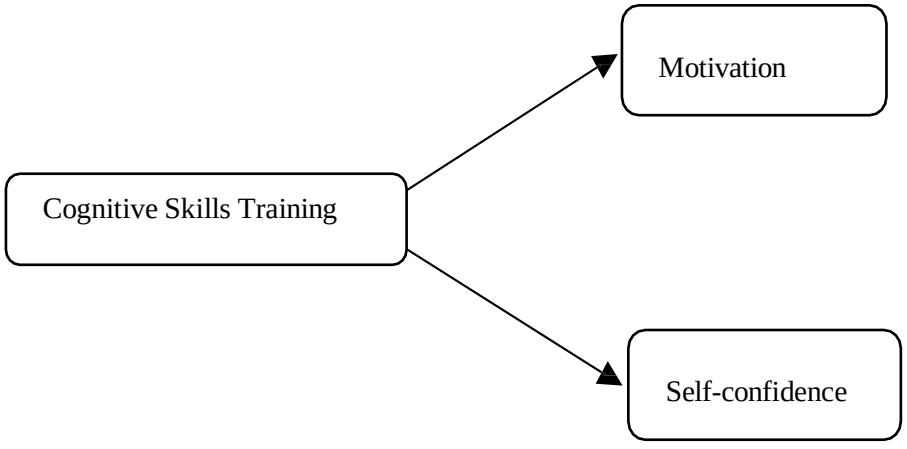

Figure 2. Cognitive Skills Training

2.2. Instruments and procedures

All constructs and items were measured on a Likert five-point scale anchored from 1(strongly disagree) to 5(strongly agree).

- **Physical Training (PT):** PT was measured using a self-developed scale consisting of 18 items. The Cronbach's alpha value we obtained using SPSS 21 was (α 0.87). A sample item example: "I am satisfied with my physical fitness and development."
- **Skills and Techniques Training (STT):** STT was measured using a self-developed scale having 19 items. The scale Cronbach's alpha value (α 0.90) was obtained. A sample item example: "Training helps me in building set of skills and techniques compatible with freestyle wrestling."
- **Endurance and Stamina (ES):** The ES scale was self-developed and consists of 20 items with Cronbach's alpha value (α 0.89). A sample items example: "I have developed my endurance abilities with the training program"; "I have developed my Stamina abilities with the training program".
- **Cognitive Skills Development (CSD):** CSD instrument was self-developed and consists of 19 items with Cronbach's alpha value (α 0.91). A sample item example: "I am able to develop cognitive skills with the training program".
- **Motivated (MOT):** Motivation instrument was self-developed and consists of 19 items with Cronbach's alpha value (α 0.89). A sample item example: "I am motivated to the take on the challenges of freestyle wrestling".
- **Self-Confidence (SC):** SC scale was self-developed it consists of 21 items with Cronbach's alpha value was received was (α 0.89). A sample item example: "I am fully capable and ready for the freestyle wrestling match".

2.3. Statistical analyses

Data were analyzed using IBM SPSS Statistics version 21. Descriptive statistics (mean, standard deviation, skewness, and kurtosis) were calculated to examine the distribution and central tendency of the responses for each construct. The internal consistency of each scale was assessed using Cronbach's alpha, with all constructs demonstrating acceptable reliability (α ranging from 0.87 to 0.91). To evaluate the effectiveness of the training program, paired sample t-tests were conducted to compare the pre-training and post-training scores for each construct: Physical Training (PT), Skills and Techniques Training (STT), Endurance and Stamina (ES), Cognitive Skills Development (CSD),

Motivation (MOT), and Self-Confidence (SC). Additionally, Pearson correlation analyses were performed to explore the relationships between physical and cognitive constructs and the overall athletic performance outcomes. Where applicable, effect sizes (Cohen's d) were calculated to assess the magnitude of the differences observed. A significance level of $p < 0.05$ was used as the threshold for statistical significance across all analyses.

3. RESULTS AND DISCUSSION

Table 1 presents the regression analysis, the model 1 was run using physical training (PT) as dependent variable along with skills and techniques (ST); and endurance and stamina (ES) as independent variables. It was found that physical training (PT) has direct impact on the development of skills and techniques regarding the freestyle wrestling and the development of endurance and stamina among the students' athletes. The training design for the improvement of physical fitness has a positive association with the increase in the skills, techniques, endurance and stamina which are vital aspect of the sport. The model 1 has the strength of 94% and model 2 has strength of 85.9% which mean both models has a capability to predict the variation in independent variables due to dependent variable. In second model, it was found that training for cognitive skills development (CSD) has a direct impact on the development of motivation and self-confidence. This finding is in according to Pierce et al. (2016) in wrestling and also is in agreement with van Rens et al. (2021) who reported efficacy of special training program to optimize cognitive appraisal, emotion regulation, and sport self-confidence in women's state cricket players.

Table 1. Regression results

Paths	**Estimate-β**	**F Value**	**Std. Error**	**p-value**
PT□ST	0.759	91.366	0.944	0.000
PT□ES	0.629			
CSD□MOT	0.562			
CSD□SC	0.711	33.919	0.478	0.000

Model Strength	**R square**	**Adjusted R Square**	**Std. Error of the Estimate**
IV-ST, ES & DV-PT	.940	.884	.69421
IV-MOT, SC DV-CSD	.859	.739	.39963

Model 1 DV: PT – IV: ST & ES; **Model 2** DV: CSD – IV: MOT & SC

*Note. Significance levels: ***p< .001; *p< .05; 1-Physical Training PT; 2-Skills and Techniques (ST); 3-Endurance and Stamina (ES); 4-Cognitive Skills Development (CSD); 5-Motivation (MOT); 6-Self-Confidence (SC).*

3.1. Directly Proportional PT-ST

The regression analysis in Table 1 shows the positive direct association between physical training (PT) with Skills and techniques (ST) as the Estimate- β values of PT and ST (0.759) obtained. This mean increase in Physical training will develop the skills and techniques (ST) in students' athlete. This mean the developed training program was effective in building skills and techniques regarding the freestyle wrestling. This finding is in agreement with Bakhodirovich (2024) study which developed the strength qualities of qualified young freestyle wrestlers in Uzbekistan.

3.2. Directly Proportional PT-ES

Table 1, shows the relationship between physical training (PT) and endurance and stamina (ES) it was found that PT and ES has positive direct relationship as the as the Estimate- β values of PT and ES (0.629) was obtained. Endurance and stamina are two most important factors of the free style wrestling our designed training program helps athletes to develop these two skills which shows the effectiveness of the program. These findings are in agreement with Endrawan et al. (2024) which studied on motor education levels and circuit training on enhancing wrestling techniques.

3.3. Directly Proportional CSD-MOT

The relationship between cognitive skills development (CSD) and Motivation was positive and direct as statistically significant β values was obtained (0.562) was obtained. Our training program was successful in development of cognitive skills among students' athletes which results in the development of motivation of athletes to deliver their maximum performance. Present findings are in agreement with report of Pierce et al. (2016) with study on youth athletes with intensive program.

3.4. Directly Proportional CSD-SC

The relationship between cognitive skills development (CSD) and self-confidence (SC) was positive and direct as statistically significant β values was obtained (0.711) was obtained. Our training program was successful in developing students' athletes' cognitive abilities which results in the development of their self-confidence.

3.5. Correlation Analysis

Table 2 shows that ST has a very strong positive and statistically significant (p .000) association with PT (r = .872**). ES has a positive moderate association with PT (r = .733**) and a moderate positive association with ST (r = .532**). Furthermore, CSD has a positive moderate

association with PT (r = .609*) and weak positive correlation with ST (r = .468**) and moderate positive association with ES (r = .623**). SC has moderate positive association with PT (r = .565**) moderate positive association with ST (r = .773**) strong positive association with ES (r = .941**) and strong positive association with MOT (r =.990**). All the association was statistically significant at 0.01 (2-tailed) and 0.05 (2-tailed). Therefore, from the Pearson correlation analysis, we explore that PT, ST, ES, CSD and SC are all statistically positively associated.

Table 2. Correlation coefficients between key study measures

Correlations						
		PT	**ST**	**ES**	**MOT**	**SC**
PT	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	48				
ST	Pearson Correlation	.872**	1			
	Sig. (2-tailed)	.000				
	N	48	48			
ES	Pearson Correlation	.733**	.532**	1		
	Sig. (2-tailed)	.000	.000			
	N	48	48	48		
CSD	Pearson Correlation	.609**	.468**	.623**	1	
	Sig. (2-tailed)	.000	.002	.000		
	N	48	48	48	48	
SC	Pearson Correlation	.565**	.773**	.941*	.990**	1
	Sig. (2-tailed)	.000	.000	.025	.000	
	N	48	48	48	48	48

*Note. **. Correlation is significant at the 0.01 level (2-tailed); *. Correlation is significant at the 0.05 level (2-tailed).*

3.6. Hypotheses Summary

Table 3 summarizes the hypotheses tested in the study. All hypotheses were accepted, indicating that the physical training program is directly associated with athletes' performance in skills and techniques development, as well as their endurance and stamina. Additionally, cognitive development is directly linked to athletes' motivation and self-confidence to perform at their best. These findings highlight the importance of incorporating both physical and cognitive aspects in training to enhance freestyle wrestling performance.

Table 3. Summary of hypothesis testing results

Hypotheses	Status
Hypothesis 1: Physical training program has a direct association with athletes' performance (skills and techniques development)	Accepted
Hypothesis 2: Physical training program has a direct association with athletes' endurance and stamina	Accepted
Hypothesis 3: Athletes cognitive development has a direct association with motivation to deliver maximum performance.	Accepted
Hypothesis 4: Athletes cognitive development has a direct association with self-confidence of athletes.	Accepted

The mean scores were used to assess the effectiveness of the training program it was found that the training program, significantly improved the performance of students' athletes as the mean scores were improved dramatically as compared to the pre-assessment. This shows the effectiveness of new training program designed to address challenges and problems associated with athlete performance in freestyle wrestling, which is in agreement Melki and Bouzid (2023) which stablished pedagogical program for wrestling education. The new training program has capabilities to engage students' athletes more effectively as compared with the old training program. The training was successfully in delivering skills, techniques that are relevant in freestyle wrestling along with building of endurance to maintain the level of performance through strong stamina (Table 4).

Table 4. Comparison of athletes' performance scores

Descriptive Statistics					
		N	**Mean**	**Std. Deviation**	**p**
Pre-training assessment	Skills	48	1.8368	2.28177	<0.01
	Techniques	48	1.9734	2.18202	<0.01
	Endurance	48	1.0281	1.83258	<0.01
	Stamina	48	2.9672	2.01792	<0.01
	Motivation	48	2.1271	1.93789	<0.01
	Self-confidence	48	1.9258	2.09897	<0.01
Post-training assessment	Skills	48	3.2515	2.12332	<0.01
	Techniques	48	4.2816	1.98011	<0.01
	Endurance	48	4.0979	1.26583	<0.01
	Stamina	48	3.9152	1.00982	<0.01
	Motivation	48	4.9878	2.26521	<0.01
	Self-confidence	48	4.1632	2.09082	<0.01
	Valid N (listwise)	48			

4. CONCLUSIONS

This study addresses the performance gaps faced by Kazakh athletes in freestyle wrestling. The training program was designed according to international standards and rules to prepare student athletes for international competitions, such as the Olympic Games. The program was developed with a broad perspective, including both physical fitness and cognitive skill development.

It was found that physical fitness and cognitive skills are important factors in improving the performance of freestyle wrestling athletes. In conclusion, there is a positive association between athletes' physical skills, techniques, endurance, stamina, motivation, and self-confidence with their overall performance. Moreover, athletes' performance was assessed before the start of the training program and after its successful completion, revealing a significant improvement in their performance.

It was found that athletes' performance improved across all seven weight categories through the implemented training program. Physical fitness alone is not sufficient for enhancing athlete performance; the mental aspect is essential for winning. Cognitive skills training enabled athletes to remain positive and motivated before, during, and after matches. Specifically, the cognitive training targeted mental challenges that negatively impact athletic performance.

Therefore, we recommend this training program for its comprehensive approach to developing both the physical and mental capacities of freestyle wrestling athletes.

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AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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