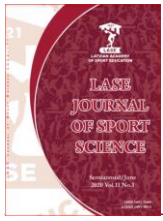

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ORIGINAL RESEARCH PAPER

CHANGES IN THE PERFORMANCE INDICATORS OF BASKETBALL PLAYERS IN IMPROVING MENTAL TOUGHNESS AND SELF-EFFICACY

Aleksandrs Astafičevs, Žermēna Vazne, Andra Fernāte, Yanis Grants

Latvian Academy of Sport Education,
Address: 333 Brivibas Street, Riga, LV 1006, Latvia
Phone: +371 67543355
E-mail: aleksandrs.astaficevs@lspa.lv, zermena.vazne@lspa.lv,
andra.fernate@lspa.lv, grants.yanis@gmail.com

Abstract

The mental toughness and self-efficacy of athletes are some of the most important factors that directly influence and predict an athlete's performance. The aim of this research is to evaluate the impact of improving basketball players' mental toughness and self-efficacy on increasing performance indicators. Material and methods: research participants – U-16 basketball players (n=15), the Psychological Performance Inventory Alternative version (PPI–A), the Sports Mental Toughness Questionnaire (SMTQ) and the General Self-Efficacy Scale (GSE) questionnaires, the control exercise method was applied before and after the determining experiment, as well as mathematical statistics. Three measuring instruments adapted to the Latvian environment – PPI-A, SMTQ, GSE (Astaficevs, Vazne & Fernate, 2020) – were used in the research. The results show that the performance indicators of basketball players are affected by the implementation of psychological tasks improving mental toughness and general self-efficacy in sport in two control exercises – midrange jump shots ($p<0.05$) and free throws ($p=0.001$). An increase was also found in the results of other shots, but it was not statistically reliable. Moreover, moderately close correlations were found between mental toughness and self-efficacy improvement ("Self-efficacy and determination"; "Positive cognition and imagery", "Self-belief") after the implementation of psychological tasks in the training process and in individual performance indicators of basketball players ($p<0.05$).

Key words: *improvement of mental toughness, improvement of general self-efficacy, performance indicators of basketball players, basketball, U-16 basketball players*

Introduction

The world we live in today is dominated by the desire to succeed and win. Perhaps the knowledge that you are the best, the strongest or the smartest excites us and makes us persistently strive for victory. High-performing athletes have realized that the winning formula involves much more than just good technical, physical, or tactical preparation. On the way to success, athletes inevitably face various psychological issues. It is often observed that in the event of a poor performance, athletes and their coaches plan to adjust their physical, technical, or tactical preparation routine, perceiving the psychological aspect as less important. However, in order to overcome issues and improve performance, it is necessary to pay attention to the aspect of psychological preparation. The mental toughness and self-efficacy of athletes are some of the most important factors that directly influence and predict an athlete's performance. These factors contribute to athletes' motivation, confidence in their abilities, persistence, and self-control.

The study of mental toughness was mainly implemented in the context of sport, gaining wide resonance among sport researchers. In sport science, the concept of mental toughness is defined differently (Loehr, 1986; Jones et al., 2002; Thelwell, Weston & Greenlees, 2005; Coulter et al., 2010; Weinberg et al., 2011; Gordon & Gucciardi, 2011), but the consensus reached by researchers is that it is a key factor that affects performance regardless of stress or environmental conditions. Mental toughness includes several components: determination, self-belief, positive cognition, visualization, self-confidence, constancy, and self-control. The commitment component is related to athletes' motivation.

Several studies have indicated that the motivation of athletes in general is significantly influenced by the coach's support (Langan, Lonsdale, Blake & Toner, 2015; Ryan & Deci, 2017; Joesaar, Hein & Hagger, 2012; Sheldon & Watson, 2011; Healy, Ntoumanis, Veldhuijzen van Zanten & Paine, 2014; Quested et al., 2013). Self-belief is an optimistic assessment of oneself and one's abilities, an inner feeling of trust that creates confidence within athletes. Various research indicate that self-belief is a prerequisite for athletes to fulfil their athletic potential (Connaughton, Hanton & Jones, 2010). An athlete's self-belief can be influenced by many factors, but several studies point to positive self-talk as a vital aspect of self-belief (Bandura, 1997; Hatzigeorgiadis, Zourbanos, Goltsios &

Theodorakis, 2009; Hatzigeorgiadis, Zourbanos, Mpoumpaki & Theodorakis, 2008; Weinberg, Grove & Jackson, 1992; Zetou et al., 2014; Abdoli et al., 2017; Park, Lim & Lim, 2020). Visualization is described as the process of imagining the desired actions and their results before they happen. Research on the impact of imagery on sport performance indicate that the application of the imagery method to the training and competition process has a significant impact on performance in sport (Eddy & Mellalieu, 2003; Caliari, 2008; Newmark, 2012; Mattie & Munroe-Chandler, 2012). Self-confidence describes athletes' unshakable belief in their ability to succeed. This belief is mainly based on personal experience gained during the training and competition process. Scientific research clearly shows that athletes with a higher level of self-confidence perform better than those with a lower level of self-confidence (Burton 1988; Moritz, Feltz, Mack & Fahrbach, 2000). Constancy as a component of mental toughness is described as athletes' persistence to achieve their goals and the ability to adapt in the face of failure. Research indicate that the definition of constancy used in the context of sport refers to psychological processes in behaviour that protect athletes from experiencing negative stressors, helping them to overcome short-term and long-term setbacks (Rees et al., 2016; Sarkar & Fletcher, 2014; Galli & Gonzales, 2015). Improving the components of mental toughness contributes to the mental toughness of athletes.

General self-efficacy refers to athletes' belief in their abilities to solve new or complex issues. The study of scientific literature indicates that the self-efficacy of athletes greatly influences and is able to predict the result in the context of the present and the future (Maddux, & Lewis, 1995; Singh, Bhardwaj & Bhardwaj, 2009; Hays, Thomas, Maynard & Bawden, 2009; Heazlewood & Burke, 2011).

Research aim – to evaluate the impact of improving basketball players' mental toughness and self-efficacy on increasing performance indicators.

Material and Methods

In order to evaluate the impact of improving basketball players' mental toughness and self-efficacy on increasing performance indicators, the following research methods were used: the Psychological Performance Inventory Alternative version (PPI–A), the Sports Mental Toughness Questionnaire (SMTQ) and the General Self-Efficacy Scale (GSE) questionnaires, the control exercise method for determining performance indicators of basketball players was applied before and after the determining experiment, as well as mathematical statistics. The group of respondents

consisted of basketball players (n=15) aged 16, and the experience of team players participating in competitions was on average seven years. The study has been approved by the Academy of Sport Educational Ethics commission.

At the beginning and at the end of the determining experiment, the team players answered the statements of the mental toughness and self-efficacy questionnaires. In order to determine the mental toughness of the players, the Latvian versions of the three questionnaires were used: Psiholoģisko prasmju aptaujas alternatīvā aptauja" (*Psychological Performance Inventory Alternative version*), and, Psihiskās noturības sportā aptauja" (*Sports Mental Toughness Questionnaire*), and "Vispārējās pašefektivitātes aptauja" (*General Self-Efficacy Scale*) (Astaficevs, Vazne, Fernate, 2020). In order to determine the performance indicators of basketball players, control exercises of basketball techniques were performed at the beginning and at the end of the experiment, which consisted of 6 different types of basketball shooting drills, which were evaluated according to the time limit of the task and accuracy indicators (see Fig. 1).

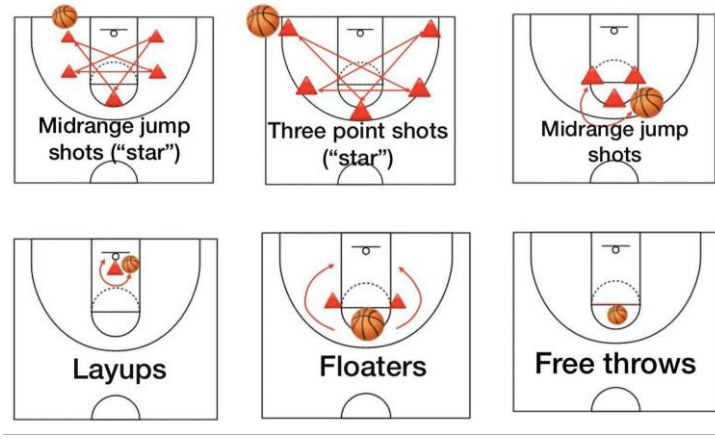

Figure 1. Basketball Technique Control Exercises Used to Determine Performance Indicators of Basketball Players

Based on the structural model of mental toughness and general self-efficacy (Self-efficacy and determination, Self-control, Positive cognition and imagery, Self-belief) and the results of the Psychological Performance Inventory Alternative version (PPI–A), the Sports Mental Toughness Questionnaire (SMTQ) and the General Self Efficacy Scale (GSE) questionnaires, tasks were developed for the improvement of mental toughness and self-efficacy of basketball players. The content of the tasks for the improvement of mental toughness and self-efficacy of basketball players is based on the needs of the players, as well as on a previously developed structural model of mental toughness and general self-efficacy.

The content of classes was implemented in 12 classes, within three months and divided into four parts, improving: *self-efficacy and determination* skills; *self-control* skills; *positive cognition and imagery* skills, as well as *self-belief* skills. Goal-setting strategies, strategies for overcoming anxiety and regulating emotions, improvement of attention management skills were worked on with the basketball players. Furthermore, players were introduced to some basic autogenic training skills, positive self-talk strategies, and various routines before shooting free throws. After the implementation of psychological classes, the determination and analysis of the mental toughness and self-efficacy indicators of basketball players was repeated. After testing the impact of implementing mental toughness and general self-efficacy improvement on the achievements of basketball players, control exercises were developed that combined various basketball shooting techniques (see Fig. 1). The effects of mental toughness and self-efficacy improvement on team players' mental toughness, self-efficacy and performance indicators were experimentally tested. The Wilcoxon signed-ranks test was used to assess the reliability of the increase.

After the determining experiment, a correlation analysis was performed with the aim of checking whether there are correlations between the effects of mental toughness and self-efficacy improvement and the performance of basketball players (shooting accuracy during control exercises) after performing the psychological tasks. The results of the questionnaires and technique control exercises were processed with SPSS software.

Results

By comparing the individual indicators of the participants of the determining experiment group, it can be seen that all basketball players have positive changes in the indicators of all scales of the Psychological Performance Inventory Alternative version (PPI-A) (see Fig. 2). The biggest changes were found for basketball players A1 (51), A12 (53) and A14 (60) with an indicator increase of 8 points. These players have acquired and been able to successfully apply goal-setting strategies, resulting in the improvement of their motivation to develop their skills in order to achieve the self-set goals and imagery techniques.

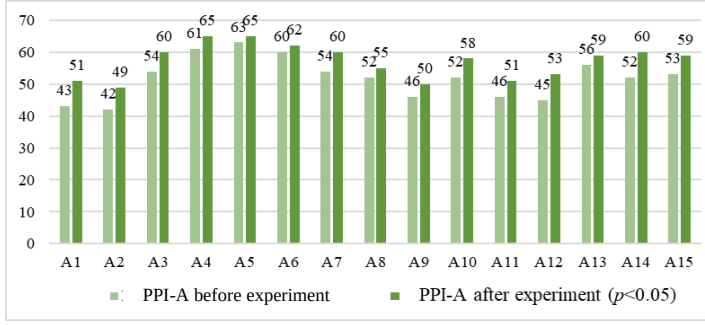

Figure 2. Individual indicators of the Psychological Performance Inventory Alternative Version Recorded in the Group of Basketball Players Before and After the Determining Experiment (n=15, p<0.05)

Results were improved in the *imagery* scale, which indicates the ability of basketball players to apply different imagery techniques to be able to train basketball techniques in their thoughts and to predict different situations during competitions. For all scales of the PPI-A questionnaire, the test reliability calculated for the group of basketball players is p<0.05, which means that the group has statistically significant differences between the answers to the PPI-A questionnaire before and after the determining experiment. The overall results of the respondents of the Psychological Performance Inventory Alternative version (PPI-A) questionnaire can be evaluated as average (see Fig. 2). All respondents noted difficulties in maintaining positive emotions during competitions in situations where mistakes are made, as well as that their self-talk is often negative. In general, the results of the Psychological Performance Inventory Alternative version in all scales of the respondent group have improved after the implementation of the psychological tasks (p<0.05).

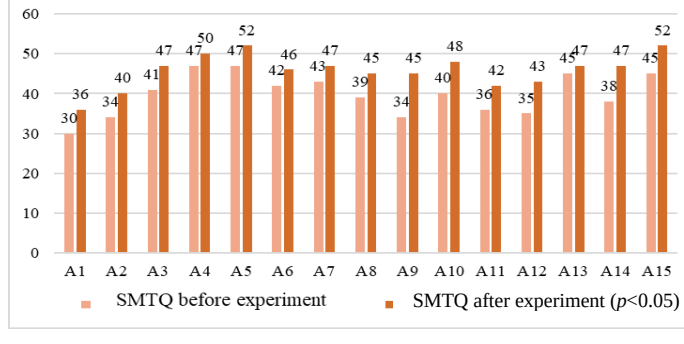

Figure 3. Individual indicators of the Questionnaire on Mental Toughness in Sport Recorded in the Group of Basketball Players Before and After the Determining Experiment (n=15, p<0.05)

By comparing the individual indicators of the participants of the determining experiment group, it can be seen that all basketball players have positive changes in the indicators of all scales of the mental toughness questionnaire in sport (see Fig. 3). The biggest changes are observed for basketball players A9 (45) – by 11 points, and A14 (47) – by 9 points. The significant improvements in the indicators of the A9 player's self-confidence scale indicate the basketball player's understanding and confidence in his abilities, as well as positive changes in the player's perception of stressful situations and their coping mechanisms. In turn, player A14 significantly improved the indicators of the self-control scale at the end of the experiment, which indicates the basketball player's ability to control his thoughts and emotions when mistakes are made or when it is necessary to deal with unexpected events (p<0.05). The overall results of the respondents of the Sports Mental Toughness Questionnaire (SMTQ) before the experiment are rated as moderately low. The main difficulties often faced by the players of this team are worries about poor performance or failure in the training process and competitions. The players admit that they feel anger and frustration if they have not managed to do what they set out to do. In general, the indicators of the respondent group of the mental toughness questionnaire in sport have improved after the implementation of psychological tasks, and the result of the self-confidence scale after the experiment is rated as high (p<0.05).

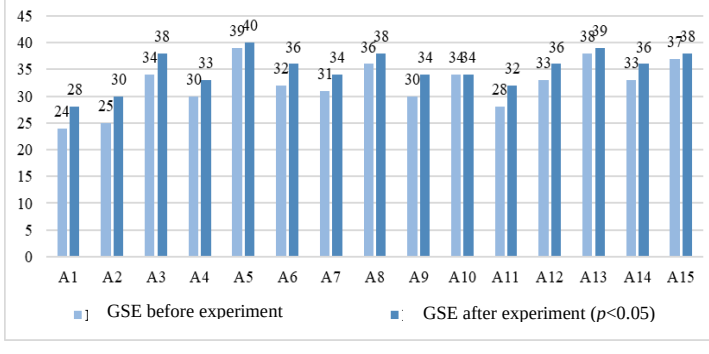

Figure 4. Individual indicators of the General Self-Efficacy Questionnaire Recorded in the Group of Basketball Players Before and After the Determining Experiment (n=15, p<0.05)

By comparing the individual general self-efficacy indicators of the basketball players before and after the experiment, it can be concluded that 14 basketball players have positive changes in the general self-efficacy indicators, but for one player these indicators remained unchanged. The biggest increase in general self-efficacy indicators was observed for

basketball player A2 (30) by 5 points. Moreover, there is an increase of 4 points for basketball players A1, A3, A6, A8, A9 and A11. No changes were observed for the basketball player A10 after the experiment. The test reliability calculated for the athlete group of the general self-efficacy questionnaire is p=0.001, which means that the group has statistically significant differences between the answers to the general self-efficacy questionnaire before and after the experiment (see Fig. 4).

The average indicators of the general self-efficacy (GSE) questionnaire recorded among the respondents of the determining experiment before the experiment can be evaluated as average (see Fig. 4). The team players indicate that they are often able to cope with unpredictable situations, and in the face of difficulties the players remain calm and rely on their own abilities. However, it is difficult to stick to their goals and achieve the desired results. This is due to the lack of application of goal-setting strategies. The general self-efficacy indicators of the respondent group have improved after the content implementation and are rated as high. It is interesting to note the trend that the overall increase in results for the leading players of the team is lower than the rest of the players of the team. This can be explained by the different levels of psychological preparation of the players.

In order to experimentally test the effectiveness of the content of the theoretical model of mental toughness components and self-efficacy improvement on the example of the basketball team, a performance assessment (control exercise performance) was conducted at the beginning and at the end of the determining experiment. The control exercises consisted of six different types of shooting techniques in basketball: midrange jump shots (star); three-point shots (star); midrange jump shots; layups; floaters; as well as free throws (see Figure 1). The control exercises were performed two times, and the best result of the two was selected. The limiting factors of the experiment were the number of shots, accuracy, and the time limit.

By applying the strategies of the mental toughness components, basketball players are able to prepare more effectively to perform the necessary techniques (shots into the basket) as accurately as possible. By imagining the technically correct execution of throws, using positive self-talk and various types of pre-start rituals, as well as by controlling the rhythm of breathing, players focus more effectively on the execution of shots. In competition and training conditions, it is often observed that players, in the event of an inaccurate shot, dwell on the experience of the missed shot, which is followed by negative body language, thus losing time and focusing their attention on a past event that can no longer be changed.

In turn, while working on the improvement of general self-efficacy, the players' confidence in their abilities to accurately perform the specific technique was promoted.

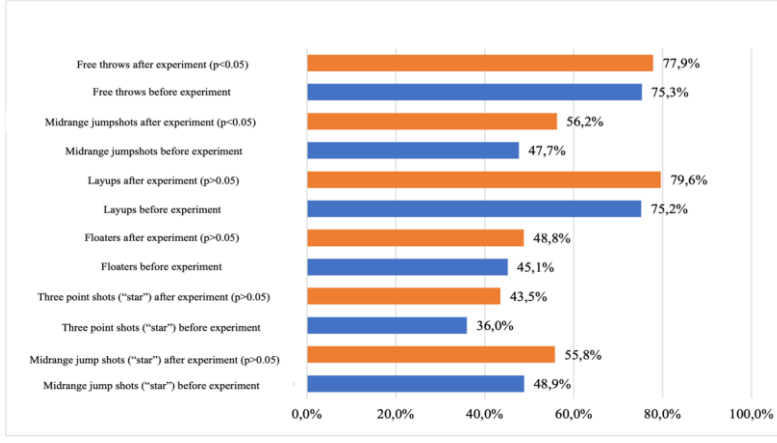

Figure 5. Basketball Player Performance Indicators – the Percentages of Control Exercise Results Before and After the Determining Experiment (n=15)

The level of players' self-efficacy varies, so it is necessary to individually evaluate which of the sources of self-efficacy is decisive. Whether the player has gained enough experience in performing the specific technical elements to feel confident in his ability to accurately execute shots in the basket, whether the player gains confidence by seeing how his teammates successfully deal with specific technical elements, whether the player needs verbal support from the coach or teammates to gain more confidence, whether the player's emotional state at a given moment determines his self-efficacy. By evaluating the main sources of self-efficacy of each player, it is possible to predict and promote the player's level of self-efficacy.

By summarizing the overall results of the control exercises before and after the determining experiment, changes in the performance indicators of the basketball players can be observed, and Figure 4 shows the overall changes in the percentages of players' indicators when performing different types of shots at the basket. Overall, the players of the team improved the accuracy of free throws by 2.6% (p=0.001), the accuracy of midrange jump shots was improved by 8.5% (p<0.05), layups were improved by 4.4%, floaters – by 3.7%, three-point shots ("star") were improved by 7.5%, and the accuracy of midrange jump shots ("star") was improved by an average of 6.9%. The reliability of the increase in performance indicators calculated for the group of basketball players according to the Wilcoxon test shows an increase in indicators in all shots, but the increase is statistically reliable only in two control exercises - "midrange jump shots" (p>0.05) and free

throws (p=0.001) (see Fig. 5).

Moderately close, positive correlations were found between performance indicators (results of control exercise performance after the experiment) and the psychological tasks for improving mental toughness and self-efficacy.

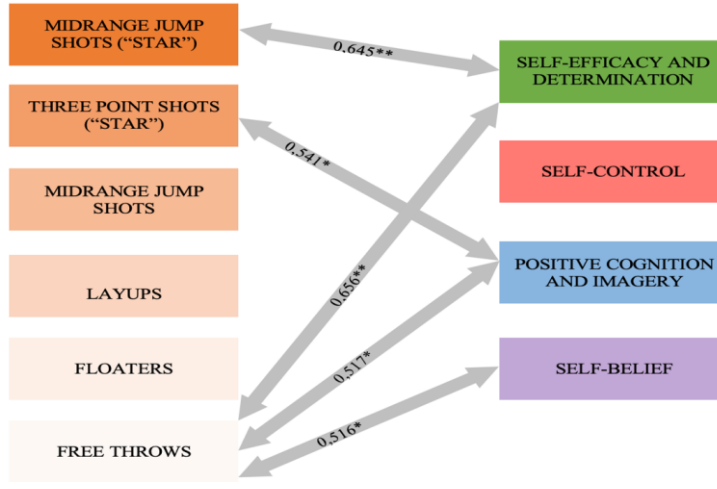

Figure 6. Correlations Between the Factors of the Mental Toughness Components and Self-Efficacy Structural Model and the Performance Indicators (n=15)

By conducting a correlation analysis, it was found that there is a positive, moderately close correlation between "Midrange jump shots ("Star")" and "Self-efficacy and determination" (r=0.645, p<0.05). There is also a positive, statistically reliable correlation between "Three-point shots ("Star")" and "Positive cognition and imagery" (r=0.541; p<0.05). Furthermore, it was found that there is a positive, statistically reliable correlation between „Free throws" and „Self-efficacy and determination" (r=0.656; p<0.01), as well as with „Positive cognition and imagery" (r=0.517; p<0.05) and „Self-belief" (r=0.516; p<0.05). Correlations with "floaters", layups and midrange jump shots were not found (see Fig. 6).

Discussion

The development of mental toughness, along with physical, technical and tactical aspects, is considered the basis for the full development of athletes (Bergeron, et al., 2015). In the context of sports, psychological skills include desirable personal characteristics such as self-efficacy that influence sports performance (Zakula, Tubic & Jovanovic, 2017).

The results obtained during the development of the study indicate that there are correlations between mental toughness, general self-efficacy, and performance. In contrast, psychological techniques encompass methods or processes by which desired levels of personal characteristics can be

achieved, such as self-talk and imagery (Ponnusamy et al., 2018). Evidence supports the importance of several psychological skills (Moritz et al., 2000; Woodman & Hardy, 2003) and techniques (Brown & Fletcher, 2017; McCormick, Meijen & Marcora, 2015) for optimizing athletic performance. Naturally, the process of developing psychological skills is the focus of sports science researchers and sports psychologists (Adler et al., 2015). Qualitative (Weinberg et al., 2017), longitudinal (Gucciardi et al., 2015) and experimental studies (Bell, Hardy & Beattie, 2013) indicate that athletes' mental toughness has characteristics that can change from situation to situation, however, can be developed and perfected.

The results of more and more studies point to the importance of mental toughness in promoting high performance (Arthur et al., 2015; Mahoney et al., 2014; Cowden, 2017), as well as contributing to the adaptation mechanism for psychosocial risks such as burnout (Madigan & Nicholls, 2017) anxiety (Schaefer et al., 2016) for prevention, therefore researchers' efforts are focused on understanding the development of mental toughness (Newland et al., 2013; Anthony, Gucciardi & Gordon, 2016; Jin & Wang, 2018; Schild et al., 2020). After analysing the results of the respondents', the main factors affecting performance were identified, which are related to the skills to deal with worries about poor performance and the ability to maintain positive emotions with the help of self-talk. There are statistically reliable improvements in the results shown by the respondents in control exercises after the implementation of the created content ($p<0.05$).

Taking into account the specifics of other sports, the created content for improving mental toughness and self-efficacy indicators and performance is adaptable to athletes of various sports. By experimentally testing the effectiveness of the created content on basketball players, an improvement in performance results was found, which indicates the possibilities of improving mental toughness and general self-efficacy. By carrying out further research on the components of mental toughness and general self-efficacy, it is possible to approbate it on a larger group of respondents, as well as to adapt it to the specifics of other sports. There is a possibility that the developed content can be modified to apply to athletes of a younger age, taking into account the development peculiarities of different age stages.

Conclusions

The indicators of mental toughness and self-efficacy of basketball team players increased after the implementation of the content of the developed psychological task ($p<0.05$).

The performance indicators of the players are statistically reliably affected by the implementation of the psychological tasks for improving mental toughness and general self-efficacy in two control exercises – midrange jump shots (p<0.05) and free throws after the experiment (p=0.001). There is an increase in the results of other control exercises, but it is not statistically reliable (p>0.05).

Moderately close correlations were found between "Self-efficacy and determination" and performance indicators after the experiment: "Midrange jump shots ("Star")" (r=0.645, p<0.05) and "Free throws" (r=0.656; p<0.01). "Positive cognition and imagery" have moderately close correlations with the result of "Three-point shots ("Star")" (r=0.541; p<0.05) and "Free throws" (r=0.517; p<0.05). The "Self-belief" content has a moderately close correlation with the result of "Free throws" (r=0.516; p<0.05).

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