

The Impact of Motivational Imagery on the Emotional State and Self-Efficacy Levels of Novice Climbers

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This study examined the impact of an imagery script intervention on the levels of perceived stress, self-efficacy and climbing performance of volunteer female participants. Novice climbers were randomly assigned to either a control group, or to an imagery intervention group. Each participant attended four sessions, during which they practiced basic climbing techniques and took part in either a light exercise program (control group) or a scripted imagery training program (experimental group). The imagery script comprised both motivational general-mastery and motivational general-arousal types of imagery. During the testing session the participants climbed a 5.1 meter climbing wall following a designated route. Pre-climb levels of self-efficacy and perceived stress were measured. Perceived stress levels were also assessed on three occasions during the climb itself. The experimental group reported significantly lower levels of perceived stress before and during the climb and higher levels of self-efficacy in their ability to execute the correct technique during the climb. There was no significant difference in climbing performance between groups. The results are consistent with the propositions of Martin, Moritz and Hall's (1999) conceptual model of mental imagery use in sport and suggest that motivational general-mastery and motivational general-arousal types of imagery can be effective in controlling emotions during athletic activity and may also enhance self-efficacy.

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The beneficial use of imagery in sport settings has been documented by a number of athletes, for example, Tiger Woods in golf (Vealey & Greenleaf, 1998), Sylvie Bernier in diving (Butler, 1996) and supported by compelling research evidence (e.g., Feltz & Landers, 1983; Martin, Mortiz & Hall, 1999). Imagery is commonly defined as "... quasi-sensory and quasi-perceptual experiences of which we are self-consciously aware and which exist for us in the absence of those stimulus conditions that are known to produce their genuine sensory or perceptual counterparts" (Richardson, 1969; pp. 2-3). This is distinct from mental rehearsal in that imagery refers to a mental process or mode of thought, whereas mental rehearsal is defined as the employment of imagery to mentally practice an act (Hardy, Jones & Gould, 1996). Recently, Martin et al. (1999) presented a conceptual framework of imagery use in sport, identifying four key factors relating to its use: the sport situation, the type of imagery used, imagery ability, and outcomes associated with imagery use. Although the sport situation (training, competition, rehabilitation) and imagery ability (kinesthetic, visual) are recognized as being important aspects of imagery use, the present study was particularly concerned with the type of imagery used and the outcomes associated with imagery use, focusing specifically on the use of imagery to change cognitions and control emotions.

Past research by Paivio (1985) has identified that imagery serves both cognitive and motivational functions. Using Paivio's original taxonomy of imagery function as a basis, Hall, Mack, Paivio and Hausenblas (1998) identified five functions of imagery in the development of the Sport Imagery Questionnaire, recently incorporated by Martin, et al. (1999) in to their conceptual model of imagery use in sport settings. The five functions of imagery include, motivational-specific, motivational general-mastery, motivational general-arousal, cognitive specific, and finally, cognitive general. Martin et al. (1999) proposed that the five types of imagery are functionally orthogonal. That is, while an athlete may choose to use only one type of imagery it is also possible for him or her to experience two or more types simultaneously. However, Martin et al. (1999) also caution that what is critical to the potential effectiveness of an imagery intervention is that, regardless of the different types of imagery contained within a script, the type(s) of imagery used should be consistent with, and appropriate for, the desired outcome(s). In other words, it is important to consider the imagery function, which is distinct from imagery content (Monroe, Giacobbi, Hall, & Weinberg, 2000). Martin et al's. (1999) conceptual model outlined three outcomes of imagery use, including improving skilled performance, however the two of particular relevance to this study were modifying cognitions and arousal and competitive anxiety regulation.

Martin et al. (1999) proposed that motivational general-mastery imagery, which refers to effective coping and mastery of challenging situations (e.g., imagining feeling confident while climbing a difficult rock face) may be used to modify cognitions, and specifically may be

beneficial in terms of increasing self-efficacy and self-confidence. Indeed, Bandura's self-efficacy theory (1997) identifies imaginal experiences as a determinant of self-efficacy. Consistent with theory, research by Feltz and Riessinger (1990) found that participants who underwent imagery treatment aimed at generating images of competence and performing better than their opponent on an isometric quadriceps task (i.e., motivational general-mastery imagery) had higher expectations of doing well. Callow, Hardy and Hall (1998) reported similar findings for self-confidence when they conducted a motivational general-mastery imagery intervention with badminton players.

The use of motivational general-mastery imagery in modifying cognitions may also be associated with athletes responding with a more positive emotional state when placed in stressful situations. Many emotion theorists (e.g., Lazarus 1991) have emphasized the role of cognition in emotion, and an individual who perceives him or herself as being better able to cope in a stressful situation, through the use of motivational general-mastery imagery, may very well experience a more positive emotional state than an individual who perceives that they cannot cope.

In addition to modifying cognitions Martin et al. (1999) also proposed that imagery, and specifically motivational general-arousal imagery, could be used as an effective tool to regulate arousal and competitive anxiety. Motivational general-arousal imagery focuses on feelings such as relaxation, stress, arousal and anxiety in conjunction with sport competition (e.g., imagining feeling excited as you take the field for your first-ever international match in cricket). Martin et al. utilized Bioinformational Theory (Lang, 1977, 1979) as a theoretical explanation for why motivational general-arousal imagery may be useful in regulating arousal and competitive anxiety. According to Lang's theory, when an individual imagines a situation, he or she activates a stimulus proposition, which describes the content of the image and contextual factors (Hardy, Jones & Gould, 1996). For example, if an individual were to imagine taking a penalty kick in a soccer match s/he would see the goal, the crowd, teammates, and would also be aware of contextual factors such as the number of minutes remaining in the game and the match score. In addition to activating a stimulus proposition, an image activates a particular response proposition for that image. The response proposition determines the situational emotional response, which may include some excitement (e.g., it is a chance to win the game), some apprehension (e.g., what if I miss?) and some physiological symptoms (e.g., butterflies in the stomach).

Martin et al. (1999) suggest the use of motivational general-arousal imagery to modify response propositions to a particular stimulus should enable athletes to change undesirable emotional responses during stressful situations. Indeed, there is some empirical support for the contention that emotional states can be manipulated through the use of imagery. For

example, Lee (1990) reported participants who imagined a situation in which they felt happy and confident prior to a sit up task reported higher levels of vigor and lower levels of fatigue than participants who imagined doing the task itself, and a control group.

Although there is some support for the successful manipulation of emotional arousal using mental imagery, there is less empirical evidence indicating that imagery can be used to manage arousal or competitive anxiety prior to and during physical activity in naturalistic settings (e.g., sport contests). The strongest evidence has come from studies where imagery was incorporated with other stress management techniques, (see Mace, 1990 for a review). This evidence is supplemented by qualitative accounts reported in a recent study by Munroe, Giacobbi, Hall and Weinberg (2000) who interviewed 14 elite athletes about aspects of imagery use. Athletes indicated that imagery was not only used to increase excitement and get "psyched up", but was also used to maintain composure during competition. However, thus far there has been no quantitative research that has examined the effectiveness of imagery alone, in enabling athletes to control emotions during sports performance.

While Martin et al.'s (1999) model indicates that motivational general-arousal imagery should be effective in regulating arousal and anxiety (and presumably other emotions e.g., excitement, distress) it is important that any research testing this proposal focuses not only emotional states prior to, but also during the activity itself - when emotions are likely to have the greatest effect on effort, persistence and performance (cf. Bandura, 1997). Indeed, given that an individual's emotional state is likely to be highly transient, Jones (1991) noted that reliance on measuring pre-competitive anxiety, which can change seconds after the competition begins, is a serious limitation. This point is clearly illustrated in the results of a study by Krane, Joyce and Rafeld (1994) who measured softball players' anxiety levels immediately prior to their entering the batter's box. Results showed that anxiety levels changed throughout the game depending on how important the situation was to the outcome of the game. Similar findings were reported by Jones, Mace and Williams (2000) who found international field hockey players experienced greater levels of annoyance and less tension during the game compared to immediately before.

The assessment of emotions prior to performance as well as during the event itself has important implications for the evaluation of the benefits of motivational general-arousal imagery as a strategy to regulate emotional states. Therefore, the primary purpose of the present study was to examine the effect of a motivational guided imagery script intervention on novice climbers' emotional states. Consistent with Martin et al.'s (1999) recommendations, the imagery script incorporated motivational general-arousal imagery in order to manipulate climbers' perceived stress levels prior to and during the climb. It was hypothesized that exposure to a motivational general-arousal imagery script intervention would be associated with lower lev-

els of perceived stress in an intervention group, compared to no treatment controls. A secondary purpose of the study was to examine the impact of the imagery script intervention on self-efficacy levels prior to the climb. Thus, in addition to motivational general-arousal imagery, the imagery script contained elements of motivational general-mastery imagery (as it detailed a successful climb). In line with Martin et al.'s propositions and the theorizing of Bandura (1997), self-efficacy prior to the climb was expected to be higher among participants who engaged in imagery compared to controls.

The use of an imagery script intervention addressing two functions of imagery attends to Martin et al.'s (1999) call for controlled experiments that examine several of their model's components concurrently. Further to this end, we assessed climbing performance as an additional outcome variable. According to Martin et al.'s model, cognitive specific imagery (imagining specific sport skills) and cognitive general imagery (imagining competitive strategies) are the types of imagery most likely to relate to performance. However, because specific movement patterns were likely to differ from person to person, depending on factors such as height, flexibility, reach and athletic ability, the imagery script was purposely devoid of cognitive specific and cognitive general imagery for the climb itself, and accordingly, no differences in performance between the intervention and control groups were expected.

Method

Participants and Design

The participants were 33 female volunteers between 18 years and 48 years of age ($M = 22.33$, $SD = 5.63$) who had no previous climbing experience. They were either undergraduate students ($n = 30$), or employees ($n = 3$) at a college of higher education recruited to the study by posters placed in the college. All participants provided informed consent prior to participation in the study.

Participants were randomly assigned to either an experimental group ($n = 16$, M years of age = 21.63, $SD = 3.12$), who underwent an imagery script intervention, or a control group ($n = 17$, M years of age = 23.00, $SD = 7.31$) who took part in a light exercise program. The exercises performed by the control group involved stretching and low impact aerobic exercise and were not expected to have any significant benefits for climbing performance. Indeed, a similar control procedure alongside an imagery intervention has been successfully utilized in previous research by Hardy and Callow (1999). In order to ensure safety and to give participants some experience at the task upon which to base their imagery and self-efficacy, all participants received climbing instruction supervised by an experienced climber. In total, participants attended four one-hour sessions in their groups (experimental or control), scheduled at the

same time, on the same day, for 4 consecutive weeks. All of the sessions took place in the same sports facility, which had a climbing wall at one end. To ensure that each participant received an appropriate amount of attention from the instructor, groups were limited in size to no more than 10. In total, 37 participants attended the training sessions and attempted the climb, however four participants were unable to complete the climb and their data were not analyzed.

Task and Apparatus

Each participant climbed a 5.1 meter climbing wall along a route marked in white chalk. The route consisted of three climbing stages followed by a passive descent. In Stage 1, participants climbed directly upwards to a designated point, 3.65 meters above the ground. Stage 2 involved a climbing traverse to the left, across the face of the wall to another designated point, 4.07 meters off the ground. The third stage of the climb required participants to climb directly upwards to tag a white sling above the top of the wall, 5.1 meters off the ground. Upon completion of Stage 3 of the climb, participants were lowered to the ground. Standard equipment such as climbing harnesses, safety helmets, and an 11 millimeter climbing top rope were used in the climbing task.

Measures

Perceived Stress. The Perceived Stress Index (PSI; Jacobs & Munz, 1968) was used to assess perceived stress prior to and during the test climb. This measure was constructed from an original list of 208 adjectives (generated by psychology students as describing emotional or affective states) using two well-established psychometric techniques; Thurstone's method of Equal-Appearing Intervals and Osgod's Semantic Differential. The final inventory consists of 15 single-word or phrase items that describe how an individual is feeling at a specific moment in time. The scale was designed to measure a continuum of stress ranging from extreme positive stress (eustress) to extreme negative stress (distress). Items range from feelings of thrilled to extremely terrified. Each phrase or word has a corresponding numerical intensity weighting, with those phrases or words denoting stronger perceived negative stress assigned higher weightings than those denoting stronger perceived positive stress (e.g., thrilled = 1.97; extremely terrified = 10.72).

Respondents complete the PSI by selecting one item from a 15-item scale continuum that best describes how they are feeling at the present moment. Although single-item measures have been criticized because their reliability can not be determined, their utility has been touted when situational constraints prohibit the use of multiple item scales (cf. Wanous et al., 1997). We selected the PSI on the basis of its established validity in general psychology (see Jacobs & Munz, 1968) as well as its ease of completion. In addition, it has been used in

previous research to assess perceived stress levels in sporting tasks such as abseiling and gymnastics (Mace & Carroll, 1985; 1989). Furthermore, because a major purpose of the study was to examine emotional stress throughout a continuous activity that required constant attention, it was reasoned that a more detailed measure could have interfered with the attentional demands of the climbing task.

Self-efficacy. We are not aware of any existing instruments that assess climbing self-efficacy. Therefore, we developed two items designed to measure participants' self-efficacy prior to climbing: How confident are you of climbing well using the appropriate techniques that you have been taught (e.g., three contact points on the wall?) and How confident are you of climbing to the best of your ability?. Although a more comprehensive list of specific items relating to climbing abilities could have been generated, it was felt that because participants had a minimal amount of experience performing the task that items reflecting a perception of climbing efficacy in general would be more correspondent with their actual capabilities at their novice skill level. Thus, the two items were designed to measure separate, but related components of general climbing self-efficacy representative of abilities to a) utilize appropriate techniques and b) climb to the best of her ability. The response scale for each item ranged from 1 not at all to 4 very much so. Although not the scaling format advocated by Bandura (1997), Likert scales have been found to correlate highly with levels of self-efficacy (Maurer & Pierce, 1998) and allow for more generally worded questions (Mudgett & Quinones, 1997) as were required in the present assessment.

Climbing Performance. Climbing performance was assessed by two qualified mountaineering instructors who were blind as to the nature of the experiment. Each instructor independently watched a video recording of the climb and rated each participant's climbing technique on a 10 point scale anchored by 1 (very poor) and 10 (excellent). The instructors looked for an agreed set of characteristics, incorporating, three contact points on the wall, confidence of movement, and minimum foot or hand hold slips. The scores from each instructor were combined yielding a total score for each participant out of 20.

Covariate Measures

In order to examine and control for possible pre-existing differences between groups, participants completed a series of questionnaires assessing trait anxiety and perceived value of their climbing training as well as a task assessing their fear of heights.

Trait Anxiety. The Trait Anxiety Scale of the State Trait Anxiety Inventory - Form Y2 (Spielberger, 1983) was used to assess trait anxiety. The questionnaire required participants to respond to 20 statements indicating how they generally felt on a 4-point scale ranging from 1 (Almost never) to 4 (Almost always). The Trait-Anxiety Scale has demonstrated concurrent

and predictive validity, good psychometric characteristics, and adequate test-retest reliability (Spielberger, 1983).

Perceived Value of the Training. Participants rated how useful they thought the training provided before the testing session was in preparing them for the climb. Ratings were in response to a single item, which asked "How useful was the training you did in preparing you for the climb?" and were assessed on a scale ranging from 1 (not useful) to 4 (very useful).

Fear of Heights Test. In order to assess participants' emotional responses while at heights, each participant completed a simple test of fear of heights prior to testing. Participants climbed up a Y-frame step ladder to a step 2.7 meters off the ground at which point they were asked to choose a word or phrase from the Perceived Stress Index that best described how they were feeling at that time.

Procedure

The climbing training was identical for both experimental and control groups. The experimental protocol differed only when the experimental group underwent imagery training and mentally imaged themselves performing the climb at which time, to control for attention placebo effects, the control group engaged in a light exercise program.

Session 1. Participants were given a general introduction to the study, followed by the fear of heights test. This was followed by a general introduction to basic climbing techniques and equipment given by an experienced climber. After the introduction, the participants were allowed to climb up the wall face to feel what the holds felt like in order to enhance the quality of the imagery for the experimental group. The control group underwent the same training to control for attention placebo effects. The participants used all parts of the wall and not just the areas that would be used in the climb. At no time were the participants allowed to climb higher than a few feet off the ground.

Following the first instruction session, the first experimental manipulation took place. Participants in the experimental group were given an introduction, comprising a brief handout and short talk outlining the use of imagery in sport and some potential benefits (e.g., skill acquisition, mental preparation for sport activities). It was important to provide a rationale for the intervention as Bandura (1997) noted the importance of outlining to athletes the benefits of cognitive strategies, to ensure motivation and adherence to the program. After this introduction, the experimenter instructed participants to be seated in a comfortable position while he read through an imagery script detailing a successful climb up the wall. The imagery script (available from the first author) took about 5 minutes to read and was designed to reflect two of the five major types of imagery identified by Martin et al. (1999): motivational general-arousal (emotional control while on the wall), and motivational general-mastery (feeling confi-

dent and focused as they moved up to the top). Following the first intervention session, participants met briefly with the experimenter who informally inquired as to the content of the session. In every case, participants indicated they understood the script and were able to imagine themselves performing the activity as described.

Over the four experimental sessions the participants engaged in approximately 70 minutes of actual imagery comprising 20 minutes of vividness training and 50 minutes mentally rehearsing the climb. This procedure is comparable to similar studies in the area, for example Lee and Hewitt (1987) asked gymnasts to image the four routines they were practicing (vault, bars, beam, floor) once a week for six weeks. Similarly, Burhans III, Richman, Bergey (1988) asked participants to image for 5-10 minutes prior to each training and test run over an 8 week period.

Participants in the control group were given a short talk, about how being physically fit can improve climbing ability. Again, in line with Bandura's (1997) suggestions, a rationale was provided for the use of physical exercise to ensure participants motivation and adherence to the program. The talk was followed by 5 minutes of stretching and aerobic exercises.

Session 2. All participants began the session by completing Spielberger's Trait Anxiety Test followed by a 5-minute stretching warm-up and practiced climbing the wall as outlined in session 1 (10 minutes). The participants in the experimental group then took part in an imagery vividness exercise (5 minutes), based on those outlined in Mace (1994) and were read the imagery script twice (10 minutes). During this time the participants in the control group engaged in light exercises. Participants from both groups then practiced climbing the wall a second time (10 minutes). Again, while the participants in the experimental group took part in imagery vividness exercises (5 minutes) and were read the imagery script twice (10 minutes) participants in the control group engaged in light exercise (15 minutes).

Session 3. This session was identical to Session 2, other than Spielberger's Trait Anxiety Test was not completed, and thus the session began with a 5-minute stretching warm-up for all participants.

Session 4. The fourth session incorporated further training as well as a testing session. Participants from both groups began the session by warming up for 5 minutes. Following the warm-up, participants in the experimental group were read the imagery script once and the controls had 5 minutes of gentle exercise. All participants completed the testing session that followed on their own (i.e., independent of any other study participants with whom they had been grouped for training sessions).

Testing Session. Present at the testing session were the participant, principal experimenter, an experienced climber, a qualified climbing instructor, and a technician who videotaped the climb. The order in which the participants climbed was determined randomly for both

groups. When it was her turn, each participant put on a climbing harness and was taken to the wall and clipped to the climbing rope. Participants were reminded of the route to take and directed to the three points on the route where they were to stop and read aloud the word from the Perceived Stress Index that best described how they were feeling at that point during the climb. The participant then completed the self-efficacy questionnaire, chose a word from the Perceived Stress Index to indicate how she was feeling, and began the climb. Each participant completed the climb as outlined in the task section. Immediately after the climb, participants completed their rating of how useful the training had been in preparing them for the climb. The participants were then debriefed as to the nature of the experiment and thanked for their participation.

Results

Potential Covariates

In order to examine and control for any potential confounding due to differences between groups, scores for the fear of heights test, trait anxiety, and ratings of training usefulness were compared between experimental and control groups. Results revealed no significant (p 's > .10) differences between the groups on the fear of heights test, $t(31) = 0.05$, trait anxiety, $t(31) = 1.17$, and ratings of training usefulness, $t(31) = 0.36$. Thus, experimental and control groups were considered homogenous with regards to these potential covariates and they were not controlled for in subsequent analyses.

Perceived Stress Levels Before and During the Climb

The means for each group on the Perceived Stress Index at the pre-climb stage and at the three stages during the climb are shown in Table 1. Perceived stress at the four stages was analyzed using a 2 (group) X 4 (stage) general linear model ANOVA with repeated measures on the second factor (stage). The data were initially examined using both Mauchly's Test of Sphericity and Levene's Test of Equality of Error Variances and the data satisfied the assumptions underlying a two factor ANOVA with repeated measures on one factor.

A significant main effect was observed for group, $F(1, 31) = 4.64$, $p < .05$, with the experimental group reporting lower average perceived stress levels over the 4 stages of the climb ($M = 5.44$, $SD = 1.93$) than the control group ($M = 6.38$, $SD = 2.01$). There was also a significant main effect for stage, $F(3, 93) = 3.97$, $p < .05$, indicating perceived stress levels changed over the course of the climb, however, the interaction between stage and group was not significant, $F(3, 93) = 0.37$.

Pre-climb Self-Efficacy

The two climbing self-efficacy items correlated significantly $r = .41, p < .05$, but the internal consistency (Cronbach's $\alpha = .58$) of the two-item scale was not appropriate for aggregation (Nunnally, 1978). Thus, self-efficacy for technical climbing and self-efficacy for climbing to the best of ability were analyzed separately. The experimental group ($M = 2.88, SD = .50$) reported higher technical climbing self-efficacy than the control group ($M = 2.41, SD = .80$). A significant Levene's test, $F = 6.71, p < .05$, indicated the variances between experimental and control group scores were unequal. An independent groups t-test with equal variances not assumed revealed the difference in scores between groups was significant, $t(27.15) = 2.02, p = .05$. A trend in higher self-efficacy for climbing to the best of ability was also observed. The experimental group ($M = 3.19, SD = .66$) reported higher scores than the control group ($M = 2.71, SD = .85$) on this variable, however, the difference between groups was just outside the traditional level of significance, $t(31) = 1.82, p = .08$.

Climbing Performance

The ratings of climbing performance from the two experienced climbing instructors correlated significantly ($r = .88, p < .05$), indicating good inter-rater agreement. Consequently, both ratings were summed to form a composite performance score. The performance scores did not differ significantly, $t(31) = 1.57, p > .05$, between the experimental group ($M = 14.81, SD = 2.59$) and the control group ($M = 13.76, SD = 2.61$).

Table 1
Group Means and Standard Deviations for the Perceived Stress Index During the Climb

	Experimental Group		Control Group	
	<i>M</i>	<i>S.D.</i>	<i>M</i>	<i>S.D.</i>
Pre Climb	5.35	1.53	6.56	1.85
Stage 1	5.63	1.95	6.50	1.82
Stage 2	6.30	2.01	6.76	1.69
Stage 3	4.49	1.91	5.73	2.57

Discussion

The present study examined the impact of an imagery script intervention on the levels of perceived stress, self-efficacy and climbing performance of volunteer female participants. The purpose was to test selected predictions of the conceptual model proposed by Martin et al. (1999) in a sport situation likely to engender a strong emotional response. The results supported Martin et al.'s predictions in that novice climbers who took part in an imagery script intervention comprising both motivational general-arousal and motivational general-mastery imagery reported lower perceived stress compared to controls, both before and during the climb. Furthermore, results offer partial support for the prediction that motivational general-mastery imagery use would result in higher levels of self-efficacy in the experimental group compared to controls prior to the test climb. While no differences in climbing performance were observed between groups, this finding is also consistent with Martin et al.'s assertion that the use of motivational general-arousal or motivational general-mastery imagery may not be directly associated with the enhanced performance of sport skills.

The primary finding of this study was the main effect associated with a motivational imagery intervention in decreasing the negative stress experienced by novice participants during an intense athletic activity (i.e., climbing). Specifically, in line with the predictions of Martin et al. (1999), the participants in the imagery script intervention group reported significantly lower levels of perceived stress over the four stages assessed compared to the control group. This finding is also consistent with both theory (Bioinformational Theory: Lang, 1977, 1979) and previous research on imagery and stress management (see Mace, 1990). Yet, as noted above, in those studies the independent effects of imagery could not be ascertained because previous research incorporated imagery in conjunction with other stress management techniques (e.g., relaxation training). Therefore, this study represents a first attempt, based on the recommendations of Martin et al. (1999), to examine the impact of imagery, alone, on emotional control in a stressful sport situation. However, we should also note that these findings are complimentary to those recently reported by Munroe et al. (2000) who found that some athletes used motivational general-arousal imagery to control emotions during competition. Taken together, the results of Munroe et al. and those observed in the present study provide strong initial evidence for the internal and external validity of motivational general-arousal imagery as a factor that can be used to manage emotions before and during sport performance.

The secondary purpose of the study was to investigate the impact of the imagery script intervention on participants' self-efficacy levels. The findings offered partial support

for the notion that motivational general-mastery imagery may be used to enhance self-efficacy. Participants in the experimental group reported significantly higher levels of self-efficacy for climbing technique and a trend towards higher self-efficacy for climbing to the best of their ability, prior to starting the climb. Although not conclusive, these findings are consistent with both theory (Bandura, 1997) and previous research (Callow et al., 1998; Feltz & Riessinger, 1990). Bandura (1997) points out that mastery experiences are the most powerful determinants of self-efficacy, but that imaginal experiences are another potential antecedent. All participants in this study had equivalent opportunities to practice climbing techniques on a vertical wall, however, the participants exposed to the imagery script intervention were more efficacious in their technical climbing abilities prior to the test session, supporting the notion of imaginal experiences as a determinant of self-efficacy beliefs.

Although the findings of the study are promising, there are gaps in what we were able to assess in terms of theory and the role of imagery in the management of emotion, self-efficacy, and performance. From our data, it is not possible to determine which aspects of the imagery script (motivational general-arousal or motivational general-mastery) contributed to the lower levels of perceived stress. Martin et al. (1999) suggest that consistent with Lang's Bioinformational Theory, the use of motivational general-arousal imagery to modify response propositions to a particular stimulus should enable athletes to change undesirable emotional responses during stressful situations. However, it is also possible that the lower levels of perceived stress reported by the participants in the experimental group were associated with a perception of being better able to cope due to the motivational general-mastery imagery. The results of previous research by Vadocz, Hall and Moritz (1997), which documented relationships between anxiety and motivational general-arousal, but found no relationship between anxiety and motivational general-mastery imagery suggest this possibility is unlikely. However, from both research and applied perspectives it is important to recognize that there may be two routes to manipulating stress with imagery use. Our findings illustrate that using motivational general-arousal and motivational general-mastery imagery in combination is an effective way of reducing perceived stress prior to and throughout an intense activity. Future research aimed at teasing apart the functions of various imagery use components in relation to emotions such as perceived stress is required.

The study might also have been strengthened had a measure been taken of the participants' abilities to image successfully. Martin et al. (1999) indicated that imagery ability is an individual difference variable that could moderate the relationship between imagery use and outcomes such as performance. Given the random assignment of participants to groups in the present study, any effect associated with imagery ability in the intervention group contributed to error variance. Because it is unlikely that everyone in the intervention group was either high

or low in imagery ability, the fact that effects associated with the imagery intervention were observed attests to the general effectiveness of the intervention regardless of imagery ability. However, considering previous findings that imagery ability varies from person to person, it seems plausible that an imagery intervention such as the one employed in this study may be more effective for those with greater imagery ability. Future research should aim to examine this issue as well.

Although the conclusions drawn from this study are restricted due to its experimental nature, implications of the results for sport psychology practitioners may be important. Based on our findings, an imagery script comprising both motivational general-arousal and motivational general-mastery aspects would appear to be effective in enabling participants to experience a more positive emotional state (e.g., lower perceived stress) throughout a stressful situation (e.g., first climb). Numerous authors have recognized the potentially transient nature of emotional states in physical activities (e.g., Krane et al., 1994; Jones et al., 2000) and that emotion-focused research and interventions must take this fact into consideration. All participants in this study reported their highest levels of perceived stress at Stage 2 of the climb, which was 4.07 meters off the ground and followed a traverse across the face of the wall. These findings clearly illustrated the transient nature of emotional states in wall climbing. The fact that participants in the experimental group experienced lower levels of negative stress throughout the entire course of the climb provides encouraging evidence with respect to the potential effectiveness of an imagery script intervention during challenging physical activities.

The impact of the imagery intervention on self-efficacy levels also have applied implications, particularly given the causal relationship between self-efficacy and performance advanced by theory (Bandura, 1997) and the positive association between self-efficacy and performance demonstrated in sport settings (e.g., Treasure, Monson, & Lox, 1996; Kane, Marks, Zaccaro, & Blair, 1996). For example, sport psychology practitioners and athletes may consider using motivational general-mastery imagery as an intervention to increase self-efficacy and consequently improve performance in sports settings. While this suggestion might seem to contradict our findings in that no difference in skilled climbing performance levels were observed between the imagery and control groups, such a result can be explained with reference to self-efficacy theory. Specifically, higher levels of self-efficacy should be more immediately associated with increases in persistence and effort and not necessarily skilled performance. Therefore, it is likely that performance benefits may be seen gradually over time or should be more clearly observed when viewed in comparison to one's previous performances. Future research should examine the impact of imagery and self-efficacy on intermediary mechanisms (i.e., effort, persistence) proposed by theory as well as performance indicants.

Concluding Remarks

The results of the study are consistent with the propositions of Martin et al.'s (1999) conceptual model and suggest that motivational general-mastery and motivational general-arousal types of imagery can be effective in enhancing self-efficacy as well as controlling emotions during athletic activity. To enlarge on the findings of this study future research may seek to determine whether motivational general-mastery and motivational general-arousal types of imagery can be used independently as interventions to facilitate emotional control during athletic activity or whether a stronger effect is observed when both are used jointly.

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