STUDY REGARDING THE LEVEL OF MANIFESTATION OF ATTENTION AND REACTION TIME IN JUNIOR BASKETBALL PLAYERS

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https://doi.org/10.52846/jskm/39.2022.1.8

Abstract: The purpose of the present study is to measure and establish the relationships between analogical transfer ability, psychometric skills, simple reaction time and choice reaction time in performance athletes, basketball players (n= 17). In this sense, a standardized psychological instrument was used to measure each of the four aforementioned dimensions, thus, analogical transfer was measured using the Analogical Transfer test, psychometric skills were measured with the Psychomotor Skills Questionnaire, the simple reaction time was measured with the Simple Reaction Time Test (SRT), and Choice Reaction Time was measured with the Choices Reaction Time Test (CRT). All instruments were administered via the Cognitrom Psychological Testing Platform CAS++. The conclusions we reached through the study were that there are no significant differences between men and women regarding the levels of reaction time, psychomotor skills and reaction time, but psychomotor skills and analogical transfer ability are significant positive predictors of simple reaction time. Another conclusion was the fact that psychomotor skills and analogical transfer ability are not significant predictors of choices reaction time.

Keywords: *basketball players, reaction time, analogical transfer, psychomotor skills*.

Introduction

General intelligence involves a set of specific and general abilities, among which cognitive abilities occupy a central place. The link between information processing speed and cognitive abilities has been widely studied (Brown, 1985, Deary, 2000, Lemke et al., 1967). The conducted studies demonstrated that the speed of information processing can be highlighted by the reaction time (RT), recorded in elementary cognitive tasks (tasks that predominantly involve perceptual processing), (Neubauer & Bucik, 1996). In problem-solving or reasoning tasks, success is sensitively dependent on the speed with which information relevant to the central task becomes available to higher cognitive processing (Macar, 2002). Any delay in taking in external information can lead to a failure to solve a problem or an error in reasoning (Lindley et al., 1988). There are quite large differences between the SRT and the CRT, the first involving the time interval between the appearance and detection of a stimulus, and the second involves making some choices, among several possible options (Jayaswal, 2016). The SRT is much shorter than the CRT (Vences de Brito et al., 2011). Reaction times can be influenced by many variables, including attention, fatigue, gender, physical condition, training, motivation, and more (Woods et al., 2015). They could be included in the category of external

factors, but internal ones also play a rather important role. Among them, cognitive factors were found to have the greatest influence on reaction times (Leckie et al., 2014). Attention is the first decisive factor in terms of reaction times and especially the selectivity and distributiveness of attention (Petersen and Posner, 2012). It is the selectivity of attention that leads to the ability to correctly choose one stimulus and ignore others (Gomez-Ramirez et al., 2016).

There are empirical data that prove the significant weight that the speed of reactions has on the performances in different professions. People who have sports professions and physical activity are known to have much better reaction times than those who do not practice sports (Walton et al., 2018). Reaction time can be trained (Kirk et al., 2017) and is particularly important in both individual and team sports (Mudric et al., 2015). Basketball is one of the most demanding sports of coordination training (Glauser& Nieber, 2000, Nevill, 2000). Basketball players must provide a quick and correct response during the game. During a match, in their case, both the simple and the CRT are involved, as well as analogic transfer abilities depending on game sequences. In this study, we measured SRT and CRT, as well as psychomotor skills and analogical transfer ability of 17 professional basketball players

Method

The aim of the present study is to capture the relationships between analogical transfer capacity, SRT, CRT and psychomotor skills of performance athletes. To this end, we formulated a series of objectives.

Objectives

O1. To identify gender differences in the variables analysed.

O2. To establish relationships between psychomotor skills and analogical transfer capacity on the one hand and reaction time (simple and choice reaction) on the other.

Hypotheses

H1. Men show higher levels of reaction time than women.

H2. Men have higher levels of psychomotor skills than women.

H3. Men show higher levels of analogical transfer ability than women.

H4. Psychomotor skills and analogical transfer ability are significant positive predictors of SRT.

H5. Psychomotor skills and analogical transfer ability are significant positive predictors of CRT.

Research design

The present study has a cross-sectional, descriptive, differential and correlational design.

Participants and procedure

Seventeen competitive athletes aged 18 participated in the present study, four of them male (23%) and 13 female (77%), all from the South-Muntenia region.

Participants were informed about the testing procedure. They responded positively to the invitation to take part and the actual testing was carried out on computers in a specially equipped room.

Instruments

Sociodemographic data were measured using a list of questions on age, gender and residence.

Simple reaction time was measured with the Simple Reaction Time Test (SRT). The test assesses the speed of information processing by the time elapsed between the visual presentation of a single stimulus and the motor response provided by the subject as evidence of its identification. Subjects are shown 30 geometric figures (circle, square, triangle) in succession in the centre of the monitor. As soon as each stimulus appears, they are asked to press the "Space" bar on the keyboard as quickly as

possible as proof that they have identified the figure presented.

CRT was measured with a test is an extension of the SRT, in which the subject is confronted with two or more stimuli and two or more response modes, respectively. The test involves two target stimuli and two response modes.

The subject has to decide on the relative spatial arrangement of two geometric figures which, at each presentation, are inserted into a set of 5 items, including, along with the targets, three distractor figures. The target figures may be adjacent or separated by the insertion of another figure.The answer is given by pressing one of two preset keys. Depending on the relative position of the 'neighbouring' or 'distant' targets.

Psychometric skills were measured with the Psychomotor Skills Questionnaire. The questionnaire assesses psychomotor skills, skills that Fleishman says enable the person to perform choice reaction body movements in which physical and cognitive qualities (e.g. reaction speed, attention, decision making) are combined. This skill

set includes fine motor skills, safety and stability of movements, speed and accuracy, manual dexterity, reaction time, muscle strength and coordination between different limbs and sense organs.

Analog transfer ability was measured with the Analogical Transfer Test. The purpose of this test is to assess a person's ability to apply previously acquired knowledge to new situations. As already mentioned, analogical transfer is concerned with those processes that give us the opportunity to solve new problems on the basis of similarity to problems already solved (Singley and Anderson, 1989).

All instruments were applied in a computerized version, using the Cognitrom psychological testing platform.

Descriptive statistics

Mean scores, standard deviations, internal consistency coefficients and correlations between variables are given in Table 1.

Table 1. Mean scores, standard deviations, internal consistency coefficients and correlations between variables

	M	AS	α	1. Simple reaction time (SRT)	2. Choices Reaction time (CRT)	3. Psychomotor skills	4. Analogical transfer
1	293.01	57.65	-	1			
2	1020.23	527.53	-	.11	1		
3	3.82	.51	-	-.58*	-.17	1	
4	10371.41	2489.28	-	-.24	.06	-.24	1

It can be seen that the mean score obtained by the athletes in SRT is M = 293.01, AS = 57.65, and in CRT is M = 1020.23, AS = 527.53. Also in psychomotor skills, the mean score is M = 3.82, AS = .51, while in analogical transfer ability M = 10371.41, AS = 2489.28.

Skewness and kurtosis do not fall within the range (-2, 2), reflecting an abnormal distribution of the data. This requires the use of non-parametric tests for statistical analyses to test for differences.

Inferential statistics

In order to organize the data and test the hypotheses, IBM.SPSS.25 statistical analysis software (IBM Corp, 2016) was used.

H1. Men show higher levels of reaction time than women.

H2. Men show higher levels of psychomotor skills than women.

H3. Men show higher levels of analogical transfer ability than women.

In order to test these hypotheses, the nonparametric Mann-Whitney U test was conducted for independent samples.

Table 2. Mean ranks for SRT, CRT, psychomotor skills and analogical transfer ability by gender

	Gender	N	Mean rank	Sum of ranks
SRT (SRT)	Male	4	8.00	32.00
	Female	13	9.31	121.00
	Total	17		
Choices	Male	4	9.25	37.00
Reaction time (CRT)	Female	13	8.92	116.00
	Total	17		
Psychomotor skills	Masculin	4	10.25	41.00
questionnaire	Feminin	13	8.62	112.00
	Total	17		
Analogical transfer	Masculin	4	10.25	41.00
	Feminin	13	8.62	112.00
	Total	17		

Table 3. Mann-Whitney U test for gender differences in SRT, choice reaction time, psychomotor skills and analogical transfer ability

	Simple reaction time (SRT)	Choices reaction time (CRT)	Psychomotor skills questionnaire	Analogical transfer
Mann-Whitney U	22.00	25.00	21.00	21.00
p	.65	.91	.57	.57

It can be seen that although there are differences in the mean ranks of the variables analysed, they are not statistically significant. For this reason, we can say that hypotheses H1, H2, H3 are not supported by the analysed data.

H4. Psychomotor skills and analogical transfer ability are significant positive predictors of SRT.

To test this hypothesis, a multiple linear regression analysis was performed with psychomotor skills and analogical transfer ability as predictors and SRT as the dependent variable.

Table 4. Multiple linear regression analysis for psychomotor skills and analogical transfer ability as predictors of SRT

Model	Unstandardised coefficients		Standardized coefficients		
	B	ES	β	t	Sig.
Psychomotor skills	-76.19	22.61	-.67	-3.37	.01
Analogical transfer	-.01	.01	-.40	-1.99	.06

R^2 = .48

It is observed that psychomotor skills and analogical transfer ability account for 48% of the variation in SRT, the regression equation is statistically significant, F(2, 14) = 6.42, p < .05. Of the two predictors, only one is significantly associated with SRT, namely psychomotor skills, β = -.67, t(17) = -3.37, p < .05. Thus, the higher the psychomotor skills, the lower the SRT.

Given this result, we can say that hypothesis H4 is partially supported by the analysed data.

H5. Psychomotor skills and analogical transfer ability are significant positive predictors of CRT.

In order to test this hypothesis, a multiple linear regression analysis was performed with psychomotor skills and analogical transfer ability as predictors and CRT as the dependent variable.

Table 5. Multiple linear regression analysis for psychomotor skills and analogical transfer capacity as predictors of CRT

Model	Unstandardised coefficients		Standardized coefficients		
	B	ES	β	t	Sig.
Psychomotor skills	-175.40	282.12	-.17	-.62	.54
Analogical transfer	.00	.06	.02	.07	.96

R^2 = .03

It is observed that psychomotor skills and analogical transfer ability account for only 3% of the variation in CRT, the regression equation is statistically insignificant, F(2, 14) = .22, p = .81. Of the two predictors, neither is significantly associated with CRT.

Given this result, we can say that hypothesis H5 is not supported by the data analyze.

Conclusions

In the present study, we found that there are no gender differences in reaction times, psychomotor skills, and analog transfer ability, but the latter two are significant positive predictors of SRT. The main disadvantage of conducting a study with performance athletes was their small number and the ratio between male and female genders was disproportionate (4 men and 13 women), so the results related to the differences between genders should be interpreted with caution. Presenting the results of this study in relation to the

findings of other researchers is a little more difficult because of the multitude of the reaction time tests, and the huge number of research tools used to assess this ability. One conclusion of a study is that actively sustained repetitions over long periods of time tend to diminish the type of reaction (Ando et al., 2002). Players can improve their performance by improving reaction time. A study that measured SRT and CRT, carried out on 50 basketball players and 50 healthy people, concluded that basketball players have a much better reaction time and that it is an indicator of performance in sports (Ghuntla et al., 2012). Another study conducted on 17 female basketball players, which tested reaction time and specific coordination motor abilities, concluded that the best-developed ability in participants is reaction time, while the other abilities show average development (Mańkowska et al., 2015). At the level of a research carried out on 360 basketball players, 130 handball players, 124 volleyball players, reaction times were tested. The conclusions reached were the following: simple motor reaction time (MSRT), the greatest progress between tests was the volleyball group, and for women, it was the basketball group. In all tests, the progress of the female basketball, handball, and volleyball players showed superior progress to similar male players (Badau et al., 2022). A study of 40 male basketball players, ages 16 to 19, tested rope training. The players were separated into 2 groups, a control group (n= 20) and one experiment (n= 20), who actively participated in the training, and they were recorded age, basketball age, height, body weight, resting heart rate, heart rate immediately after the rope training, anaerobic peak and average power, hexagon agility test and right and left hand visual and auditory reaction times. The conclusions were that jumping training performed with weighted rope and by explosive tempo and repetition method has influenced the heart rate and anaerobic characteristics positively, and agility and reaction time negatively (Orhan, 2013). Another study tested SRT in 57 male university students, 20 basketball players, 24 baseball players, and 13 sedentary students as a control group. The conclusions were that the basketball and the baseball players had significantly shorter reaction times than the nonathletes in both tasks (Nakamoto & Mori, 2008).

Success in basketball is a function of the player's ability to move quickly and in the right direction, only reaction speed is not enough. Basketball players can concentrate in improving their reaction time to improve their performance in game. Reaction time reduces by practice.

Acknowledgment

All authors contributed equally to this research.

We would like to thank all the athletes that participated in this study.

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