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INFLUENCE OF PERSONAL AND REACTIVE ANXIETY ON PERSONALITY CHARACTERISTICS, COGNITIVE ABILITIES AND PERFORMANCE OF BASKETBALL ACTIONS

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Abstract:

The purpose of this paper is to establish the possible influence of personal and reactive anxiety on personality characteristics, cognitive abilities and performance of basketball actions of basketball players. An empirical study is conducted with basketball players (which are also students at University of Economics – Varna - UEV) in 2016, playing basketball at the Sports Club at the UEV. To establish the level of effectiveness of the students' game actions, their performances in 9 meetings (10 units of observation) are recorded. ANOVA is used to determine differences in basketball performance measures for individuals with relatively high levels of anxiety and for individuals with relatively low levels of anxiety. One of the indicators is "personal anxiety" (Q6). Another indicator is available. It is "reactive anxiety" (Q7). PSPP is used to analyze the dataset. The ANOVA test shows that there is a statistically significant difference ($p<0.05$) in Q21 "Countering a shelter with successful" for the examined two groups of basketball players. The practical significance of the results refers to the effectiveness of the educational and sports process of university students. The novelty of the paper refers to the analysis of personal characteristics of basketball players (such as anxiety) on their performance in action.

Key words: *University of Economics Varna, sports, PSPP, basketball, anxiety.*

1. Introduction and literature review

Effective activity in sports games, characterized by immediate resistance of the opponent and problematic situations of conflict nature, requires a particularly complex and diverse complex of qualities and personality properties.

The regular dynamics in the game and the differentiation by posts of the participants in the game of basketball (Emery *et al.*, 2022; Torres-Ronda *et al.*, 2022) are factors that naturally affect the effectiveness of basketball performance in individual game situations (Morrison *et al.*, 2022). In our opinion, a deeper insight into causal relationships and revealing the influence of temperament will make it possible to control and manage the educational and sports process in basketball.

Of interest in this study is the indicator revealing the state of anxiety – personal (Q6), which determines the state of anxiety as a personality trait and reactive anxiety (Q7), which arises as an internal mental reaction of students during activity under the influence of psychological factors of the environment (Ana-Maria Ramona, Marian Pompiliu and Stoyanova, 2020; Stoyanova, 2020).

Personal anxiety generally refers to feelings of unease, fear, or worry that individuals experience in response to various stressors or challenges in their lives. It is a common and natural human emotion, but when these feelings become excessive, persistent, and interfere with daily functioning, they may be indicative of an anxiety disorder.

Personal anxiety can manifest in various ways, and individuals may experience it differently. Common symptoms of anxiety usually include:

a) Excessive Worry: Constant, irrational, and overwhelming concern about everyday situations or specific events.
b) Physical Symptoms: Anxiety can also have physical manifestations, such as increased heart rate, muscle tension, trembling, sweating, and restlessness.
c) Sleep Disturbances: Difficulty falling asleep, staying asleep, or experiencing restless sleep are common in people with anxiety.
d) Difficulty Concentrating: Anxiety can make it challenging to focus on tasks or make decisions.
e) Irritability: Individuals with anxiety may feel more irritable or on edge than usual.
f) Avoidance: Some individuals with anxiety may avoid certain situations or activities that trigger their anxious feelings.

It's important to note that personal anxiety becomes a concern when it significantly affects a person's quality of life, relationships, and daily functioning. If you or someone you know is struggling with anxiety, seeking support from mental health professionals, such as therapists or counselors, can be beneficial. They can provide strategies and interventions to manage anxiety and improve overall well-being.

Reactive anxiety is not a formal diagnostic term but is often used to describe anxiety that arises in response to specific situations or stressors. It refers to anxiety that is triggered by external events or circumstances rather than being a chronic or generalized condition. In other words, reactive anxiety is a reaction to something happening in one's life.

For example, someone might experience reactive anxiety before a job interview, a public speaking engagement, or a major life change such as moving to a new city. It can also be a response to traumatic events or unexpected challenges. The anxiety is considered "reactive" because it is a response to a particular stimulus or stressor.

While reactive anxiety is a normal part of the human experience, it can become problematic if it is excessive, persistent, or interferes with daily functioning. If someone finds that their reactive anxiety is overwhelming and difficult to manage, seeking support from mental health professionals may be beneficial. Therapists can help individuals develop coping strategies and provide support in navigating specific stressors.

In some cases, basketball players are also students. The performance of these people may be studied in both dimensions: students and basketball players. Each dimension has several performance indicators. Students performance indicators are studied in many areas (Sulov, 2016; Salem and Parusheva, 2018; Aleksandrova and Parusheva, 2019; Bankov,

2020; Petrov *et al.*, 2021). These performance indicators need special evaluation (Mishra, Polkowski and Mishra, 2020; Petrov *et al.*, 2020; Polkowski *et al.*, 2020; Todoranova and Penchev, 2020; Pólkowski, Prasad and Mishra, 2021). The analysis of the literature sources shows an aspiration for a complex approach to the diagnosis of basic psychological factors that affect basketball performance (Tsvetkov, 1999). The EU needs highly qualified people to solve complex unstructured tasks (Cristescu, 2019; Dogaru, Brandas and Cristescu, 2019; Bogoslov *et al.*, 2022; Bogoslov, Stoica and Georgescu, 2022; Georgescu *et al.*, 2022). People with sports activities and low levels of anxiety usually easily solve complex tasks. Conducting a survey identifying differences in mental indicators influenced by anxiety may lead to better recruitment processes, better adaption of employees in a stressful environment. Specific methods are always needed (Marinova, 2016; Marinova *et al.*, 2016; Raychev, 2020; Aleksandrova and Armianova, 2022).

Interesting data on the topic receives (Ivanov, 2019), who tries to establish links between the psychological peculiarities of personality and tactical actions in basketball in attack. The author tries to find links in the indicators characterizing the properties of temperament between the components of anxiety – personal and reactive and the indicators determining the quality and speed of thought processes. From this we can assume that people with relatively high or relatively low personality (or reactive) anxiety have an impact on any of the studied indicators. We expect that we may identify the influence of the anxiety on cognitive abilities and basketball performance indicators.

P. Ivanov (Ivanov, 2019) found links (r=-792 and r=-702) between reactive anxiety and non-effects of pick and roll (P&R) in basketball performance caused by synchronization in actions - space and effort. A relative /r=-600/ relationship of personality anxiety and P&R with a marked basket was also revealed. According to this author, the increased level of anxiety in the studied two components leads to inefficiency in the execution of pick and roll with marked basket and synchronization by space and effort. The author also finds that the actor "anxiety" has a great impact on the effectiveness of the game in attack.

Adhering to the author's findings, we suggest that the indicator revealing the state of reactive anxiety will have an impact on basketball performance in attack (Nacheva, Sulova and Penchev, 2022; Sulova *et al.*, 2022). And we expect this mainly to be on P&R with a basket marked and a shelter of an attacker in the weak side – with a shooting performance. Students performance indicators are studied in many areas (Kuyumdzhiev, 2016, 2020; Salem and Parusheva, 2018; Aleksandrova and Parusheva, 2019). But basketball performance indicators may depend from many possible factors. That is why we have conducted the current research.

2. Methods

A survey is conducted in 2016. 45 basketball players participated in the survey. These basketball players are also students at the University of Economics Varna. The complete list of measured items (26 items) is given in a previous article (Vasilev and Iliev, 2023). Link: https://www.temjournal.com/content/121/TEMJournalFebruary2023_445_451.pdf

The main assumption (hypotheses) of this research is the possible existence of differences in mental and basketball indicators for basketball players with different levels of

personal and reactive anxiety – low and high. The survey and the following statistical checks are conducted to identify possible differences in mental and basketball indicators for basketball players/students with high/low levels of personal/reactive anxiety.

One of the indicators (Q6) is “personal anxiety”. 21 players are with comparative low level of personal anxiety. 24 players are with comparative high level of personal anxiety. A new categorical bi-nominal variable “Q6_cat” is created in PSPP. It holds “0” for basketball players with comparative low level of personal anxiety and “1” – for basketball players with comparative high level of personal anxiety.

Mental performance indicators are Q1 to Q15 (Table 1 in the recently given link). They include specific items for: concentration of attention, operational thinking, anxiety, ability to analyze and solve problems. Two of these items are focused on anxiety: reactive anxiety (Q6) and personal anxiety (Q7).

Basketball indicators in defense are Q16 to Q26 (Table 2 in the recently given link). Since the variable “Q6_cat” is categorical and the indicators Q17 to Q26 are on interval scale, ANOVA may be used to check if there are statistically significant differences in basketball indicators for the two groups of basketball players: (1) with comparative low level of personal anxiety and (2) with comparative high level of personal anxiety.

One-way ANOVA is a well-known method which may find the existence of dependency between several variables. It is applied when the dependent variable is on an interval scale and there is a reason to consider that it is a normally distributed variable and the independent ones are on a nominal or ordinal scale (Hadzhiev, 2009).

Besides “personal anxiety”, another indicator is available. It is “reactive anxiety” (Q7). 22 players are with comparative low level of reactive anxiety. 23 players are with comparative high level of reactive anxiety. A categorical bi-nominal variable “Q7_cat” is created in PSPP. It holds “0” for basketball players with comparative low level of reactive anxiety and “1” – for basketball players with comparative high level of reactive anxiety. Since the variable “Q7_cat” is categorical and the indicators Q16 to Q26 are on interval scale, ANOVA may be used to check if there are statistically significant differences in basketball indicators for the two groups of basketball players: (1) with comparative low level of reactive anxiety and (2) with comparative high level of reactive anxiety.

3. Results

PSPP is used to analyze the dataset. The descriptive statistics for Q10-Q15 (items in the survey for memory and thinking) for the two categories of “Q6_cat” show the following results.

Descriptives

	Q6_cat	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Q10	0	21	102.10	12.48	2.72	96.41	107.78	74.00	134.00
	1	24	107.04	15.32	3.13	100.57	113.51	74.00	145.00
	Total	45	104.73	14.13	2.11	100.49	108.98	74.00	145.00
Q11	0	21	96.43	12.41	2.71	90.78	102.08	74.00	127.00
	1	24	97.50	10.20	2.08	93.19	101.81	83.00	127.00
	Total	45	97.00	11.17	1.66	93.65	100.35	74.00	127.00
Q12	0	21	120.14	11.68	2.55	114.83	125.46	89.00	131.00
	1	24	120.00	12.96	2.65	114.53	125.47	83.00	131.00
	Total	45	120.07	12.24	1.82	116.39	123.74	83.00	131.00
Q13	0	21	112.43	17.87	3.90	104.30	120.56	57.00	140.00
	1	24	114.58	22.49	4.59	105.09	124.08	57.00	160.00
	Total	45	113.58	20.26	3.02	107.49	119.67	57.00	160.00
Q14	0	21	99.71	17.85	3.90	91.59	107.84	54.00	118.00
	1	24	96.17	16.82	3.43	89.07	103.27	54.00	118.00
	Total	45	97.82	17.20	2.56	92.65	102.99	54.00	118.00
Q15	0	21	97.85	15.56	3.40	90.76	104.93	64.01	129.31
	1	24	100.82	14.52	2.96	94.69	106.95	77.45	127.39
	Total	45	99.43	14.92	2.22	94.95	103.91	64.01	129.31

Figure. 1. Descriptive statistics for indicators for memory and thinking (Q10-Q15) for people with low and high levels of personal anxiety (Q6_cat) Source: Own elaboration

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Q10	Between Groups	274.03	1	274.03	1.38	.246
	Within Groups	8516.77	43	198.06		
	Total	8790.80	44			
Q11	Between Groups	12.86	1	12.86	.10	.752
	Within Groups	5473.14	43	127.28		
	Total	5486.00	44			
Q12	Between Groups	.23	1	.23	.00	.969
	Within Groups	6590.57	43	153.27		
	Total	6590.80	44			
Q13	Between Groups	52.00	1	52.00	.12	.726
	Within Groups	18014.98	43	418.95		
	Total	18066.98	44			
Q14	Between Groups	140.96	1	140.96	.47	.496
	Within Groups	12879.62	43	299.53		
	Total	13020.58	44			
Q15	Between Groups	98.93	1	98.93	.44	.511
	Within Groups	9694.75	43	225.46		
	Total	9793.68	44			

Figure. 2. ANOVA for indicators for memory and thinking (Q10-Q15) for people with low and high levels of personal anxiety (Q6_cat) Source: Own elaboration

The results of the ANOVA test show that there are differences in mental indicators (memory and thinking) for people with low and high levels of personal anxiety, but these differences are not statistically significant ($p>0.05$). The descriptive statistics for Q10-Q15 for the two categories of “Q7_cat” show the following results.

Descriptives

	Q7_cat	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Q16	0	16	127.19	64.27	16.07	92.94	161.43	48.00	231.00
	1	14	120.21	73.65	19.68	77.69	162.74	53.00	260.00
	Total	30	123.93	67.68	12.36	98.66	149.21	48.00	260.00
Q17	0	16	18.25	9.53	2.38	13.17	23.33	5.00	36.00
	1	14	14.36	6.51	1.74	10.60	18.12	5.00	31.00
	Total	30	16.43	8.36	1.53	13.31	19.56	5.00	36.00
Q18	0	16	17.06	8.78	2.20	12.38	21.74	5.00	38.00
	1	14	13.79	7.90	2.11	9.23	18.34	4.00	30.00
	Total	30	15.53	8.40	1.53	12.40	18.67	4.00	38.00
Q19	0	16	15.63	8.16	2.04	11.27	19.98	4.00	30.00
	1	14	12.64	6.80	1.82	8.72	16.57	5.00	32.00
	Total	30	14.23	7.58	1.38	11.40	17.06	4.00	32.00
Q20	0	16	13.44	7.96	1.99	9.20	17.68	3.00	28.00
	1	14	10.14	6.83	1.82	6.20	14.08	4.00	29.00
	Total	30	11.90	7.51	1.37	9.09	14.71	3.00	29.00
Q21	0	16	24.31	14.90	3.72	16.37	32.25	12.00	60.00
	1	14	14.21	6.65	1.78	10.38	18.05	7.00	33.00
	Total	30	19.60	12.68	2.32	14.86	24.34	7.00	60.00
Q22	0	16	16.75	11.54	2.89	10.60	22.90	4.00	43.00
	1	14	11.57	6.88	1.84	7.60	15.54	3.00	28.00
	Total	30	14.33	9.85	1.80	10.65	18.01	3.00	43.00
Q23	0	16	1.88	1.86	.46	.89	2.86	.00	6.00
	1	14	2.36	1.65	.44	1.41	3.31	.00	5.00
	Total	30	2.10	1.75	.32	1.45	2.75	.00	6.00
Q24	0	16	.88	1.02	.26	.33	1.42	.00	3.00
	1	14	2.00	1.66	.44	1.04	2.96	.00	5.00
	Total	30	1.40	1.45	.27	.86	1.94	.00	5.00
Q25	0	16	1.13	1.15	.29	.51	1.74	.00	4.00
	1	14	1.86	1.29	.35	1.11	2.60	.00	4.00
	Total	30	1.47	1.25	.23	1.00	1.93	.00	4.00
Q26	0	16	.69	.79	.20	.26	1.11	.00	2.00
	1	14	.71	.83	.22	.24	1.19	.00	2.00
	Total	30	.70	.79	.15	.40	1.00	.00	2.00

Figure. 3. Descriptive statistics for basketball indicators (Q16-Q26) for people with low and high levels of reactive anxiety (Q7_cat)
Source: Own elaboration

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Q16	Between Groups	363.07	1	363.07	.08	.784
	Within Groups	132470.8	28	4731.10		
	Total	132833.9	29			
Q17	Between Groups	113.15	1	113.15	1.66	.209
	Within Groups	1914.21	28	68.36		
	Total	2027.37	29			
Q18	Between Groups	80.17	1	80.17	1.14	.295
	Within Groups	1967.29	28	70.26		
	Total	2047.47	29			
Q19	Between Groups	66.40	1	66.40	1.16	.290
	Within Groups	1600.96	28	57.18		
	Total	1667.37	29			
Q20	Between Groups	81.05	1	81.05	1.46	.237
	Within Groups	1555.65	28	55.56		
	Total	1636.70	29			
Q21	Between Groups	761.41	1	761.41	5.46	.027
	Within Groups	3903.79	28	139.42		
	Total	4665.20	29			
Q22	Between Groups	200.24	1	200.24	2.14	.154
	Within Groups	2614.43	28	93.37		
	Total	2814.67	29			
Q23	Between Groups	1.74	1	1.74	.56	.461
	Within Groups	86.96	28	3.11		
	Total	88.70	29			
Q24	Between Groups	9.45	1	9.45	5.11	.032
	Within Groups	51.75	28	1.85		
	Total	61.20	29			
Q25	Between Groups	4.00	1	4.00	2.70	.111
	Within Groups	41.46	28	1.48		
	Total	45.47	29			
Q26	Between Groups	.01	1	.01	.01	.928
	Within Groups	18.29	28	.65		
	Total	18.30	29			

Figure. 4. ANOVA for basketball indicators (Q16-Q26) for people with low and high levels of reactive anxiety (Q7_cat)
Source: Own elaboration

A one-way analysis of variances (ANOVA) is conducted to explore the impact of “reactive anxiety” on some basketball indicators in defense. There is a statistically significant difference at the p<0.05 level in Q21 “Countering a shelter with successful” for the examined two groups of basketball players: F (1, 28) = 5.46, p<0.05. There are statistically significant differences in “Countering a shelter with successful” for people with low level of reactive anxiety (Mean=24.31, SD=14.90) and high level of reactive anxiety (Mean=14.21, SD=6.65).

There is a statistically significant difference at the p<0.05 level in Q24 “Duplication "Sandwich" unsuccessful” for the examined two groups of basketball players: F (1, 28) = 5.11, p<0.05. There are statistically significant differences in “Duplication "Sandwich" unsuccessful” for people with low level of reactive anxiety (Mean=0.88, SD=1.02) and high level of reactive anxiety (Mean=2.00, SD=1.66).

The conducted post hoc Tukey HSD tests show the same differences for Q21 and Q24 at level p<0.05.

The rest of indicators (in the group Q10-Q15) does not show statistically significant differences at $p<0.05$ for people with low level of reactive anxiety and high level of reactive anxiety.

4. Discussion

Initially, we expected that personal anxiety may have influence on indicators for memory and thinking. But the empirical results showed that the personal anxiety does not have strong influence on indicators for memory and thinking.

We expected to find many differences for people with high and low anxiety. But the empirical results showed statistically significant differences in just two performance indicators. Regarding the results obtained, we consider the fact that no more differences were found. It is because of certain limitations in this study. First, a relatively small number of participants who are included. If more people are included, better results will be obtained. Secondly, it would be good to increase the number of dependent variables, i.e., to include other basketball skills in the study. Third, in the future, similar studies should be conducted, focusing on the properties of personality in different periods of sports training.

Regarding the indicator of reactive anxiety Q7, we found that it was a statistically significant factor and influenced the indicator Q21 “Shelter of a striker without a ball with shooting performance”. The direction of increase determines that basketball athletes with low reactive anxiety will perform this tactical action successfully, and respectively this will lead to the creation of opportunities with a high conversion rate. Basketball athletes with high reactive anxiety will not perform this tactical action successfully.

Reactive anxiety (Q7) is a statistically significant factor affecting the ineffectiveness of the tactical action shelter of an attacker without the ball - synchronization by space (Q24). This relationship leads us to assume that during the interaction, those basketball players with lower reactive anxiety will succeed in achieving better spatial synchrony. Basketball players with high reactive anxiety will not succeed in achieving the positive space during the interaction between them.

5. Conclusions

The purpose of this paper was to establish the possible influence of personal and reactive anxiety on personality characteristics, cognitive abilities and performance of basketball actions of basketball players.

The results of the conducted ANOVA tests show that there are differences in some of the basketball indicators in defense for people with low and high levels of personal anxiety, but these differences are not statistically significant. The conducted ANOVA test shows that there is a statistically significant difference in “Countering a shelter with successful” for the examined two groups of basketball players (for people with low level of reactive anxiety and high level of reactive anxiety).

In our forthcoming research, we anticipated discovering numerous distinctions among individuals with high and low anxiety levels. However, the empirical findings revealed statistically significant differences in only two performance indicators. Given these results,

we attribute the absence of additional differences to certain peculiarities within this study. Firstly, the inclusion of a relatively small number of participants may have impacted the outcomes; including a larger sample size is likely to yield more robust results. Secondly, enhancing the study by incorporating additional basketball skills as dependent variables could provide a more comprehensive understanding. Lastly, we recommend future studies that explore personality traits at various stages of sports training to contribute further insights to the field. Future research may also focus on testing the same assumptions (the possible existence of differences in mental and basketball indicators for basketball players with different levels of personal and reactive anxiety) with larger number of basketball players. In this case, the results of the initial assumptions may be different.

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