The Effect of Self-talk and Mental Imagery on Motor Performance in Adolescents

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ABSTRACT: The current study examined the effect of varying combination of positive and negative imagery and self-talk (ST) on performance in adolescents. Seventy-five adolescents boy with an age range of 12-16 and a mean age of 13.9 years (SD = 1.45) volunteers and after completed the Movement Imagery Questionnaire-Revised (MIQR; Hall & Martin, 1997) randomly allocated to one of the five evenly sized conditions (n = 15/condition), namely (1) negative imagery + positive ST, (2) positive imagery + negative ST, (3) positive imagery + positive ST, (4) negative imagery + negative ST, or (5) control group. Standard dartboard used for this research that include 0-100 scores. Mixed-design ANOVAs revealed that performance (F=4.99, P<0.05) changed over time as a function of the assigned experimental condition. Participants in the positive imagery/positive ST condition had the best performance and participant in the negative imagery/positive ST condition had the worst performance, also participants in the negative imagery/positive ST was better than control condition. The finding suggest combination of positive mental imagery and ST as a potential technique to improve performance, combination of negative mental imagery and ST can hamper performance whereas positive ST can remove negative effects of mental imagery.

Keywords: mental imagery, self-talk, performance, adolescents

Introduction

Cognitive techniques are one of the suitable treatment methods to improve athletic performance (Anderson, 1997; Cumming et al., 2005; Eddy et al., 2003). Mental imagery and self-talk are two examples of these techniques. Mental imagery is an intervention, which may bring about favorable outcomes including better self-confidence and improved performance (Hall, 2001). It is a particular mental training that includes the use of all senses to produce a comprehensive experience in the mind of the athlete (Ungerleider, 1996). Imagery may be divided into two categories: visual and sensorimotor. Visual imagery includes internal and external imagery. In internal mental imagery, the individual visualizes themselves as doing the task while, in external mental imagery, the individual visualizes themselves from a third-person perspective (Hall et al., 1998; Hall et al., 1997; Hall, 2001). Hall (1998) divides the functions of mental imagery into two categories: motivational and cognitive. Though several studies have been conducted on Hall’s categorization of mental imagery, recent studies have mainly focused on the orientation of mental imagery and comparison of the effects of positive and negative mental imagery on performance (Short et al., 2002; Taylor & Shaw, 2002). Woolfolk et al. (1985) contend that the orientation of mental imagery can be either positive or negative. Taylor & Shaw (2002) investigated the effect of positive and negative mental imagery on golf shot task. They found that negative mental imagery deteriorates the golf shot task performance. However, they reported no significant difference between the individuals who performed positive mental imagery and the control subjects in terms of performance (Taylor et al., 2002). Besides, Janssen & Sheikh (1994) contend that there are more detrimental effects to negative mental imagery than the values of positive mental imagery.
One of the marked cognitive techniques used by athletes is self-talk which refers to what individuals tell themselves either loudly so that it could be heard or subvocally as it occurs in the mind (Anderson, 1997). Researchers consider different categorizations of self-talk as positive, negative, instructional and motivational. Weinberg (1984) defines positive self-talk as a technique that allows the individual to maintain their focus on the task at hand while ignoring the past failures and looking forward to future. In this type of self-talk, athletes frequently use instructional phrases such as Keep your elbow up and Look at the ball or motivational phrases such as Take it, Go, and I can do it. Negative self-talk refers to the phrases that cause anxiety and negative feelings in the individual such as I always feel exhausted under pressure, and What a bad pass. Like mental imagery, positive self-talk may result in favorable outcomes while negative self-talk brings about adverse outcomes (Dagrou et al., 1996; Van Raalte et al., 1995).

Theoretically, the interaction between mental imagery and self-talk may be accounted for in terms of dual coding theory and action-language-imagery view. Either theory propose that information is obtained through two independent channels one of which is specialized for non-verbal information, such as mental imagery and observation of displays, while the other relates to verbal information (Annib, 1996; Lawrence, 1995). Hanton et al. (2004) conducted a qualitative study on different athletes and reported that the athletes may use self-talk to persuade themselves to avoid negative thoughts and images. Previous studies have mostly focused on qualitative investigation of the combined effect of mental skills on performance; however, few experimental studies have yet been conducted on the issue. For example, Brent (2004) used a treatment procedure to help adolescents avoid competition anxiety. To this end, he taught such skills as relaxation, mental imagery and self-talk to 30 athletes. The results showed a significant difference in competition anxiety between the individuals who used these techniques and those who did not. Neil et al. (2006) studied the relationship between mental skills and competition anxiety in both novice and elite rugby players and found that the combination of cognitive techniques results in reduced competition anxiety to a greater degree in elite than in novice athletes. Previous studies have investigated the compensatory effects of cognitive techniques including self-talk, imagery and relaxation on anxiety but have not studied the effect of these techniques on performance (Neil et al., 2006). Besides, most studies have investigated the individual effects of self-talk and mental imagery on performance. Ramsy et al. (2008) reported that even slight amounts of negative images might exert adverse effects on athletic performance. Previous studies have scarcely addressed the effect of cognitive techniques on performance in adolescents. Cumming et al. (2006) investigated the effect of the direction of self-talk and mental imagery on self-efficacy in throwing darts in adults. They used different combinations of self-talk and positive and negative mental imagery. The results showed improved performance in the experimental subjects. Besides, the combination of positive self-talk and positive imagery was shown to improve performance while the combination of negative self-talk and negative imagery deteriorated the performance. Considering the present theories on the relationship between self-talk and mental imagery, the researcher aims to investigate the combined effect of these two cognitive techniques on performance. Research shows that athletes may use the combination of mental skills to control anxiety and achieve athletic success. Most studies have investigated the interactions between relaxation, mental imagery, self-talk and goal setting (Cumming et al., 2006; Mmmasis & Doganis, 2004). Research on the effect of mental imagery as well as positive and negative self-talk on motor skills has yielded contradictory results (Nordin & Cumming, 2006; Dagrou et al., 1992). Nordin and Cummings (2005) contend that, based on the level of competence, even negative mental imagery may be considered as positive. For example, when a novice darts player thinks their throws have landed on an area other than the bull’s eye, they may use this as a positive imagery. The present undertaking may be justified considering the fact that most studies have so far been qualitative and descriptive. Besides, previous studies have mostly investigated the interaction between cognitive skills but not the compensatory, debilitating or facilitative aspects of these skills (Brent, 2004; Mmmasis & Doganis, 2004). Few experimental studies have been conducted to investigate the interaction between these skills (Nordin & Cumming, 2005; Cumming et al., 2006). Both athletes and coaches intend to achieve improved performance through different techniques. Thus, if the compensatory orientation of positive self-talk and mental imagery proves to exert positive effects on performance, this orientation may then be used to prevent anxiety and improve performance in athletic competitions. Considering the present theories on the relationship between self-talk and mental imagery, the researcher aims to investigate the combined effect of these two cognitive techniques on performance in adolescents.
Materials and Methods

Participants
The population of the study consisted of adolescent athletes in the darts club of Tehran municipality district 12. From among the population, a number of 75 athletes volunteered to participate in the study. All the participants were in good physical health and were novice athletes.

Instruments and tasks
The instruments used in the study included standard dartboard (made in China, Model JB-D6-1, size: 1.2×18 inch) and standard darts (made in China, Model X-D3 with aluminum body). The scoring procedure is such that the darts hitting Bull’s eye receive 100 scores, the darts landing on the circle 9 obtain 90 scores, the darts hitting the circle 8 receive 80 scores, and so on and finally the darts to hit the circle 1 receive 10 scores. The darts, which do not strike the board, receive zero score. A TDK headphone Model MMP-200, made in Japan, was also used in the study. Smith and Holmes (2004) reported that mental imagery through audio-visual records might better improve performance than written forms. Headphones are used to help define the steps of imagery for the participants so that they can proceed accordingly, avoid distractions and reduce the effects of interfering thoughts. Records of positive and negative mental imagery are presented to the individuals step by step. The revised movement imagery questionnaire (MIQ-R) developed by Hall and Martin (1997) was used to collect the data. Sohrabi et al. (2009) have validated the questionnaire in Iran so that the internal consistency and test-retest reliability of the questionnaire were shown to be 0.73 and 0.77, respectively. The questionnaire is used to assure that the individual’s imagery competence does not influence the imagery intervention.

Procedure
The dartboard was hung 173 cm from the floor and the oche was considered 237 cm from the dartboard (official distance). In other words, the throwing player had to stand 293 cm from the center of the dartboard measured horizontally.

Following the selection of participants, they were divided into five groups based on MIQ-R questionnaire including Group 1 (negative imagery & positive self-talk), Group 2 (positive imagery & negative self-talk), Group 3 (positive imagery & positive self-talk), Group 4 (negative imagery & negative self-talk), and Group 5 (control group). The measurement procedure in each group is as follows:

In Group 1, every participant stood up in front of the dartboard and had 15 throws. Then he sat on the chair and took a one-minute rest. Afterwards, the individual had to put on the headphones and listen to the instructions. The record instructed the individual to produce negative imagery step by step. Then, the individual had to stand up and make 15 throwing attempts, and before every throw, the participant made negative imagery. Research has shown that imagery has its strongest impact immediately before every throw (Smith and Holmes, 2004). Before the next step was started, the tester himself performed the task to help the participants understand the procedure for the new stage. In this step, the participant was to repeat the positive self-talk phrase “I will hit the bull’s eye” loudly before every throw. The participant was to perform 15 throws in this step using positive self-talk. In Group 2, the same procedure was followed except that positive imagery was used instead of negative imagery and negative self-talk “I will miss the bull’s eye” was substituted for positive self-talk. In Group 3, the participants used both positive imagery and positive self-talk. In Group 4, the participants used both negative imagery and negative self-talk. The control Group used the same procedure; however, instead of going through the imagery stage, they performed backward counting filler task so that the control subjects were given a number before every throw out of total 15 throws (15,30,60,75,90,105,120,135,150,165,180,195,210,225). They had to count down from the assigned number by threes as many as five numbers. This mental task has no impact on the test results and was solely used to produce the same test time as that of experimental subjects. It was also used to prevent the individual from making imagery. When the participants had difficulty counting down the assigned numbers, the tester would help them.

Data analysis
One-way ANOVA was run to make sure that performance was not significantly different among the groups in the first step. Repeated measures ANOVA 5(group)× 3(trial) was also used to analyze the data. Post hoc LSD
test was run to examine the effect of grouping. LSD pairwise comparison was also used to examine the effect of time in each group. SPSS 16 was used to do the statistical analysis (P<0.05).

**Results**

The mean and standard deviation of participants’ age was 13.9±1.45. The results of one-way ANOVA showed no significant difference in the mean scores of the initial amounts of effort (trial 1) among the five groups in the first step (F=0.02, P>0.05). Thus, the results confirmed that there was no significant difference in performance among the participants in different groups in the first step.

The results illustrated in Figure 1 reveals that the performance of Group 3 (positive imagery & positive self-talk) has significantly improved while the performance of Group 4 (negative imagery & negative self-talk) has deteriorated.

![Figure 1. Participants’ performance in different groups](image)

### Table 1. Results of repeated measures ANOVA

<table>
<thead>
<tr>
<th>Variance</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1883.79</td>
<td>4</td>
<td>470.94</td>
<td>2.65</td>
<td>*0.04</td>
</tr>
<tr>
<td>Time</td>
<td>173.11</td>
<td>2</td>
<td>86.55</td>
<td>4.99</td>
<td>*0.008</td>
</tr>
</tbody>
</table>

*P<0.05

The results of repeated measures ANOVA in Table 1 shows a significant difference in the attempts made by different groups over time (F=2.56, P<0.05). The results of post hoc LSD test showed that Group 1 (negative imagery & positive self-talk) outperformed Group 4 (negative imagery & negative self-talk) (MD=5.735, P=0.045). Group 3 (positive imagery & positive self-talk) outperformed Group 4 (negative imagery & negative self-talk) (MD=8.82, P=0.002) and Group 5 (control group) outperformed Group 4 (negative imagery & negative self-talk) (MD=6.36, P=0.027).

The results of post hoc LSD test in Group 1 (negative imagery & positive self-talk) showed that, with positive self-talk, the participants had better performance comparing with the initial throwing attempts (trial 1) (MD=6.161, P=0.014). Besides, with positive self-talk, they had better performance comparing with the initial attempts (MD=10.287, P=0.00). The results of post hoc LSD test in Group 2 (positive imagery & negative self-talk) showed no significant difference in participants’ performance over time. The results of post hoc LSD test in Group 3 (positive imagery & positive self-talk) revealed that, with positive imagery, the participants had better performance comparing with the initial attempts (MD=3.733, P=0.062). Besides, with positive self-talk, they had better performance comparing with the initial attempts (MD=7.468, P=0.014). Moreover, with
positive self-talk, they had better performance comparing with the attempts they made with positive imagery (MD=-3.735, P=0.000).

The results of post hoc LSD test in Group 4 (negative imagery & negative self-talk) showed that the participants had better performance in the initial attempt (trial 1) comparing with the attempts they made with negative imagery (MD=5.468, P=0.000). Besides, they had better performance in the initial step (trial 1) comparing with the attempts they made with negative self-talk (MD=8.090, P=0.000). Moreover, with negative imagery, they had better performance than with negative self-talk (MD=2.622, P=0.004). The results of post hoc LSD test in the control group showed no significant difference in participants’ performance over time.

Discussion and Conclusion

The present study aimed to investigate the effect of self-talk and mental imagery on dart throwing performance in adolescent players. To this end, the performance of experimental groups was compared with that of a control group. The present findings showed that the combination of self-talk (both positive and negative) and mental imagery (both positive and negative) influences darts throwing performance in male adolescents. The present study was experimental in which both positive and negative influences were considered. The control subjects received no treatment; instead, they performed backward counting filler task. As expected, no significant difference was found in their performance over time. However, a significant difference was found in the performance of Group 3 (positive imagery & positive self-talk) and Group 4 (negative imagery & negative self-talk). The results showed that the combination of positive psychological treatments brings about improved performance while the combination of negative psychological treatments results in deteriorated performance. However, the combination of positive and negative skills was found not to exert a significant positive influence on darts throwing performance. It was, however, found that positive self-talk may remove the effects of negative imagery while negative self-talk may not remove the effects of positive imagery. According to action-language-imagination (ALI) model (Annett, 1996), there is a close relationship between imagery and verbal system to process motor information. Hall et al. (1997) reported that the participants who did mental imagery in combination with verbal signs performed the movement pattern better than those who used either technique in isolation.

The combination of self-talk and imagery in the positive form resulted in the best performance while the same combination in its negative form led to the worst performance in the participants. Therefore, the present findings correspond to the ALI model. This is also consistent with the findings of Hanton et al. (2004) who reported that athletes may use self-talk to prevent negative thoughts and images. In contrast to Hanton and colleagues (2004) who conducted a descriptive-qualitative study, the present study experimentally showed that positive self-talk may remove the adverse effects of negative imagery in Group 1 (negative imagery & positive self-talk). This is consistent with the findings of Cumming et al. (2006) who reported that the combination of positive self-talk and imagery may improve performance and vice versa. They reported that the control group outperformed the group that made negative imagery followed by positive self-talk. However, in the present study, Group 1 (negative imagery & positive self-talk) outperformed the control group. In Group 1, the strong effect of positive self-talk removed the effects of negative imagery. Research has shown that adults use less apparent self-talk (Glenn et al., 200; Duncan et al., 1999). Like Cumming et al. (2006), the present study used apparent self-talk (both positive and negative). The strong effect of self-talk in this study may relate to the fact that adults less frequently use apparent self-talk. Janssen et al. (1994) contend that detrimental effects of negative imagery are stronger than the values of positive imagery; however, the beneficial effects of positive imagery were found to outweigh the negative effects of negative imagery in the present study. According to Smith and Homles (2004), mental imagery through audio-visual records may better improve performance than written forms. The inconsistency between the present findings and those of Janssen and colleagues may relate to the fact that the present treatment was performed using a headphone while Janssen et al. (2004) used the written form of imagery. Though the present participants were non-elite, they were influenced by the adverse effects of negative imagery. However, Nordin & Cumming (2005) reported that, based on the level of competence, negative mental imagery may lead to positive effects in the adolescents. The imagery task used in this study was different from that used by Nodin & Cummings.

The present findings showed that the combination of self-talk and mental imagery may influence darts throwing performance in adolescents so that the combination of treatments in the positive form may improve
performance while the combination of treatments in the negative form may deteriorate performance. Besides, positive self-talk may remove the adverse effects of negative imagery while negative self-talk may not reduce the favorable effects of positive imagery. Considering the fact that the present participants were novice adolescent athletes, it is recommended that future studies use elite athletes as well. It is also recommended that the combination of these techniques be investigated in different sports.

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