MILITARY PSYCHOLOGY, 20:(Suppl. 1)S11–S37, 2008
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ISSN: 0899-5605 print / 1532-7876 online
DOI: 10.1080/08995600701804772

Emotions, Coping Strategies, and Performance: A Conceptual Framework for Defining Affect-Related Performance Zones

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This article presents the crisis theory (Bar Eli & Tenenbaum, 1989) and its related approach for determining individual affect-related performance zones (IAPZ: Kamata, Tenenbaum, & Hanin, 2002). The theory and methodology delineate the uniqueness of each individual's ability to appraise stressful conditions and perceive them as functional or dysfunctional to his performance. In addition, the theory and methodology allow incorporating self-regulatory behaviors and coping strategies used during the encounter with situations, which vary in stress appraisal. The article also describes coping mechanisms used to energize (i.e., activate) and relax persons facing situations that vary in cognitive, physical, and affective demands. In particular, the use of imagery and self-talk as coping strategies in stressful situations are presented in more details. Since performance of military personnel involves substantially stressful circumstances (Wallenius, Larsson, & Johansson, 2004), the article advises how sport psychology theories, methodology, and findings can be used in the military environment.

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INTRODUCTION

Vallerand and Blanchard (2000) introduced an integrative analysis of emotion theory and research in sport and exercise. They formulated their work in sequential stages, beginning with emotional antecedents—which evoke affective responses in the form of emotions, feelings, and mood—and ending with intrapersonal consequences in the form of cognitions, motivations, health, performance, and interpersonal consequences (i.e., communications among team members). The authors relied mainly on Lazarus's (1994) position, where cognitions play a major causal role in the formation of emotional responses.

In reviewing the major theories regarding emotions and sport, Vallerand and Blanchard (2000) found that, while substantial disagreement exists among the theories, there seems to be agreement about the stimulus-cognitive appraisal-emotional response sequence. Cognitive appraisal can be intuitive and/or reflective (Arnold, 1960; Vallerand, 1987) depending on the objective situation, one's trait anxiety disposition and defense mechanisms (Smith, 1996), motivational climate (Deci & Ryan, 1985; Nicholls, 1984), perceptions of success and failures (Bandura, 1997), and cognitive interpretations of perceived physiological changes (Schachter, 1964). Once the performer makes an appraisal, she experiences an emotional response.

The consequences of emotional responses can lead to adaptive and maladaptive behaviors. When emotions are interpreted as pleasant, they may facilitate performance, but, when perceived as unpleasant, they may interfere (Hanin, 2000). Hanin also added the dimension of *functionality* into the emotions-outcome link. He claimed that some emotions can be perceived as unpleasant but at the same time functional and helpful to performing the task, whereas pleasant emotions can be dysfunctional and therefore debilitative to performance. For example, a rugby player may experience anger, which he perceives as unpleasant, though this emotion actually facilitates his play. Likewise, this player's performance may be debilitated by certain pleasant emotions, such as joy.

For some athletes, high arousal may evoke feelings of anxiety and fear, which in turn lead to maladaptive behaviors, whereas low levels of anxiety may lead to feelings of competence, which energize behavior (Vallerand & Reid, 1988). However, some people may perform best under high arousal levels, perceive the situation as challenging, and thus create enhancement in performance. According to reversal theory (RT; Apter, 1982; Kerr, 1997), such individuals would possess a tendency to experience a paratelic metamotivational state (see Kerr, 1997, for extensive review of telic/paratelic states and their applications in sport). According to RT, telic (i.e., serious minded) people perceive a high-arousal state as threatening and thus feel anxious; paratelic people (seeking challenges and playful) perceive such conditions as exciting; they avoid routine tasks, which result in boredom. These metamotivational components must be considered when performing under psychological pressure.

Linking emotions and athletic performance in sport has relied primarily on popular theoretical approaches within the field, such as Hardy and Fazey's catastrophe model (1987), Hull's drive theory (1943), Martens, Burton, Vealey, Bump, and Smith's multidimensional anxiety theory (1990), and Yerkes and Dodson's inverted-U theory (1908), which have conceptually only focused on the anxiety-performance relationship, thus creating a negative bias (Hanin, 2000). Anxiety was the most frequently investigated topic in sport psychology because of the known stressful effects it has on both cognitive functioning and physical activity (Tenenbaum & Bar-Eli, 1995a). However, Hanin posited that a broader range of emotions must be considered in order to develop a clearer understanding of the emotion-performance link. He posited that recent developments in the individual zone of optimal functioning (IZOF) model would provide a solution for this problem. Though the research is not unequivocal as a consequence of methodological shortcomings, all findings support the conclusion that optimal and functional emotions are related to the task characteristics, interpersonal differences, and environmental conditions under which the task is performed. A military unit operating in an urban terrain against hostile fighters must consist of soldiers who are able to maintain high awareness and high motivation while highly aroused but at the same time remain self-controlled. Under different time and life stress conditions, individual differences in emotion may emerge; the fear and concern of some persons may jeopardize the mission and cause fatalities.

To account for these three determinants, the Individual Zone of Optimal Functioning (IZOF; Hanin, 2000), Individual Affect-Related Performance Zones (IAPZ; Kamata et al., 2002), and the Individual Psychological Crisis Theory (IPCT; Bar-Eli & Tenenbaum, 1989), are presented next to postulate an innovative idiographic framework for understanding emotions-performance linkage in sport. Furthermore, a conceptual framework supported by research findings on "choking" under pressure is presented.

THE INDIVIDUAL ZONE OF OPTIMAL FUNCTIONING (IZOF)

Hanin's (1978) idiographic approach for defining the "zone of optimal functioning" originally used anxiety as the indicator of performance but has since evolved to encompass a wider range of emotional states. The IZOF principle implies a distinct relationship between the perceived intensity of functional and dysfunctional emotional states and the quality of a relative performance outcome. An optimal performance state is one in which the best internal conditions (i.e., cognitions and emotions) result in a complete involvement in the task and the best possible recruitment of coping resources. Based on Lacey and Lacey's (1958) contention that interindividual differences do exist, and individuals differ widely in the way they reflect emotions, the IZOF model indicates that there are unlikely to be a single specific set of optimal levels of emotion resulting in better or poorer performance for different athletes in the same sport realm. Therefore, the IZOF model is an ideographic approach that emphasizes the intraindividual dynamics of perceived emotional experiences in relation to optimal, moderate, and poor performances. For example, an athlete may perform optimally while maintaining pleasant emotions (e.g., happiness) and a relatively low level of physiological arousal, whereas another may need to feel more unpleasant emotions (e.g., anger) at a higher level of arousal to obtain an optimal performance, thus resulting in substantially different affective zones distributed across performers. Because of the ideographic nature of the IZOF model, case study designs are well suited for IZOF investigations. Since military tasks and operations vary in risk levels, complexity, duration, and additional specific characteristics, one can assume that soldiers who carry out these operations must possess emotional states and coping resources appropriate for or "fitting" those operations. Such a task-person fit is in accordance with the IZOF conceptualization of linking cognition and emotions to task performance.

Research has shown that the major components for enhancing athletic performance are a clear understanding of the task and a precise prediction of the performance outcome, which are contingent on emotional states (Annesi, 1998; Gould & Udry, 1994; Hanin, 2000; Hardy, Jones, & Gould, 1996). As a result, researchers expressed a cultivated interest in the affect-performance linkage (Gould & Tuffy, 1996; Hanin, 2000; Lazarus, 2000; Raglin & Hanin, 2000; Robazza, Bortoli, Zadro, & Nougier, 1998). Empirical results utilizing pre- and postregistrations of individually oriented (i.e., idiosyncratic) subjective reports to determine the emotion-performance relationship provide evidence for the validity and practical utility of the IZOF concept (Hanin & Stambulova, 2002; Jokela & Hanin, 1999; Pons, Balaguer, & Garcia-Merita, 2001; Robazza & Bortoli, 2003). Military researchers interested in understanding situation awareness have faced similar methodological problems. In particular, attempting to assess whether or not an operator possesses situation awareness during a complex military training exercise or simulation requires that one interrupt the processes being assessed. The methodological flaws in such an approach have nevertheless given way to techniques, which incorporate task interruptions (e.g., Endsley & Garland, 2000), with the rationale being that data collected with minor interruptions provide valuable information over and above the inherent measurement problems.

Typical conceptualizations of the IZOF model place athletes either in or out of the zone of maximal performance (i.e., intensity of emotion leads to a dichotomous in-out conditional assignment) for the purposes of assessing, predicting, and optimizing an individual's performance. However, a recent revision to the model employs a probabilistic approach (Kamata et al., 2002). The revised model serves as a conceptual basis for the qualitative and quantitative analyses of the structural and functional relationship between affective states and performance quality while providing probabilistic estimations. Affect denotes a broad range of psychological states of feelings and emotions (Watson & Tellegen, 1985). Therefore, Kamata et al. (2002) posited that the principle of individual affect-related performance zones (IAPZs) consists of the reciprocal relationship between the perceived intensity of an affective state and the quality of an ensuing performance. The model consists of the structure and functions of idiosyncratic and distinctive affective experiences unique to each performer in various competitive situations. More specifically, it emphasizes the intraindividual dynamics of perceived states based on varied degrees of performance quality. Therefore, the unit of analysis is the individual in relation to her personal performance.

Applications of the IAPZ Concept

Recent examinations utilizing Kamata et al.'s (2002) probabilistic method as a basis for analysis has revealed that unique IAPZs can be determined. For instance, Cohen, Tenenbaum, and English (2006) applied the probabilistic approach in a study involving female collegiate golfers. They were interested in defining the relationship between two dimensions of affect (i.e., arousal level and pleasantness) and functionality (i.e., how helpful the affective state was to performance) in relation to objective and perceived performance levels. In addition, they examined how perceived affect and golf performance changes following a psychological skills training (PST) intervention.

Cohen et al. (2006) utilized a multiple case study format to identify and refine individual IAPZs for the participants. The profiles and assessment of psychological strategies employed during practice and competition were used to develop a brief PST intervention. The PST intervention targeted the psychological and emotional strategies of self-talk, emotional control, imagery, relaxation, activation, resistance to disruption, negative thinking, attentional control, and automaticity. Results indicated that Kamata et al.'s (2002) conceptualization of the IAPZ was supported via probabilistic estimations in that varying levels of affect were associated with different levels of performance within and between the participants (i.e., each participant maintained unique and idiosyncratic IAPZs). Additionally, the PST intervention resulted in the participants' attainment of optimal affective states via psychological and emotional self-regulation strategies, which ultimately led to improved golf performance.

Golden and Tenenbaum (2004) conducted a study utilizing the probabilistic approach with collegiate female tennis players. They established IAPZs for each player across an entire season of tennis. Additionally, throughout the season after each match, they administered positive-negative affect scales (PNA; Hanin, 2000) and flow state scales (FSS; Jackson & Marsh, 1996). Results revealed that the IAPZs for each athlete were unique and distinct. In addition, they found that when the athletes were performing at optimal or near optimal levels, they were experiencing elevated levels of flow. The results from the PNA revealed that during optimal performances, pleasant emotions perceived to be helpful were most prevalent, however, during moderate and poor performances, unpleasant emotions perceived to be harmful became elevated.

Johnson, Edmonds, Tenenbaum, and Kamata (2007) extended the examination of the IZOF model by utilizing the probabilistic approach (i.e., IAPZ model) to determine IAPZs in male collegiate tennis players. They observed the athletes across an entire tennis season and found that the linkage between affect and performance was demonstrated by illustrating the dynamic nature of affect during competition relative to each athlete's perceived performance. The athletes in the study demonstrated distinguishable and unique IAPZs for the two levels of affect (arousal and pleasantness) and functionality (i.e., visual inspection of the probability curves of the IAPZs and the affective ranges illustrated that each athlete had unique IAPZs, and the zones for each affective dimension differed for each athlete). This research is inline with Hanin's (2000) IZOF model, which is built upon a pillar that the affect-performance linkage is unique to each individual.

Data from the reported IAPZ studies only utilized retrospective subjective reports across competitions in nonexperimental conditions and did not incorporate data sources derived from psychophysiological indices. Instances occur when individuals may experience an unconscious emotion (i.e., individuals cannot subjectively report their emotional reaction at the time it is caused), yet there is evidence of the emotional reaction through their behavior, a physiological response, or a subsequent subjective impression of an affect-laden event (Berridge & Winkielman, 2003; Kihlstrom, Mulvaney, Tobias, & Tobis, 2000). Therefore, one may recommend the importance of making distinctions between perceived and actual physiological states (Parfitt, Hardy, & Pates, 1995; Raedeke & Stein, 1994). Thus, coupling online physiological and retrospective measures of affective states in relation to performance is necessary to delineate the underlying mechanisms of this relationship.

In recognition of the need for an expansion of previous research endeavors using the IAPZ frameworks, Edmonds, Mann, Tenenbaum, and Janelle (2006) conducted an exploratory investigation of the IAPZ model by integrating perceived affective states (i.e., arousal, pleasantness) and physiological measures of arousal (i.e., heart rate, skin resistance) online in a competitive driving simulator. Participants in the study were given the same race settings on the race simulator and were required to drive a total of five race trials (i.e., one trial equaled four laps), with the main goal to reach the finish line as fast as possible. Participants completed all four laps of each trial in succession; however, between trials they were able to take a 3-minute break. Indicators of heart rate and skin conductance were taken simultaneously to the perceived measures of arousal-pleasantness at three different stages of a lap (i.e., when the participant orally stated his level of arousal/pleasantness, a flag or indicator point was inserted on the heart rate output stream on the monitor).

Results from this investigation were in line with the conjecture—based on research utilizing the conventional IZOF approach (Hanin & Stambulova, 2002; Pons et al., 2001; Robazza & Bortoli, 2003), and on the IPAZ research that has used probabilistic estimations (Cohen et al., 2006; Golden et al., 2004)—that athletes maintain idiosyncratic performance zones. Additionally, since arousal is known to be a multidimensional construct (Gould & Udry, 1994; Hardy, Jones, & Gould, 1999), the findings did reveal that arousal manifested at the subjective and physiological levels (Lazarus, 2000; Vallerand & Blanchard, 2000).

Figure 1 is an illustration of how IAPZs for each parameter are revealed. The individual's optimal performance occurs when she is within the 5.2–6.5 range of perceived arousal. When within this range, the probability to perform optimally is 58%. Ranges for moderate and poor performances when arousal level is above or below the optimal range are also displayed. The performer's APZs show that under very low arousal, the performer's probability (40–100%) of performing poorly is the highest of all the zones (see "poor performance" on the left to "optimal performance"). The performer also has the highest probability of performing poorly (33–100%) when overaroused (above 6.8 on the scale) but can still perform moderately (1–33%) or optimally (1–33%). Moderate performance is most probable within the 4.7–5 range (~40%) of the scale. At each arousal level, the probability estimates of the respective APZs sum up to 100%.

The distinct IAPZ profiles linking arousal and performance that were revealed in the driving simulation are also indicative of relative changes in driver perfor-

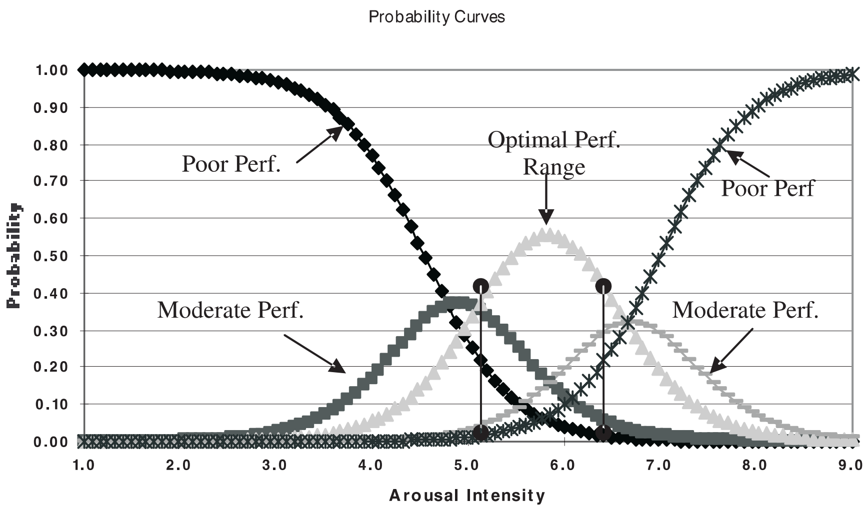

FIGURE 1 Graphical representation of an individual's performance probability curves for optimal arousal performance range and poor and moderate performances above and below the optimal range.

mance, which were indexed by changes in physiological parameters (Brookhaus & Waard, 1993). Furthermore, a driver's performance could be determined by the driver's level of arousal or activation, corresponding with findings reported by Wiener, Curry, and Faustina (1984). The present study also demonstrated the importance of differentiating and coupling actual physiological and perceived arousal (Partfitt et al., 1995; Zaichowsky & Baltzell, 2001), which was demonstrated through the utility and effectiveness of Kamata et al.'s (2002) probabilistic method. By utilizing Kamata et al.'s probabilistic model, probability curves were formulated that provided a clear and precise picture of the optimal levels and probabilities required to yield the highest performances. This procedure revealed that it is indicative to determine the underlying mechanisms affecting performance quality. This concept and applications represent a critical issue to be examined within military contexts.

THE INDIVIDUAL PSYCHOLOGICAL CRISIS THEORY (IPCT) AND ITS MAIN TENETS

A theory that links affective states to performance and is conceptually linked to the main assumptions of the IZOF is the IPCT theory (Bar-Eli & Tenenbaum, 1989). The IPCT views the athlete as a dynamic, open system that responds to environmental stimuli with certain probability levels. The athlete continuously processes information and makes decisions (DM) aimed at maximal adaptation of the system to the environmental conditions via the reduction of event uncertainty.

The IPCT views physiological arousal as the energizing component of motivation and the cognitive component as its direction; their relations are viewed within a bilateral transaction process (Nitsch, 1982). Physiological arousal may be unaffected by cognitive directional mechanisms or, alternatively, controlled or regulated by them. Continuous exposure to similar situations and conditions shifts the operational mode of the system from intentional to an automated mode. According to Nitsch, automaticity via the adaptation process reduces the vulnerability of the system to "choking" under pressure and/or uncertainty. Therefore, performance expertise may be determined through the extent to which an athlete has assimilated and accommodated the arousal-coping strategies, which are linked through exposure to practice and competition. In this respect, the acquisition of expertise in an anxiety-provoking setting requires deliberate practice under conditions of high arousal and uncertainty. The extent to which vulnerability to crisis depends on experience and expertise level is related to the quality and quantity of cognitive mechanisms available to cope with the emotional state of the athlete, the level of attained simplification and routine of relevant responses, and the point of balance between damaging and contributing effects resulting from the emotional state of the athlete.

The IPCT was the first theoretical concept to describe the emotion-performance relationship in a probabilistic nature and a continuous time frame. In other words, when a performer is in a given stressful situation, experiences high pressure and anxiety, cannot pay attention to the task, and lacks self-regulatory mechanisms to reduce pressure, it is highly probable (say 90%) that he will choke or face a significant performance decline. Though the IPTC referred merely to arousal/activation levels of the athlete at a certain time point during competition, other emotions have similar relevance in the emotion-performance linkage. Relying on the classical inverted "U" function, the athlete was viewed to be in a phase of hypoactivation, optimum activation, or hyperactivation at any moment in time. The probability of a psychological crisis occurring increases as the individual shifts away from the optimal state toward the hypo- or hyperactivation states.

IAPZ and Expert Performance

To our knowledge, this approach has never been implemented to distinguish athletes who vary in skill level. There are, however, two hypotheses that can be postulated with respect to expert versus novice athletes. On any occasion, an expert has a higher probability of producing an optimal performance than does a novice, and both hypotheses provide an explanation of this greater likelihood. One hypothesis is that expert athletes operate consistently within a narrow zone of optimal functioning because they regulate themselves to be in their preferable zone regardless of the competitive conditions at the moment. In contrast, novice players experience consistent emotional alterations that result in inconsistent performance due to their lack of appropriate self-regulatory mechanisms. In short, experts may be more adept at maintaining their optimal emotional zones.

The second hypothesis postulates that expert athletes have a wide zone of emotions in which they perform optimally. Though a novice may be hard pressed to perform well during any emotional pattern other than that which falls into a narrow zone, it is possible that experts are able to perform well consistently, regardless of their emotions. The novice may have to feel good in order to play well, whereas the expert can be expected to turn in an optimal performance regardless of how he feels.

Another way of expressing this is to suggest that, for experts, emotions may not play as significant a role in affecting performance. While support for such a hypothesis is lacking in the sport-related literature, a model dealing with the effect of emotions on social judgments may lend credence to this premise. The Affect Infusion model presented by Forgas (1995) suggests that when individuals are highly motivated, their emotions have a relatively minimal effect on their judgments. A parallel may exist in the sport domain, where experts are so highly motivated that they are relatively unaffected by fluctuations in their emotions. At this point in time, these two hypotheses are largely speculative in nature, yet they offer a rich area for future study of expert-novice differences in emotions and performance.

SELF-REGULATORY MECHANISMS AND COPING STRATEGIES

Emotions and psychoregulative processes are experienced consciously and interact continuously each with the other throughout a competition. In accordance with research findings by Nitsch and Allmer (1979) and the IPTC concept (Bar-Eli & Tenenbaum, 1989) states that psychoregulative processes can be classified and differentiated according to their functionality. Once an athlete or a soldier feels emotions associated with an optimal performance state, the psychoregulative process is directed to preserve this state in the form of stabilization. In contrast, when emotions are felt as unpleasant and dysfunctional, the psychoregulatory system works toward a modification of this state. The two psychoregulatory functions are further distinguished when they are implemented under hypoactivation or hyperactivation arousal conditions. In the case of hypoactivation, the problem is one of mobilization to reach optimal activation (i.e., arousal) levels. Conversely, when the system operates under a hyperactivation mode, the psychoregulatory mechanism strives toward relaxation of the current state in order to reach a homeostatic emotional state required for an optimal performance. Depending on the emotional state, the athlete is confronted continuously with a payoff functional problem, which depends on the athlete's level of satisfaction with the current state. If the current state is optimal, then stabilization regulations are employed to maintain the system in balance, but modification regulations in the form of mobilization or relaxation are employed if the system is out of balance. One key to expert performance, then, is an athlete's ability to regulate his emotions in an efficient manner in order to attain (or maintain) an optimal state.

The IPCT and the IAPZ conceptualize the emotions-psychoregulation process-performance linkage on a time-based dimension. Events that occur during the competitive phase may require compensatory self-regulatory mechanisms, but these may be prevented through the early stages of anticipation. Accordingly, a sequence of interplays between preventive and compensatory self-regulatory mechanisms takes place to stabilize the system and bring it to an optimal affect-related performance zone. Similarly, during the anticipation time phase, emotions can be compensated with respect to feeling tense, anxious, or uneasy, and preventive measures may take place. Emotions after competition can be compensated as well and used for subsequent competitive events. Thus, both emotions and their associated self-regulatory mechanisms are learned and stored as mental representations in long-term memory. In expert athletes, this association is easily retrieved and applied, whereas in novices the process requires much mental effort and is largely in-efficient (see Tenenbaum, 2003). Thus, the self-regulatory system and the coping strategies used by athletes are aimed at stabilizing the emotional-mental-motor systems and allow decisions and motor actions to be balanced within the optimal emotions-related performance zone. Since highly skilled performers' mental representations associate emotions with adequate motor performance, it is highly probable that these specific knowledge structures enable them to cope efficiently with stress, which results in performance enhancement; this is in contrast to a low skill-level performer, who lacks emotions-motor-coping linked representations in long-term memory.

The self-regulations and coping strategies employed to stabilize the system to enable optimal performance depend heavily on the immediate and subsequent stress appraisal levels by the athlete (Folkman & Lazarus, 1985). Hanin (2000) posited specific examples of the appraisal-emotions interaction. Functional emotions (pleasant and/or unpleasant) before or during competition are usually anticipatory and are triggered by appraisals of challenge and threat. In contrast, dysfunctional emotions (again, pleasant or unpleasant) are triggered by outcome-oriented appraisals of gain and loss accompanied with task completion thoughts. According to Hanin (2000), athletes continually reappraise their performance processes and interchangeably shift from an anticipatory active mindset to outcome-emotions mindset. Typically, when dysfunctional emotions are experienced, these are associated with impaired energy mobilization and utilization accompanied with performance decline. Hanin further distinguished between physical and psychic energy and their possible outcomes on behaviors. According to his concept, expert athletes experience functional emotions that enable them to mobilize and utilize energy to initiate and maintain adequate effort levels, whereas less skilled athletes experience unpleasant and dysfunctional emotions that result in utilizing too much or too little energy, leading to impaired performance. Thus, efficient utilization of energy resources is the main indicator of proper use of coping and regulatory mechanisms, and the more efficiently athletes use them, the better they perform.

While emotions may be temporarily regulated, as the situation requires, modifying the underlying belief system related to performance is a more lasting and adaptive change of emotional adaptation and reactions to the competitive task. This deeper, second-order change ultimately results in a more balanced and positive approach to any stressful situation. Thus, a stressful situation may be perceived as challenging to the expert athletes and facilitate positive and functional emotions, which trigger positive mobilization of psychic energy to the neural-motor systems and result in performance enhancement. For the novice and unskilled athletes, stressful situations trigger unpleasant and dysfunctional emotions with "fright" thoughts that are maladaptive and detrimental to performance. Thus, the degree to which the emotional system adapts to the competitive demands determines the extent to which the athlete's mental and motor systems can adjust and be modified while interacting with the external and internal competitive environment.

Traditionally, coping strategies were categorized into two categories: problem-focused and emotions-focused (Folkman & Lazarus, 1985). Problem-focused strategies are related to activities aimed at overcoming difficulties and problems. Examples include setting goals, planning moves, anticipating upcoming activities, attention control, using strategic planning, imaging desired moves, and the like. Emotion-focused strategies are aimed at regulating the athlete's emotional state so that cognitive and motor functioning can be optimized. Mobilization (excitation, activation) and relaxation, meditation, cognitive restructuring, self-talk, and imagery are examples of this coping category. Though distinguished and categorized, the use of any coping strategy may have an effect on both the emotions and cognitions of the performer. Avoidance of coping with emotions is also considered a coping strategy that may have short-term beneficial effects. When it becomes a common strategy of coping with adversity, however, it can have a detrimental effect on athletes' emotional states as well as their performances. Soldiers, who operate under stress, may benefit from problem-solving strategies by planning and practicing repeatedly, extensively, and deliberately. Self-talk, team communication, mutual encouragement, and similar strategies can help them to cope with emotions, which are felt strongly under such conditions.

Unfortunately, the scientific evidence relating coping strategies to emotions and performance lacks a sound theoretical foundation. Thus, most of the studies on the implementation of self-regulations and coping strategies by athletes in competition were correlational in nature and avoided the dynamic nature of the emotions-coping-performance linkage, which is a cornerstone of the IPCT, IZOF, and IAPZ theoretical conceptualizations. Findings from some of these studies indicated that seeking social support, elevated effort, and problem-focused strategies were the most commonly used by middle distance runners who experience performance slumps (Madden, Kirkby, & McDonald, 1989). Additionally, when the situation is appraised as more stressful, athletes utilize strategies such as increased effort and resolve, problem-focused strategies, social support seeking, and wishful thinking (Madden, Summers, & Brown, 1990). In baseball, batting performance slumps were associated with more extensive use of emotion-focused strategies, whereas problem-focused strategies were associated with increased self-efficacy, especially in performance slump situations (see Hardy et al., 1996). Athletes who were high self--handicappers used more emotion-focused, detachment/avoidance, and wishful thinking strategies and less task-focused or cognitive strategies. These athletes developed strategies of disengagement and fantasy strategies, which were not helpful to their performance. Crocker (1992) reported that athletes use the following coping strategies to attempt to adapt to the situational demands: active coping, problem-focused coping, seeking social support, positive reappraisal, self-control, wishful thinking, self-blame, and detachment. He further stated that when performance slumps are experienced, problem-focused strategies are the most adaptive strategies, whereas wishful thinking and detachment are the most maladaptive ones.

Based on interviewing American Olympic wrestlers, Gould (1993a, 1993b) categorized their coping strategies into four clusters: (a) thought-control strategies (blocking distracters, perspective taking, positive thinking, coping thoughts, and prayer), (b) task-focused strategies (narrow, more immediate focus and concentration on goals), (c) behavior-based strategies (changing or controlling the environment, following a set routine), and (d) emotional control (arousal control and visualization). Gould reported that these coping strategies were used simultaneously and in combination by each of the wrestlers, but the most successful ones reported that the use of these strategies was automatic and effortless for them. It was reported that they could fully concentrate on the task while feeling that all thoughts and actions were automated and smooth. Interviewing national and international figure-skating champions, Gould found that the most common coping strategies used were rational thinking and self-talk, positive focus and orientation, seeking social support, time management and prioritization, precompetitive mental preparation and anxiety control, training hard and smartly, isolation and deflection, and ignorance of stress. Coping strategies were found to match different stressors. Thus, personal stressors generate different coping strategies than precompetitive anxiety. When the coping strategies employed match the stress sources, then optimal adaptation is experienced, which results in self-resourcefulness. When coping strategies fail to match the stressor demands, however, a self-helplessness response is experienced, which is detrimental to performance (see Lazarus & Folkman, 1984, Transactional model). Hardy et al. (1996) proposed a comprehensive working model of coping in sport that, if incorporated within the IPTC and IAPZ concepts, might provide a sound model to explain the emotions-appraisal-coping-performance linkage. Such a framework would increase our understanding this chain of idiographic events, which occur within a dynamic and fluctuating environment. Such a concept is essential if one desires to account for the almost perfect match of these links in expert performers.

The results of three decades of research on athletes' use of self-regulatory skills were summarized by Hardy et al. (1996). These authors asserted that there are four basic psychological skills that are used by athletes for self-regulation. These are self-talk, mental imagery, goal-setting, and relaxation. An important point is that the use of these skills is not exclusive to skilled sports performers. Every person uses these skills to some extent. An office worker giving a presentation to her peers will often apply a basic relaxation skill, that of deep breathing, when she begins to experience anxiety in the moments before the presentation. Consider also an everyday use of imagery. Ask yourself whether you have ever imagined the satisfying feeling of achieving a goal in order to help motivate yourself to work toward achieving that goal. Kosslyn, Seger, Pani, and Hillger (1990) asked college students to document their experiences of imagery over a week. In their diaries, students reported using between 15 and 40 images per week for a variety of purposes that included problem-solving and comprehending descriptions. However, the self-regulatory skills used by skilled performers, when performing in their domain, appear to be more elaborate, and applied more often and more consistently, than those used by everyday folk and less skilled athletes (e.g., Mahoney, Gabriel, & Perkins, 1987). Skilled athletes have typically amassed thousands of hours of practice over a period lasting as long as 10 years in reaching their level of performance (Starkes & Ericsson, 2003). Thus, it is likely that the self-regulatory skills used by skilled sports performers have been developed and refined over time.

A brief overview follows of the research that has been conducted on the self-regulatory skills identified by Hardy et al. (1996). For the purpose of brevity, research on only two of these skills, self-talk and imagery, is described. For the same reason, the focus of the overview is concentrated more on the empirical findings of investigations of the relationships between the use of self-regulatory skills, emotional state, and performance, than on the variety of theories that have been proposed to explain these findings. Following this, a brief discussion is provided of how athletes often use psychological skills in combination as a part of an overall strategy for regulating their emotions during performance.

Self-Talk

Self-talk describes the situation in which individuals talk to themselves, either internally or externally (Ellis, 1977). Researchers in clinical areas of psychology have asserted that self-talk affects emotional state and, furthermore, that skills can be developed to control self-talk and thus control emotional state (Ellis, 1977). Hardy, Gammage, and Hall (2001) provided evidence of the development and use of such skills to control emotional state by athletes in sport. They surveyed 150 college athletes about their use of self-talk skills. The athletes reported that they used self-talk to help them "'get…[their] mind into the game,' 'to feel prepared,' and to be 'in…[the] zone'" (p. 327). Orlick and Partington (1988) provided similar evidence when they interviewed 75 Canadian athletes from the 1984 Olympic Games, including 13 gold, 3 silver, and 1 bronze medalists. The best athletes reported that they made conscious use of self-talk to "feel the way they wanted to feel" in preparation for competition. An example is provided in this excerpt from a report provided by an athlete.

> I was thinking all kinds of positive things, like I could do well, I was going to be good, I was feeling strong, how we had worked so hard, and our boat was fast, and things like that; all positive, trying to feel like I wanted to feel. (p. 115)

Hardy, Hall, and Hardy (2005) surveyed 291 athletes ranging between recreational and international standards, and active within a variety of sports, ranging from speed skating to volleyball, about their use of self-talk. Self-talk was used more at competitions than during training, and more during competitions than immediately before or after competitions. This is likely to be because the need to obtain, and then maintain, an appropriate emotional state is greatest during competition, owing to the presence of a multitude of competition-related stressors. Furthermore, Hardy, Hall, and Hardy (2004b) used the same method to provide evidence that skilled athletes use self-talk more frequently, and that their self-talk is significantly more preconceived (as opposed to reactionary), structured, and consistent than their less skilled counterparts.

In a more controlled study, Vera, Vila, and Godoy (1994) provided evidence of how self-talk could affect emotional state. Participants, members of the normal population, were exposed to traffic noise broadcast at 85–95 db. The noise caused an anxiety response in the participants that was reflected by tachycardia and arterial vasoconstriction. However, this response was more pronounced when participants were asked to read aloud negative self-talk statements such as “I cannot stand this horrible noise,” and “This noise is making me crazy.”

Findings from experimental studies have provided evidence that self-talk with a motivationally oriented content can positively affect performance (e.g., Dagrou, Gauvin, & Halliwell, 1992; Van Raalte et al., 1995; Van Raalte, Brewer, Rivera, & Petitpas, 1994). For example, Van Raalte et al. (1995) conducted a study of the effect of three different self-talk conditions on dart throwing performance. College students with little dart throwing experience were required to throw darts so that they landed as near to the bull’s-eye as possible. Participants were assigned either to a positive-motivation self-talk condition, in which they were asked to say “you can do it” to themselves before each throw, a negative-motivation self-talk condition, in which they were asked to say “you cannot do it” to themselves before each throw, and a control condition in which they were not provided with any instructions other than to throw. A manipulation check was used in the form of asking participants after each throw about what they were thinking or saying to themselves before each throw. The results indicated that participants in the positive-motivation self-talk group used significantly more positive-motivation self-talk than those in the other groups, and those in the control group used significantly more positive-motivation self-talk than those in the negative-self talk group. Furthermore, participants in the positive-motivation self-talk group were significantly more accurate in their throwing than those in the other groups, but there was no significant difference between the other two groups.

In a similar study, Hatzigeorgiadis, Theodorakis, and Zourbanos (2004) investigated the effects of positive-motivation self-talk on thought content and performance on water polo tasks. College students with no experience of water polo were assigned to either a positive-motivation self-talk group or a control group. While treading water in a pool, participants undertook a precision task, which was throwing a water-polo ball in an attempt to hit a target 5 meters away, and a power task, which was throwing the same ball as far as possible. Participants in the positive-motivation self-talk group were asked to say "I can" immediately before attempting each throw, whereas those in the control group were not provided with any instructions other than to throw. Participants in the positive-motivation self-talk group significantly outperformed those in the control group on the throwing tasks and experienced fewer thoughts that interfered with performance. Thus, as Jones (2003) recently commented, self-talk might affect emotional state directly by triggering an appropriate emotional state but also indirectly by preventing inappropriate thoughts from interfering with performance.

Imagery

The first reason that imagery has become an important topic related to emotional regulation in sport is that research on imagery has provided evidence that the skill can be used as a form of simulation that is useful for practice, albeit mental rather than physical. As White and Hardy (1998) offered, "Imagery is an experience that mimics real experience. We can be aware of 'seeing' an image, feeling movements as an image, or experiencing an image of smell, tastes, or sounds without actually experiencing the real thing" (p. 389). Thus, with regard to emotions, if an athlete purposely and repeatedly imagines herself feeling confident rather than anxious as she steps out onto the competition field at a major competition, it will help her achieve a confident mental state rather than experience anxiety when actually stepping out onto the field at the competition.

The second reason imagery has become an important topic related to emotional regulation in sport is that skilled performers have reported making extensive use of imagery when mentally preparing for competitions (e.g., Murphy, 1994; Orlick & Partington 1988). For example, Orlick and Partington (1988) conducted a survey of psychological skills usage by 160 Canadian athletes from the 1984 Olympic Games, including five silver and five bronze medalists, and reported that 99% of the athletes used imagery for mental preparation.

Paivio (1985) has argued that imagery can have motivational functions, and that these functions can operate at either a specific or general level (Hall, 2001). Motivational imagery that operates at the specific level (MS) involves imagining specific goals, such as winning an upcoming competition. Martin and Hall (1995) investigated the relationship between MS and motivation using an experimental design. Beginner golfers learning putting were assigned to six sessions of either performance imagery, which involved imagining achieving the perfect putt stroke, or performance plus outcome imagery, which involved imagining achieving the perfect putt, followed by the ball rolling across the green and into the hole, or an attentional control condition, which involved golf-specific stretching exercises. Participants in the performance imagery group spent significantly longer practicing than those in the attentional control group. Participants in both imagery groups also set more demanding goals for themselves, had more realistic self-expectations, and exhibited better adherence to their training programs.

Hall, Mack, Paivio, and Hausenblas (1998) delineated motivational imagery that operates at the general level (as proposed by Paivio, 1985) into subfunctions: motivational general-mastery imagery (MG-M), which relates to perceptions of control, self-confidence, and mental toughness; and motivational general-arousal imagery (MG-A), which relates to the regulation of arousal and stress. Research on athletes' use of MG-M imagery has in general found that engagement in this type of imagery is positively related to confidence. For example, in a correlation-level study of the relationship between MG-M and confidence, Moritz, Hall, Martin, and Vadocz (1996) asked 57 elite roller skaters at a championship event to complete the Sport Imagery Questionnaire. Results indicated that athletes with high state confidence use more MG-M imagery than those with low state confidence. Furthermore, MG-M imagery, compared to other types of imagery, was the best predictor (20%) of confidence.

Callow, Hardy, and Hall (2001) investigated the nature of the relationship between MG-M and confidence. Four skilled badminton players undertook a six-session (two sessions per week for 3 weeks) imagery intervention at weeks 5, 7, 9, and 11, respectively, in a 20-week period leading up to a competition. The imagery sessions were focused on enhancing control, self-confidence, and coping under stress. The intervention had a facilitative effect on performance-related confidence for 3 of the 4 participants.

Several studies delineated the relationship between MG-M and self-efficacy; a more situation-specific form of self-confidence (for a review, see Hall, 2001). Bandura (1997) asserted that one key predictor of self-efficacy is positive visualizations: imaging oneself as feeling competent and confident. In a correlation-level study of the relationship between MG-M and self-efficacy, Mills, Monroe, and Hall (2000) used 50 college athletes involved in wrestling, rowing, and track and field. They found that those high in self-efficacy in competition situations used more motivational imagery, especially MG-M imagery, compared to those low in self-efficacy in these situations.

Feltz and Riessinger (1990) conducted an experimental study of the effects of MG-M imagery on self-efficacy for, and performance on, a "skier's sit" exercise task, which involves muscular endurance. College participants were assigned to one of three groups: an MG-M plus performance feedback group, a performance feedback only group, and a control group. Participants in the first group listened to a 5-minute audiotape recording of a mastery-related imagery script, in which participants were asked to imagine such images as "holding out" at the task and being successful. The results indicated that this group, compared to the other groups, had higher self-efficacy for and performed longer at the task.

Recent reviews of the research on MG-A imagery have described how this type of imagery can affect arousal and competitive anxiety (i.e., anxiety experienced as a result of competition-related stressors; e.g., Hall, 2001). For example, athletes sometimes report using MG-A imagery to help elevate their arousal levels before competition, a process often labeled as *psyching up*. In line with these proposals, Hecker and Kaczor (1988) showed that college softball players who undertook an MG-A imagery session, which involved imagining walking to the batter's box on the final inning of a home game, experienced a significant increase in heart rate from resting levels.

Vadocz, Hall, and Moritz (1997) conducted a correlation-level study of the relationship between MG-A and anxiety, using the same population of roller skaters that featured in the study by Moritz et al. (1996). The results indicated that MG-A imagery, but not other types of imagery, significantly predicted cognitive state anxiety. Thus, the use of MG-A can affect anxiety levels, and MG-A can be used to control a performer's anxiety level.

In Table 1, a summary is provided of the different types of motivational imagery reviewed here and their effects on emotions (see Hall, 2001). The evidence currently available indicates that, by developing imagery skills, performers are better able to control their emotions. By being able to control their emotions, performers are, inter alia, better able to sustain on-task practice and effort, which results in better performance.

Self-Regulatory Skills Used as Part of Mental Preparation Strategies

Skilled performers often use self-regulatory skills in combination as part of a larger strategy employed to achieve an emotional state appropriate for a task (for a review, see Jackson & Baker, 2001). For example, a performer preparing for a critical competition might imagine approaching the competition in a confident manner and also apply a breathing routine simultaneously to help relax. A recent study was conducted of the Rugby Union player Neil Jenkins, who is the world's most successful penalty kicker in the game (Jackson & Baker, 2001). Researchers studied in particular how Jenkins prepared just before taking a kick. Jenkins had developed

TABLE 1
The Effects of Different Types of Motivational Imagery on Emotions

Level	*Subtype*	*Example*	*Effects on Emotions*
Specific	Not applicable	Imagining being praised for good performance	Determination
General	Mastery	Imagining performing confidently and in a masterly manner	Self-confidence and efficacy
General	Arousal	Imagining performing in a relaxed manner	Arousal, anxiety, and relaxation

and practiced a preparation strategy that he believed helped achieve an emotional state appropriate to the task of kicking, and this strategy comprised in part the use of self-regulatory skills such as self-talk and imagery. To elaborate, in an interview conducted immediately after a kicking session, Jenkins commented on his use of imagery: "I always love practicing on my local ground in Church Village. And that's the main thing I do basically. I just try to imagine that I'm there with no-one there, just on my own" (Jackson & Baker, 2001, p. 59). Thus, Jenkins appears to use imagery in competitive situations to try to mentally simulate practice conditions, which has the effect of detaching him from the importance of the competition and helping him relax into a state most conducive to the kicking task. Jenkins also reported attempts to cope with negative self-talk by using a method of thought-stopping that included swearing at intrusive thoughts.

Hanton and Jones (1999) have also shown how skilled athletes use self-regulatory strategies to achieve an appropriate emotional state. They employed an interview method to investigate the development and application of self-regulatory strategies by skilled swimmers. The swimmers reported that they routinely apply strategies for the purpose of self-regulation before competition and that these strategies comprise the use of imagery and self-talk. The swimmers reported that the function of these skills was to help rationalize their thoughts and feelings so that they were able to interpret their symptoms of anxiety as facilitative to their performance. Furthermore, they also reported that the strategies have become more refined throughout their development as swimmers.

"CHOKING" UNDER PRESSURE

Despite the strong theoretical and scientific foundation of emotions, stress appraisal, and coping with adversity, the unexpected and sometime surprising phenomena of "choking" under pressure is not sufficiently understood. Research suggests five situational variables that increase arousal state, stress, and psychological pressure appraisal, and directs attention inwards: competition, reward contingency, punishment contingency, ego relevance, and the presence of others (Baumeister & Showers, 1986). Inherent in competitive situations is the explicit factor (i.e., one's performance is comparable to another competitor's performance). The implicit factor is evoked when one compares his performance to his expected preplanned course of action. Both explicit and implicit factors can cause choking in stressful situations (Baumeister, 1984; Church, 1962). During diagnostic and evaluative conditions, an increase in stress appraisal is noticed by making performance ego relevant. Ego relevance has caused choking in numerous cognitive tasks (Deffenbacher, 1978) and is of much relevance to sport situations. The presence of an audience further elevates pressure appraisal (see Zajonc's [1965] Social

Facilitation theory), which may facilitate performance on simple tasks but hinder performance on a poorly learned task or tasks of a complex nature.

Two mediating variables were found to paradoxically affect performance: task complexity and efficacy expectations (Baumeister & Showers, 1986). Individuals choking on difficult or complex tasks under pressure were found to improve performance in simple or easy tasks under the same pressure conditions (Beilock & Carr, 2001; Cottrell, Rittle, & Wack, 1967; Masters, 1992). Masters assumed that performance pressure directs the athlete's attention to the proceduralized skill, resulting in choking on complex tasks. In an attempt to control individual elements in a multistage skill, interference of the integrated move is evident, a process not present when performing complex tasks. However, self-efficacy can play a decisive role in efficiently coping with emotional pressure and task demands (Bandura, 1997). When the athlete feels competent and confident in executing the complex task, these feelings are used to self-regulate the emotional state and prevent chocking despite elevated stress appraisal. In this respect, self-efficacy takes a "relaxation" coping role to insure a balanced emotional state required for optimal performance or, alternatively, it enables one to override the perceived pressure by distinguishing the motor system operation from the emotional system operation, a strategy that prevents choking. Anecdotal evidence exists to support the notion that expert athletes feel the audience and competitive pressure as pleasant and facilitative to their performance, thus minimizing the probability of choking. Recent findings in the military setting (Driskell, Johnston, & Salas, 2001) have indicated that stress reduction techniques, having been applied successfully in one task, can be useful in other tasks. One should, of course, study the extent of the transfer of such techniques as a function of task similarities and the coping strategies required for task completion.

A recent study by Beilock and Carr (2001) found evidence for choking under pressure in a complex golf-putting task but not in a simpler, declaratively based alphabet arithmetic test. Thus, choking seems to be prevalent in tasks that require an underlying procedural knowledge base and less in tasks that require an explicit knowledge base. They also found support to the "explicit monitoring hypothesis of choking"; i.e., participants in dual-task situations are not affected by distraction because the secondary task served to focus one's attention away from the step-by-step process of the proceduralized skill. Support to this notion has been given in several studies (Baumeister, 1984; Lewis & Linder, 1997).

Explicit monitoring theories predict that performance pressure causes athletes to attend to the step-by-step details of their performance. Therefore, it is not surprising that at low levels of practice performance pressure was found to facilitate learning (Beilock & Carr, 2001). Novice performers with an increasing amount of performance pressure were prompted to closely monitor the task at hand, resulting in facilitated skill acquisition. Beilock and Carr further found that self-consciousness training not only eliminated choking completely, but performance was also enhanced when the performers used such a self-regulatory strategy.

Despite the scientific results pointing to the interactive effects of skill complexity and self-regulatory mechanisms on performance, their conclusions remained somewhat inconclusive. A task like shooting a penalty kick in soccer, for example, should not require a constant online attentional control when the motor skill is automated (Fitts & Posner, 1967; Langer & Imber, 1979; Schmidt & Lee, 1999). Furthermore, shooting on goal should be robust to conditions that draw attention away from the primary task (i.e., distraction theory) but sensitive to situations in which one attempts to control the automaticity of a learned skill (i.e., self-focus theory). Thus, according to expertise studies (see Tenenbaum & Bar-Eli, 1993, 1995b), one should expect choking to occur in high-skill athletes once their attentional style is disturbed by either external or internal sources, which attract attention from the automaticity and flow state they are used to.

High pressure prevents novice and low-skill athletes from performing complex skills skillfully and competently because attention is diverted to other sources, and the lack of automaticity results in an increase of procedural errors. Experts, in contrast, through years of practice and coping with pressure experiences, developed coping strategies that enable them to remain in their preferable emotions-attentional state. This is a state that minimizes their vulnerability of choking. Once this equilibrium state is interrupted, choking has a higher likelihood to occur (see Tenenbaum, 2003).

CONCLUSION

Implications of This Research for the Military

Scientific evidence supports the use of the revised Kamata et al.'s (2002) model determining perceived and physiological parameters associated with performance zones while providing an estimation of a given probability. Although current research utilizing the IAPZ model has shown that collecting data from athletes during or in between execution of tasks in nonexperimental conditions can prove to be a distraction (Cohen et al., 2006), it is important to continue to search for and refine methods, designs, and techniques that allow examinations of the effects of various strategies and interventions that increase the probability for sustained optimal performances. For instance, laboratory settings demonstrated that it is possible for individuals to alter and control their heartbeat (Moleiro & Cid, 2001) and self-regulate cortical activity via biofeedback (Siniatchkin, Kropp, & Gerber, 2000). As a result, with more precise information concerning an individual's idiosyncratic tendencies, practitioners can develop accurate and well-defined techniques to improve arousal and emotional regulation in novice and expert performances

(Ericsson & Charness, 1994; Zimmerman & Kitsantas, 1994). In addition, there is a relationship between cognitive processes, physiological functioning, and performance (see Zaichkowsky & Baltzell, 2001). Therefore, one should take into account simultaneous functions of cognitive, affective, and physiological components that regulate physiological arousal during performance (Ledoux, 1995). Although some of these techniques may be limited to laboratory settings, they can be applied to other performers that require closed motor skills, such as marksmen and fighter pilots. The online measures of emotions, affective states, coping strategies, self-regulatory strategies, thoughts, and performance can be collected while operations are performed using simulators. Technological advances such as virtual reality and computerized simulators are ideal tools and environments whereby our method can be implemented and can be used to enhance the performance of military personnel.

In some highly aggressive and combative sports (e.g., football, hockey) or in tasks that require intense sustained performance with minimal motor movement (e.g., fighter pilots, racecar driving), there can be an advantage to intensifying and regulating arousal in the heat of competition or battle in order to improve reaction times and decision making (Hanin, 2000). However, in many other tasks involving finite muscle control (e.g., marksmen, golf), it is important for an individual to reduce and regulate the negative effects heightened arousal has on performance during competition (Deeny, Hillman, Janelle, & Hatfield, 2003). Military tasks share the same characteristics. In some tasks, full concentration and situational awareness are required, whereas other tasks require extreme physical effort, endurance, persistence, and at the same time appropriate response selection, coordination, and mental strength.

Muscle bracing and residual tension are the classic symptoms of performance-related stress. Most dynamic activities, including some static tasks, feature long periods of controlled movement, regularly punctuated by varying levels of arousal intensity. Controlling this range of arousal to conserve energy in addition to maintaining optimal levels of arousal is a difficult skill that is usually developed over time and with considerable experience. However, even veteran competitors and soldiers are often vulnerable when the stakes are high, and “choking” is experienced (Baumeister, 1984). Successful performers learn to compare multidimensional components of anxiety, arousal, anticipation, and worry in good and bad performances in order to identify their unique optimal state for competition (Hanin, 2000). The soldiers, airmen, seaman, and Marines who utilize techniques and strategies that reduce the risk of choking and improve the frequency at which they enter their optimal performance zones will breed composure and confidence. As a result, the individual who perceives high levels of confidence is likely to expend greater effort and persist longer in the face of adversity, which nurtures certain individual and group virtues such as motivational commitment, resiliency to adversity, and performance accomplishments (Bandura, 1997).

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