PSYCHOPHYSIOLOGY OF BASKETBALL PLAYERS SUBMITTED TO HIGH INTENSITY EXERCISE

PSICOFISIOLOGIA DOS JOGADORES DE BASQUETEBOL SUBMETIDOS AO EXERCÍCIO DE ALTA INTENSIDADE

PSICOFISIOLOGÍA DE LOS JUGADORES DE BALONCESTO SOMETIDOS A EJERCICIOS DE ALTA INTENSIDAD

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Qiyong Duan[1]
(Physical Education Professional)
Tingna Zhou[2]
(Physical Education Professional)

1. Hunan International Economics University, Faculty of Physical Education, Changsha, Hunan, China.
2. Hunan International Economics University, Changsha, Hunan, China.

Correspondence:
Qiyong Duan
Changsha, Hunan, China. 410205.
duanqiyong1974@163.com

ABSTRACT

Introduction: The improvement of basketball performance results from the global impact of several factors such as physical complexion, function, quality, technology, tactics, psychology, intelligence, among others. The athlete's mental index has a high degree of importance in game performance. Objective: Analyze the influence of high-intensity exercise on the psychophysiological quality in basketball players by checking the correlation of the factors that affect basketball performance. Methods: Volunteer basketball players were randomly selected for the research. A comprehensive analysis and evaluation of physical function, physical quality and psychological characteristics of the athletes was performed. Results: There is a close relationship between physical quality, fundamental skills and psychological characteristics of basketball players. These factors showed a positive correlation trend. Physical fitness is most closely related to the basic techniques of the game. Conclusion: Basketball players must possess excellent physical and psychological qualities. Only in this way can athletes perform better on the sports field. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Basketball; Athletes; Physical Fitness; Adaptation, Psychological.

RESUMO

Introdução: A melhoria do desempenho do basquete resulta do impacto global de vários fatores como compleição física, função, qualidade, tecnologia, tática, psicologia, inteligência, entre outros. O índice mental do atleta tem um elevado grau de importância no desempenho do jogo. Objetivo: Analisar a influência do exercício de alta intensidade sobre a qualidade psicofisiológica nos jogadores de basquetebol verificando a correlação dos fatores que afetam o desempenho do basquetebol. Métodos: Jogadores de basquetebol voluntários foram selecionados aleatoriamente para a pesquisa. Efetuou-se análise e avaliação abrangente da função física, qualidade física e características psicológicas dos atletas. Resultados: Existe uma estreita relação entre a qualidade física, as habilidades fundamentais e as características psicológicas dos jogadores de basquetebol. Estes fatores mostraram uma tendência positiva de correlação. A aptidão física está mais intimamente relacionada com as técnicas básicas do jogo. Conclusão: Os jogadores de basquetebol devem possuir excelentes qualidades físicas e psicológicas. Somente desta forma os atletas podem ter um melhor desempenho no campo esportivo. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Basquetebol; Atletas; Aptidão física; Adaptação Psicológica.*

RESUMEN

Introducción: La mejora del rendimiento del baloncesto es el resultado del impacto global de varios factores como la complexión física, la función, la calidad, la tecnología, la táctica, la psicología y la inteligencia, entre otros. El índice mental del deportista tiene un alto grado de importancia en el rendimiento del juego. Objetivo: Analizar la influencia del ejercicio de alta intensidad sobre la calidad psicofisiológica en jugadores de baloncesto, verificando la correlación de los factores que afectan al rendimiento en baloncesto. Métodos: Se seleccionaron aleatoriamente jugadores de baloncesto voluntarios para la investigación. Se realizó un análisis y una evaluación exhaustivos de la función física, la calidad física y las características psicológicas de los atletas. Resultados: Existe una estrecha relación entre la calidad física, las habilidades fundamentales y las características psicológicas de los jugadores de baloncesto. Estos factores mostraron una tendencia de correlación positiva. La aptitud física está más relacionada con las técnicas básicas del juego. Conclusión: Los jugadores de baloncesto deben poseer excelentes cualidades físicas y psicológicas. Sólo así los atletas pueden rendir más en el campo deportivo. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Baloncesto; Atletas; Aptitud Física; Adaptación Psicológica.*

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INTRODUCTION

The improvement of sports performance results from the combined effect of various factors such as body shape, function, quality, technology, tactics, psychology, intelligence, etc. Many studies at home and abroad are based on the above factors. The United States has been developing technical testing standards for various sports. Will Baird of the United States has invented eight test items, including physical fitness and basic skills.[1] This test program tests athletes every two weeks during the basketball season. This will promote the improvement of athletes' physical fitness and basic skills. David Hopkins in the United States uses mathematical methods to gradually identify six test items to examine and assess the athletic ability of basketball players. Canadian M. L Rizebo et al. used multi-factor statistical methods to select nine physiological, morphology, technology, and quality indicators that were significantly related to women's basketball performance.[2] Domestic scholars have studied the examination and evaluation of basketball players' training level from a single factor for a comprehensive assessment of two factors. Zhao Zhongming, Dong Zhiquan, Cheng Xijin, and Ke Zunyu evaluated basketball players' training levels from one aspect of physical fitness or basic skills. In 1996, Liu Hongbin comprehensively evaluated the training level of young men's basketball players in China from two aspects: physical fitness and basic skills. The system view of sports training shows that we can get an objective reflection only if we put these factors into the same system for analysis and research. We comprehensively evaluate the sports training level of male basketball players in colleges and universities from the three elements of physical quality, fundamental skills, and psychological characteristics of basketball players.

METHOD

Research objects

The research object of this paper is 63 male players from 6 teams of a college basketball league.

Research methods

The research methods of this paper are the literature data method, expert interview method, questionnaire survey method, test method, mathematical statistics method, and standard synthetic method.[3] We use the combination of specialist subjective evaluation and objective evaluation of competition technology statistics to determine the standard. The correlation coefficient between the two is r=0.5542 and t=5.2000. P<0.01 indicates that the level correlation is very significant. We summed the scores of each player's objective and subjective assessments and averaged them. We refer to this as an athlete's athletic training level.

RESULTS

We empirically screened the 112 test items designed and primarily selected through data review, interviews with experts, and two expert questionnaires. Nineteen projects were finalized.[4] We obtained the calculation results of the stepwise regression of the five physical fitness items and the identification standard. (Table 1) The calculation results of the five essential technology items and the stepwise regression of the identification standard are shown in Table 2. The calculation results of the stepwise regression analysis of the nine items of psychological characteristics and the identification standard are shown in Table 3.

The above three equation selection indicators have different weights for identification. It would be imprecise if we all dealt with equal rights. This is one of the characteristics of the evaluation method in this paper.[5] The weight of each selected project is calculated by the standard regression coefficient normalization method. (Table 4)

We further study the quantitative relationship between physical quality, basic skills, psychological characteristics, and sports training level of men's basketball players in colleges and universities.[6] At the same time, we analyze the overall effect of 9 inspection representative indicators on identifying the standard. We take the raw grades of the nine indicators introduced into the equation above as independent variables. We performed the following 9-way regression calculations on the dependent variable. (Table 5)

We converted the nine inspection indicators into standard percentages. We merge by class according to the weight of each metric in that class. We take them as comprehensive indicators reflecting athletes' physical fitness, fundamental skills, and psychological characteristics.[7] We calculated the correlation coefficient and their significance test. (Table 6)

There is a relatively close relationship between physical fitness, fundamental skills, and psychological characteristics. They show a positive correlation trend. The material quality is most closely related to basic skills, psychological factors, and basic skills.

We use the standard regression coefficient normalization method to obtain the weight of the nine indicators' contribution to the identification. We calculated the consequences of the gift of physical fitness, fundamental skills, and psychological characteristics to the level of sports training.[8] The calculated results are 39.9%, 40.9%, and 19.4%, respectively. Its contribution size is approximately 4:4:2. We have designed a conversion table between test indicator values and standard percentages. The purpose is to standardize raw test scores.

The standard percentage conversion table is a scoring standard based on the principle of the dispersion method. We calculated the corresponding scores of each item and each scored segment according to the theory of the distribution of the area under the standard curve. We make it into a test index value and standard percentage conversion table.

Table 1. Stepwise regression equations of five items of physical fitness and identification.

Items that introduce equations	Regression equation (1)	FPR
S1-30m start run	Y=126.9065-5.2533S1-2.9645S2-0.2236S3	15.0930<0.010.6599
S2-shuttle run		
S3-29m×10 turnaround run		

Table 2. Stepwise regression equations of five essential technologies and identification.

Items that introduce equations	Regression equation (2)	FPR
J1-Comprehensive Dribble	Y=96.1662-0.9465J1-0.9293J2+0.6124J3	13.9990<0.010.6446
J2 - Combination pass to the wall		
J3 - Ten Twenty Shots		

Table 3. Stepwise regression equation of nine items of psychological characteristics and identification.

Items that introduce equations	Regression equation (3)	FPR
X1-Comprehensive response wrong times	Y=69.1119-1.0661X1-0.9694X2-0.2645X3	5.0660<0.010.4529
X2 - Operational thinking steps		
X3 - Spatial Judgment Ability		

Table 4. Weights of selected indicators in their respective equations.

Category	Index	Standard regression coefficients	Weights
Equation One (Y-S)	30m start run (S1)	-0.3166	36.00%
	Shuttle run (S2)	-0.3519	39.90%
	29m×10 turnaround run (S3)	-0.2132	24.10%
Equation Two (Y-J)	Integrated Dribble (J1)	-0.2299	26.50%
	Combination pass to the wall (J2)	-0.2995	35.90%
	10:20 Shots (J3)	0.3064	36.60%
Equation Three (Y-X)	Comprehensive response wrong times (X1)	-0.3931	49.50%
	Operational thinking steps (X2)	-0.2419	29.90%
	Spatial judgment ability (X3)	-0.1659	21.60%

Table 5. Nine-element regression equation of physical fitness, basic skills, psychological characteristics, and identification.

Items that introduce equations	Regression equation (4)	FPR
S1S2S3	Y=119.4096-0.3514J1-0.6221J2+0.4421J3-4.1504S1-1.2631S2-0.1421S3-0.3619X1-0.1459X2-0.1269X3	19.4669<0.010.6690
J1J2J3		
X1X2X3		

Table 6. Correlation coefficients among physical fitness, fundamental skills, and psychological characteristics and their significance test results.

Category	Correlation coefficient	T	Significant level
Physical fitness and basic skills	0.5051	4.5605	P<0.01
Physical fitness and psychological characteristics	0.3111	2.5565	P<0.05
Essential technical and psychological characteristics	0.445	3.9911	P<0.01

We first find the original score value of the corresponding test item in each column. Then the value in the standard percentage column of the row is the expected score of the grade.[9] After completing the conversion of the expected points of each item, we can also calculate the physical fitness (S), basic skills (J), and psychological characteristics (X) scores. We substitute them into the following formulas to find the S, J, and X values. These are composite scores for physical fitness, fundamental skills, and psychological characteristics:

$$\begin{aligned} S &= 0.360S1 + 0.399S2 + 0.241S3 \\ J &= 0.275J1 + 0.358J2 + 0.367J3 \\ X &= 0.485X1 + 0.298X2 + 0.217X3 \end{aligned} \quad (1)$$

The total score of the sports training level is based on the score of every single factor and combined according to the different weights of every element to the sports training level. This is also the total athletic training level score:

$$Y = 0.398S + 0.408J + 0.194X \quad (2)$$

We conduct a rank correlation test between the ranking of the average score of the players' sports training level scores in the sample and the hierarchy of the performance of this game. The test result is the validity coefficient r=0.9296. This is very significant. This shows that the comprehensive evaluation method developed in this paper is reliable and has a good application effect. It can more objectively reflect the sports training level of athletes.

The comprehensive evaluation method developed in this paper is the research result within a specific scope and period. Therefore, it is suitable for men's basketball players in colleges and universities. Evaluation criteria should be modified as the level of athletic training changes.

DISCUSSION

The reliability test adopts the method of repeated testing. We tested ten players in the same way twice in two weeks. The test results showed that the correlation coefficient representing the consistency between the two tests and the split-half coefficient representing the consistency before and after the comprehensive test reached 0.9339 and 0.9322, respectively.[10] They all achieved P<0.01. This indicates that the result is at a very significant level.

The multiple correlation coefficients of the above three regression equations are 0.6599, 0.6446, 0.4529, and 0.6690, respectively. The P values at the significant level of the F value reached 0.01, respectively. This shows a close relationship between the items selected in the equation and the identification of the standard. Therefore, we have chosen these nine indicators to reflect athletes' physical fitness, fundamental skills, and psychological characteristics.[11] The inspection test items are practical.

We also performed an expert validity test. Fourteen basketball experts evaluated the content validity of the selected three typical indicators. Among the 14 experts, five votes were considered adequate, nine valid, and 0 general and invalid. Therefore, this paper's three representative test indicators have good content validity.

The three test items identified in this paper conform to measurement validity and reliability principles. This indicator can be used as a check test indicator to measure the basic technical level of athletes. The established regression equation has a better prediction effect and higher prediction accuracy. It has usage meaning.

In this paper, the powerful difference method is used in the calculation process to make an evaluation table of physical fitness, basic technology, psychological characteristics, and the development balance of sports training level—weaknesses in certain aspects of technical and psychological factors and targeted improvements.

CONCLUSION

Nine inspection indicators that reflect the training level of college men's basketball players are determined in this study. It more objectively reflects the physical quality, fundamental skills, and psychological characteristics of the current college men's basketball players. There is a relatively close quantitative relationship among the physical quality, fundamental skills, and psychological characteristics of college men's basketball players and a positive correlation trend. The basic skills, physical quality, and psychological characteristics of college men's basketball players are all important factors that affect sports training. The former has the most significant influence and effect, the latter is relatively least, and the physical quality is in the middle. The evaluation method developed in this paper can evaluate the physical quality, basic skills, psychological characteristics, sports training level, and development balance of college men's basketball players.

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REFERENCES

1. Yanci J, Calleja-González J, Romaratezabala E, Iturricastillo A. Perceived Exertion in Small Sided-Games Internal Load Quantification in Wheelchair Basketball Players. Rev Psicol Deporte (J Sport Psychol). 2021;30(2):145-51.
2. García-Santos D, Gómez-Ruano MA, Vaquera A, Ibáñez SJ. Systematic review of basketball referees' performances. Int J Perform Anal Sport. 2020;20(3):495-533.
3. Koryahin V, Blavt O, Doroshenko E, Prystynskyi V, Stadnyk V. Training effect of special basketball exercises. Teorìâ ta Metodika Fizičnogo Vihovannâ. 2020;20(3):137-41.
4. Koryahin V, Blavt O, Prystynskyi V, Stadnyk V. Research of training loads of basketball players. Teorìâ ta Metodika Fizičnogo Vihovannâ. 2021;21(2):107-12.
5. Scanlan AT, Sitko S, Vaquera-Jiménez A. Influence of the Game Context and Levels of Physical Activity on the Behavior of Basketball Coaches. Rev Psicol Deporte (J Sport Psychol). 2021;30(2):240-5.
6. Manci E, Özdalyan F, Kosova S, Gümüş H, Gençoğlu C. Comparison of the Cognitive Skills of Adolescent Basketball Players and Sedentary Adolescents. TJSE. 2021;23(3):320-7.
7. Uludağ S, Dorak F, Vurgun N, Yüzbaşioğlu Y, Ateş E. Effects of 10 weeks of imagery and concentration training on visual focus and free-throw performance in basketball players. J Phys Educ Sport. 2021;21(4):1761-8.
8. Ferioli D, Rucco D, Rampinini E, La Torre A, Manfredi MM, Conte D. Combined effect of number of players and dribbling on game-based-drill demands in basketball. IJSPP. 2020;15(6):825-32.
9. D'Elia F, D'Andrea D, Esposito G, Altavilla G, Raiola G. Increase the Performance Level of Young Basketball Players through the Use of High Intensity Interval Training. Int J Hum Mov Sports Sci. 2021;9(3):445-50.
10. Ntasis L, Panagi T, Strigas A, Koronios K, Dashi M. Greek Basketball Referees Performance and Stress Factors During and After the Games. JPESM. 2021;8(1):24-9.
11. O'Grady CJ, Fox JL, Conte D, Ferioli D, Scanlan AT, Dalbo VJ. Call to action: recommendations to improve the methodological reporting of games-based drills in basketball research. IJSPP. 2021;16(2):316-21.