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Research article

A COMPARISON OF MENTAL STRATEGIES DURING ATHLETIC SKILLS PERFORMANCE

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ABSTRACT

The current study examined the effects of performance enhancement techniques (PET's) on motor skill performance. Specifically, one hundred fifty college student volunteers (Men = 41; 27.3% and Women = 109; 72.6%) were randomly assigned to one of the nine conditions (Cond): Cond 1 and 2, simultaneous, externally verbalized self-talk or imagery (e.g., participants were instructed to say "aim, back, birdie" or engaged in imagery out loud while putting); Cond 3 and 4, delayed externally verbalized self-talk or imagery (e.g., participants were instructed to say "aim, back, birdie" or engaged in imagery out loud before putting); Cond 5 and 6, simultaneous, internally verbalized self-talk or imagery (e.g., participants were instructed to say "aim, back, birdie" or engaged in imagery silently to oneself while putting); Cond 7 and 8, delayed internally verbalized (e.g., participant were instructed to say "aim, back, birdie" or engaged in imagery silently to oneself before putting); and Cond 9, no instruction control group. All participants were asked to perform a golf-putting task. Results indicated that participants who implemented several (PET's) increased their putting accuracy across overall difference score evaluations $F(8, 141) = 4.01$, $p < 0.05$ when compared to a no instruction control condition. Follow-up analyses indicated that participants who reportedly engaged in ten hours or less of athletic activities per week preferred self-talk strategies $F(2, 119) = 4.38$, $p < 0.05$ whereas participants who endorsed ten hours or more of athletic activity per week preferred imagery strategies $F(2, 25) = 5.27$, $p < 0.05$.

KEY WORDS: Sport psychology, performance enhancement techniques, self-talk, arousal regulation, mental imagery, attention.

INTRODUCTION

Mental imagery and self-talk strategies are implemented by athletes in order to regulate arousal, reduce maladaptive behaviors, reconstruct negative thoughts, and to increase one's concentration and focus. Suinn (1990) states that mental imagery incorporates one's visual, auditory, tactile, emotional, and kinesthetic senses. He suggests that visual motor behavioral rehearsal (VMBR) integrates the senses, which ultimately leads to increased awareness and performance enhancement. In contrast, cognitive theorists stress the importance of symbolic learning theory to mental imagery construction. This process driven model advocates the significance of how one learns a task rather than how one initiates specific motor skills. For instance, Feltz and Landers (1983) reported increased performance when athletes implemented imagery practice on cognitive tasks (i.e., analyzing an opponent's offensive scheme to implements one's own defensive strategy) as opposed to purely motoric tasks (i.e., tackling an opponent).

Imagery is simply not relaxation or a cure for poor skill. Rather, it is an active process that heightens one's levels of concentration, focus, arousal regualtion, and attempts to eliminate maladaptive cognitions and behavior. Many athletes feel that acquiring a "mental edge" on their opponents will ultimately give them an invaluable

advantage during competition. For example, DeFrancesco and Burke (1997) reported that imagery techniques were found to be the most common strategies employed by both female and male professional tennis players. Lejuene, Decker, and Sanchez (1994) studied the training styles of 40 novice table tennis players and found that "imagining oneself successfully completing a sports skill in the absence of the actual movement or activity increases the probability of improving one's performance" (p. 627). In addition, Mckenzie and Howe (1997) reported that engaging in a 15-week imagery training program improved accuracy scores among dart throwers when compared to participants not exposed to any imagery training. Peluso (2000) reported that participants who engaged in relevant imagery practice increased performance on both a mirror tracing and jack catching task when compared to participants in non-relevant, relaxation, and control conditions.

Many athletes will engage in self-talk practice to increase concentration and focus during training and competition. Beauchamp et al. (1996) suggested that novice golfers who implemented pre-putt routines reported higher accuracy ratings when compared to golfers who simply hit the ball. In addition, Theorodakis et al. (2001) indicated that participants who engaged in appropriate self-talk imagery practice (i.e., "relax") made more free throws during a basketball task when compared to participants who engaged in inappropriate self-talk imagery practice (i.e., "fast"). Furthermore, Hatzigeorgiadis et al. (2004) revealed that athletes who implemented various forms of self-talk (i.e., instructional, motivational) increased overall performance and decreased susceptibility to maladaptive and competing thoughts, on a water polo task, when compared to baseline scores. These findings suggest that athletes who incorporate self-talk imagery strategies will ultimately benefit from increased levels of awareness, concentration, and performance enhancement.

However, the time interval between Performance Enhancement Techniques (PET's) and the actual task may be an important factor in performance outcome. Specifically, the time between PET's practice and task may allow an opportunity for maladaptive cognitions to set in. The present study investigated the effects of the time interval between one's utilization of PET's and task on subsequent performance. Specifically, skilled motor performance was compared under conditions of *simultaneou*s self-talk or imagery (e.g., person using either self-talk or imagery during the task) versus *delayed* self-talk or imagery (e.g., person using either self-talk or before the task); *internalized* self-talk or imagery (e.g., person vocalizing their PET silently to themselves) versus *externalized* self-talk or imagery (e.g, person vocalizing their PET out loud so the experimenter can hear); and a no instruction control condition.

METHODS

Participants

Participants were male (41; 27.3%) and female (109; 72.6%) college-aged student volunteers from introductory psychology classes. Age distribution of subjects was age 18 (n = 85), age 19 (n = 36), age 20 (n = 18), age 21 (n = 8), age 22 (n = 1), age 23 (n = 1) and age 25 (n = 1). The hours participating in organized athletics activity of subjects were 5.07 ± 7.02 hrs (ranging 0.00-40.00) per week. Participants were predominately right handed (138; 92%) and between the ages of 18 to 21. Individuals who participated in the study were issued extra-credit points to be used towards course grades.

Equipment

Participants were assessed using a regulation nine-foot Professional Golfer's Association (P.G.A.) automatic putting mat, standard left and right handed thirty-five inch Tour Classic putters, and ten standard Top Flight XL golf balls.

Sports imagery questionnaire

Participants were instructed to fill out the Sports Imagery Questionnaire (1998) in order to determine personal imagery ability. The Sports Imagery Questionnaire (SIQ; Hall et al., 1998) is a 30 item questionnaire that delineates imagery characteristics into five subscales (Cognitive Specific (CG), Cognitive General (CG), Motivational Specific (MC), Motivational General- Arousal (MG-A), and Motivational General-Mastery (MG-M)), which measure the cognitive and motivational functions of mental imagery techniques used by athletes.

The five subscales of the SIQ have been shown to have a favorable internal consistency. A Cronbach's alpha analysis on the five imagery subscales reported an internal consistency ranging from .70 for Motivational General-Arousal to .88 for Motivational Specific (Hall et al., 1998). Mortiz et al., (1996) found skilled athletes employed significantly higher rates of MG-M imagery than low confident/novice athletes. In addition, research has suggested that the motivational subscales of the SIQ (i.e., MC, MG-A, MG-M) were more descriptive of the imagery abilities and imagery styles of elite high school athletes when compared to average high school athletes who employed more cognitive imagery styles (Hall et al., 1998). Therefore, research suggests that the SIQ enables

experimenters to adequately assess athlete's cognitive and motivational imagery abilities and preferences.

Demographics questionnaire

Participants were asked to complete a self-report questionnaire in order to attain demographic information (e.g., age, gender, etc.) as well as to assess their athletic/golfing activity and perceived levels of athletic/golfing abilities.

Self-Efficacy Questionnaire

Participants were asked to complete a self-report questionnaire in order to attain an estimate on how many putts out of ten one believed he or she would make

Validity check questionnaire

Finally, a post-experiment questionnaire was issued to all participants to determine if the participants engaged in any PET practice during the treatment trials. If participants in the delayed or control conditions affirm the use of simultaneous self-talk or imagery practice during the posttest evaluation, his or her data did not undergo further analyses. In addition, participant's data sets from the internally verbalized conditions who denied the use of their respective mental set during the posttest evaluation, did not undergo further analyses.

Procedure

Conditions for participation followed APA ethical standards. Participants were told the nature of the study and were given an opportunity to withdraw from the study at any time without the loss of any extra-credit points. To maintain confidentiality, names of the participants were not placed on the data sheets.

Participants were randomly assigned to one of nine groups; a simultaneous externally verbalized self-talk or imagery condition, a delayed externally verbalized self-talk or imagery condition, a simultaneous internally verbalized self-talk or imagery condition, a delayed internally verbalized self-talk or imagery condition, and a no instruction control condition. All participants were asked to perform a golf-putting task. The experimenter initially demonstrated twice how and where to putt the golf balls. Participants performed a pretest trial during which the participants were instructed to putt ten golf balls from six feet away. Pretest trials were conducted before any PET's were introduced to the participants. Participants were assessed for the number of correct shots made into the hole.

Between trials, during the posttest interventions, participants were asked to close their eyes and the experimenter instructed the participants to visualize themselves performing the same putt successfully, but also instructed them to do so with their appropriate mental set, (i.e., "aim, back, birdie") or imagery vignette. Participants were instructed to say "aim" when they are measuring up their shot, "back" when they initiated their back swing, and "birdie" when the ball was struck. Participants in the externally verbalized conditions vocalized their self-talk mental set or imagery vignette out loud at a level in which the experimenter could hear clearly; whereas participants in the internally verbalized conditions vocalized their self-talk mental set or imagery vignette silently to themselves.

Participants in the simultaneous self-talk conditions performed their putts while vocalizing either their self-talk mental set, (i.e., "aim, back, birdie") or imagery vignette. Participants in the delayed self-talk conditions were asked to focus on their self-talk mental set, (i.e., "aim, back, birdie") or imagery vignette prior to any putting attempts. Between trials, participants were asked to engage in their specific PET for an additional minute.

Participants in the no instruction control condition were asked to attempt all of their putts without any PET's. Between trails, participants were asked to count out loud backwards from 500 to zero, by threes. The introduction of the counting acted as a distracting task for the participant to reduce the likelihood of the participant engaging in any self-initiated self-talk and/or imagery techniques. At the conclusion of the pretest and posttest evaluations, participants were asked if they engaged in any type of self-talk or imagery practice during the experiment. Next, participants filled out the Self-Efficacy Questionnaire, which assessed how many putts a participant believed he or she would make. Finally, all participants filled out the Sports Imagery Questionnaire (SIQ) in order to determine their respective imagery skills and abilities.

Each participant attempted twenty putts: ten during the pretest evaluation and ten putts during the posttest evaluation. Participants were assessed for the number of correct putts into the hole. Upon the conclusion of the posttest evaluation, mean scores were calculated and difference scores from the pretest and posttest trials were compared.

RESULTS

The majority of participants reported playing organized athletics (e.g., high school, 88%; college, 19.3%; intramurals, 53.3%) and a minority of the overall population reported playing organized golf (e.g., high school, 4.7%; college <1%; intramurals; 2%). A series of Pearson's correlations examined the

relationship between participants' overall time spent playing regulation P.G.A. and miniature golf and overall difference scores. Results indicated a significant relationship between P.G.A. golf experience and overall difference scores across all conditions $r = 0.172$; $p < 0.05$. Follow-up analyses suggested that of the 68% of the participants who selected "other" on the demographic questionnaire, approximately 87% reported "never" playing golf; therefore suggesting an overall unfamiliar/novice sample. In addition, results indicated no significant relationship between miniature golf experience and overall difference scores $r = 0.044$; $p > 0.05$ across conditions.

A series of ANOVAs were conducted across all nine conditions comparing pretest putting abilities. Results indicated that no significant differences were seen across all conditions across pre-test putting trials; therefore suggesting that participants' overall putting abilities were commensurate $F (8, 141) = 5.779$, $p > 0.05$. A 9 x 2 repeated measures ANOVA was conducted across all nine conditions comparing overall outcome performance between participants' pretest and posttest trial scores. Results indicated no significant differences across conditions and between trials existed, $F (8, 141) = 1.916$, $p > 0.05$.

In contrast, a follow-up ANOVA indicated a significant interaction across conditions between participants' overall difference score across pretest and posttest trials, $F (8, 141) = 4.009$, $p < 0.05$. Follow up paired comparisons on overall difference scores indicated improved putting performance across seven of the eight PET experimental conditions. Specifically, participants in the simultaneous internal imagery condition exhibited the largest difference score, Cohen's $d = .7359$, $p< .05$. In addition, results indicated a negative decline in performance across overall differences scores for participants in the delayed external imagery and no instruction control group (please refer to Table 1 and Table 2). Overall, across conditions results indicated that participants significantly benefited from implementing internalized forms of PET's when compared to externalized forms of PET's and the no instruction control conditions $F (2, 147) = 7.009$, $p < 0.05$.

Given the high degree of variability regarding the number of hours of organized athletic activity participants reported, a series of one-way ANOVAs comparing performance across conditions was conducted. Results indicated that participants who endorsed ten hours or less a week of athletic activity preferred self talk interventions over the imagery and the no instruction control condition $F (2, 119) = 4.389$, $p < 0.05$.

In contrast, participants who endorsed ten hours or more a week of athletic activity preferred imagery strategies to self-talk and the no instruction control condition $F (2, 25) = 5.27$, $p < 0.05$.

In addition, no significant differences were found between participants in both the ten hour or more and ten hour and less condition when assessing for preferences styles between internalized,

Table 1. Paired samples statistics.

		Mean	n	SD	SEM	Change Score	Cohen's d
Pair 1	Pre	3.86	15	1.55	.401	.13	.0699
	Post	4.00	15	2.39	.617		
Pair 2	Pre	3.20	15	1.70	.439	.20	.0958
	Post	3.40	15	2.41	.623		
Pair 3	Pre	3.46	15	2.13	.551	1.07	.5057
	Post	4.53	15	2.10	.542		
Pair 4	Pre	3.80	15	1.26	.327	-.027	.1926
	Post	3.53	15	1.46	.376		
Pair 5	Pre	3.46	15	1.88	.487	.07	.0351
	Post	3.53	15	2.10	.542		
Pair 6	Pre	3.20	15	1.15	.296	1.26	.7359*
	Post	4.46	15	2.13	.551		
Pair 7	Pre	3.00	15	1.73	.447	.33	.2097
	Post	3.33	15	1.40	.361		
Pair 8	Pre	3.53	15	2.70	.696	1.13	.4218
	Post	4.66	15	2.66	.688		
Pair 9	Pre	3.93	30	1.64	.299	-.53	.2905
	Post	3.40	30	1.99	.364		

Pair 1: Sim. Ex. Ver. Self-Talk, Pair 2: Sim. Ex. Ver. Imagery, Pair 3: Del. Ex. Self-Talk, Pair 4: Del. Ex. Imagery, Pair 5: Sim. Int. Self-Talk, Pair 6: Sim. Int. Imagery, Pair 7: Del. Int. Self-Talk, Pair 8: Del. Int. Imagery, Pair 9: Control Condition. * $p < 0.05$.

Table 2. Cohen's d Effect Sizes across conditions (1-9) on putting performance.

	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5	Pair 6	Pair 7	Pair 8	Pair 9
Pair 1	*								
Pair 2	.0234	*							
Pair 3	.4654	.3406	*						
Pair 4	.2050	.1865	.9919*	*					
Pair 5	.0366	.0555	.7813*	.2794	*				
Pair 6	.5416*	.4081	.1215	.9707*	.8495*	*			
Pair 7	.0977	.0516	.0516	.3958	.1988	.5515	*		
Pair 8	.3865	.3086	.3086	.6384*	.5138*	.0575	.3516	*	
Pair 9	.3644	.3312	.3312	.3312	.4430	1.135*	.5607*	.8352*	*

Pair 1: Sim. Ex. Ver. Self-Talk, Pair 2: Sim. Ex. Ver. Imagery, Pair 3: Del. Ex. Self-Talk, Pair 4: Del. Ex. Imagery, Pair 5: Sim. Int. Self-Talk, Pair 6: Sim. Int. Imagery, Pair 7: Del. Int. Self-Talk, Pair 8: Del. Int. Imagery, Pair 9: Control Condition. * $p < 0.05$.

externalized, simultaneous, and delayed conditions. These findings are consistent with the current literature which states that novice athletes will often engage in self-talk practice for athletic skill mastery whereas more experienced athletes will implement imagery techniques as an arousal regulation and/or motivational technique (Cox, 2002). Finally, a paired comparison was conducted to determine the effect of participants' self-efficacy on the golf putting task between one's predicted putting accuracy score (e.g., how many putts they thought they would make) and their actual putting accuracy score. Results suggest that participants across all conditions were able to accurately predict their actual putting score $t(149) = -17.24$, $p < 0.05$.

DISCUSSION

Results of the current study suggest that participants who engaged in several performance enhancement techniques exhibited enhanced performance on a golf putting task when compared to participants in a control condition. Overall, both self-talk and imagery conditions were found to significantly increase putting performance. Internalized forms of self-talk and imagery yielded higher differences scores when compared to external and the no-instruction control conditions. In addition, participants who endorsed limited athletic familiarity and activity (e.g., ten hours or less) preferred self-talk practice whereas participants who endorsed higher ratings scores of athletic familiarity and activity (e.g., ten hours or more) preferred imagery strategies.

Regardless of skill level or type of sport, PET's (e.g., self-talk, imagery) allows coaches, trainers, athletes, and sport psychologists seemingly limitless opportunities to design treatment plans, which focus exclusively on an athlete's intellectual, emotional, and physical strengths and weaknesses. For instance, in a series of case studies with elite junior tennis players who implemented a year long mental training program (e.g., goal-setting, positive thinking/self-talk, concentration/routines, arousal regulation, and imagery). Mamassis and Doganis (2004) reported increased overall performance and self-confidence with lowered pre-competition anxiety when compared to control conditions. The results of this current study demonstrate the flexibility of PET's (e.g., imagery v. self-talk, internal v. external, simultaneous v. delayed) and how they can be implemented to help an athlete reach his or her full potential.

In contrast, researchers are suggesting that directly applying self-talk strategies in athletic competition may serve as a potential problem for athletes. For instance, Ming and Martin (1996) stated that many athletes may be reluctant to express their mental sets out loud. Athletes and coaches may not want their opponents to hear their upcoming plans and/or moves during competition. Additionally, the process of implementing a self-talk intervention during competition may be both physically and cognitively difficult for an athlete. For instance, a basketball player on a fast break or a soccer player dribbling in the open field will need to assess their position on the field, find open teammates, be aware of oncoming opponents, and make a decision to pass, shot, or hold onto the ball all within a matter of seconds. The possible presence of fatigue, environmental stimuli (i.e., weather, visiting crowd/opponent's verbal distractions), and performance anxiety may also contribute to an athlete's loss of concentration, focus, and inability to think clearly.

Various situational elements of team athletics may not allow an athlete enough time to engage in appropriate self-talk practice. In light of these potential problems, it is suggested that self-talk interventions may be best implemented with athletes who are engaging in expected individualized activities (i.e., free throw shooting, golf-putting, and field goal kicking). Seeing both the positive and

potential negative factors associated with self-talk interventions, researchers have agreed that the primary concern regarding self-talk is the need to adopt more systematic research paradigms (Theodorakis et al., 2001). Continued research efforts based on sound theoretical and conceptual models will allow researchers to further understand the complexities of self-talk interventions. Regardless of what type of sport or athlete one is examining, an absence of a theory-based framework will continue to limit researchers' understandings of the overall strengths and weaknesses of self-talk interventions (Hardy et al., 2001).

CONCLUSIONS

A potential limitation of this study may be the subject sample pool. Saint Louis University is a traditional midwestern, Jesuit institution, which is primarily Caucasian, therefore not truly representing the current demographics of the general population. In addition, the results of this study may be difficult to generalize across a number of athletic situations. For instance, participants completed this study in an indoor laboratory setting using an artificial putting mat; therefore, the final results may have varied if participants completed the study on an outdoor putting green. Also, participants completed the study on an individual basis and were unaware of the results of other participants. Participants were not issued any incentives for superior performance and were given as much time as needed to attempt their putts. Given these factors, the results of this study may have varied across conditions if participants were placed in a more competitive format. In addition, participants were only assessed on putting ability; therefore one should not generalize these results to other golf skills (e.g., chipping, bunker shots, fairway shots, driving off the tee), athletic ability (e.g., novice, advanced, elite), and other sports. Furthermore, outcome performance was solely determined by the number of putts made and not by other factors such as closeness to the hole or number of attempts to make a putt. Finally, participant's imagery styles and abilities may have influenced posttest scores. In order to control for these effects, participants were asked to complete the Sports Imagery Questionnaire (SIQ; Hall et al., 1998). Analyses suggested that no significant differences, $F(8, 141) = 1.589$, $p > 0.05$, were seen between participants across all five conditions on measures of imagery style, ability, and motivation.

In light of these limitations, several areas of future research are suggested. First, these findings should be replicated with participants representing different levels of skills (i.e., professional, collegiate, novice) and types of sports (i.e., team versus individual). Additionally, it is suggested that further research include the investigation of the effects of simultaneous, externally verbalized, task-relevant imagery techniques in comparison to more traditional forms of imagery practice (i.e., premeditation, relaxation). Finally, future research is needed to compare the effectiveness of visually presented imagery interventions (i.e., watching a video of successful golf putts, live modeling) with verbally instructed imagery interventions.

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KEY POINTS

- Mental imagery and self-talk strategies are implemented by athletes in order to regulate arousal, reduce maladaptive behaviors, reconstruct negative thoughts, and to increase one's concentration and focus.
- Results of the current study suggest that participants who engaged in several performance enhancement techniques exhibited enhanced performance on a golf putting task when compared to participants in a control condition.
- Participants who endorsed limited athletic familiarity and activity (e.g., ten hours or less) preferred self-talk practice whereas participants who endorsed higher ratings scores of athletic familiarity and activity (e.g., ten hours or more) preferred imagery strategies.
- The results of this study demonstrate the flexibility of Performance Enhancement Techniques (e.g., imagery v. self-talk, internal v. external, simultaneous v. delayed) and how they can be implemented to help an athlete reach his or her full potential.

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