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Dominika Wilczynska

Gdansk University of Physical Education and Sport in Gdansk, Poland, dominika.wilczynska@awf.gda.pl

Patrycja Lipinska

Gdansk University of Physical Education and Sport in Gdansk, Poland

Malgorzata Wolujewicz-Czerlonko

Gdansk University of Physical Education and Sport in Gdansk, Poland

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The influence of intention implementation on throw effectiveness of young basketball players

Dominika Wilczynska^{ABCDEFG}, Patrycja Lipinska^{BF},
Malgorzata Wolujewicz-Czerlonko^{BF}

Gdansk University of Physical Education and Sport in Gdansk, Poland

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Authors' Contribution:

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

Abstract

Background: *The purpose of the following research was to find out the influence of imaginary training based on intention implementation on throw effectiveness of young basketball players, both male and female in stressogenic situations. Individual differences (action vs state orientation) between players were also measured in this research.*

Material/Methods: *76 players (32 females and 44 males) in the cadet category (15-16 years old) from basketball clubs of Gdansk, Gdynia and Sopot took part in this research. In the first stage all players did a throw efficiency test ERPE 05 under two conditions, and their heart rate was measured. Then players were randomly assigned to one of two groups. The first one did imaginary training based on the influence of intention implementation for 10 days, while the other did not. After 10 days ERPE 05 test under two conditions was run again.*

Results: *Test results showed that intention implementation does not influence effectiveness improvement in stressogenic conditions as far as state-oriented players are concerned, but it does lower the physiological cost of physical effort in form of a decreased heart rate.*

Conclusions: *This research proves that visualization training based on implementation instructions does influence young players' physiology and significantly lowers their heart rate under stressogenic conditions. However useful, visualization techniques used in this research still need other tests and should be applied for a longer period of time to acutely show how they affect young players' mental preparation.*

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Corresponding author:

Dominika Wilczynska, Ph.D.

80-442 Gdansk, Lelewela 32/4 Str., Poland

Phone: 504050675

E-mail: dwilczynska@awfis.gda.pl / domiwilczynska@gmail.com

Introduction

When it comes to young athlete's mental training, it is necessary to find methods enabling better self-control during sport competition. For this purpose various physioregulatory techniques are applied: ranging from relaxation techniques and meditation to all kinds of imaginary techniques, to form a tough and hardy player. It is important to individualize the process of training not only among development and improvement of motoric features, technical and tactical skills, but also among all the skills responsible for being in control of the body in order to take advantage of the body's reserves when in critical moments of competition. It also relates to the cognitive aspect: to being able to control unwanted thoughts, replace negative thoughts with positive ones, choose behaviour allowing to continue sport action and enabling satisfaction and joy from sport and also progressing effort. The usage of individually matched imaginary techniques can allow one to cope efficiently with excitement in sport competition and be a prediction of a long-term sports career [1, 2, 3, 4, 5].

In order to meet mental work individualization requirements, imaginary schemes have been created for players examined in this research. Training instructions were based on Gollwitzer model (1996) – intentions implementation: 'I intend to do X when situation Y occurs'. Extensive research shows that such schemes prepare an individual for critical moments when reaching their goal and make the recognition of these threats easier and allow using specific methods to cope with them [6, 7]. They are some kind of volitional strategies sustaining goal-oriented action through a blockage of all kinds of unwanted internal and external influences and retardation of anticipated, unwanted reactions in a disturbance situation [8]. Gollwitzer proved in his research on tennis players that intentions implementation and the 'if... then...' scheme creation considerably support persistent endeavour, especially in times when negative thoughts and emotional states appear during a tennis match. Imagining difficult situations and methods of how to cope with them would increase self-efficiency among the examined tennis players [6]. Research shows that creation of intentions implementation also influences athlete's psychological well-being. It is important that the scheme is created by the player and not imposed by someone else, a researcher or a coach, which has been taken into consideration in this work [9].

Self-regulation of athletes also greatly depends on individual differences, especially at the pre-master level, when the player is young, not fully formed and has little competition experience. Players differ individualistically, so they can differently regulate excitement. According to Kuhl's personality theory (1996), which distinguished two types of personalities (state-oriented people vs. action-oriented people), state-oriented people have problems with affective regulation, they raise positives and neutralize negatives, which reduces their effectiveness in terms of both the cognitive, emotional and purely physical process, when facing difficulties, setbacks, stressful situations. That weakness of the internal mechanisms of self-regulation results in state-oriented people having problems with planning activities and their commencement, and deliberating defeat and failure. A high level of negative affect that occurs in state-oriented people means that these people lack insight into their own preferences and needs.

By contrast, the second personality type described by Kuhl, action-oriented individuals, have an inner ease of inducing positive affect in demanding, monotonous situations and they also can reduce negative emotions associated with failure or stress. Action-oriented people feature mobilization, high activity and high efficiency of the internal mechanisms of self-regulation, so they can quickly and efficiently formulate an action plan as well as take such an action [10]. It can be assumed that a player who successfully and efficiently implements his/her athletic goals will be action-oriented. So action-orientation will affect athletic performance. In Marszal-Wisniewska's study (1998) on adult male and female basketball players, concerning the relationship between the athletes' efficiency and their volitional characteristics, a better performance of action-oriented athletes was revealed. The study results showed that state-oriented people regulate their energy worse and have weaker sporting achievements [11, 12]. Also, other studies on adult basketball players showed that state-oriented athletes incur higher psychological costs and also physiological ones in the form of a substantially higher heart rate in stressful situations, compared to action-oriented athletes [13, 14]. Authors found no research on young athletes concerning correlations

between personality (state orientation and action orientation) and implementation plans, which was the main motive for that study.

Trying to bind the aspects described above, the work refers to the following hypotheses:

1. Implementation of intentions improves throw effectiveness of state-oriented athletes and does not affect the throw performance of action-oriented athletes in terms of "to set the record" (next match performance is dependent on the outcomes of the ERPE 05 test).
2. The difference in the heart rate of the state-oriented athletes under condition "to set the record" is lower after the implementation of intentions.

Material and methods

Participants. The study participants were youth basketball players competing in the cadet category, i.e. between 15 and 16 years of age ($M = 15.34$; $SD = 0.47$). In this research 76 players (32 females and 44 males) took part, all from basketball clubs of Gdansk, Gdynia and Sopot: VBW GTK Gdynia, UKS de la Salle Gdansk, UKS Konrad Gdansk, UKS Bryza Kolbudy.

Scheme and procedure. The study proceeded in two stages. In the first stage male and female athletes performed a throw effectiveness test ERPE 05 under two conditions (training – no stress, "to set the record" – stress). Before and after each execution of the throw test the heart rate (HR) in both conditions was measured. Then the participants were randomly assigned to one of two groups. The first group performed imaginary training based on implementation of intentions, which lasted 10 days ($N = 38$, 16 female athletes, 22 male athletes), while the second group ($N = 38$, 16 female athletes, 22 male athletes) did not perform any imaginary training. After ten days, the second phase of the study took place, in which all participants repeated the ERPE 05 test under both conditions, followed the by heart rate measurement.

During the first stage, a throwing effectiveness test ERPE 05 under two conditions, in the first condition (training – no stress) the instruction was as follows: *During this training exercise we ask you to put 15 throws into the basket (10 jump shots and 5 free throws). The throws are done in the order from 1 to 10 according to the scheme shown in Fig. 1, and explained and presented by the coach. Immediately after the jump throws you perform 5 free throws. You do this attempt with two other team mates using two balls. When you perform the test, the second player collects, and the third one gives you the ball while standing on the axis of the field and facing the basket at a distance of 1 meter behind the 3-point line. The starting place for the test is under the basket. Do the test fast as possible. The instruction of the second condition ("to set the record" – stress) was: During this test do everything to perform the best and most effectively you can. Consider this task very seriously and do as many successful throws as you can, when set in the test time. Your results will be compared with the results of other players. Your performance in the coming league game depends on the effectiveness you show in that test. You have to try to do your best!*

The heart rate (HR) in both conditions was measured with a Polar Wearlink 31 sport tester before and after each performance of the throwing test. After that the participants were asked to complete Kuhl's Action Control Scale (ACS-90).

Then the participants were randomly assigned to one of two groups. The first group performed imaginary training based on implementation of intentions, which lasted 10 days ($N = 38$, 16 female athletes, 22 male athletes), while the second group ($N = 38$, 16 female athletes, 22 male athletes) did not perform any imaginative training. After ten days, the second phase of the study took place, in which all participants repeated the ERPE 05 test under both conditions, followed by the heart rate measurement. Athletes from the first group created their own visualization based on the implementation scheme: if... then..., with the help of an experimenter (psychologist). They were also asked to complete the 10 days' calendar, where they wrote down the hour of performing the imaginary training and how they felt after it.

Measuring tools. *Kuhl's Action Control Scale(ACS-90).* The questionnaire for the study of differences in the action control (ACS-90) was developed by J. Kuhl (1994), based on years of research. The Polish adaptation and translation was made by M. Marszal-Wisniewska (2002). It

consists of three subscales, consistent with orientation types highlighted by Kuhl. Each subscale contains 12 questions about different situations of everyday life. The subscales are as follows:

1. Action-orientation subscale in situations of failure vs state (absorption, involvement) [AOF; failure-related action-orientation vs preoccupation]. Example answer: "When I lose something very precious to me and I cannot find this anywhere, I stop thinking about it after a short time."
2. Action-orientation subscale in decision-making situations vs state (fluctuation) [AOD; decision-related action-orientation vs hesitation]. Example answer: "When I know that I need to finish something fast, it is easy for me to deal with it."
3. Action-orientation subscale while conducting vs variability [AOP; performance-related action-orientation vs volatility]. Example answer: "When I play a new and interesting game, it absorbs me for a long time."

The test participant has two response options indicating the action-orientation or state-orientation / variability. The results in each scale is calculated separately. You can leave either of the scales, but never a part of the scale. The authors left the scale AOP and used the two other scales: AOF and AOD for the purpose of this study. A low score in the AOF and AOD scales indicate the state-orientation (preoccupation and hesitation). A low score on the AOP scale (below 6 points) indicates variability-orientation. According to the Kuhl theory, both the state and variability-orientation hinder the execution of the design. In contrast, a higher score (above 6 points) in the AOF and AOD subscales represent action-orientation.

Throwing effectiveness test – ERPE 05. TeErpe05 throwing effectiveness test consists of the execution of 10 jump throws from specific points on the basketball court, and 5 free throws. Players have 60 seconds to perform this test, 40 seconds for jump shots, and 20 seconds for free throws. One can get a maximum of 40 points. The scheme is as follows: Player 1 throws for 2 points from the corner of the court, then runs to the other side and throws for 2 points. Then again goes to the other side to the corner and throws for 3 points etc. The second player collects the ball under the basket, and the third one throws back to Player number 1 who is doing the test. The scheme is presented in Fig. 1.

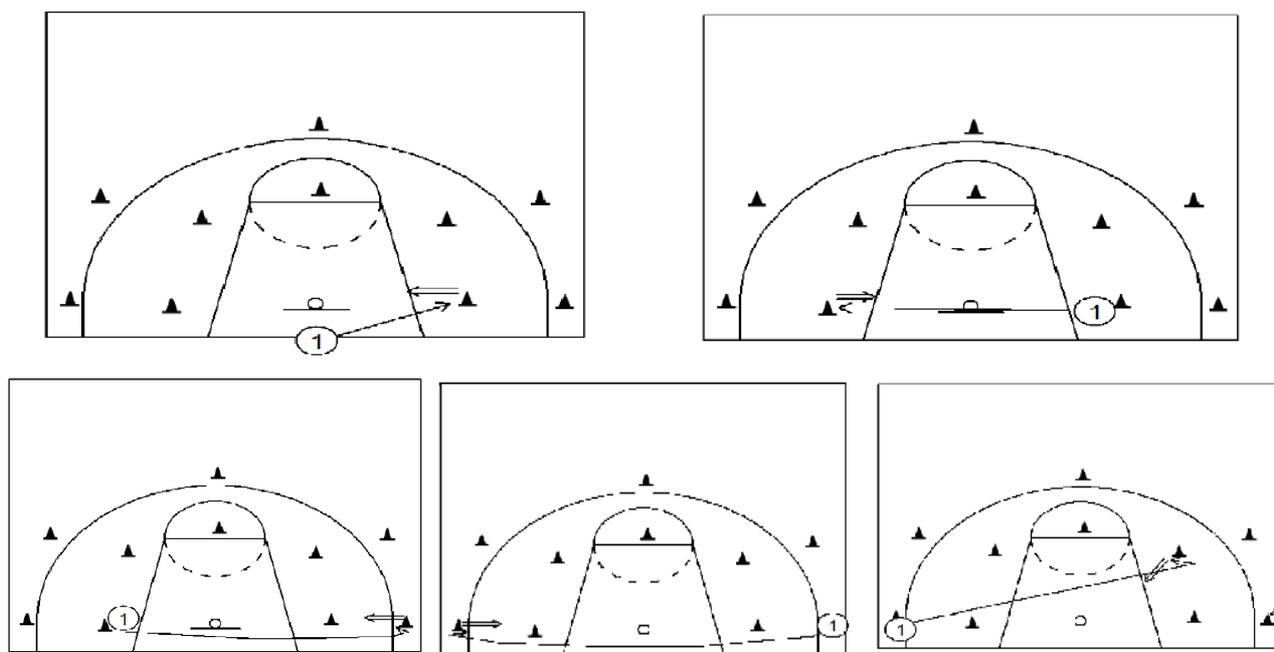


Fig. 1. Scheme of the ERPE 05 test

Results

The type of orientation (the state / the action) as an indicator of a better sport outcome and the effectiveness of implementation of intentions concerning action-oriented athletes

Hypothesis 1: Implementation of intentions improves the throw effectiveness of state-oriented athletes and does not affect the throw performance of action-oriented athletes in terms of "to set the record".

In order to verify the first hypothesis, participants were divided into two groups: state-oriented people and action-oriented people on the basis of the results obtained in Action Control Scale (ACS-90). The results have been divided on the basis of the central value of 6 for each of the scales. Within the analysis only AOF and AOD scales were taken into consideration. The AOP scale was not included in the study because of its low reliability.

Table 1. Statistical characteristics of Action Control Scale ACS-90 in the sample of N = 76

Scale	Reliability α Cronbach	Average scale results	Standard deviation
AOF	0.74	5.79	2.98
AOD	0.65	6.96	2.54
AOP	0.5	8.11	2.15

In order to test the first hypothesis one-way analysis of variance with repeated measures was made. The analysis showed no main effect of implementation $F(1,72) = 0.43$, n.i., state-orientation and action-orientation for the scale AOD $F(1,72) = 0.02$, n.i., than for the scale AOF $F(1,72) = 0.1$, n.i., and interaction effects: implementation and scale AOD $F(1,72) = 0.86$, n.i., and the implementation and scale AOF $F(1,72) = 0.08$, n.i.

The impact of implementation of intentions on the reduction of physiological parameters in athletes before and after exercise

Hypothesis 2: The difference in heart rate of the state-oriented athletes under condition "to set the record" is smaller after the implementation of intentions.

The analysis of the second hypothesis showed a significant effect of imaginary training (implementation intentions) on difference in the heart rate (HR) among state-oriented athletes in the situations of decision-making under stress conditions (performing ERPE 05 test "to set the record"). Student's t-test for independent samples was made, which revealed significant differences in the heart rate (HR) of state-oriented athletes in the situations of failure $t(44) = 2.12$; $p < 0.05$, prior to implementation ($M = 48.45$, $SD = 28.83$), after implementation ($M = 42.45$, $SD = 13.92$) and state-oriented athletes in decision-making situations of $t(30) = 2.26$; $p < 0.05$, prior to implementation ($M = 45.57$, $SD = 13.92$) and after implementation ($M = 40.36$, $SD = 15.39$). Physiological parameters during the ERPE 05 test performance "to set the record" were significantly decreased among state-oriented athletes who did 10-day imaginary training (the first group). The results are presented in Figure 2.

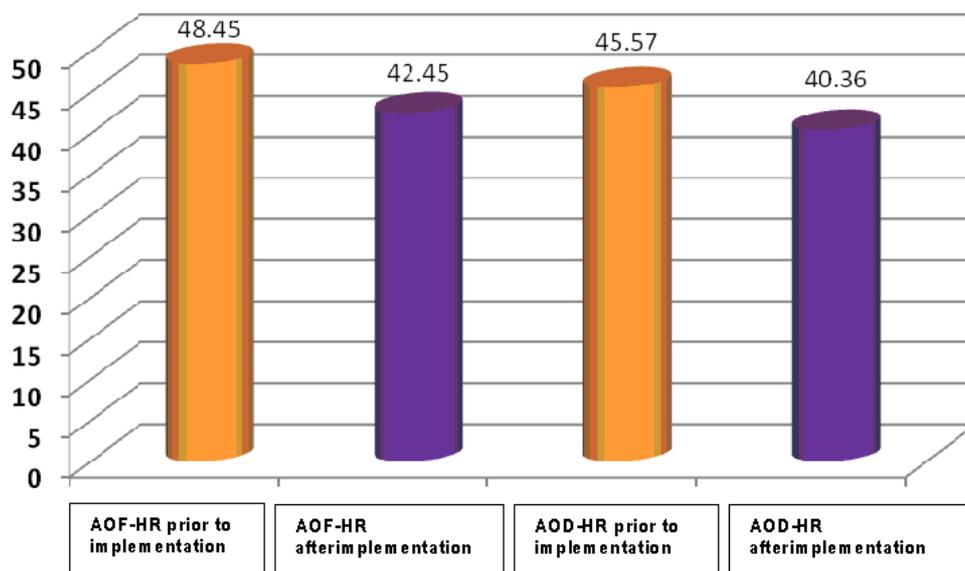


Fig. 2. The average marginal difference in the heart rate (HR) among state-oriented athletes performing the Erpe 05 throwing effectiveness test "to set the record"

Discussion

The purpose of the study was to verify whether visualization training, based on the implementation intentions scheme of difficult situations in sports, may affect the throwing effectiveness of young basketball players. The implementation intentions are cognitive creation schemes which one creates to cope with critical situations taking place at different times of human activity [8], in this study a difficult situation connected with sport performance. In order to objectively examine the presumed impact of imaginary training based on implementation intentions schemes, the ERPE 05 test was used to estimate the throwing effectiveness of young basketball players. The creation of the implementation of the intention allows one to control the situation, but producing them in the mind largely depends on the imagination abilities of the individual. The imagination of a persistent person leads to continuation of the action [11]. Imagery in sport performance has been used for many years, and it brought a very positive effect on athletes' self-regulation during starting conditions, reducing the impact of stressful situations on their psychomotor system [4, 5, 15]. Recently sports psychologists also use implementation plans to prepare athletes for better control of unwanted thoughts and behaviours that interfere with concentration and do not allow for the effective continuation of sports activities [16]. However, this practice involves highly skilled athletes.

This study was designed to check whether young female and male basketball players (under 16 years old) may improve their efficiency through the use of visualization based on implementation intentions schemes, especially under conditions of stress ("to set the record" condition). But not only has the cognitive aspect an impact on a player's behaviour during competition. Also individual differences as well as the physiological response to stress plays an important role in athletes coping with difficult situations. The research among athletes has shown that high arousal and experiencing a high level of cognitive anxiety may cause failure [17]. Kuhl's concept of personality emphasizes that state-oriented individuals have problems with affect regulation [10] as a stressful situation and rumination may cause strongly psychosomatic experience for the players. By contrast, action-oriented athletes quickly close unwanted thoughts and focus on remaining effective in activity [6].

However, the study did not confirm the effect of implementation intentions on the effectiveness of young athletes in stress condition ("to set the record"). State-oriented players did not improve their effectiveness after visualization training based on implementation intentions schemes in both failure and decision-making situations. We may come to the conclusion that imaginary training did not bring the desired effects. However, agreement to use imaginary training, as an attractive and

little time-consuming form of mental training for young female and male basketball players, lead authors and coaches to the assumption that it will have a positive training effect.

The research on physiological parameters of the stress response confirms the idea contained in the hypothesis. The difference in the heart rate (HR) among state-oriented young basketball players decreased significantly after 10-day visualization training based on implementation of intention schemes in both failure and decision-making situations in stress conditions ("to set the record"), which may demonstrate the effectiveness of those instructions.

Conclusions

It is widely known that visualization, as a kind of cognitive training and self-regulation technique, plays an important role in the process of training and performance. However, the results of this study did not confirm the hypothesis, and there was no effect of imaginary training based on implementation intentions schemes on throwing effectiveness of young basketball players. The reason may be the fact that the male and female athletes were in the wrong period of training in order to bring this kind of method effect. All kinds of visualization techniques and other mental techniques should start in the first part of the preparatory period. Also the conditions of the experiment should be more controlled and probably the psychologist or the coach should read the instructions of visualization and not the player himself.

The second hypothesis confirmed that visualization training may help lower physiological parameters, such as the heart rate, measured in stressful conditions. Regular visualization training may in the future allow young players to respond to stressful situations automatically and improve their self-regulation during competition and other critical and difficult situations which occur in sport.

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