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EXPLORING THE ASSOCIATIONS BETWEEN COGNITIVE EMOTION REGULATION, RESILIENCE AND SPORT PERFORMANCE AMONG DARTS PLAYERS

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Abstract

The aim of this study was to investigate the link between cognitive emotion regulation strategies, resilience, and sport performance among darts players. Participants included 102 darts players who were members of the Romanian Darts Federation (*Mage*= 39.5; *SD* = 9.24; 74.5% males). They were asked to fill out scales for cognitive emotion regulation, resilience, training and demographic questions online, before the national competitions. Results showed positive correlations between refocus on planning, acceptance and sport performance, and negative correlations between blaming others, catastrophizing and sport performance among darts players. These findings underscore the importance of enhancing cognitive emotion regulation strategies, highlighting the value of refocusing on planning and acceptance, while avoiding catastrophizing in order to improve sport performance.

Introduction

Professional athletes experience a high level of pressure during competitions. Additionally, they experience various emotions such as anger, anxiety and joy [1], which need to be regulated in order to achieve their objectives. In sports, these emotions can create changes at physiological, perceptual, and cognitive levels, which may influence motor performance [2]. Thus, it is important to use the most suitable emotion regulation strategies for achieving one's own aims.

Previous studies have shown that competitive athletes use emotion regulation strategies such as cognitive reappraisal, suppression, distraction, seeking social support, or classes of emotion regulation such as attention deployment, situation

selection, situation modification, behavioral regulation, or physiological regulation [1, 3, 4]. The most commonly used strategies were concentration, thought stopping and plan future actions [1]. However, in general, it was argued that using cognitive reappraisal led to having an appropriate emotional climate for competition [4, 5]. Moreover, it has been found that cognitive reappraisal is better suited to prevent the emergence of dysfunctional emotions in a competitive environment than suppressing the felt emotions [5]. Although, cognitive reappraisal seems to be beneficial before and during the competition, consistent literature suggests that only refocusing on planning is positively associated with sport achievement [6]. Furthermore, throughout their careers, athletes experience various adversities such as unsatisfactory performance, accidents, and burnout, so they need a good ability to recover, namely a high level of resilience, after experiencing these adversities. In accordance with this, studies have shown that increased resilience helps athletes overcome the adversities they encounter and increase their performance levels [7, 8]. While emotion regulation strategies have been linked to sports performance and resilience in other sports, such as table tennis, football, and basketball, this link has not yet been explored among darts players. Thus, the objective of this study is to analyze the link between emotion regulation strategies used by darts players, resilience and their sport performance.

Emotion regulation and sport performance

Emotion regulation refers to the processes by which individuals consciously or unconsciously manage their emotions and use various strategies to modify or maintain the intensity of emotions at the desired levels with the aim of achieving their goals [9]. By time, various theoretical models were proposed. For instance, individuals can regulate their emotions using both cognitive and behavioral strategies [10]. Cognitive emotion regulation refers to the thoughts a person has after experiencing a negative event [10]. Based on their effectiveness, some strategies are considered adaptive strategies, while others are considered maladaptive. Adaptive strategies are *positive reappraisal* which supposes giving positive meaning to the negative event, *acceptance* consists of having thoughts of resignation about the situation experienced, *refocusing on planning* supposes thinking os strategies about steps to take for dealing with the situation, *positive refocusing* supposes focusing your thoughts on more pleasant things than the negative event experienced, and *putting into perspective* consists of reducing the severity of the negative event by comparing it to other events [10]. The maladaptive strategies are *self-blame* which consists of putting the entire responsibility for the event on one's own, *blaming others* which consists of putting the responsibility for the negative event on other people, *rumination* which consists of having repetitive thoughts about the ideas related to the negative situation, and *catastrophizing* which consists of thinking that the event is the worst thing that could happen [10]. Additionally, studies have indicated that

athletes utilize different emotion regulation strategies, such as cognitive reappraisal, distraction, refocusing on planning, and rumination, depending on the context and the type of sport they play [11; 12]. Recent studies suggest that refocusing on planning is the most commonly used adaptive strategy in the context of sports [13, 14; 15]. Another recent study focused on exploring the relationship between cognitive emotion regulation strategies, and sports performance among 17 paintball teams. The results showed that refocusing on planning, positive reappraisal, positive refocusing, putting into perspective, and self-blame positively correlated with sports performance, while acceptance, rumination, catastrophizing, and blaming others negatively correlated with sports performance [15]. Another important theoretical framework in emotion regulation literature is represented by the *Extended Process Model of Emotion Regulation* proposed by Gross and Thompson (2007) [16]. Previous studies have focused on examining the link between emotion regulation and sports performance using this framework. This model suggests that emotion regulation develops in a sequence of events, starting with an individual's attention being drawn to a particular situation. The situation is then evaluated by assigning a meaning, which determines a response that is consistent with the individual's prior experiences. This model identifies five classes of emotion regulation strategies. These strategies can be categorized as antecedent-focused and response-focused, depending on when they are employed.

Antecedent-focused strategies are employed before or during the emotional experience and include situation selection, situation modification, attentional focus, and cognitive modification. Response-focused strategies, on the other hand, are employed after the emotional experience and include response modulation. A study examining emotion regulation during table tennis competitions found that athletes preferred to use antecedent-focused emotion regulation strategies more than response-focused strategies [1]. Another line of research is related to emotion regulation strategies and types of sport. It was suggested that athletes who participate in team sports tend to have less ruminative thoughts and use less rumination compared to those who do not engage in team sports [12]. In team sports, a lower level of rumination is associated with greater flexibility in fulfilling team requirements. This flexibility is essential for athletes in team sports to meet the demands of their teams effectively [12]. However, in individual sports, athletes may exhibit higher levels of reflexive rumination. This higher level of reflexive rumination can help athletes improve their cognitive and motor skills through repetition and focused thoughts, ultimately leading to increased performance levels [12].

In a study conducted by Horvath and colleagues (2022), the link between heart rate variability, emotional states, and emotion regulation strategies used by athletes was examined. This study involved a sample of 20 athletes who participated in both individual and team sports. It was one more time observed that athletes used most

frequently refocusing on planning as an emotion regulation strategy. In another study, which involved 141 athletes playing again both team sports (volleyball, football, handball, and basketball) and individual sports (badminton, swimming, and karate), it was investigated the relationship between cognitive emotion regulation, coping styles, and sports performance. This study revealed that refocusing on planning predicts sports performance [6].

Another topic of research is taking into account the athletes' status. For instance, the results of a study comparing the usage of emotion regulation strategies by amateur and semi-professional athletes showed that semi-professional athletes reported higher scores on refocus on planning and acceptance than amateur athletes [17]. These results are also consistent with the results of another study on competitive level differences, where elite athletes use more refocusing on planning, acceptance, and putting into perspective compared to amateur athletes [13]. Elite athletes were observed to use rumination and catastrophizing more, while amateur athletes had higher self-blame scores [13]. Another study on emotion regulation in amateur and semi-professional athletes revealed that amateur athletes reported higher scores on blaming others compared to semi-professional athletes [17]. In conclusion, these results suggest that context and status matter. More specifically, although previous studies including athletes suggest that strategies that have been considered maladaptive in general contexts, general population, or clinical populations are not necessarily maladaptive in sport contexts [10].

Resilience in sport

Resilience is a personal characteristic that has a significant impact on performance and recovery from injury. Various approaches have been proposed to study resilience over time. Resilience has been conceptualized by researchers as a trait, a process, or an outcome. Thus, resilience as a trait refers to the fact that a person experiences mild distress following adversity [18]. Additionally, resilience as a personal trait helps individuals cope with adversity, such as stress, trauma, or illness, and allows them to grow and develop positively [19, 20]. Resilience as a psychological resource involves successfully adaptation to major stressors [21]. According to these conceptualizations, resilience contributes to optimal functioning, which in sports can enhance performance.

Previous studies have shown that there is a positive correlation between resilience and athletic performance [7, 8]. Additionally, in a study that focused on examining the relationship between coping strategies and resilience in beach volleyball athletes showed that athletes with high resilience levels were more likely to use coping strategies effectively, set goals, stay motivated, and maintain concentration during competitions [7]. Furthermore, it was found that elite athletes had significantly higher resilience levels compared to students or employees [22]. Another study that involved 41 national and international swimmers from England and Australia who

completed measures of resilience and provided saliva samples for cortisol analysis showed that resilience was a significant predictor of performance and that resilience moderated the relationship between cortisol release and performance [8]. Another important personal characteristic is age. A recent study revealed that older athletes tend to be more resilient than younger athletes [23].
Research on resilience and performance in darts has shown that individuals with higher resilience tend to have higher throwing accuracy when compared to individuals with lower resilience [24]. However, no significant difference in resilience levels was found between elite athletes and non-elite athletes [22].
Previous research on darts has focused on examining the relationships between the performance achieved during training and the outcomes in competitions [25], as well as the influence of specific emotion regulation strategies, such as attentional focus, on competitive performance [26, 27]. Additionally, studies have explored the role of motor imagery, which involves the mental simulation of an action without physical execution [28]. Other areas of interest include the phenomenon known as choking under pressure, where individuals experience a decline in performance when faced with pressure or incentives for superior results [29], and the relationship between resilience and sports performance [24].

Steel darts game description

Darts is a sport that requires a high degree of motor skill and a very good ability to concentrate to perform [30]. The game of darts involves throwing darts at a specific target made up of 20 segmented zones, each with a corresponding point from 1 to 20 points. In the center of the target, there are two zones: the green zone, worth 25 points, and the red zone, also known as Bull's Eye, worth 50 points. Each of the 20 zones has three parts: two single parts indicating the actual number of the zone, one part inside the zone indicating the triple number of the zone, and the third part outside the zone indicating the double number of that zone. Players shoot darts from a distance of 2.37 meters in front of the target, and the height they aim for is the center of the Red Bull's Eye zone, which is 1.73 meters above the ground. Darts games come in different variations, such as cricket, 301, 501, and 701. However, the official game played by professional athletes is the 501. In this game, both players start with 501 points and take turns throwing three darts. The aim is to score as many points as possible by hitting the triple 20 and triple 19 to reduce the starting score of 501. The winner of the leg or the set is the player who reaches zero points first, with the last dart closing the game in a check-out double zone. For instance, a close of 160 points means two triples of 60 and a double of 40 points. Practicing darts leads to increased psychomotor skills because darts players develop neuro-muscular coordination, improved cognitive skills, through arithmetic operations, and emotional development (by developing tolerance to frustration) [30].

The present study

The purpose of this study is to investigate the relationship between emotion regulation, resilience, and sport performance among Romanian steel darts players. Specifically, we expect (a) significant positive correlations between adaptive cognitive emotion regulation strategies (acceptance, putting into perspective, cognitive refocusing, and positive reappraisal) and sport performance; (b) significant positive correlations between resilience and sport performance; and (c) significant negative correlations between maladaptive cognitive emotion regulation strategies (blaming others, catastrophizing, ruminating, and self-blaming) and sport performance.

Material-method

Participants

One-hundred three darts players, members of the Romanian Darts Federation participated in this study. One of the participants was not fluent in Romanian, so to avoid completion bias, the answers were eliminated. Thus, the final sample consists of 102 participants, seventy-four percentage being males, aged between 17 and 65 years, (M = 39.5, SD = 9.24), with an average number of training hours per week of 7.86 (SD = 5.77) and with an average number of years of playing experience of 7.97 (SD = 5.66).

Procedure

Darts players registered to participate in national competitions were invited to participate in this study. All the study questionnaires were filled in online, using a computer, before the national competition. The players were required to answer the questions in the questionnaires by analyzing their feelings and thoughts from the previous matches in the national championship stages. Data was collected during two stages of the competition; the first stage took place from 11th to 13th November 2022, and the second stage took place from 9th to 11th December 2022.

All participants signed informed consent. Participants were not compensated for their involvement in this study.

Measures

Emotion regulation. The Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski et al., 2001), adapted to the Romanian population by Perte and Miclea (2011) was used to evaluate participants' emotion regulation. The 36 items refer to what a person thinks when experiencing stressful or challenging situations. CERQ has 9 subscales, each consisting of 4 items. Five out of the nine emotion regulation strategies are adaptive: *acceptance* (e.g. "I think about accepting the situation."), *positive refocusing* (e.g. "I think about pleasant experiences."), *refocusing on planning* ("I think about changing the situation."), *positive reappraisal* ("I look for

the good parts of the situation."), *putting into perspective*, while the other four are maladaptive: *self-blame* (e.g. "I feel I am to blame for what happened."), *rumination* ("I think about how I feel about what happened to me."), *catastrophizing* (e.g. "I keep thinking about how awful the situation was."), and *blaming others* (e.g. "I think about the mistakes others made in the situation."). All items are evaluated on a 5-point Likert scale, ranging from 1 to 5, where 1 means rarely and 5 means almost always. Previous studies have shown that this scale can be used in a sport contexts, because it has appropriate psychometric properties (Belem et al., 2014; Kubiak et al., 2019). Cronbach's alpha was calculated for each subscale obtaining the following indices self-blame α = .71, acceptance α = .44, rumination α = .77, positive refocus α = .68, refocus on planning α = .69, positive reappraisal α = .70, putting into perspective α = .60, blaming others α = .58, catastrophizing α = .72.

Resilience. The Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) was used to measure participants' resilience. This scale has 10 items. Items are evaluated on a 5-point Likert scale ranging from 0 to 4, where 0 means *not true at all* and 4 means *true almost always*, with higher scores indicating a higher level of participant resilience. Example of item "I believe I can achieve my goals despite obstacles." The CD-RISC-10 scale has also been previously used in a sports context. Previous studies have also reported adequate psychometric properties for this scale [31, 32]. To check the internal consistency of the scale, Cronbach's Alpha was also calculated, yielding α =.86.

Sport performance was evaluated based on scores from competitions held by the Romanian Darts Federation, which are centralized in the federation's rankings.

Results

In order to test the hypotheses of this study, Pearson correlations were run. The results showed significant positive correlation between refocusing on planning and darts players' sport performance (r = .233, *p* = .009), marginal significant positive correlation between acceptance (r = .156, *p* = .058) and dart players' sport performance, while no significant correlations were found between putting into perspective (r = .056, *p* = .289), positive reappraisal (r = .150, p = .066), positive refocusing (r = -.130, *p* = .963) and dart players' sport performance (see Tabel 1).
In terms of the link between resilience and sport performance, no significant correlation was found between these two variables.

Concerning the relationships between cognitive maladaptive emotion regulation strategies and sport performance, significant negative correlation was found between blaming others and sport performance (r = -.186, *p* = 0.031) and marginal significant negative correlation between catastrophizing and sport performance (r = -.163, *p* = .051), while no significant correlation was found between rumination (r = .094, *p* = .825) and sport performance and self-blame and sport performance (r = .147, *p* = .930), respectively.

Table 1: Correlation coefficients for cognitive emotion regulation strategies and sport performance

	M	SD	Min	Max	1	2	3	4	5	6	7	8	9	10	11
1. Sport performance	58.9	55.4	0	256	-										
2. Acceptance	14.6	3.11	5	20	.156*	-									
3. Putting into perspective	12.5	3.66	4	20	.056	.394***	-								
4. Positive reappraisal	17.4	2.68	6	20	.15	.469***	.494***	-							
5. Refocus on planning	17.4	2.66	4	20	.233**	.313***	.156	.583***	-						
6. Positive refocusing	11.9	3.18	4	19	-.13	.143	.489***	.288**	.128						
7. Blaming others	6.45	2.53	4	13	-.186*	.125	.154	.038	-.076	.237	-				
8. Catastrophizing	7.33	3.2	4	16	-.163*	.129	.236	-.115	.035	.217	.312	-			
9. Rumination	14.3	4	4	20	.094	.465	.349	.484	.48	.192	.16	.196	-		

10. Self-blaming	16.3	3.25	4	20	.147	.391	.054	.28	.53	-.028	-.003	.163	.47	-
11. Resilience	32	5.79	17	40	.06	.039	.093	.314	.155	.055	-.074	-.203*	-.076	-.088	-

*p <.05, ** p <.01, ***p < .001

Discussions

This study aimed to investigate the relationships between cognitive emotion regulation strategies, resilience, and sport performance in darts players over the past year. The first hypothesis examined the relationship between adaptive cognitive emotion regulation strategies and sport performance of darts players. Results showed that there was a positive correlation between refocusing on planning and sport performance; thus, athletes who used this strategy had also a higher level of sport performance. This result is consistent with the results of previous studies which suggest that there is a positive correlation between refocusing on planning and sport performance [6, 15]. This result is also consistent with the results related to the emotion regulation strategy used and athlete's status. For instance, it was found that elite athletes used refocusing on planning as an emotion regulation strategy [13]. The same pattern of results was suggested by the study where emotion regulation strategies were compared based on other two status: amateur and semi-professional. It was found that semi-professional athletes scored higher than amateur athletes for refocusing on planning [17]. Thus, we can assume that refocus on planning is an important emotion regulation strategy among semi-professional and professional athletes as they need to plan the next steps after experiencing the emotions associated with both winning or losing a competition.

We also found marginal signification between acceptance and sport performance among darts players. Some studies indicated that acceptance correlated positively with sport performance among athletes from various sports like baseball, basketball, soccer, swimming, tennis [13, 17]. Our findings are consistent with these results, as we also found positive association between acceptance and performance among darts players.

Positive reappraisal did not show any significant correlation with performance in the present study. However, a study on the relationship between emotion regulation strategies and sport performance found a positive correlation between positive reappraisal and sport performance [15]. Another study on meaning-making, which is the process by which people interpret situations based on their previous

experiences, showed that positive reappraisal is effective in increasing situational meaning. However, this strategy may not be effective in all sports. Therefore, it is possible that playing darts is not a condition that emphasizes the effectiveness of positive reappraisal [33].

Concerning positive refocusing it was observed no correlation with sport performance. However, one study showed that positive refocusing positively correlates with sport performance [15]. One explanation for the result of this study would be that in darts there is a need for continuous focus on actions and tasks to be accomplished, or refocusing involves diverting the focus of thoughts to other things more pleasant than the situation being experienced. Thus, the result of this study adds new knowledge in the area of emotion regulation and sport performance for a specific sport, namely darts. Furthermore, no correlation was found between putting into perspective and sport performance. A previous study suggested that putting things into perspective is a strategy used by elite athletes [13]. The same study also revealed that female athletes tend to use this strategy more than male athletes. In another study, it was found a positive association between putting into perspective and sport performance [15]. In a study of depression and anxiety symptoms in adults by Garnefki et al. (2003), it was found that putting into perspective was a significant predictor of depression symptoms [34]. Thus, it is possible that thinking "other people are going through much worse experiences" may not be helpful for high performance in sports [35]. Therefore, the result of this study is complementary to the results of other studies.

The second hypothesis examined the link between resilience and sport performance of darts players. However, the results showed no significant positive correlation between resilience and sport performance. Previous studies have demonstrated a significant positive correlation between resilience and sport performance among swimmers and paintball players [8, 15].

The last hypothesis examined the link between maladaptive cognitive emotion regulation strategies and sport performance of darts players. We found a significant negative correlation between blaming others, catastrophizing and sport performance. In other words, darts athletes who used blaming others and catastrophizing had also a low level of sport performance. These results are consistent with the results of Pourebrahimi and colleagues (2022) that suggested the negative associations between these two maladaptive cognitive emotion regulation strategies and sport performance among paintball players. Additionally, we found no significant correlation between rumination, self-blame and performance. However, previous studies have found a negative correlation between rumination and performance, suggesting that athletes who ruminate more tend to have lower performance [15, 12]. The results on the linki between self-blame and sport performance are mixed. For instance, one study found a positive correlation between self-blame and performance [15], while other studies found that performant athletes and semi-professional

athletes reported lower use of this strategy [14; 17]. Given that the game of darts focuses more on the action and demands of the game and less on the self, finding no significant results may be specific to the darts players.

In conclusion, our results indicate that darts athletes who use refocus on planning and acceptance have also a better performance, while athletes who use strategies such as blaming others and catastrophizing have a lower performance.

The results could have practical implications. For instance, interventions and programs can be implement in order to develop the abilities to accept and to refocus on planning after winning or losing a competition and to avoid to blame others for or to catastrophize after losing a competition. An effective intervention that emphasizes the importance of planning is known as the 5Rs [36]. The acronym 5Rs stands for the following steps: *Respond*: this step involves adjusting your mental state to execute the next move effectively. *Release*: this step refers to regulating your emotions resulting from winning or losing a point. *Replay*: this step involves reviewing and correcting your move or maintaining it, if it is effective. *Recharge*: this step refers to managing your psycho-physio-neuro-muscular reactions. *Refocus*: this final step involves planning and strategizing to regain focus and execute the next move effectively. In this program, refocusing helps players plan tactics, develop strategies, and make decisions about their actions [36].

Furthermore, cognitive behavioral therapy proposes various interventions that can be applied to sport. One such intervention is cognitive restructuring, which involves recognizing negative and maladaptive thoughts and replacing them with more practical and adaptive ones [37]. Suppose a player tends to blame others for their situation or exaggerate their opponent's level of play, they can learn to distinguish unrealistic thoughts from realistic ones. They can also find alternative explanations and identify their role in the situation. This will help them to improve their overall performance and cope with difficult situations more effectively. Therefore, darts players and coaches could use these findings to optimize the possible beneficial effects of emotion regulation strategies on sports performance.

It is important to also note that this study is not without some limitations. Firstly, it relied on self-report questionnaires which may not always be completely accurate. Secondly, the questionnaires were administered before the competition, which could introduce some bias in the responses due to the mood of the darts athletes. Additionally, as this was a cross-sectional study, it is not possible to draw any causal relationships between the variables. Therefore, to gain a better understanding of the effects of emotion regulation strategies on sport performance among darts athletes, a longitudinal study is needed. However, despite its limits, this study also has several notable strengths. Firstly, it is the first study to investigate the correlations between emotion regulation, resilience, and athletic performance in the game of darts. Additionally, it represents the first research conducted on the performance of darts players in the Romanian cultural context.

Conclusions

In conclusion, the results of the present study show positive correlations between refocusing on planning, acceptance and sport performance and negative correlations between blaming others, catastrophizing and sport performance among darts professional players.

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