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Dissertation

THE EFFECTS OF A STRATEGIC SELF-TALK INTERVENTION ON PERFORMANCE PARAMETERS IN A SHOOTING TASK

by

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Introduction

In a sports environment where physical training is pushing the limits of human biology, there is an increasing demand to develop the psychological aspect of the athletes' abilities in order to gain an edge on performance and handle the pressure that is naturally associated with competitive environment but also the growing popularity and media coverage of sports. Towards this direction, the ability of athletes to self-regulate is a fundamental psychological skill through which athletes are able to maintain high levels of performance despite the added pressure. A psychological technique that could assist with athletes' self-regulation is self-talk. Self-talk has been defined by Latinjak et al. (2019) as verbalization addressed to one's self characterized by interpretative elements associated to their content; and it also either (a) reflects dynamic interplays between organic, spontaneous and goal-directed cognitive processes or (b) conveys messages to activate responses through the use of predetermined cues developed strategically, to achieve performance-related outcomes. Self-talk can be articulated either covertly or overtly (Hardy, 2006), thus making its distinction troublesome. Although thoughts and self-talk are intertwined and quite often overlap, self-talk consists of two characteristics that distinguish it from other cognitive phenomena: (a) it consists of linguistic elements, including semantics and syntaxes and (b) the sender of the message is also the intended receiver (Heavey & Harlburt, 2008).

Organic and strategic self-talk

According to Latinjak et al. (2020), the most fundamental distinguishment concerning self-talk is between organic self-talk and strategic self-talk. Organic self-talk can be anywhere

within a spectrum of unintentional to conscious and intentional (Hatzigeorgiadis & Galanis, 2017). Within organic two modes of self-talk have been identified: spontaneous and goal-directed. More often than not, spontaneous self-talk happens unintentionally and automatically, Latinjak et al. (2019) have described it as non-goal-directed verbalizations, addressed to the self that reflect various psychological events. While non-goal-directed self-talk includes also mind wandering and various other forms of undirected self-talk, research has focused on spontaneous self-talk that is relevant to the task and are non-instructional statements that come to mind effortlessly (Latinjak, 2018a, 2018b, Latinjak & Hatzigeorgiadis, 2020). On the other hand, goal-directed self-talk is consisted of statements directly and purposefully used to achieve or make progress towards the athlete's goals. Moreover, it is specifically used to select and apply psychological skills as soon as a psychological challenge has been identified (Latinjak, Hatzigeorgiadis, et al., 2019).

Strategic self-talk refers to the use of self-talk cues that are pre-determined and serving a specific purpose and aim ultimately at enhancing performance or achieving self-regulation goals. (Latinjak, Hatzigeorgiadis et al., 2020). The principle underlying the implementation of self-talk strategies was that individuals provide to themselves instructions or directions for action, and subsequently execute the appropriate action by simply following the self-instruction they have used, or reinforce themselves towards a desired outcome (Hatzigeorgiadis, Zourbanos, Latinjak, & Theodorakis, 2014). Such interventions can be self-managed but must be fixed before-hand, although assigned cues are equally effective (Hatzigeorgiadis et al.,2011). The effectiveness of strategic self-talk interventions has been documented, among others, by two review studies, a meta-analysis by Hatzigeorgiadis, Zourbanos, Galanis and Theodorakis (2011) and a systemic review by Tod, Hardy and Oliver

(2011). Both studies have confirmed that strategic self-talk has a positive impact on sports performance.

Types and effectiveness of strategic self-talk

Strategic self-talk interventions mostly involve mostly two types of self-talk cues, instructional and motivational self-talk. Instructional self-talk is defined as cues addressed to one-self attempting to give technical or tactical directions (e.g. refers to focusing or directing attention cues, and cues providing instruction with regard to technique, strategy, or kinesthetic attributes of a skill). Motivational self-talk refers to the attempt of the athlete to psych himself up and overcome difficulties (e.g. refer to "psyching-up" and confidence building cues). Theodorakis et al. (2000) proposed a hypothesis regarding the matching of the nature of the task and the type of self-talk. In particular, they suggested that instructional self-talk should be more beneficial than motivational self-talk for tasks requiring accuracy and precision, whereas motivational self-talk should be more beneficial than instructional for tasks requiring strength and endurance. In a meta-analysis (Hatzigeorgiadis, Zourbanos, Galanis & Theodorakis, 2011) this hypothesis was examined, they found that instructional self-talk was more effective for fine tasks compared to gross tasks, and more effective than motivational self-talk in the fine tasks. Considering gross tasks instructional and motivational didn't have a significantly different effect, although motivational tended to have a greater effect. Hatzigeorgiadis, Zourbanos, et al. (2014) attempted to expand the matching hypothesis by considering additional factors such as learning stage of the participants and performance setting, they suggested that novices would benefit to a greater extent by instructional self-talk rather than motivational self-talk whereas experienced athletes would benefit more from motivational self-talk since their expertise allows for an automatic execution of the task. Furthermore, regarding the performance setting, Hatzigeorgiadis et al

(2014) speculated that instructional cues would be more effective in training settings as it would aid the learning setting, while on the hand, motivational self-talk would complement a competitive setting in which the athlete needs are to decrease anxiety, maintain composure and gain confidence.

Self-talk mechanisms

It has been established that self-talk can have a positive impact on sports performance and learning when used correctly (Hatzigeorgiadis et al., 2011). Taking this one step further, researchers have examined the mechanisms through which self-talk affects performance and learning exploring ‘’what does self-talk do to us (or makes us do) that influences our performance?’’ (Latinjak & Hatzigeorgiadis, 2020). Several studies have been conducted to investigate this inquiry; these have identified confidence building, efficient attention direction (Johnson, Hrycaiko, Johnson, & Halas, 2004), regulation of effort, and anxiety reduction (Cutton & Hearon, 2014) as potential mechanisms. In an attempt to categorize them Galanis et al. (2021) presented a model pinpointing two major mechanisms through which self-talk facilitated performance: attention and motivation. Furthermore, Galanis et al. (2016) presented a prospective model of self-talk mechanisms which includes two broad clusters of mechanisms mediating the effect of self-talk on performance, which reflect the relevant theories but mostly the existing self-talk literature in sport. The first cluster relates to an attentional interpretation of the facilitating effects of self-talk, comprising the different dimensions of attention (intensity-vigilance, selectivity-executive, and spatial-orienting), and including attentional constructs and theoretical perspectives that can be linked to the study of self-talk mechanisms: width and direction of attention, distractibility, and mental effort.

The second cluster relates to a motivational interpretation of the facilitating effects of self-talk, comprising cognitive, affective, and behavioral aspects of motivation, and including constructs and theoretical perspectives that can be linked to the study of self-talk mechanisms: self-efficacy, self-confidence and anxiety, and effort and persistence.

Strategic self-talk in fine motor tasks

Fine tasks are tasks that naturally require higher levels of precision and attention. Therefore, sports that are either partly or exclusively based on fine tasks have received a great deal of attention from self-talk researchers, with the belief that performance would be enhanced via attentional mechanisms (Latinjak & Hatzigeorgiadis, 2020). Extensive research has been conducted with tasks requiring accuracy and precision, like dart throwing (Dagrou, Gauvin, & Halliwell, 1992), tennis (Latinjak, Torregrossa, & Renom, 2011), and golf-putting (Bell & Hardy,2009), but also basketball free throws (Abdoli, Hardy, Riyahi, & Farsi, 2018), and football shooting (Johnson et al., 2004). All of the aforementioned studies have found increases in performance and could logically lead to the conclusion that self-talk is effective through attention mechanisms. More recent research has provided important more direct evidence for the attentional mechanism. Sarig et al. (2017) examined the effects of strategic instructional self-talk on quiet eye (a technique in which athletes achieve high visual attention) in a golf task. The results showed that the duration of quiet eye was prolonged with the use of strategic self-talk, thus supporting an improved focus of attention. Galanis et al. (2018), using a different approach, examined the effects of self-talk under distracting conditions, specifically through loud, sudden sounds in two experiments (laboratory and field settings). The laboratory experiment involved a computerized cognitive task, while the field experiment involved a basketball free-throw shooting task. After a three-week intervention

where the experimental group practiced with the use of strategic self-talk whereas the control group practice without self-talk, the experimental group performed better under distracting conditions than the control group in both tasks. These experiments provide strong evidence for the attentional mechanisms as a mediator of the effects of self-talk on performance in fine tasks.

Studies in shooting

Shooting has been identified as a sport where psychological skills play a bigger role in performance compared to other sports (Bahrami, Moradi, & Rasouli, 2020). Early investigations shooting studies have revealed a significant heart rate (HR) deceleration moments before the shot. Studies in both archery (Wang & Lander, 1987) and rifle shooting (Landers, Christina, Hatfield, Daniels, & Doyle 1980) exhibited the similar results; both novice and elite participants had a HR deceleration, with elite shooter having a larger deceleration. Both studies concluded that HR deceleration is associated with more efficient attentional focus. Based on these findings, Bahrami, Moradi, and Rasouli (2020) investigated the relationship between focus and shooting performance. Significant positive correlation was established between attention and pistol shooting performance was established with the authors speculating that athletes that are capable of concentrating their attention and minimizing distraction would greatly benefit in performance. These findings suggest that self-talk may be an important tool for shooting.

Taking into consideration the effectiveness of strategic self-talk interventions, the matching hypothesis, the psychological demands of shooting tasks, and attention as a self-talk mechanism, the aim of the present study was to examine the effectiveness of a strategic

self-talk intervention (focused on attention and calmness) on performance and fine-skill performance parameters in a pistol shooting task on novice participants. In particular, we examined shooting performance but also stability of aim, and average length of tracing, which are considered crucial performance parameters in pistol shooting. We hypothesized that shooting performance and performance parameters would improve for both groups due to the learning effect, but that the change would be greater when using self-talk.

Methodology

Participants

A total of 40 sport science study from the departments of physical education and sport science of Thessaly participated in this study. The student were 19 to 25 years old and had no previous pistol shooting experience. All students participated in the study voluntarily.

Apparatus and measures

An air-pistol (Walther) and the SCATT shooting analysis system were used in the experiment. Participants shot from the distance of 5 meters. The average shooting score of both sets and the length of tracing as well as the stability of aim on the last second before the shot were measured. In this study we chose to measure three variables: average shooting score (AS), stability of aim (SOA), and average length of tracing (ALOT). Average shooting score (AS) is the average shooting score of the 20 shots each participant took in each session. Scores range from 0-10. This is the performance output and what would be measured in a competitive environment. Average length of tracing (ALOT) is the total distance of the tracing from one second before the shot up to when the trigger is fully pressed. This is the most fundamental indicator of steadiness and it is measured in mm. Stability of Aim (SOA) is the diametrical dispersion of the average points (in small intervals) of the tracing before the shot. It also indicates overall steadiness. The difference between SOA and ALOT is that ALOT measure the total distance traveled within the one second while SOA measures how the center of the aim moves across small intervals across this second. Naturally ALOT values are

higher than SOA values. However, these two variables together accurately depict overall steadiness.

Procedures

Participants were randomly assigned into a control and an experimental group (20 students in each group). The study consisted of a total of 9 sessions. The first session contained the initial meeting where the researcher fully informed the participant about the study and its procedures as well as the demands from the participants. Consent forms were signed and after this briefing the participants became familiar with the equipment (Scatt System) and the basic techniques of shooting. The subsequent two sessions were identical for both groups. Following calibration, participant practiced 2 sets of 10 shots from 5 meters with a 1-minute break in-between. They were instructed to shoot at their own pace while remaining in stance for the duration of the set. Both groups received continuous feedback on their performance and instructions on these two initial measurements. For the subsequent six sessions the format remained the same, however participants received no feedback during practice. Participants of the experimental group practiced using different self-talk cues and were given the chance to choose they preferred. At the end of each session both groups completed self-talk manipulation checks to confirm the use of self-talk in the experimental group while assuring the lack of self-talk for the control group. The average of the first three sessions was used as the baseline measurement for both groups (received identical treatment up to this point) in order to adjust for the volatility of novice shooters.

Results

Data were analyzed using SPSS V21.0. An independent samples t-test was used to examine differences in the baseline measurements between the two groups on the same three variables (AS, SOA, ALOT). The results showed that there were no significant differences between the experimental and the control group at baseline for any of the variables; for AS, t(38) = 0.08, p= .94; for AOS, t(38) = -1.70, p= .-09 ; for A LOT, t(38) = -.40, p= .68. The mean scores are presented in Table 1.

Paired-samples t-tests were used to examine the differences between baseline and final measurements of the average shooting score (AS) between for the control and the experimental group (Figure 1). The analysis revealed significant changes in the average shooting scores for both the control and the experimental groups between the first measurements (M_{ctr}=4.17, SD_{ctr}=1.88) (M_{exp}=4.13, SD_{exp}=1.19) and the final measurement (M_{ctr}=5.09, SD_{ctr}=1.62) (M_{exp}=5.55, SD_{exp}=1.49), $t_{ctr}(19)$=-2.73, p_{ctr}=.013 , t_{exp}=-4.40, p_{exp}<.00.

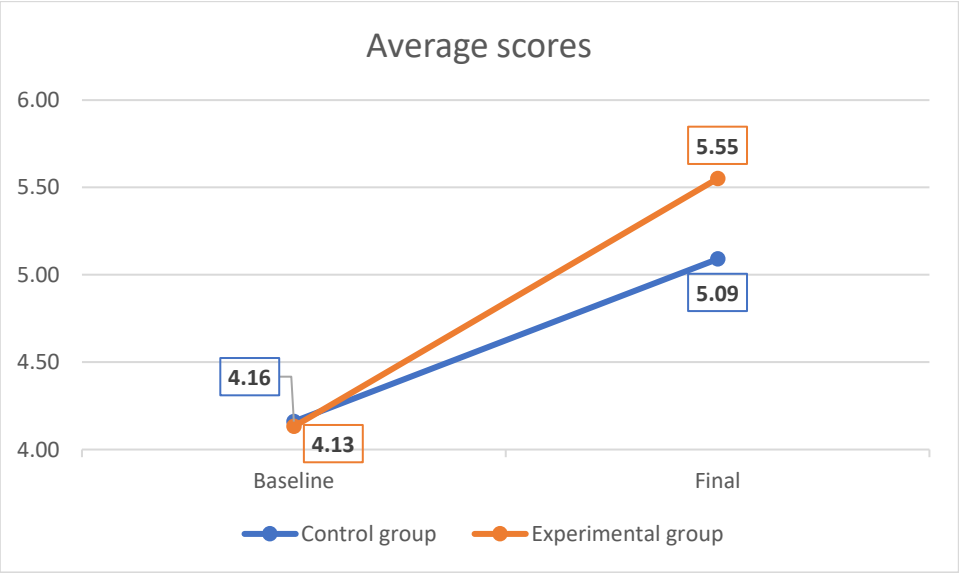

Figure 1. Differences between baseline and final measurements of the average shooting score (AS) between for the control and the experimental group.

Paired-samples t-tests were also used to examine the differences between baseline measurements and final measurements of stability of aim (SOA) and average length of tracing (ALOT) both control and experimental groups (Figures 2 & 3). Regarding SOA the analysis showed that only the experimental group experimental exhibited statistically significant change. Specifically, there were significant differences in SOA between the initial measurement (M=100.11, SD=18.12) and the final measurement (M=80.99, SD=19.69), t(19)=-4.39, p<.000. The control group exhibited no significant changes in SOA, t(19)=.525, p=.605.

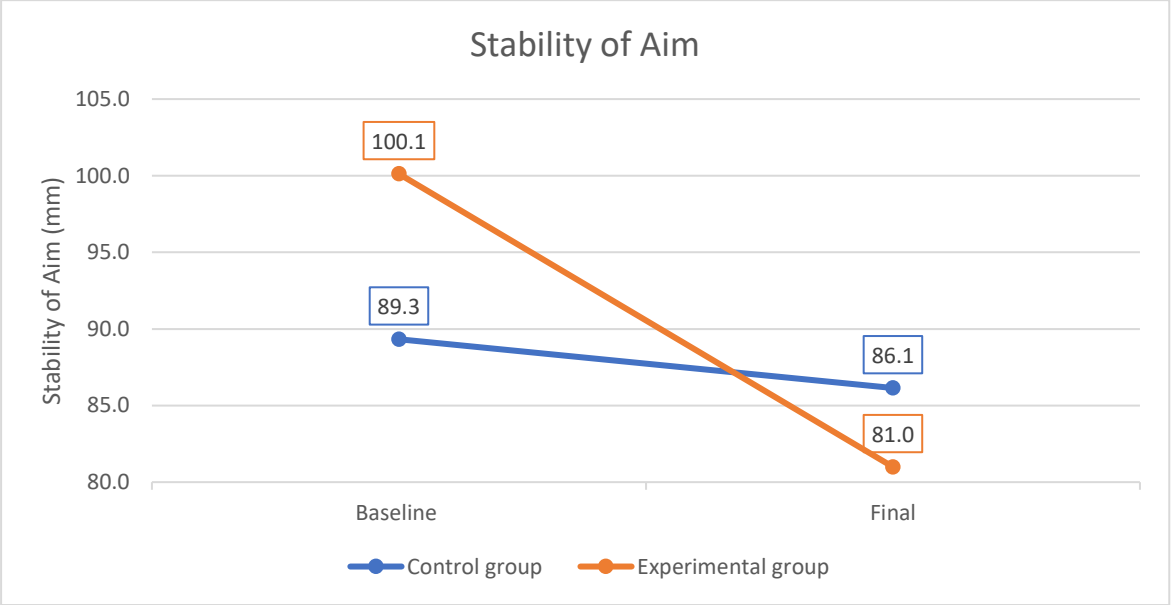

Figure 2. Differences between baseline measurements and final measurements of stability of aim (SOA) between for the control and the experimental group.

Regarding ALOT, there were statistically significant changes for the experimental group from the initial measurements (M=449.72, SD=123.88) and the final measurement

(M=378.00, SD=81.65), t(19)= 4.05, p<.000. Once again, no significant differences in ALOT were found for the control group, t(19)=1.04, p=.311.

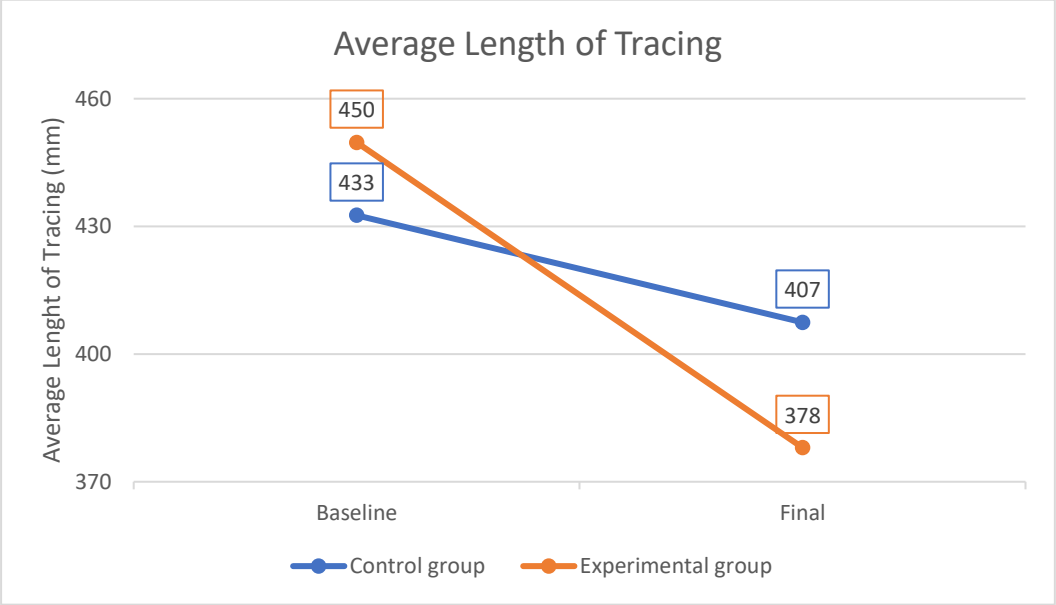

Figure 3. Differences between baseline measurements and final measurements of the average length of tracing (ALOT) between for the control and the experimental group.

Finally, an independent samples t-test was conducted to test for differences in all three variables between the two groups in the final measurements, no significant differences were found in any of the three variables.

Table 1. Descriptive statistics of all measures for the experimental and the control groups.

	Baseline		Final	
	M	*SD*	*M*	*SD*
AS				
Experimental	4.13	1.18	5.55	1.49
Control	4.16	1.62	5.09	1.62
SOA				
Experimental	100.11	18.13	80.99	19.69
Control	89.32	4.87	86.14	30.68
ALOT				
Experimental	449.72	123.88	378.00	81.65
Control	432.58	143.39	407.44	83.64

Discussion

The purpose of this study was to examine the effects of a strategic self-talk intervention in a shooting task in novice athletes, in terms of performance and also in term of mechanisms used through self-talk, namely attention and calmness. Overall the results were partially in agreement with our initial hypothesis, with mechanisms showing significant differences between the two groups, as far as performance in concerned no significant differences were found.

Both the experimental and control groups exhibited a significant increase in performance. While no statistically significant differences existed between those two groups, the experimental group showed a greater improvement and higher average shooting scores despite having similar scores in the initial measurements. We attribute this lack of statistically significant differences between the two groups in the final measurements to the fact that both groups exhibited high standard deviation for both initial and final measurements. This result was to be expected due to the nature of this study, novice participants always display rapid progress that is independent to the training techniques used, also the task was very fine, which by itself introduces even more fluctuation in performance in novice athletes. The observed trend was in the hypothesized direction with the intervention groups having higher scores and a greater improvement compared to the control group.

As far as the mechanisms of attention that we measured (Average Length of Tracing, Stability of Aim) only the self-talk group showed significant changes. Specifically, the experimental group improved in both of these variables, showing an increase in attention. Despite the self-talk group scoring worse in both variables in the initial measurements, the effect of the self-talk was so pronounced that in final measurement participants scored better

than the control group. Regarding differences between the final measurements between the two groups, no significant differences were observed, possibly due to the relatively high standard deviations that were recorded. These results seem to highlight the effect of self-talk on cognitive and affective mechanisms that can assist performance, specifically the participants seemed to have higher levels of attention and overall be calmer.

Limitations

Experiments involving psychological interventions are very complex on their implementation, especially ones that rely on self-report for the researcher to evaluate whether or not the participants are carrying out the interventions (in this case whether or not the participant is using self-talk), manipulation checks were performed at the end of each session to adjust for this limitation.

Fluctuation of performance was also a limitation of this study; all of the participants were novices in the sport of pistol shooting. The combination of novice participants with pistol shooting, which is a very fine motor task, resulted in session-to-session fluctuation of performance and to lesser degree the mechanisms we were observing. This directly led to the lack of statistically significant differences in performance despite there being changes in the hypothesized direction. Either a larger sample or a longer duration of the experiment would suffice on overcoming this limitation.

Another limitation in this study was the fact that multiple researchers were involved, this led to groups getting slightly different instructions (as far as technique goes) and different feedback on the first three sessions, this could have influenced both the cognitive and affective aspects of the study.

Overall, this study provided preliminary evidence on how strategic self-talk can benefit shooting performance but also for attentional parameters that are deemed important for shooting. To further enhance our confidence in these findings but also to forward self-talk research on shooting and the attentional mechanism through which self-talk can be beneficial, studies employing psychophysiological measures are warranted in future research.

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