Correlations between selected coordination motor abilities and technical skills of Greco-Roman wrestlers aged 14–15

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

Jerzy Sadowski[ADE]**, Dariusz Gierczuk**[BCDE]

Faculty of Physical Education in Biała Podlaska, Biała Podlaska, Poland

Abstract

Background and Study Aim:
The aim of this study was to evaluate the correlations of selected indices of coordination motor abilities (CMA) and technical skills of Greco-Roman wrestlers.

Material/Methods:
Twenty-one wrestlers of the Greco-Roman style representing the student sports club UKS "Dwójka" took part in the research. The age of the examined was 14–15, and their sports experience was between 2.5 and 4 years long. The correlations between 12 indices (describing 7 CMA) and 10 technical elements of wrestling used in a horizontal and vertical posture were analysed. Technical skills were evaluated by five highly qualified wrestling coaches.

Results:
It was confirmed that there occurred significant correlations between technical skills and most CMA examined in wrestlers. In 55.8% of the cases correlation coefficients of the examined relations were higher than 0.50, which indicates a strong connection. The strongest correlations were observed between elements of wrestling technique and kinesthetic differentiation, movement combining, motor adjustment, dynamic balance and partly time-space orientation. In turn, the largest amounts of significant correlations with CMA were noticed in the following technical elements: curve trunk grip throw with an arm, curve back trunk grip throw as well as arm grip back throw. Technical elements performed in a vertical posture revealed stronger correlations with CMA than those done in a horizontal posture.

Conclusions:
Strong correlations between technical skills and kinesthetic differentiation, movement combining, motor adjustment, dynamic balance and time-space orientation prove that these CMA are extremely important in a training process of beginning wrestlers. Therefore, we should pay attention to their development particularly at the earliest stages of training.

Key words:
Greco-Roman wrestling • coordination motor abilities • technical skills

Author's address:
Dariusz Gierczuk, Faculty of Physical Education in Biała Podlaska, Akademicka 2 Str., Biała Podlaska, Poland, e-mail: darekgierczuk@op.pl

BACKGROUND

Coordination motor abilities (CMA) – psychomotor qualities that define the readiness to control and regulate movement activities.

Technical skills – sensory-motor habits acquired and reinforced during a teaching process in sport.

In the structure of technical preparation of wrestlers understood as a long-term process of acquiring and reinforcing motor habits, an important role is played by **coordination motor abilities** (CMA) [1–7]. They form a basis for effective learning of new motor skills as well as expand the area of their implementation in sports competitions [2,6–9]. A number of authors claim that there exist essential correlations between CMA and **technical skills** [8–11]. They suggest that achieving a high level of sports technique without simultaneous oriented development of CMA will be hindered [2,12–15].

However, views on this subject are not unanimous [11,12,16–19]. Some authors maintain that the importance of CMA increases together with the increase in sports technique [19; 20], while others do not share this opinion [16,18].

The aim of this study was to evaluate the correlations of selected coordination motor abilities (CMA) and technical skills of Greco-Roman wrestlers aged 14–15.

MATERIAL AND METHODS

Twenty-one wrestlers of the Greco-Roman style representing the student sports club UKS "Dwójka" took part in the research. The age of the examined was 14–15 ($\overline{x}$ =14.7±0.58), and their sports experience was between 2.5 and 4 years long ($\overline{x}$=3.4±0.62).

The correlations between 12 indices (describing 7 CMA) and 10 technical elements of wrestling were analysed. The motor tests described in literature [9] but modified by the study authors [21] were applied. The tests were checked in terms of accuracy and diagnostic informativeness [21].

Kinesthetic differentiation was evaluated on the basis of the test result of 'long jump at 50% of maximal capabilities', while rhythmization was evaluated by means of rhythm imitation and differentiation of 'the exercise of 5 cycles'. As for time-space orientation, it was evaluated with the use of the test of 'aimed jumps' and on the basis of the result of 'run towards colourful balls', whereas movement combining was also measured using the time of 'movement of a gymnastic baton' test and the result of 'standing long jump with and without a swing'. Speed of reaction was defined with the help of the test 'grabbing Ditrich's stick', while motor adjustment was evaluated on the basis of the 'standing long jump forwards and backwards' test in relation to the result achieved in the test 'run forwards and backwards 3×10 m'. Static balance was defined basing on the test result of 'standing with calves raised'. Static balance was defined basing on the test result of 'standing with calves raised', while in the case of dynamic balance, 'turns on an inverted gymnastic bench' test was applied. This test consisted in performing a maximum number of rotations around your axis within 30 sec. on a batten of an inverted gymnastic bench [9,21].

Moreover, five basic elements of **Greco-Roman wrestling** technique used in horizontal and vertical posture were analysed:
a) *in 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 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 tests measuring CMA and technical elements can be found in references [22 after 12].

Greco-Roman wrestling – Olympic sport which consists in a direct combat between two competitors.

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 strength of correlation was calculated drawing on Spearman's rank correlation coefficient.

RESULTS

The data concerning the correlations of selected CMA with technical skills of Greco-Roman wrestlers are presented in Table 1.

They show that in most cases there occur significant correlations. It turned out that 76 out of 120 correlations (63.3%) were statistically significant at different strength levels.

The highest correlation coefficients occurred between the E2 index evaluating dynamic body balance and T8, i.e. curve trunk grip throw with an arm, where r=0.91 (p<0.01); between the E2 index also evaluating dynamic body balance and T4 evaluating wrestling technique through curve back trunk grip throw, where r=0.87 (p<0.01); between the D2 index defining movement combining and T4, i.e. curve back trunk grip throw, where r=0.84 (p<0.01) and the A2 index evaluating motor adjustment and T10 measuring wrestling technique in a standing position, i.e. arm grip back throw, where r=0.82 (p<0.01). The weakest correlations were found between test B1 measuring rhythmization and T1 evaluating trunk grip gut wrench (right side), r=–0.26 (> 0.05) as well as between test E1, which defines static balance, and T2, i.e. left side trunk grip gut wrench, where r=0.27 (p>0.05) (Table 1).

The highest number of correlations observed were weak correlations with coefficients r<0.49 (43.3%), while the lowest number concerned strong correlations, where r=0.70–0.99 (19.2%). In the case of moderate correlations with r=0.50–0.69, the number of coefficients constituted 37.5% of all the analysed correlations (Figure 1).
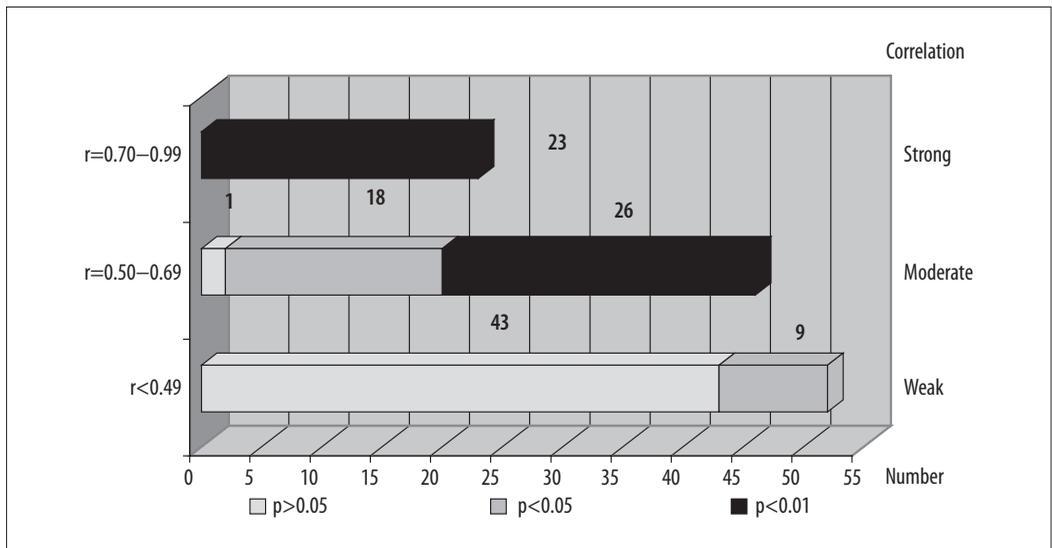
The strongest correlations between CMA and technical elements were observed in the case of kinaesthetic differentiation, movement combining, motor adjustment, dynamic balance and partly time-space orientation (index C2). As for speed of reaction, static balance, rhyth-

Table 1. Correlations between selected indices of CMA and technical skills of Greco-Roman wrestlers aged 14–15.

Technical skills		Coordination motor abilities											
		Motor adjustment		Rhythmization		Time-space orientation		Movement combining		Body balance		Speed of reaction	Differe-ntiation
		A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	F1	G1
Horizontal posture	T1	**0.50***	**0.56****	−0.26	**−0.49***	0.41	−0.41	−0.49	**0.57****	0.32	**0.58****	−0.30	**0.81****
	T2	0.43	**0.71****	−0.36	**−0.58****	0.34	−0.43	**−0.53***	**0.67****	0.27	**0.69****	−0.37	**0.77****
	T3	0.32	**0.65****	−0.39	−0.36	0.43	−0.29	**−0.46***	**0.63****	0.30	**0.77****	−0.39	0.44
	T4	**0.57****	**0.74****	**−0.50***	**−0.50***	0.43	**−0.53***	**−0.74****	**0.84****	**0.48***	**0.87****	**−0.50***	**0.68****
	T5	0.39	0.28	−0.38	**−0.54***	0.39	**−0.44***	**−0.45***	0.42	0.42	0.31	−0.39	**0.64****
Vertical posture	T6	**0.63****	**0.77****	−0.37	−0.40	0.34	**−0.59****	**−0.65****	**0.81****	0.41	**0.79****	**−0.54***	**0.66****
	T7	0.41	**0.68****	**−0.58****	−0.29	**0.54***	**−0.45***	**−0.65****	**0.61****	0.34	**0.75****	−0.54	**0.73****
	T8	**0.54***	**0.74****	**−0.53***	−0.38	**0.49***	**−0.49***	**−0.69****	**0.77****	**0.53***	**0.91****	−0.41	**0.67****
	T9	**0.46***	**0.64****	−0.42	−0.33	**0.55***	**−0.57****	**−0.51***	**0.74****	0.41	**0.71****	−0.29	**0.63****
	T10	**0.79****	**0.82****	**−0.54***	**−0.55****	**0.51***	**−0.52***	**−0.55***	**0.81****	**0.72****	**0.87****	−0.36	**0.58****

Notice: statistical significance at the level of * – 0.05; ** – 0.01; T1 – trunk grip gut wrench (right side), pts; T2 – trunk grip gut wrench (left side), pts; T3 – trunk grip gut wrench throw, pts; T4 – curve back trunk grip throw, pts; T5 – reverse trunk grip throw, pts; T6 – hand grip tackle, pts; T7 – hip throw with an arm and neck grip, pts; T8 – curve trunk grip throw with an arm, pts; T9 – waist grip tackle, pts; T10 – arm grip back throw, pts; A1 – standing long jump forwards and backwards, %; A2 – run forwards and backwards 3x10m, %; B1 – rhythm imitation in exercises of 5 cycles, error in sec.; B2 – rhythm differentiation in exercises of 5 cycles, error in sec.; C1 – aimed jumps, %; C2 – run towards colourful balls, sec.; D1 – movement of a gymnastic baton, sec.; D2 – standing long jump with and without a swing, %; E1 – standing with calves raised, sec.; E2 – turns on an inverted gymnastic bench, no.; F1 – grabbing Ditrich's stick, cm; G1– long jump at 50% of maximal capabilities,%.
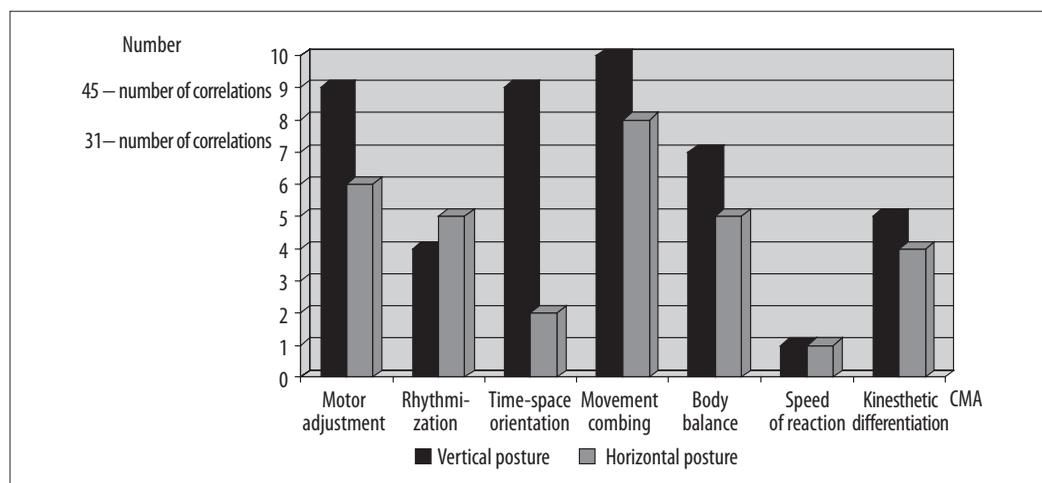

Figure 1. The strength of correlations between CMA and technical skills of Greco-Roman wrestlers aged 14–15.

mization and time-space orientation (index C1), in most cases the analysed correlations turned out to be statistically insignificant (p>0.05).

While analysing the correlations between technical skills and CMA examined, the highest correlation co-

efficients were observed in curve back trunk grip throw (index T4); in arm grip back throw (index 10) and curve trunk grip throw with an arm (index T8). The weakest correlations with CMA were noted in reverse trunk grip throw (index T5) and in trunk grip gut wrench throw (index T3).

Figure 2. Differences in the number of significant correlations between CMA and technical skills of wrestlers in horizontal and vertical posture.

It is worth mentioning that the strength of correlations between CMA and elements of wrestling technique performed both in a horizontal and a vertical posture turned out to be diverse. Technical skills applied by wrestlers in the vertical posture correlated with CMA in a statistically significant way in 44 cases, while in the horizontal posture it occurred in 33 cases (Figure 2).

The most considerable differences concerning the strength of correlations between technical skills and CMA were observed in time-space orientation, motor adjustment, movement combining and body balance. In the case of speed of reaction, rhythmization and kinaesthetic differentiation, no big differences were noted concerning the correlations with technical skills taking into consideration the division into technical elements performed in horizontal and vertical posture (Figure 2).

Discussion

The study performed on Greco-Roman wrestlers aged 14–15 confirmed the opinions of many specialists dealing with combat sports, according to which there exist correlations between CMA and technical skills [3,4,7–10,12] and they constitute integral elements of the material structure of sports training (technical preparation) [11].

Significant correlations between technical elements and most CMA examined were observed. The strongest correlations with technical elements were found in kinesthetic differentiation, movement combining, motor adjustment, dynamic balance and partly in time-space orientation. It proves that they are very important in this complex sport. The data obtained suggest that in the training of beginning wrestlers particular attention should be paid to developing those coordination motor abilities. Speed of reaction (simple reaction), static balance and rhythmization do not reveal such strong correlations with the examined technical skills, which may indicate their lesser importance. As for speed of reaction, it is said to be one of the leading CMA in wrestling [11,17,18]. However, it is probably the case only in complex reaction.

It is worth mentioning that technical elements performed in a vertical posture revealed stronger correlations with particular indices of CMA. It primarily concerns dynamic balance, time-space orientation and motor adjustment. It is probably connected with the occurrence of more diverse technical elements performed in the vertical posture. More difficult conditions of applying a particular technique also require a proper level of CMA from a wrestler. The studied technical elements used in the vertical posture are more coordinationally complex and more difficult to perform due to the fact that, for instance, the centre of gravity is situated higher and there are fewer support points than in the case of the horizontal posture.

Conclusions

Taking into consideration the strength of correlations between basic technical elements and such CMA as kinesthetic differentiation, movement combining, motor adjustment and time-space orientation, it might be assumed that they belong to the group of CMA which are the most important at this stage of training. According to the research [13–15], deliberate emphasis put on selected CMA in wrestling training increases the effectiveness of learning and improving technical skills mainly at the stage of general and oriented training. The data concerning the leading CMA ought to be used as one of the criteria during a recruitment and selection of wrestlers as well as in a training process.

The data obtained made it possible to draw the following conclusions:

1. In Greco-Roman wrestlers aged 14–15 in most correlation coefficients examined statistically significant correlations were observed between CMA and technical skills. In 55.8% of the cases correlation coefficients of the examined relations were higher than 0.50, which indicates a strong connection.

2. The strongest correlations were observed between elements of wrestling technique and kinesthetic differentiation, movement combining, motor adjustment, dynamic balance and partly time-space orientation. In turn, the largest amounts of significant correlations with CMA were noticed in the following technical elements: curve back trunk grip throw, arm grip back throw as well as curve trunk grip throw with an arm.

3. Technical elements performed in a vertical posture revealed stronger correlations with CMA than those done in a horizontal posture.

4. In the training process of wrestlers more attention ought to be paid to developing CMA.

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