Research on the Sports Intelligence Structure System of High-level Swimmers in Colleges and Universities

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Abstract: This paper uses questionnaires, interviews, mathematical statistical analysis and other research methods to study the structure of sports intelligence of high-level swimmers in colleges and universities. Motor intelligence (0.79) and specific motor intelligence (0.68), general motor intelligence including attention (0.69), motor perception (0.70) and thinking (0.60), specific motor intelligence including motor will (0.36), memory (0.85) and Sports image (0.52); there are significant differences in the structure of general sports intelligence and specific sports intelligence among swimmers of different sports levels. The purpose is to provide a theoretical reference for the improvement of the athletic intelligence level of high-level swimmers in colleges and universities, the scientific and systematic training of coaches, the enrichment of the theoretical system of sports training, sports scientific research and college sports teaching.

Keywords: colleges and universities, swimmers, sports intelligence, structure

1. Introduction

Through the database retrieval of the research results on intelligence in the past 20 years, and the analysis of the literature on intelligence and sports intelligence, the concept of sports intelligence recognized by most scholars in the sports field is: "Sports intelligence refers to athletes based on general intelligence, the ability to use multidisciplinary knowledge, including sports theory, to participate in sports training and competition" [1]. From the perspective of intelligence, many scholars have used general intelligence tests, Wexler Adult Intelligence Scales, Reactive Cognitive Tests, and Operational Thinking Ability [2-5] to study the athletic intelligence of their athletes and students of physical education colleges. These research results are based on the intelligence perspective to infer the level of sports intelligence, and there are few studies on the scale and structure of athletes' sports intelligence.

In order to clearly understand the sports intelligence structure of athletes, establish and verify the structural system model of sports intelligence of athletes, and find out the core factors affecting the sports intelligence of athletes. Implement training to enrich the theoretical knowledge system of sports training and provide theoretical reference.

2. Theoretical understanding of sports intelligence research

In the field of intelligence research, the definition and structure of intelligence are obtained by scholars in different fields. Scholars in the field of sociology believe that "intelligence refers to people's ability to use knowledge, including self-learning ability, research ability, thinking ability, expression and organization ability" [6]; Intelligence, spatial intelligence, musical intelligence, logic-mathematical intelligence, interpersonal communication intelligence and personal introspection intelligence"[7]; Sequence, multi-element, multi-level dynamic complex. It includes Marx's basic theory and knowledge; general knowledge and professional basic knowledge, basic skills, innovation ability, etc." [8]; the field of sports management believes that "intelligent structure consists of ideas, ability, the three qualities of culture are positively correlated" [5].

In terms of kinematic intelligence, different scholars at home and abroad have gained understanding of kinematic intelligence. American Howard Gardner believes that "Kinematic intelligence refers to the

ability to express oneself by using the body and body movements" [9]; Chinese scholar M J Tian believes that "Kinematic intelligence is a kind of general intelligence, which refers to the ability of athletes to express themselves with ordinary Intelligence-based, using multidisciplinary knowledge including sports theory, the ability to participate in sports training and sports competitions; the improvement of sports intelligence is based on general intelligence. Improve various factors that affect sports intelligence, such as improving the observation of athletes ability, attention and thinking imagination are the basis for improving sports intelligence"[1]; X H Zheng believes that "sensitivity, fluency, flexibility, originality, combination and insight are the theoretical basis for intelligent selection of gymnasts"[10]; Y J Zeng et al. believed that "the intellectual structure of Sanda athletes is mainly attention, imagination, observation, thinking and memory" [11].

Based on the related research results of intelligence and sports intelligence, this study puts forward the theoretical conception of athletes' sports intelligence structure from the perspective of cognitive psychology, which mainly includes sport will, attention, sports perception, thinking and memory ability, sports imagery and other aspects.

3. Research objects and methods

3.1 Research objects

This study selected the swimmers who held the National University Swimming Championships in Hangzhou in July 2010 as the test subjects. The test subjects were from 6 colleges and universities including Southwest University, Beijing Sports University, Shanghai Jiaotong University, Tianjin University, Tongji University and China University of Mining and Technology, mainly to study the structure of sports intelligence of high-level swimmers.

3.2 Research methods

3.2.1 Documentation method

With the help of the school's digital resources (CNKI, VIP, Wanfang and other databases) and books, materials and journals, the research results on intelligence and sports intelligence are consulted and analyzed, which has laid a theoretical foundation for the study of the structure of high-level swimmers' sports intelligence.

3.2.2 Questionnaire survey method

This study adopts the self-compiled "High-level Swimmers Sports Intelligence Scale in Colleges and Universities", which has been revised and tested to meet the standards for the preparation of psychological scales. A total of 120 questionnaires were distributed, 106 questionnaires were effectively recovered, and the questionnaire efficiency was 88.33%. Among them, there are 12 national athletes, 64 national first-level swimmers, and 30 national second-level athletes; the average age is 20.01±1.97 years old; the average sports years are 5.96±3.15 years old.

3.2.3 Expert interview method

Through interviews with swimming coaches and sports training experts from Southwest University, Beijing Sports University and Shanghai Jiaotong University, combined with the characteristics of swimming events, the sports intelligence structure of athletes is analyzed, and corresponding amendments are put forward.

3.2.4 Mathematical statistics

This study uses SPSS 17.0 and AMOS7.0 statistical software to process the measured data to ensure the scientificity of the data processing results.

4. Results and analysis

4.1 Reliability and validity analysis of the Sports Intelligence Scale for High Level Swimmers in Colleges and Universities

4.1.1 Reliability test

Since this study is a survey of students in the National University College Swimming Championships, and does not have the conditions for re-testing, the Cronbach's consistency coefficient is used to test, and the reliability test results of the scale analysis are obtained (see Table 1), which reaches the reliability of the scale to better standard [12].

Table1. Reliability test list of "High-level Swimmers Sports Intelligence Scale in Colleges and Universities"

Dimension	F1	F2	F3	F4	F5	F6	F total
Title number	5	4	4	4	4	4	25
αcoefficient	0.711	0.679	0.732	0.754	0.749	0.710	0.792

Note: F1 represents will to exercise; F2 represents attention; F3 represents motor perception; F4 represents thinking ability; F5 represents memory ability; F6 represents motor image; F always represents motor intelligence. Same below

4.1.2 Structural validity test

In order to further investigate the structural validity of the sports intelligence scale for high-level swimmers in universities, KMO=0.886,1525.420, P=0.000, which is suitable for factor analysis. The correlation analysis of each dimension and total scale is used to obtain the correlation matrix of each dimension and total scale (see Table 2), indicating that the scale has good structural validity [13].

1Table 2. List of correlation matrix of high-level swimmers in universities

dimension	F1	F2	F3	F4	F5	F6	F overall
Movement will	1						
attention	0.376**	1					
Movement perception	0.489**	0.533**	1				
Thinking force	0.376**	0.648**	0.533**	1			
the faculty of memory	0.511**	0.606**	0.540**	0.606**	1		
motion image	0.505**	0.597**	0.515**	0.597**	0.616**	1	
sport intellect	0.665**	0.881**	0.762**	0.881**	0.798**	0.783**	1

Note: * A significant correlation for P <0.05; * * indicates a very significant correlation for P <0.01

4.2 Exploratory research on the structure of sports intelligence of high-level swimmers in colleges and universities

On the basis of discussing the connotation of the structure of high-level swimmers' sports intelligence in colleges and universities, a sports intelligence structure model of athletes is constructed to understand the relationship and structure of potential variables that affect the structure of high-level swimmers' sports intelligence [14]. Therefore, this study adopts a more concise model. (that is, the optimization model) to represent the structure of high-level swimmers' sports intelligence in colleges and universities, and empirically analyze the model. Using spss17.0 software principal component analysis method to carry out exploratory factor analysis on 6 first-order factors, KMO=0.793, Baritt's sphericity test value is 155.138, P=0.000<0.05, indicating that swimmers' athletic intelligence has 6 first-order factors. The factor is suitable for factor analysis [12], and its factor loading matrix (see Table 3)

Table 3 List of factor loadings of sports intelligence structural model for high-level swimmers in colleges and universities

Dimension and load	f1	f2	Common degree
F2(attention)	0.730		0.755
F3 (motion perception)	0.768		0.793
F4 (Thinking)	0.698		0.721
F5 (Memory)		0.811	0.842
F6 (motion representation)		0.573	0.698
F1 (movement will)		0.498	0.602

Note: f1 represents general motor intelligence, and f2 represents special motor intelligence

From Table 3, during the exploratory analysis, there are two shared factors in the structural system of high-level swimmer motor intelligence. The first sharing factor includes attention, motion perception and thinking ability, and the second sharing factor includes memory, motor representation and motor will. In this study, the first factor, the first factor is named f1: general motor intelligence; the second factor is named f2: special motor intelligence. The name is based on the research that "motor intelligence includes general intelligence and special intelligence, and general intelligence based on operational thinking is the basis"[10]. Based on this research, the author through network technology to swimming experts 10 letters, borrow the national college students swimming championships, questionnaire for six swimming coaches, interview, communication, questionnaire survey is about general movement intelligence and special movement intelligent structure division, after the interview, survey data sorting and analysis, get its movement intelligent structure system is reasonable.

Based on the rationality of the intelligent structure of high-level swimmers, this study tries to explore the correlation of the substructure in the high-level swimmers.AMOS7.0 maximum likelihood estimation method was used to test the fitting degree of the sports intelligent structure model of high-level swimmers in universities (see Table 4 and Figure 1). According to the test results of Table 3, all the fitting indicators meet the requirements of model fitting [13]. Therefore, it shows that the fit of the motor intelligent structure system model better reflects the theoretical model and has good indicators.

Table 4. List of fitting indicators of the sports intelligence structural system model for high-level swimmers in colleges and universities

X2	X2/df	P	AGFI	NFI	CFI	RMR	RMSEA
12.7	1.591	0.114	0.869	0.901	0.943	0.028	0.069

As can be seen from Figure 1, the sports intelligence structural system model of high-level swimmers in colleges and universities is established, and the model reflects the "direct effect of each dimension on sports intelligence (it reflects the direct impact of the cause variable on the result variable), its size equal to the size of the path coefficient from the cause variable to the effect variable" [14]. The normalized path coefficient of the latent variable "general sports intelligence" to "kinetic intelligence" is 0.79, and its direct effect coefficient on sports intelligence is 0.79, which means that when other factors or conditions remain unchanged, "general sports intelligence" is improved by one unit per unit. , the swimmer's motor intelligence will improve by 0.79 units. The normalized path coefficient of the latent variable "special sports intelligence" to "sports intelligence" is 0.68, and its direct effect coefficient on sports intelligence is 0.68, which means that when other factors or conditions remain unchanged, the "special sports intelligence" increases by one unit. , the swimmer's motor intelligence will improve by 0.68 units. The path coefficient of the latent variable "memory" to "special sports intelligence" is 0.85, so its direct effect coefficient on special sports intelligence is 0.85. This shows that when other factors or conditions remain unchanged, each unit of "memory" increases the specific sports intelligence of swimmers by 0.85 units, and the latent variable "memory" has the greatest effect on "special sports intelligence". The largest contribution. In general motor intelligence, the direct effect coefficient of the latent variable "motion perception" to "general motor intelligence" is 0.70, with the largest effect and the largest contribution rate. In addition to direct effects between variables, there are indirect effects of relationships between variables. "The so-called indirect influence is the influence of a variable (independent variable) on another variable (dependent variable) through other variables (intermediate variables). The indirect variable is equal to the path coefficient of the independent variable to the intermediate variable multiplied by the intermediate variable to the dependent variable path coefficients" [14]. For example, memory can affect motor intelligence through

special motor intelligence, and this indirect effect is 0.85*0.79 = 0.6715. Therefore, the structural system model of sports intelligence of high-level swimmers in colleges and universities can better reflect the degree of influence of various dimensions on sports intelligence, and has certain practical applicability.
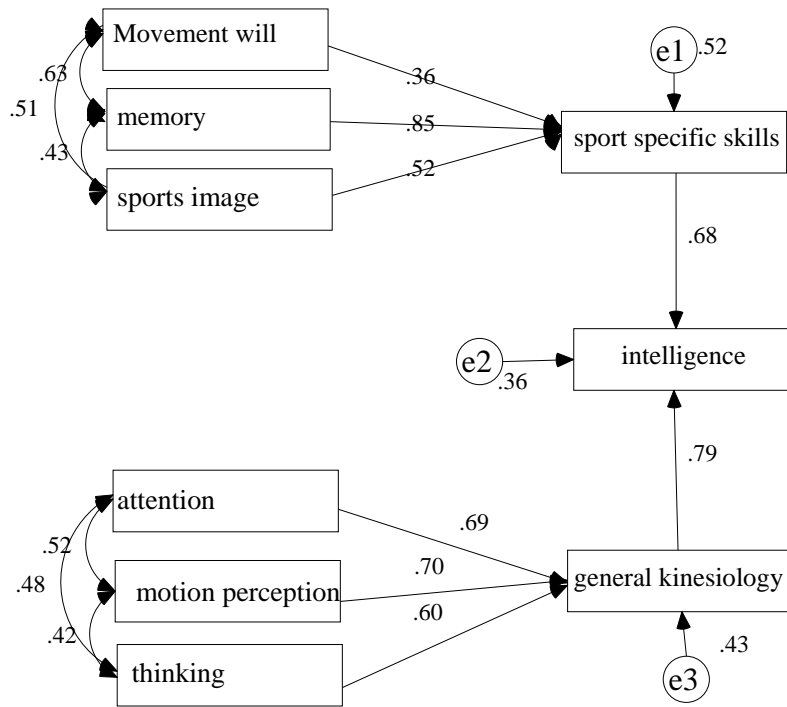

Figure 1 Model diagram of the sports intelligence structure system for high-level swimmers in colleges and universities

4.3 Overall descriptive analysis of athletic intelligence of high-level swimmers in colleges and universities

In order to analyze the characteristics of the overall situation of high-level swimmers' sports intelligence in colleges and universities, the sports intelligence of high-level swimmers was analyzed from the perspective of the overall sports intelligence and the scores of each structure (see Table 5).

Table 5 Comparison of the mean scores of sports intelligence of high-level swimmers in colleges and universities

dimension	minimum	maximum	mean	standard deviation
General sports intelligence	2.27	4.75	3.5270	0.56510
Special sports intelligence	1.25	5.00	3.4631	0.64745
sport intellect	2.06	4.87	3.4950	0.54729

From Table 5, it can be seen that the overall score of sports intelligence of high-level swimmers in colleges and universities is good, but from the perspective of the score of sports intelligence structure, the score of general sports intelligence is higher than the score of sports intelligence, and the score of sports intelligence is high For special sports intelligence. The above may be caused by the fact that swimmers attach great importance to general sports intelligence. In the usual sports training process, strengthen the training of general sports intelligence, combine the practice of athletes training and the training of sports perception, thinking ability, attention and other aspects. The formation of a good sense of movement in training, as well as the good internal cognition of factors such as water, water sense, and water buoyancy are closely related to athlete training.

4.4 Difference analysis of sports intelligence among high-level college swimmers of different genders and sports levels

Table 6 List of differences in sports intelligence of high-level swimmers in colleges and universities with different genders and sports levels

class	variable	General motion intelligence	Special sports intelligence
sex	man	3.46±0.64	3.54±0.51
	woman	3.46±0.66	3.51±0.61
	F price	0.011	0.793
Sports level	National level ii	2.59±0.55	2.91±0.38
	country-level	3.59±0.54	3.57±0.48
	master's degree	3.53±0.64	3.67±0.63
	F price	15.586**	9.672**

Note: * A significant correlation for $P < 0.05$; * * indicates a very significant correlation for $P < 0.01$

Available from Table 6, there is no significant difference in general sports intelligence and in special sports intelligence, the above differences may be due to the swimmers during swimming training, the coaches arranged the training in the same subjects, the training plan is arranged roughly the same as the implementation, there is also the phenomenon of the masculinity of female technology, the difference in motor intelligence between men and women is not obvious; High-level swimmers in general sports intelligence in different sports levels and special sports intelligence, as athletes of different sports levels are in training, the contents and plans of the training are different, the higher the level of athletes, the more attention to special sports intelligence, resulting in different levels of athletes on the sports intelligence cognition differences.

5. Discussion

In order to further explore the structure of athlete's sports intelligence and establish a high-level swimmer's sports intelligence structure system, the structural system is based on the theoretical assumption structure. The results of coach interviews and letter exchanges, but in this process, the division of its structure may be affected by experts, coaches' professional knowledge structure system and training experience, etc., resulting in unscientific structure division standards. Therefore, future research will be conducted. , it is necessary to specially organize famous experts and scholars at home and abroad to conduct special discussions on the division of its structure, so as to provide a guarantee for the establishment of the sports intelligence structure system. On the basis of the theoretical structure hypothesis structure, the model of the high-level swimmer's sports intelligence structure system is verified, and the correlation coefficients of the influence of each structure on the sports intelligence in the model are obtained: general sports intelligence (0.79) and special sports intelligence (0.68), General motor intelligence includes attention (0.69), motor perception (0.70) and thinking (0.60), and specific motor intelligence includes motor will (0.36), memory (0.85) and motor imagery (0.52). From the correlation coefficient (standardization) of the kinematic intelligence structure in this structural system model, the general kinematic intelligence substructure has a greater impact on the improvement of the level of kinematic intelligence, which is consistent with the previous research results [1]. However, this coefficient is only to verify its importance statistically. In sports practice, whether general sports intelligence is more important or special sports intelligence is more important, a large number of experiments are needed to prove it, which will be a major issue in future research. In the general sports intelligence structure, the correlation coefficient of motion perception is the largest. It may be that when athletes are training, the movement movements of each swimming posture are different. The optimized sports techniques are applied to their own special projects to improve their competitive level. In the special sports intelligence structure, the sub-structure of memory has the largest correlation coefficient. It may be that when high-level swimmers are training, coaches use methods such as descriptions of their own actions and observation of action videos to make athletes have a certain understanding of swimming movements. And let them remember the essentials, difficulties, key points, mistakes, etc. of movements, so as to form an accurate sports technical system in their own training. However, this sports intelligence structural system model is established on the basis of high-level swimmers in colleges and universities. When it is extended to other sports, it should be adjusted according to the characteristics of the project.

There is no significant difference in general sports intelligence and specific sports intelligence among high-level college swimmers of different genders, but there are significant differences in general

sports intelligence and specific sports intelligence among high-level college swimmers with different sports levels. Based on the analysis of the data, there is no team-following research based on the actual situation of the athletes, to find out the general sports intelligence level of athletes of different sports levels at their respective levels, and to formulate the standard for the general sports intelligence level of athletes of different levels, thus making up for the mere The defect of grading sports performance, which will be an important direction of future research. In the future, research should also focus on the differences between men and women, and formulate different training plans. Different levels of athletes have different requirements for special sports intelligence. It is necessary to find different standards for division. This provides a guarantee for the improvement of the level of athletes' special sports intelligence. At the same time, it will be a major research topic to combine the training of special sports intelligence with the actual characteristics of sports, and to arrange the relationship between mobilized physical fitness, skills and intelligence.

6. Conclusion

In this study, the structure of motor intelligence (correlation influence coefficient) of high-level swimmers in colleges and universities was found to be general motor intelligence (0.79) and special motor intelligence (0.68). 0.60), specific sports intelligence includes sports will (0.36), memory (0.85) and sports image (0.52): there are significant differences in the structure of general sports intelligence and specific sports intelligence among swimmers of different sports levels, which provides information for future research on sports intelligence to some theoretical references.

Acknowledgements

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