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STUDY ON THE IMPORTANCE OF COORDINATION ABILITIES IN THE GAME OF WATER POLO AT THE EUROPEAN LEVEL

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Abstract:

Aim. To assess the opinions of European specialists about the importance of coordination abilities and their applicability in the game of water polo.

The present research will help us to understand the personal experience of specialists from other countries and to know scientifically the real impact of the need for coordination abilities in training and competitive activities.

Methods. The research participants are 36 water polo specialists from 8 countries, namely: Greece, Netherlands, Great Britain, Hungary, Serbia, Italy, France, and Slovakia.

Results. According to Cronbach's Alpha values, the analyzed variables are adequate for the design of the model. The analysis included two formative variables, Training and importance of coordination abilities, and a reflective variable, coordination abilities. The weighting of the subitems forming the *Training* variable indicates that the greatest importance is attached to technical training (0.486), followed by theoretical training (0.457) and physical training (0.440), while tactical training is in last place (0.389). It is observed that psychological training has negative values (-0.561). Negative values can be excluded from the model, but some statisticians (for example, Hair) believe that they should be kept if they have high values. In this case, psychological training seems to be important, but probably coaches think that its management is the psychologist's responsibility.

Conclusions. All specialists agree on the importance of developing coordination abilities in the training process. The entire study validates the formulated hypotheses.

Keywords: coordination abilities; water polo; performance; training.

Introduction

Water polo has a history of over 140 years, this sport originating in England in the 1880s. Less than 20 years later, it was among the first sports games to reach the highest level of competition through its inclusion in the Olympic program.

The complexity and difficulty of water polo characterizes it as a sports discipline that develops motor skills and abilities unmatched by other sports due to the fact that it takes place in an artificial environment where the human body, even from the early age of about 6-8 years, learns to adapt to it because it is not as familiar as dry land (bipedal walking).

From a scientific point of view, learning to move through water (swimming) involves the use of many methods that are developed in the following sequence: adaptation to water, breathing in water, and training the legs and arms until the swimming techniques are perfected.

The game of water polo is characterized by rhythm breaks from one phase to another, static and dynamic balance, segmental and general dynamic coordination, spatiotemporal orientation, hand-eye coordination, speed and accuracy of movements, ambidexterity, skill, rhythm, tempo, agility, kinesthetic differentiation, combinatory ability, and adaptive ability. A player needs all these qualities, in addition to tenacity and exercise endurance in an unnatural environment; in scientific terms, they are called coordination abilities.

Many specialized studies address topics such as the importance of coordination abilities, the influence of exercise content on the development of coordination abilities (Tudor et al., 2014), and the relationship between motor coordination, cognitive ability, and performance in children (Higashionna et al., 2017). However, such research is almost non-existent for the training of juvenile water polo players.

Vasile (2014) defines "some methodological aspects based on which we can build sets of exercises for developing endurance, by reconsidering rest breaks"; the implementation of such exercises essentially contributes to the training of water polo players, too. Swimming provides children with the opportunity to improve their physical fitness, motor skills, and self-esteem (Bălan, 2014).

Improving the quality of speed in athletes will allow for "the acquisition and strengthening of technical and tactical actions" (Moanță et al., 2014). The close relationship between health promotion, a healthy lifestyle and harmonious physical development (Ţifrea et al., 2016) is crucial in most sports disciplines.

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In the Romanian literature, the research by Marinescu et al. (2018) integrates methods for the analysis and assessment of coordination ability in water polo players aged 14-15, which directly or indirectly influences the body position and movement through water but also the specific technique, "resulting in increased future sports performance".

The present study complements the above-mentioned research, analyzing the importance of developing coordination abilities at the European level and their impact on the specific water polo training for athletes aged between 10 and 12 years.

Objectives:

Establishing the main components of coordination abilities in specialized training;

Determining the implementation level of coordination abilities in training and their role in achieving sports performance.

Methods

The research participants are 36 water polo specialists from 8 countries, namely: Greece, Netherlands, Great Britain, Hungary, Serbia, Italy, France, and Slovakia.

By applying the survey questionnaire as a research tool, we collected data about the aforementioned objectives of the study. The opinions expressed by our respondents were also correlated by considering their levels of training.

After summarizing the information gathered from specialists, we used the mathematical statistics method and the graphical method to analyze their responses. In this paper, the SmartPLS3 and Microsoft Excel programs were used due to their accuracy in calculating the mean score differences between the surveyed participants.

Results

The collected data were used to develop a regression model for the analysis of factors influencing the development of coordination abilities. The structural equation model was designed using SmartPLS3.0.

Table 1. Analyzed variables and their labeling

Variable	Description		
	Please tick to what extent you think the following coordination abilities are important in your training lessons		
C_Balance	Static and dynamic balance		
C_Coordination	Segmental and general dynamic coordination		
C_Orientation	Spatiotemporal orientation		
C_Ambidexterity	Ambidexterity		
C_Coord-h_e	Hand-eye coordination		
C_Accyracy	Speed and accuracy of movements		
C_Skill	Skill		
C_Rhythm	Rhythm		
C_Tempo	Tempo		
C_Agility	Agility		
C_DifKinesthetic	Kinesthetic differentiation		
C_Combinatory a	Combinatory ability		
C_Adaptare	Adaptive ability		
	Please tick to what extent you think the following sports training components are important in your training lessons		
A_PregPsiho	Physical training		
A_PregTehnică	Technical training		
A_PregTactică	Tactical training		
A_PregPsiho	Psychological training		
A_PregTeoretică	Theoretical training		
СС9 -	The importance of developing coordination abilities during training		
CCDezv13 -	To what extent do you aim to develop coordination abilities in your training lessons?		
CCInv14 -	The weighting of coordination abilities in the selection process		





The type of training and the importance given by specialists to coordination abilities influence sports performance.



Figure 1. Cronbach's Alpha coefficient, Path Analysis, and Weighting of variables (LF = load factors)

Correlation.

An average positive correlation is observed between the following variables:

Training and *Coordination Abilities* (0.396), which indicates that the quality of training can influence the development of coordination abilities;

Imp Abilities and Training (0.594), which suggests that specialists who attach importance to coordination abilities adapt their training sessions accordingly;

Imp Abilities and *Coordination Abilities* (0.353), which shows that the greater the importance given by specialists to coordination abilities, the higher the sports performance achieved by athletes.

Mean, STDEV,T- Values,	Confidence	Confidence	Samples		Сору
P-Values	Intervals	Intervals Bias			to
		Со			Clipboard
	Original	Sample	Standard	Т	P-
	Sample	Men	Devia	Statistics	Values
Training >	0.396	0.420	0.117	3.384	0.001
Coordination Abilities					
Imp Abilities> Training	0.594	0.616	0.096	6.158	0.000
Imp Abilities>	0.353	0.342	0.128	2.765	0.006
Coordination Abilities					

Table 2. Path Analysis

Path Analysis demonstrates, as shown in Table 2, that the importance given by specialists to coordination abilities influences the type of training (0.594) and the development of coordination abilities (0.353). The type of training influences the development of coordination abilities (0.396). P-values are less than 0.05, so the model is valid.

Cronbach's Alpha coefficient is -0.924 (Figure 1), which suggests that the analyzed variables are adequate for the design of the model. The analysis included two formative variables, *Training* and *Imp Abilities*, and a reflective variable, *Coordination Abilities*.

The weighting of the subitems forming the *Training* variable indicates that the greatest importance is attached to technical training (0.486), followed by theoretical training (0.457) and physical training (0.440), while tactical training is in last place (0.389).

The *Imp Abilities* variable shows that most coaches give a very large weight to coordination abilities in the selection process (LF = 0.993). Some of them consider it important to develop these abilities during the training process (LF = 0.122). However, there are also few coaches who attach less importance to the development of coordination abilities during (LF = 0.103).





Among the coordination abilities that are greatly influenced by the quality of training and the importance given to them by coaches, the most relevant are the following: Tempo (0.892), Balance (0.868), Rhythm (0.804), Skill (0.710), Orientation (0.707), and Agility (0.704).

Hypothesis 2

Coordination abilities influence the performance achieved by athletes in national championships or their inclusion in national teams.



Figure 2. Cronbach's Alpha coefficient, Path Analysis and Weighting of variables (LF = load factors)

a) Weighting analysis

Path Analysis demonstrates, as shown in Figure 2, that the analyzed coordination abilities influence the performance achieved by athletes in national championships or their inclusion in national teams (0.471).

Cronbach's Alpha coefficient reveals that the analyzed variables are adequate for the design of the model. The analysis included a formative variable, *Coordination Abilities*, and a reflective variable, *Performance*.

Among the coordination abilities that have a greater influence on performance, we mention: Skill (0.704), Coordination (0.655), Ability (0.401), and Adaptation (0.302).

The weighting of the subitems forming the *Performance* variable indicates high values, which means that the development of coordination abilities has influenced over the years both the performance and inclusion of athletes in the national teams of each country.

b) Model validation

It can be seen that the model validation indicators for the *Performance* variable have very high values, which means that the subitems forming this variable are defining and relevant, as emphasized by the large weights shown in Figure 2. In our case, the model is correctly designed because all indicators validate it: CA = 0.833 > 0.7, rho_A = 0.850 > 0.7, and CR = 0.815 > 0.6 (Table 3).

	Cronbach's Alpha (C 4	rho_A	Composite Reliability (Cl
Coordination Abilities		1000	
Performance	0.833	0.850	0.815

Table 3. Model validation steps







Graph 1. Weighting of coordination abilities

Graph 1 highlights that EU specialists consider C_combine, C_Kinesthetic, C_Agility, C_Ability, C_Rhythm, and C_coordination to be important.



Graph 2. Importance of each type of training for UE specialists

According to Graph 2, EU coaches consider physical and technical training to be particularly important, while tactical training is in third place. They do not attach much importance to theoretical and psychological training.







Graph 3. Importance of developing coordination abilities for each position

Graph 3 indicates that EU coaches believe that the development of coordination abilities for the positions of goalkeeper, driver and wing is the most important, and only then for the positions of center and defender.

Discussions

The present research was developed in the context where the performance of water polo teams at senior level has considerably decreased in the last 5 years, with major effects on the U19 and senior national teams.

The emergence of this phenomenon is in contradiction with the fact that the number of water polo pools has tripled and the number of juvenile teams has doubled at national level in the past 10 years.

Following discussions with water polo experts from the specialized federation and the National University of Physical Education and Sport, we have concluded that it is imperative to assess the opinions of national and international specialists about the importance of coordination abilities and their applicability in the training process. The present study strictly refers to European specialists from countries with tradition and outstanding results worldwide. This study is part of the second stage of our research, which will be followed by a third stage where correlations will be made between the information received from European and Romanian specialists.

Our decision to focus on the development of coordination abilities in this paper is motivated by the fact that "there is consistent and emerging evidence showing that adequate motor skill competence, particularly locomotor and gross motor skills, is associated with increased PA [physical activity] levels during the preschool, child, and adolescent years" (Loprinzi et al., 2015). The same authors add that the early development of motor abilities has an impact on long-term motor performance.

Conclusions

The conclusions of this research based on the assessment of specialists' opinions and statistical analysis are the following:

According to Cronbach's Alpha values, the analyzed variables are adequate for the design of the model. The analysis included two formative variables, *Training* and *Importance of coordination abilities*, and a reflective variable, *Coordination abilities*.

Among the coordination abilities that have a greater influence on performance, we mention: Skill (0.704), Coordination (0.655), Ability (0.401), and Adaptation (0.302).

The weighting of the subitems forming the *Training* variable indicates that the greatest importance is attached to technical training (0.486), followed by theoretical training (0.457) and physical training (0.440), while tactical training is in last place (0.389).

The weighting of the subitems forming the *Performance* variable indicates high values, which means that the development of coordination abilities has an influence on both the performance and inclusion of athletes in national teams.

All specialists agree on the importance of developing coordination abilities in the training process.

The entire study validates the formulated hypotheses.

References

Bălan, V. (2014). Study on the method for teaching freestyle to young people with Down syndrome. Procedia - Social and Behavioral Sciences, 117, 710-714. <u>https://doi.org/10.1016/j.sbspro.2014.02.287</u>





Higashionna, T., Iwanaga, R., Tokunaga, A., Nakai, A., Tanaka, K., Nakane, H., & Tanaka, G. (2017). Relationship between motor coordination, cognitive abilities, and academic achievement in Japanese children with neurodevelopmental disorders. *Hong Kong Journal of Occupational Therapy*, 30(1), 49-55.

https://doi.org/10.1016/j.hkjot.2017.10.002

Loprinzi, P. D., Davis, R. E., & Fu, Y.-C. (2015). Early motor skill competence as a mediator of child and adult physical activity. *Preventive Medicine Reports*, *2*, 833-838.

https://doi.org/10.1016/j.pmedr.2015.09.015

- Marinescu, G., Ticală, L. D., Hoanță, D., Rădulescu, A., Danciu, R., & Alogaili, W. (2018). Aspects of psyhomotricity in water polo players Juniors aged 14-15. *Discobolul*, 4(54), 46-51.
- Moanță, A. D., Ghițescu, I. G., & Tudor, V. (2014). Aspects of the 30 m speed development in junior basketball players. *Procedia - Social and Behavioral Sciences, 117*, 50-54.

https://doi.org/10.1016/j.sbspro.2014.02.177

- Tudor, V., Moanță, A. D. Ghiţescu, I. G., & Trişcaş, N. (2014). Optimization of physical education classes by adapting the methods for developing the coordination ability in 5th grade students. *Procedia - Social and Behavioral Sciences*, 117, 92-97. <u>https://doi.org/10.1016/j.sbspro.2014.02.184</u>
- Tifrea, C., Giosan, A., & Costache, R. M. (2016). The importance of physical education and sport in the life of the students of the economy colleges. *Annals of Faculty of Economics, University of Oradea, 1*(1), 428-434.
- Vasile, L. (2014). Endurance training in performance swimming. Procedia Social and Behavioral Sciences, 117, 232-237. <u>https://doi.org/10.1016/j.sbspro.2014.02.206</u>