

Effectiveness of coordination training in technical preparation of freestyle wrestlers at various levels of sports advancement

Authors' Contribution:

- A** Study Design
- B** Data Collection
- C** Statistical Analysis
- D** Manuscript Preparation
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Abstract

Background and Study Aim:

The aim of the study was to evaluate the effectiveness of special coordination training in technical preparation of freestyle wrestlers at various levels of sports advancement.

Material/Methods:

Freestyle wrestlers aged 14–15 and 18–19 participated in the research. The main research tool was a pedagogical experiment which consisted in implementing a set of special coordination exercises in a training process.

Results:

An increase in the volume of coordination means in training helped to improve considerably the quality of performing selected technical elements. The most significant increase was observed in those technical elements which, according to experts' evaluation, were the least mastered prior to the experiment. Wrestlers with shorter training experience manifested a larger transfer of coordination training effects on technical skills than those with longer training experience.

Conclusions:

Special coordination training may constitute an integral part of the training process and may be used as one of the means whereby the effectiveness of training in wrestling at all levels of sports advancement is enhanced. While planning coordination training it is necessary to define its independent goals and tasks simultaneously taking into consideration the primary role of the general objective of training.

Key words:

freestyle wrestling • coordination training • pedagogical experiment

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BACKGROUND

Coordination training is considered by many authors as an important part of a training process particularly at the stage of general and oriented training [1–7]. It positively influences the speed of learning and improving complex technical elements and facilitates applying effective behaviour in a sports competition [4,7–9]. Combat sports, which are characterised by great diversity and complexity of movements, require high levels of coordination abilities. Therefore, in sports training a lot of attention is paid to coordination preparation. It is believed that there is still considerable potential in

this area as far as the training of combat sport competitors is concerned [10–14].

Positive effects of combining coordination and fitness training in Physical Education classes were also observed [15].

The viewpoints of various authors concerning the effectiveness of coordination training in sport are divergent [2,6,7,13,16–18]. Some point to its high effectiveness [4,9,13], while others disagree with the opinion that the development of coordination abilities determines the effectiveness of training [17,18].

Freestyle wrestling – Olympic sport which consists in a direct combat between two competitors.

Coordination training – training oriented at developing coordination abilities.

Pedagogical experiment – a method consisting in implementing a new factor into a process and observing undergoing changes.

In the light of existing discrepancies an attempt was made to explain the question of the effectiveness of coordination training in wrestlers at the stage of oriented and special training.

The aim of the study was to evaluate the effectiveness of special coordination training in technical preparation of freestyle wrestlers at various levels of sports advancement.

MATERIAL AND METHODS

Freestyle wrestlers undergoing oriented training participated in the research ($n=31$). They were 14–15 years old ($\bar{x}=14.7\pm 0.58$) and their sports experience was $\bar{x}=2.7\pm 0.39$ years long. They were randomly divided into an experimental group E1 ($n=16$) and a control group C1 ($n=15$).

The research also included freestyle wrestlers undergoing special training ($n=25$). They were also divided into an experimental group E2 ($n=13$) and a control group C2 ($n=12$). An average age of the subjects was 18–19 ($\bar{x}=18.4\pm 0.46$) and their sports experience was between 4 and 9 years long ($\bar{x}=6.7\pm 0.72$).

The subjects were selected randomly from competitors at a similar level of sports advancement. The selection was carried out on the basis of three criteria: summary rank evaluation of coordination preparation levels of wrestlers based on the battery of sports-motor tests, rank evaluation of technical-coordination preparation made by a coach and rank evaluation on the basis of sports results achieved in three national wrestling competitions.

A pedagogical experiment which consisted in implementing a set of special coordination exercises in a training process was used. The experiment covered 84 training sessions divided into 28 one-week microcycles. The duration of the experiment was six months.

Three times a week the subjects performed special coordination exercises at the initial stage of a training session. The total volume of those exercises in the whole experiment was 180 minutes for each ability under examination. During the first training session an emphasis was put on even development of balance and rhythmization; the second training session covered speed of reaction and time-space orientation, while the third one included kinesthetic differentiation, motor adjustment and movement combining. Moreover, once a week the wrestlers performed special coordination exercises in the form of circuit training and coordination-oriented wrestling games and plays. Circuit training consisted of seven stages. It included only special means which had an

even impact on coordination abilities under investigation. Every stage was made up of six stations designed to develop particular coordination abilities. The duration of a set of exercises aimed at developing one ability was 12 minutes. Coordination complexity of exercises increased at successive stations. The duration of games and plays in training sessions was between 30 and 45 minutes.

Control groups followed only a traditional training plan. Instead of special coordination training a similar volume of general exercises was applied. They were included in a warm-up so that the training volume would be similar in experimental and control groups at every stage of training.

Before and after the experiment the level of technical preparation was evaluated basing on the quality of performing the following elements:

- a) *in a horizontal posture*: trunk grip gut wrench – right side, trunk grip gut wrench – left side, trunk grip gut wrench throw, curve back trunk grip throw, reverse trunk grip throw,
- b) *in a vertical posture*: hand grip tackle, hip throw with an arm and neck grip, curve trunk grip throw with an arm, waist grip tackle, arm grip back throw.

A detailed description of technical elements can be found in references [19,20].

Technical skills were evaluated by five highly qualified wrestling coaches. The criterion was the average of three marks. Two extreme marks, i.e. the highest and the lowest, were excluded. The evaluation was made using the scale of 1–5 points. The following aspects were taken into consideration: starting and finishing position, correctness of a grip, smoothness and harmony of movements as well as amplitude of movements (in the case of throws). The concordance of experts' evaluation was calculated on the basis of the concordance coefficient ($r=0.81$).

The material gathered was elaborated by means of the main statistical methods with the use of *STATISTICA 6.0* software.

RESULTS

Technical elements of wrestlers from experimental and control groups are presented in Tables 1 and 2.

In both experimental groups (E1 and E2) there occurred a diversified and in most cases statistically significant increase in the quality of performing technical elements under examination used in a vertical and horizontal posture.

Table 1. Changes in technical elements of freestyle wrestlers aged 14–15.

Wrestling technique	Wrestlers of experimental group (E1)			Wrestlers of control group (C1)			
	Before experiment	After experiment	Differences %	Before experiment	After experiment	Differences %	
	x±SD	x±SD		x±SD	x±SD		
Horizontal posture	Trunk grip gut wrench – right side	3.27±0.72	3.45±0.66	5.5	3.25±0.97	3.31±0.96	1.9
	Trunk grip gut wrench – left side	2.23±0.40	2.92±0.44	30.9**	2.16±0.41	2.57±0.46	19.0*
	Trunk grip gut wrench throw	2.54±0.48	2.75±0.47	8.3	2.44±0.81	2.62±0.73	7.4
	Curve back trunk grip throw	2.42±0.39	2.61±0.39	8.3	2.49±0.40	2.58±0.36	3.6
	Reverse trunk grip throw	3.43±0.45	3.53±0.35	2.9	3.41±0.92	3.49±0.87	2.4
Vertical posture	Hand grip tackle	2.95±0.47	3.34±0.40	13.2*	2.92±0.26	3.11±0.34	6.5
	Hip throw with an arm and neck grip	3.26±0.65	3.57±0.61	9.5*	3.21±0.67	3.52±0.74	9.7*
	Curve trunk grip throw with an arm	1.83±0.38	2.23±0.38	21.9*	1.82±0.22	1.94±0.23	6.6
	Waist grip tackle	2.23±0.49	2.81±0.53	26.0**	2.32±0.35	2.74±0.41	18.1*
	Arm grip back throw	3.17±0.76	3.59±0.75	13.2*	3.28±0.59	3.41±0.51	3.9

* Statistically significant increase at the level of $p < 0.05$; ** $p < 0.01$.

Table 2. Changes in technical elements of freestyle wrestlers aged 18–19.

Wrestling technique	Wrestlers of experimental group (E2)			Wrestlers of control group (C2)			
	Before experiment	After experiment	Differences %	Before experiment	After experiment	Differences %	
	x±SD	x±SD		x±SD	x±SD		
Horizontal posture	Trunk grip gut wrench – right side	4.18±0.38	4.36±0.38	4.3*	4.21±0.43	4.31±0.32	2.4
	Trunk grip gut wrench – left side	2.59±0.61	3.15±0.48	21.6**	2.63±0.61	2.89±0.51	9.9*
	Trunk grip gut wrench throw	4.27±0.36	4.48±0.37	4.9*	4.12±0.46	4.26±0.47	3.4
	Curve back trunk grip throw	3.13±0.65	3.50±0.56	11.8*	3.26±0.58	3.37±0.51	3.4
	Reverse trunk grip throw	2.84±0.57	3.19±0.62	12.3*	2.86±0.38	3.11±0.36	8.7*
Vertical posture	Hand grip tackle	2.61±0.76	3.05±0.60	16.9*	2.51±0.36	2.88±0.40	14.7*
	Hip throw with an arm and neck grip	4.04±0.44	4.25±0.25	5.2*	4.11±0.63	4.22±0.51	2.7
	Curve trunk grip throw with an arm	2.80±0.58	3.40±0.35	21.4**	2.71±0.41	3.11±0.31	14.8*
	Waist grip tackle	4.19±0.30	4.35±0.41	3.8	4.22±0.74	4.31±0.62	2.1
	Arm grip back throw	4.06±0.45	4.28±0.54	5.4	3.95±0.52	4.09±0.63	3.5

* Statistically significant increase at the level of $p < 0.05$; ** $p < 0.01$.

In wrestlers aged 14–15 from the experimental group (E1) a six-month coordination training brought about an improvement in six out of ten technical elements (five in a vertical posture and one in a horizontal posture),

i.e. trunk grip gut wrench – left side (30.9%), waist grip tackle (26.0%), curve trunk grip throw with an arm (21.9%), hand grip tackle (13.2%), arm grip back throw (13.2%) and hip throw with an arm and neck grip

Table 3. Differences in performance levels of selected technical elements between the experimental group and the control group in wrestlers aged 14-15 and 18-19 before and after the pedagogical experiment.

Selected technical elements	Wrestlers aged 14–15		Wrestlers aged 18–19		
	Before experiment (pts)	After experiment (pts)	Before experiment (pts)	After experiment (pts)	
Horizontal posture	Trunk grip gut wrench – right side	0.08	0.14	0.03	0.05
	Trunk grip gut wrench – left side	0.07	0.35*	0.04	0.26*
	Trunk grip gut wrench throw	0.10	0.13	0.15	0.22*
	Curve back trunk grip throw	0.17	0.03	0.13	0.13
	Reverse trunk grip throw	0.08	0.04	0.02	0.08
Vertical posture	Hand grip tackle	0.07	0.23*	0.10	0.17*
	Hip throw with an arm and neck grip	0.05	0.05	0.07	0.03
	Curve trunk grip throw with an arm	0.09	0.29*	0.09	0.29*
	Waist grip tackle	0.19*	0.07	0.03	0.04
	Arm grip back throw	0.21*	0.18*	0.11	0.19*

* Statistically significant differences at the level of $p < 0.01$

(9.5%). No significant improvements were observed in the case of trunk grip gut wrench – right side, trunk grip gut wrench throw, curve back trunk grip throw and reverse trunk grip throw.

The subjects from group E2 aged 18–19 demonstrated a significant improvement in eight technical elements: trunk grip gut wrench – left side (21.6%), curve trunk grip throw with an arm (21.4%), hand grip tackle (16.9%), reverse trunk grip throw (12.3%), curve back trunk grip throw (11.8%), hip throw with an arm and neck grip (5.2%), trunk grip gut wrench throw (4.9%) and trunk grip gut wrench – right side (4.3%). No statistically significant changes were found in the remaining technical elements ($p > 0.05$).

As far as 14–15-year-old wrestlers from group C1 are concerned, a significant increase occurred in trunk grip gut wrench – left side (19%), waist grip tackle (18.1%) and hip throw with an arm and neck grip (9.7%), whereas in wrestlers aged 18-19 from group C2 it was observed in curve trunk grip throw with an arm (14.8%), hand grip tackle (14.7%), trunk grip gut wrench – left side (9.9%) and reverse trunk grip throw (8.7%). As for the remaining technical elements, an increase was statistically insignificant ($p > 0.05$).

Table 3 shows intergroup differences concerning the wrestlers before and after the pedagogical experiment.

In 14–15-year-old competitors the differences between group E1 and C1 before the implementation of special

coordination abilities were in most cases statistically insignificant ($p > 0.05$). The only exception concerned arm grip back throw ($p < 0.05$). However, after the experiment the levels of technical skills in wrestlers from group E1 increased. It brought about a considerable intergroup differentiation. Statistically significant differences were observed in four technical elements: trunk grip gut wrench – left side (0.35 pts), curve trunk grip throw with an arm (0.29 pts), hand grip tackle (0.23 pts) and arm grip back throw (0.18 pts) ($p < 0.05$).

As for wrestlers aged 18–19 (Table 3), prior to the experiment no statistically significant intergroup differences regarding the performance of technical elements were found. Only after the experiment had been carried out did greater differences between groups E2 and C2 occur, the biggest of which were noted in: curve trunk grip throw with an arm (0.29 pts), trunk grip gut wrench – left side (0.26 pts), trunk grip gut wrench throw (0.22 pts), arm grip back throw (0.19 pts) and hand grip tackle (0.17 pts) ($p < 0.05$).

The data obtained from both age groups indicate that those technical elements which turned out to be at a higher level prior to the experiment in the control group levelled with technical skills of wrestlers from the experimental group after the experiment. This phenomenon concerns e.g. waist grip tackle or arm grip back throw in the group of younger wrestlers, or curve back trunk grip throw in older wrestlers.

After having increased the volume of coordination exercises an average growth in the quality of performing the

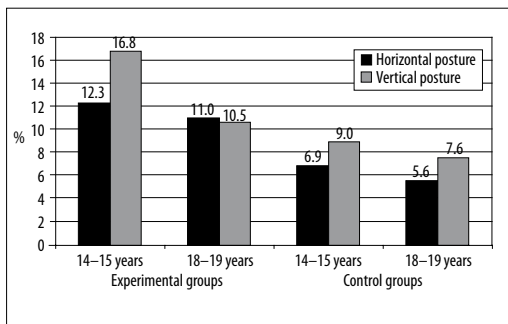


Figure 1. Average percentage growth in the levels of technical elements performed in horizontal and vertical postures by wrestlers from the experimental and control groups.

examined technical elements in horizontal and vertical postures was as follows: 14-15-year-olds – 12.3% and 16.8%; 18-19-year-olds – 11% and 10.5%. In the control groups the selected aspects of technique did not improve considerably and obtained the following values: 6.9% in a horizontal posture and 9% in a vertical posture among younger wrestlers; as for the older wrestlers, the values obtained were 5.6% and 7.6% respectively (Figure 1).

DISCUSSION

In freestyle wrestlers aged 14-15 coordination training brought about an improvement in technical preparation by 14% on average, while in 18-19-year-old competitors by 10.8%. For comparison, in wrestlers not involved in oriented coordination training during a six-month experiment there occurred an improvement by 7.9% in the group of competitors aged 14-15 and 6.6% in 18-19-year-olds.

The results obtained prove the usefulness of coordination training in the system of sports training. They are compliant with the findings of other authors [8,4,7,13,21]. Corresponding research with the use of a six-month experiment was carried out on Greco-Roman wrestlers [22,23] and the findings were similar. In 13-14-year-old competitors technical preparation levels increased by 12.8% owing to oriented coordination training, whereas wrestlers aged 18-19 demonstrated a growth by 7.2%.

Simultaneously, the results show that increasing coordination complexity plays an important role in learning and improving complex technical elements in competitors at successive stages of training [7,11,13]. Younger wrestlers manifested higher susceptibility to oriented coordination stimulation as the increase in technical elements performed in horizontal and vertical postures was higher than in the case of competitors aged 18-19.

An increase in coordination loads in groups E1 and E2 led to a more considerable growth in the quality of

performing particular technical elements in comparison to competitors not participating in coordination training even though the general training volume was similar. Furthermore, wrestlers from the experimental group attained similar levels of those technical elements which the subjects from the control group had been better at prior to the experiment.

It is worth noticing that the larger volume of coordination means of diverse complexity resulted in raising the performance levels of those technical elements which, according to experts, had been the least mastered before the experiment. The biggest changes occurred in wrestlers aged 14-15. On average, the level of technical skills increased by 19.1% in the case of less mastered elements and by 8.9% in elements which they had acquired better. Similarly, 18-19-year-olds demonstrated an increase by 16.8% in the performance levels of the technical elements they had had greater problems with prior to the experiment.

A considerable improvement in the quality of performing technical elements which before the experiment had been the least mastered by competitors who underwent special coordination programme indicates that the applied coordination exercises of diverse complexity as well as the training implemented simultaneously facilitated the acquisition of new motor elements, thus helping to learn specialist techniques more quickly and easily. It concerns both competitors with shorter and longer training experience.

The dynamics of an increase in the levels of technical skills influenced by oriented coordination stimulation confirms the findings of authors studying competitors of other sports [15,24,25]. They claim that technical training combined with coordination training produces better effects.

CONCLUSIONS

The results of the experiment prove that special coordination training may constitute an integral part of a training process and may be used as one of the means whereby the effectiveness of training in wrestling at all levels of sports advancement is enhanced. Therefore, coordination training ought to have its own independent goals and tasks subordinated to general objectives of training in a lot of sports, particularly in those with complex movement structure.

The obtained research results make it possible to draw the following conclusions.

1. Oriented coordination training combined with general (traditional) training of wrestlers produced anticipated

- training effects. After the experiment the subjects from groups E1 and E2 demonstrated considerably higher levels of technical skills than the subjects from groups C1 and C2.
- The largest increase was observed in those technical elements which, according to experts' evaluation, had been the least mastered prior to the experiment.
 - An increase in the volume of coordination means in training contributed to a significant improvement in the quality of technical elements under investigation performed by wrestlers at various levels of sports advancement.
 - Competitors with shorter training experience manifested a larger transfer of coordination training effects on technical skills than those with longer training experience.

REFERENCES:

- Krüger M, Zimmermann K: Koordinative Fähigkeitsentwicklung und Technikschtulung bei jungen Sportlern. *Theorie und Praxis der Körperkultur*. 1983; 11: 852–54 (in German)
- Hirtz P: Koordinationstraining gleich Techniktraining? In: *Sportliche Leistung und Training*. Krug J, Minor HJ (eds.), Academia Verl., S. Augustin, 1995; 205–10 (in German)
- Kühn J: Untersuchungen zur technisch-koordinativen Vervollkommnung der Kampfhandlungen junger Ringer. *Theorie und Praxis der Körperkultur*, 1985; 11: 848–54 (in German)
- Ljach WI: Miejsce ogólnego i specjalnego przygotowania koordynacyjnego w treningu sportowym dzieci i młodzieży. *Aktualne problemy sportu dzieci młodzieży*. Materiały naukowe, Warszawa, 1995 (in Polish)
- Ljach WI: Koordinationstraining im System des mehrjährigen Leistungsauffaus – ausgewählte theoretisch – methodische Grundpositionen. In: *Koordinative Fähigkeiten – koordinative Kompetenz*. Herausgeben von Gudrun und Bernd Lugwig, Univ. Kassel, 2002: 228–33 (in German)
- Raczek J: Funkcje, cele oraz model treningu koordynacyjnego (II). *Sport Wyczynowy*, 2000: 1–2 (in Polish)
- Starosta W: Motoryczne zdolności koordynacyjne. *Międzynarodowe Stowarzyszenie Motoryki Sportowej*. Instytut Sportu w Warszawie. 2003 (in Polish, summary in English)
- Szczepanik M: Wpływ treningu koordynacyjnego na szybkość uczenia się techniki ruchu u młodych siatkarzy. *Sport Wyczynowy*, 1993; 3: 4 (in Polish)
- Raczek J, Mynarski W, Ljach WI: Teoretyczno-empiryczne podstawy kształtowania i diagnozowania koordynacyjnych zdolności motorycznych. *Studia nad motorycznością ludzką*, AWF, Katowice, 1998: 4 (in Polish, summary in English)
- Tumanân GS: Motornye faktory sportivnyh dostizhenij borcov: Metod. razrab. dlâ slušat. WŠT fakulteta perepodgotovki kadrov, aspirantov i studentov. GCOLIFK, Moskva, 1992 (in Russian)
- Petrov AM: Centraľnoe programirovanie mehanizmov realizacii koordinacionnyh sposobnostej sportmenov i ih pedagogičeskoe obosnovanie. *Avtoref. dis. ... kand. ped. nauk*. Moskva, 1997 (in Russian)
- Kalina RM: Teoria sportów walki. Centralny Ośrodek Sportu. Warszawa, 2000 (in Polish)
- Sadowski E: Osnovy trenirovki koordinacionnyh sposobnostej v vostočnyh edinoborstvah. *Zamiejscowy Wydział Wychowania Fizycznego, Biała Podlaska*, 2003 (in Russian)
- Sadowski J, Gierczuk D: Correlations between selected coordination motor abilities and technical skills of Greco-Roman wrestlers aged 14–15. *Archives of Budo*, 2009; 5: 35–39
- Gallotta MC et al: Linking coordinative and fitness training in physical education settings. *Medicine & Science in Sports*, 2009; 19: 412–18
- Rostock J, Zimmermann K: Koordinationstraining zwischen Generalität und Spezifität. *Leistungssport*, 1987 (in German)
- Daug R et al: Sportmotorisches Lernen und Techniktraining zwischen Theorie und Praxis. W: *Sportmotorisches Lernen und Techniktraining*. Daug R et al; (eds.) Hofmann, Schorndorf. 1991 (in German)
- Neumaier A, Mechling H: Allgemeines oder Sportartspezifisches Koordinationstraining? *Leistungssport*, 1995: 5: 14–18 (in German)
- Lenc AN: *Zapasy wolne i klasyczne*. Warszawa, 1964 (in Polish)
- Gierczuk D: Trening koordynacyjny jako czynnik optymalizujący szkolenie zapaśników na etapach ukierunkowanym i specjalnym. *Praca doktorska*, AWF Kraków, 2004 (in Polish)
- Gierczuk D, Sadowski J: The influence of coordination training on the index level of coordination motor abilities in greco-roman wrestlers aged 13–14. *Physical Training. Sport*. Lithuanian Academy of Physical Education, 2008; 3(70): 27–34
- Gierczuk D, Sadowski J, Borysiuk Z: The influence of coordination training on technical skills and the effectiveness of sports competition in wrestling. In: *Movement and health*. Opole University of Technology, 2006; 128–35
- Sadowski J, Gierczuk D: Wpływ treningu koordynacyjnego na umiejętności techniczne zapaśników stylu klasycznego o różnym poziomie zaawansowania sportowego. *Antropomotoryka*. 2007; 17: 59–67 (in Polish, summary in English)
- Ljach WI, Witkowski Z: Koordynacyjne zdolności u piłce nożnej. Centralny Ośrodek Sportu. Warszawa, 2004 (in Polish)
- Sadowski J, Niżnikowska E, Niżnikowski T: Effectiveness of teaching the Basic acrobatic exercises and patterns in the case of acrobats having different coordination potential. *Polish Journal of Sport and Tourism*. Biała Podlaska, 2009; 16: 209–20