



Sport Psychology for Acquisition Professionals

Application of Sport Psychology Techniques for Acquisition Professionals

Noel J. Paschal

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Abstract

This research study utilizes a literature review approach to consider whether the cognitive enhancement techniques used in sport psychology are applicable and transferable from the sport domain to the domain of Department of Defense acquisition professionals. The primary cognitive enhancement techniques used in sport psychology are goal setting, self-talk, imagery, arousal control/relaxation, and attention control/concentration. This study presents examples of research results from the literature for each technique. The study also summarizes cognitive enhancement techniques taught in the Armed Forces. The results of the study are that each of the cognitive enhancement techniques are applicable to the domain of acquisition professionals.

Keywords: cognitive enhancement, sport psychology, acquisition, goal setting, self-talk, imagery, arousal control, relaxation, attention control, concentration

Chapter 1 – Introduction

Background

Elite athletes (i.e., professional, Olympic, and upper tier college) seek every possible method of improving performance and gaining competitive advantage over opponents. As science identifies new methods, athletes and athletic programs seek to incorporate these techniques into training regimens. As the science of muscular development has grown, training routines have evolved from general weight training to total fitness programs tailored to the individual athlete, sport and position. The understanding of benefits of proper nutrition has advanced such that nutrition programs are now considered an integral part of an athlete's development with specific diets depending on the time of day, activities scheduled, and physical objectives for the athlete. Science showed that cryotherapy speeds recovery from training and competitions; as a result, many elite athletes now sit in bathtubs filled with ice water following practices and games (Depta, 2013). Bostrom and Sandberg (2009) define perceptual-cognitive abilities from the behavioral sciences as the brain's capability to process and use internally or externally generated data. Depta (2013), in *Cognitive Training: The Final Frontier for Athletes*, considers improvements in these perceptual-cognitive abilities as the latest new technique spreading through sports. Depta (2013) notes that professional soccer in Europe, international rugby, professional hockey in the United States (U.S.) and Canada, and professional and upper tier college football programs in the U.S. use cognitive enhancement techniques in their training.

The benefits of cognitive enhancement might be applicable beyond elite athletes. Researchers at the University of Central Florida state, "Stress and performance, skill acquisition, attentional control, emotion regulation - all topics the military has long sought to understand to maximize human learning and performance" (Fiore & Salas, 2008, p. S1). Fiore and Salas

(2008) note that these topics are also of interest to work in the sports sciences and that more cross-disciplinary work is needed between the two domains of sport and the Armed Forces. To help address this gap, *Military Psychology* dedicated a special issue in 2008 to having sport researchers report on their work in the context of the Armed Forces. Since then, the Armed Forces have developed training programs for Special Forces that include cognitive enhancement techniques (Robson & Manacapilli, 2014), have established the Performance Psychology Program taught at the United States Military Academy (Center for Enhanced Performance, 2017), and continue to broaden exposure to cognitive enhancement techniques within the military (U.S. Army Training and Doctrine Command, 2014). Given the interest in cognitive enhancement techniques from the sport domain, as well as U.S. Armed Forces, there is merit in exploring whether the cognitive enhancement techniques from sport psychology can apply and transfer to Department of Defense (DoD) acquisition professionals.

Problem Statement

To what degree can cognitive enhancement techniques from sport psychology apply to DoD acquisition professionals?

Purpose of This Study

The purpose of this study is to determine whether cognitive enhancement techniques used in sport psychology should be included in training for DoD acquisition professionals. The study begins with identifying the cognitive techniques used in sport psychology. Next, the study reviews the literature associated with these techniques and provides examples of research results for each technique. The study includes comments from the literature on whether these techniques are effective in the context of the sport domain. The study also identifies programs within the Armed Forces that employ cognitive enhancement techniques and summarizes RAND

Corporation assessments of some of those programs. Finally, this research addresses whether cognitive enhancement techniques are applicable and transferable to the acquisition domain and provides recommendations for which, if any, to include in training for acquisition professionals.

Significance of the Research

“When facing a peer or near-peer adversary, the U.S. advantage will be in superior human performance of our warfighters,” as stated by Mr. Daniel Serfaty during the Industry Keynote speech at the 2016 Interservice / Industry Simulation, Training and Education Conference (Serfaty, 2016). The U.S. advantage can be the difference in whether lives of U.S. warfighters are lost and whether the U.S. wins or loses battles and even wars. The Army, Navy, Air Force, Marines and Special Operations Forces are helping provide this advantage by including cognitive enhancement as part of development programs in pursuit of superior human performance. The Services’ view that cognitive enhancement training can help maximize warfighter performance is justification for the DoD to explore whether incorporation of cognitive enhancement methods into training for the defense acquisition workforce would likewise help acquisition professionals provide every possible advantage to the U.S. warfighter.

Literature Review Research Methodology

Initial background information came from authors who conducted foundational research that led to the transfer of general psychological techniques into the sport domain (Brunner, 2016). These authors and their primary research areas are: Albert Bandura (self-efficacy), Carol Dweck (growth mindset), and Bernie Weiner (attribution theory). Key resources were scholarly journals available through online access portals such as Alabama Virtual Live and the online library from Webster University. Reviews of work from these initial three researchers and other general searches such as “sport psychology” and “cognitive enhancement” led to applicable

articles. The research initially targeted works published since 2000 to identify most recent results. However, some of articles included in the literature review were referenced works identified in these initial search results and were published prior to 2000 in some cases. The research targeted scholarly journal articles but also included some non-refereed publications, books or sections of books, and government sponsored assessments by the RAND Corporation.

Limitations of Study

A primary limitation to this study was available time. Although the Senior Service College Fellowship curriculum addressed the research requirement during the first weeks of the fellowship, Defense Acquisition University and Webster University coursework was the focus of the first four months.

Chapter 2 – Literature Review

History of Sport Psychology

Sport psychology has existed since the original Olympics in which the Greek athletes allocated time prior to competition specifically for concentration and relaxation (Kremer, Moran, & Walker, 2016). The roots of modern sport psychology trace back to early motor learning and motor performance research with only a few individual investigations occurring prior to 1920, according to Browne and Mahoney (1984). The first known sport psychology publication in the U.S. occurred in 1898 and addressed audience effects on cyclists in competition. A study in 1918, by Coleman Griffith (as cited by Brewer, 2014), compared reaction times among football and basketball players. Griffith continued his work to include organizing and directing the first sport psychology laboratory in the U.S. at the University of Illinois in 1925 (Brewer, 2014), initiating the first course on the subject, and supervising the first doctoral dissertation on the topic in the 1930s (Browne & Mahoney, 1984). Browne and Mahoney (1984) consider Griffith to be the Father of Sport Psychology due to his contributions in sport psychology.

Meanwhile, sport psychology emerged as a scientific field in Europe during the 1920s and 1930s (Browne & Mahoney, 1984). Germany established the Deutsche Sporthochschule, or German Sport University, in 1920 as the first laboratory specifically for sport psychology research (Kremer et al., 2016). The former Soviet Union also opened a sport psychology laboratory in the 1920s at the Institute of Physical Culture in Leningrad and another in Moscow in 1925 (Kremer et al., 2016). Eastern European countries, primarily dominated by the Soviets, became the leaders in sport psychology during the period between World War II and the mid-1960s. The Eastern European countries benefited by having involvement from their governments and collaboration among the countries (Browne & Mahoney, 1984). Western countries,

however, enjoyed no centralized government funding and did not share research with each other. Browne and Mahoney (1984) report that experts in physical education departments led most of the research during the 1950s and 1960s; however, Ward et al. (2008) provide a case where other researchers conducted experiments in the 1950s to determine whether training of perceptual-cognitive skills would help American football players recognize defensive alignments.

Sport psychology made great strides in the 1960s and 1970s through the publishing of textbooks and dedicated scholarly journals and with the establishing of professional organizations (Brewer, 2014). Specifically, the first International Congress of Sport Psychology met in 1965 and resulted in the founding of the International Society of Sport Psychology (Browne & Mahoney, 1984). In the late 1970s the field of sport psychology moved from primarily university research and for educational purposes to being a service to teams, coaches, and athletes. However, it was not until 1983 that the United States Olympic Committee published guidelines for standards and a registry process and later in 1989 that the Association for the Advancement of Applied Sport Psychology approved a sports psychologist certification program (Zaichkowsky & Perna, 1996). Other major events include establishment of the Association for the Advancement of Applied Sport Psychology (AASP) in 1985 (Brewer, 2014), the Exercise and Sport Psychology division of the American Psychology Association (APA) in 1986 (Society for Sport, Exercise & Performance Psychology, 2017), and the Sport and Exercise Psychology division of the British Psychological Society in 2004 (Kremer et al., 2016).

Summary of Sport Psychology Cognitive Enhancement Techniques

Introduction. The literature has multiple references to techniques in sport psychology with respect to skills and terminology. Fiore and Salas (2008) identify several techniques as applied to the sport domain to include: “mental imagery, multimodal goal setting, directed self-

talk, and relaxation and activation skills” (p. S4). Zaichkowsky (2006) lists “goal-setting, imagery, relaxation, self-talk, attention/concentration, and commitment to rigorous practice” (p. 3) as the most useful techniques from broader psychology to be applied by sport psychologists in teaching student athletes. Cox, Qiu & Liu (as cited in Brewer, 2014), in the *Overview of Sport Psychology, Handbook of Research on Sport Psychology*, lists techniques that have existed since the 1960s and 1970s. The list includes: “personality, arousal/anxiety, performance enhancement interventions (e.g., relaxation, imagery), achievement motivation, causal attributions, aggression and team cohesion” (Brewer, 2014, p. 5). The *SAGE Key Concepts Series: Key Concepts in Sport Psychology* has entries for anxiety and stress which includes arousal and “choking” under pressure, motivation and commitment which addresses goal setting as well as self-efficacy/self-determination theories, and cognitive processes of mental imagery, mental practice, attention and concentration, positive self-talk, and mental toughness (Kremer et al., 2016). The Test of Performance Strategies tool used to understand cognitive enhancement techniques used by athletes includes self-talk, emotional control, automaticity, goal setting, imagery, activation, relaxation, and attentional control (Taylor, Gould, & Rolo, 2008). Howland (2006) references many of the same psychological skills that can be applied to athletics, specifically, “relaxation, visualization, goal setting, positive self-talk, focusing and re-focusing” (p. 49).

Although the techniques can be applied individually for specific outcomes, sport psychology techniques might also be inter-related. For example, Gee (2010) states that precompetitive “anxiety is both cognitive (thoughts of worry and apprehension) and somatic (butterflies, cold hands, and fast shallow breathing)” and “that both forms of anxiety are inextricably linked” (p. 394). Gee suggests that addressing this anxiety might involve a combination sport psychology techniques used in mediation such as imagery, breathing methods

and self-talk. Likewise, Hardy and Oliver (2016) note, in a discussion of self-talk, that initially self-talk within the sport domain was part of a set of mental skills that also included imagery, relaxation and goal setting. Tenenbaum, Edmonds, and Eccles (2008) had similar findings and identify techniques such as self-talk, mental imagery, goal setting and controlled breathing for self-regulation.

This research focuses on a subset of the most common techniques. This subset includes: Goal Setting, Self-Talk, Imagery, Arousal Control/Relaxation, and Attention Control/Concentration. Taylor et al. (2008) provide definitions for these techniques as noted in table 1.

Table 1.

Definitions for Cognitive Enhancement Techniques

Cognitive Enhancement Technique	Definition
Goal Setting	setting performance- and outcome-related goals or objectives
Self-Talk (Positive)	maintaining an internal dialogue consisting of positive, encouraging and/or motivating dialogue
Imagery	imagining or visualizing sport movements and or tactics prior to actual participation
Arousal Control	maintaining an optimal level of physiologic and psychological arousal specific to the demands of the task at hand
Relaxation	implementing methods to remain calm in the face of challenge or pressure
Attention Control/ Concentration	maintaining focus on the task at hand and not easily succumbing to task-irrelevant distractions

Note: Adapted from “Performance strategies of US Olympians in practice and competition,” by M. K. Taylor, D. Gould, and C. Rolo, 2008, *High Ability Studies*, 19, p. 24. Copyright 2008 by European Council for High Ability.

Goal setting. “Goal setting is widely regarded as the most popular basic sport psychology technique and is an integral part of any mental training program designed to maximize athletic potential” (Kingston, 2014, para. 6). Two primary benefits of goal setting are

increases in an athlete's confidence and motivation. A series of successfully met goals or sub-goals of a larger goal helps build confidence in the athlete's capability to reach the next goal. Kingston reports that multiple researchers in the area of goal setting found that goal setting supports increased motivation by helping the athlete in four ways: focus attention on the task at hand, foster greater effort toward the task or objective, remain diligent even when encountering setbacks, and seek better approaches to meeting the objective.

Dweck (2009, 2015) is among the leaders of theories fundamental to the formation of goal setting used in sport psychology and in other domains. This is exhibited by Burnette, O'Boyle, Van Epps, Pollack, & Finkel (2012), in a meta-analytic review (a collective analysis of many studies) of implicit theories (beliefs held by an individual which influence the person's thoughts or perspectives) and self-regulation, citing Dweck as primary author eight times, co-author 18 times, and by Dweck's work being the topic of two separate articles within the review. Dweck's (2009, 2015) research focuses on two mindsets: Growth Mindset (those who think they can develop and improve their talents and abilities) and Fixed Mindset (those who believe their talents and abilities are fixed). Dweck's (2009, 2015) research has shown that those with a growth mindset tend to pursue learning goals geared to promoting improvement and those with a fixed mindset tend to pursue performance goals intended to prove oneself to others. Dweck's (2007) growth mindset model holds that "intelligence can be developed" (p.7). Thus, people with a growth mindset want to learn and have a "tendency to: embrace challenges, persist in the face of setbacks, see effort as the path to mastery, learn from criticism, and find lessons and inspiration in the success of others" (p.7). Because of the desire for learning and these tendencies, Dweck (2007) states that those with a growth mindset "reach ever-higher levels of achievement" (p. 7).

Similar to Dweck's (2009, 2015) finding that people with a growth mindset tend to embrace challenges, Locke and Latham's (2006) research, based on 400 laboratory and field studies covering 25 years, found "that specific, high (hard) goals lead to a higher level of task performance than do easy goals or vague, abstract goals" (p. 265). Locke and Latham add that the theory is applicable as long as the person is committed to the goal, has the ability to achieve it, and does not have conflicting goals. The theory has four elements which describe how goals help lead to improved performance: (a) "High goals lead to greater effort and/or persistence than do moderately difficult, easy, or vague goals" (Locke & Latham, 2006, p. 265); (b) goals result in more focus and effort toward actions that are relevant to the goals; (c) effectiveness in achieving goals depends jointly on motivation and possession of essential knowledge and/or abilities, which are interrelated; and (d) goals motivate an individual to employ readily existing knowledge/abilities, bring awareness to the individual's existing/stored knowledge/abilities that can be applied toward goal accomplishment, and/or motivate the individual to seek new knowledge/abilities (Locke & Latham, 2006).

Building upon Locke and Latham's 2006 research, Burton, Gillham, Weinberg, Yukelson, and Weigand (2013) developed a goal-setting styles model and conducted studies on how various styles impact goal setting in sports. In Burton et al.'s (2013) study, 338 prospective U.S. Olympians responded to a goal-setting questionnaire with sections on frequency of goal type, effectiveness of goal type, and goal preferences plus questions on goal commitment and goal barriers. Based on responses, Burton et al. divided participants into groups. One group, similar to those with a growth mindset (Dweck, 2009, 2015), was learning-oriented which included competitors who placed more value on process and improvement than outcome relative to others. Burton et al.'s other groupings were performance-oriented, similar to those with a

fixed mindset (Dweck, 2009, 2015), and subdivided into success and failure orientations. The performance-oriented (success) group consisted of competitors who win often and thus had high levels of perceived competence. The performance-oriented (failure) grouping comprised the competitors who lose often and thus had low levels of perceived competence. Those who were performance-oriented (failure) had scores for self-confidence of at least a one-half deviation below the overall mean. As Burton et al. hypothesized, the analyses indicated that learning-oriented athletes experienced the most goal-setting success, those who were performance-oriented (success) had less goal-setting success, and the performance-oriented (failure) athletes experienced the least goal-setting success. Learning-oriented athletes reported more goal-setting experience, sports experience and career success while performance-oriented (success) athletes reported higher perceived athletic ability and potential and the fewest goal process barriers. Burton et al. (2013) state that finding performance-oriented (failure) “athletes in an elite athlete sample seems noteworthy and suggests that even in high level sport athletes develop destructive self-perceptions that negatively impact their motivational patterns” (p. 37). Helping the performance-oriented (failure) athletes to change to being more concerned about process and improvement instead of winning or losing before their low self-perceptions cause them to quit should increase their likelihood to continue in sport, better enjoy their sport, and develop or maximize their abilities. Similar to Dweck, Burton et al. concluded that sport psychologists, coaches and athletes will have the best chance of developing talent by having goals which emphasize process and improvement over outcome relative to others.

Weinberg (2014) followed Locke and Latham’s (2006) and Burton’s et al. (2013) works by noting that as of 2014, the number of studies in industrial or organizational settings which tested the relationship between goal setting and performance had grown from 400 to 550.

Weinberg noted that research on goal setting in the sport domain was much less mature compared to industrial or organizational settings. With the exception of some early methodological and design issues which helped bring about some inconsistent findings, later studies in the sport domain generated likewise positive goal-setting results on performance. Regarding the sport domain, Weinberg (2014) notes that the setting of goals among athletes is not an issue; however, some athletes do not “set the right kind of goals, goals that enhance motivation and direct attention toward goal completion” (p. 33). Through readings of results and findings of individual studies as well as compilations of the literature, Weinberg identified consistencies in the goal-setting literature related to sport and exercise settings listed in Figure 1.

Figure 1. Goal-Setting Consistencies

- Almost all athletes use some type of goal setting to enhance performance and find these goals to be moderately to highly effective.
- Athletes using multiple goal strategies exhibit the best performances
- Athletes and coaches are not systematic in writing down their goals.
- The primary reason for setting goals is to provide direction and focus.
- Major barriers to achieving goals include lack of time, stress, fatigue, academic pressures, and social relationships.
- Goals should be moderately difficult, challenging, and realistic.
- Athletes should focus on process- as opposed to product-related goals.
- Athletes should use both short-term and long-term goals.
- Goal commitment and acceptance are important in keeping motivation high over time.
- Action plans facilitate the effective implementation of goal-setting strategies.

Figure 1. Goal-setting consistencies related to sport and exercise settings. Adapted from “Goal Setting in Sport and Exercise,” by R. Weinberg, 2014, *Exploring Sport and Exercise Psychology*, Third Edition, p. 37. Copyright 2014 by the American Psychological Association.

Self-talk. Self-talk, literally speaking to one's self, can have instructional or motivational purposes (Hardy & Oliver, 2014). However, as self-talk can be either positive or negative, Hardy and Oliver point out that the impact of self-talk can likewise be positive or negative. According to Gee (2100), self-talk is rooted in psychology's social cognitive theory and Bandura's (1997) research in self-efficacy. Bandura's findings are that perceived self-efficacy, belief in one's personal capabilities, can have impacts on a person's outlook, motivation, and stress levels. People with high perceived self-efficacy have greater confidence and visualize being successful. As a result, those with high perceived self-efficacy set more lofty goals for themselves and have high levels of motivation and commitment toward achieving those goals. In addition, these people are less anxious in tense situations because of confidence to cope with setbacks and ability to alleviate or tolerate potential stress. On the other hand, those with low levels of perceived self-efficacy tend to magnify risks, dwell on how they might be unsuccessful, be less optimistic, and avoid difficult tasks. Those with low levels of perceived self-efficacy are riddled with thoughts of self-doubt instead of self-control. (Bandura, 1997).

The use of self-talk is applicable across multiple domains according to Rogelberg and Justice (2013) such as organization, education, sport, and clinical psychology. However, Rogelberg and Justice noted that there was little quantifiable evidence of the benefits of self-talk because of the difficulty to measure the effects of self-talk. As a result, Rogelberg and Justice conducted a study of senior executives and assessed correlation of their self-talk with effective leadership of others, creativity/originality, and job strain. Rogelberg and Justice found a positive correlation between executives who used constructive self-talk in letters to their future selves and others evaluating the executives as being a more effective leader. Rogelberg and Justice also found a negative correlation between executives who used constructive self-talk and the

executives' reported job strain. Alternatively, subordinates and superiors evaluated executives who used dysfunctional self-talk, focusing on negative facets, as being less creative/original.

In considering which sport psychology methods might apply to the Armed Forces, Tenenbaum et al. (2008) referenced two studies that support the use of self-talk, involving novice dart and water polo throwers. Tenenbaum et al. identified self-talk as being useful in self-regulation to either raise or lower one's arousal in order to maintain the desired levels. The first study by Van Raalte and Brewer (1995) included three sets of college students who were novice dart throwers. Instructions for the positive self-talk group was to repeat the phrase "you can do it" to themselves prior to each throw. Instructions for the negative self-talk group was to say "you cannot do it," and the control group received no self-talk related instructions. Those in the positive self-talk group were significantly more accurate at dart throwing than the other two groups. The second study by Hatzigeorgiadis, Yannis, and Nikos (2004) involved a group of college students who were inexperienced at water polo. The study performers instructed the test group to say "I can" prior to each throw while the control group received no instructions related to self-talk. The test group using positive self-talk significantly outperformed the control group in both throwing measurements: short distance accuracy and maximum distance.

Other studies considered impacts of psychological skill use among elite Olympic athletes instead of novices. Taylor et al. (2008) had 176 U.S. Olympians from the 2000 summer games complete the Test of Performance Strategies instrument. The instrument, developed by Thomas and colleagues in 1999 (as cited in Taylor et al., 2008) and since used in multiple studies, assesses nine different cognitive techniques, or psychological subscales, that might be employed in practice and competition. Many of the techniques, including self-talk, occur in both the competition and practice subscales. Taylor et al. found that both the eight competition subscales

and the six practice subscales were significant in differentiating medalists from non-medalists. Taylor et al. interpret these results as medalists tend to use these nine cognitive techniques more frequently than non-medalists in both practice and competition. When considering these techniques individually rather than collectively, Taylor et al. found that self-talk was the most significant contributor to the separation between medalists and non-medalist with respect to practice and one of the top techniques indicating a difference between medalists and non-medalists in competition.

From a review of the self-talk literature, Hardy and Oliver (2014) composed a listing of six dimensions of self-talk. First is valence – whether the self-talk is positive or negative. With regard to impacts on performance, Hardy and Oliver note that positive self-talk promotes improved performance whereas negative self-talk inhibits improved performance. Second is the dimension of overtness. Self-talk can be verbal or internal; however, the literature does not conclude which is most beneficial toward athletic performance. The third dimension deals with whether the self-talk is assigned, as from a coach or counselor, or chosen by the athlete. Self-talk having a motivational or de-motivational interpretation is the fourth dimension. The fifth dimension pertains to functions of self-talk which can be primarily instructional or motivational. The final self-talk dimension is frequency which is a continuum between never/not at all to always/all the time. An individual athlete might engage in less self-talk during the off-season and more during practice and peaking during competitions. In addition to these six dimensions, Hardy and Oliver address use of cue-words, single words or short phrases that have a deeper meaning, as a grammatically and psychologically abbreviated version of self-talk.

In *What to Say When You Talk to Your Self*, Helmstetter (1982) recommends self-talk as an agent of change and a benefit to everyone, to bring about greater happiness and success both

personally and professionally. Helmstetter goes well beyond promoting the benefits of self-talk to identify multiple types of self-talk and even multiple levels of self-talk. He refers to silent self-talk as an internal dialog and self-speak as anything said out loud either to one's self or others. Helmstetter offers a more engaging form of self-talk as self-conversation. In self-conversation, a person might use "you are..." statements followed by "I am..." statements. For example, while alone during morning preparations the person might audibly state "you are going to have a great day today" and respond with "I am off to a great start" as a self-motivating beginning to one's day. Self-writing is literally a written form of self-talk, but the extra focus and diligence required to write brings about an increase in awareness of objectives and a corresponding energy to pursue them. Finally, tape-talk is making recordings of self-talk to listen to in the future. A key benefit of tape-talk is the opportunity to have self-talk while performing some routine activity such as driving or cooking (Helmstetter, 1982).

In addition to types of self-talk, Helmstetter (1982) identifies the five levels of self-talk. "I can't ..." statements are at the level of negative acceptance (Level I). "I need to ..." or "I should ..." statements are at the level of recognition of a need to change (Level II). These first two levels of self-talk are negative and do precisely the opposite of what self-talk intends to accomplish because they reinforce negative thought and thus negative action. Level III, the level of decision to change, might appear to be similar to Level II in that it acknowledges the need for change, but Level III goes much further by stating the decision to take action as though the action has already occurred by using "I never ..." or "I no longer ..." phrases. Level IV is the level of the better person. Level IV uses "I am ..." phrases to describe the changed person. Though he also identifies a Level V, Helmstetter's Level III and Level IV self-talk are the types aligned with the positive self-talk generally described elsewhere in the literature.

Imagery. Imagery occurs when a person consciously has an internal experience intended to be representative of an actual situation (Cumming & Williams, 2014). This virtual experience comprises one or more of visual, sound, smell, taste, muscle movement, and other bodily sensory effects. Cumming and Williams (2014) note that athletes employ imagery for a variety of reasons, such as for mental rehearsal or to increase confidence, toward an objective of improving performance. Tenenbaum et al. (2008) assessed various studies on different types of imagery used by sport psychologists and the effects on the athletes' emotions. Tenenbaum et al. observed that use of specific imagery had positive effects on determination, improved self-confidence and perceived self-efficacy, and helped control arousal, anxiety and relaxation. There are many other study results in the literature, some confirming the benefits of imagery and others with results which question the benefit of imagery use. The following paragraphs contain examples of each.

In one of the confirming studies, Ploszay, Gentner, Skinner, and Wrisberg (2006) had four collegiate golfers perform baseline putting over the course of one to four weeks during which Ploszay et al. recorded the number of putts that went into the cup each day and the distance from the hole for each missed putt. Ploszay et al. conducted an intervention at the end of week one for one golfer, week two for another golfer, week three for the third golfer, and week four for the remaining golfer. During each five days of the intervention, the participant performed 15 minutes of multisensory imagery as part of a preparation routine. The golfer would go through the same reading of the green, stance, backswing and fore swing as in normal preparation. The difference was that the participant would strike an imaginary ball, imagine a successful outcome on each putt, and as realistically as possible "try to see and feel the putter strike the ball, see the ball roll and watch it go in" (Polszay et al., 2006, p. 251). As shown in Table 2, the average number of putts made the five days following the intervention increased for

each of the four participants compared to the average over the five days preceding the intervention. Likewise, post-intervention average distance of missed putts was smaller than the pre-intervention miss distance. Each of the four participants reported that the multisensory imagery routine improved performance (Ploszay et al., 2006).

Table 2.

Number of Putts Made & Distance of Missed Putts

Golfer	Avg Number of Putts Made		Avg Distance of Misses (inches)	
	Pre- Intervention	Post- Intervention	Pre- Intervention	Post- Intervention
1	4.2	4.8	16.9	9.3
2	5.4	5.8	12.6	11.7
3	4.2	4.6	19.1	13.46
4	5.6	8.4	12.4	10.9

Note: Adapted from “The Effects of Multisensory Imagery in Conjunction with Physical Movement Rehearsal on Golf Putting Performance,” by A. J. Ploszay, N. B. Gentner, C. H. Skinner, and C. A. Wrisberg, 2006, *Journal of Behavioral Education*, 4, pp. 253-254. Copyright 2006 by Springer Science & Business Media.

However, not all studies involving imagery produce positive performance results. Carboni, Burke, Joyner, Hardy and Blom (2002) performed a study of college basketball players. The study had participants “achieve a relaxed state of mind and then imagine themselves shooting 10 free throws using correct form and making the shots” (Carboni et al., 2002, p. 63). There were four test group participants and a control participant. The study collected data on the participants’ free throw percentage from the prior season as well as during the study which

included the participants shooting five sets of ten free throws on three different days for a total of 150 shots each. Two of the participants in the test group experienced a less than ten percent (%) free throw decrease during the study while the other two participants had a greater than ten percent free throw increase during the study. The free throw percentage during the study increased by greater than 20% compared to that of the prior season for the one control participant who received no instruction to conduct pre-shot imagery during the study. There were three test group participants with free throw percentage data from the following season. Following the study each of these three reported overall effectiveness of the imagery on a five point scale. The participants reported that the use of imagery was effective, though at different levels. One reported “somewhat effective” (three points), one “effective” (four points), and one “very effective” (five points). However, each completed a lower percentage of free throws in the season following the study compared to the prior season. Carboni et al. (2002) acknowledged that these results were counter to results from independent studies conducted by other teams in 1990 and 1995 and stated, “perhaps the imagery sessions need to be carried out over a more extensive timetable and with more participants” (p. 65).

The literature has studies on the use of imagery unrelated to sport scenarios to include addressing phobias and to improve spelling bee performance. In one of the phobia studies, Minor (1984) had two separate groups of participants, all reported a strong fear of snakes, conduct a pretest approach behavior assessment. In the assessment, the observer recorded each participant’s willingness to perform several specified behaviors ranging from entering a room with a caged 4.6 meter non-poisonous black snake to actually lifting the snake from the cage. Following the pretest, one group of participants watched from a separate area as a demonstrator entered the room and provided verbal instructions while conducting each of the pre-tested

behaviors, including lifting the snake. Afterwards the demonstrator accompanied each participant from this group individually into the room, again demonstrating each behavior and providing verbal instructions and encouragement while requesting that the participant perform the behavior. Similarly, the second group also entered the room with the same demonstrator after first observing the demonstrator's actions and instructions from a separate area. However, the participants in this second group were aware that the snake had been removed from the cage. The demonstrator modeled the behavior as though the snake was present and then had each participant imagine that the snake was present while conducting the behavior. Finally all participants from both groups repeated the approach behavior assessment. The results indicated that the two methods of demonstration (in the presence of a live snake and through imagery) were equally effective in helping participants from both groups approach the snake more closely during the post-test assessment (Minor, 1984).

In another non-sport application, Sears and Johnson (1986) conducted a study of use of imagery for spelling performance and retention using 52 elementary school students. Students formed four groups with each group receiving a different treatment between a pre-test, and two post-tests for spelling performance and retention. The visual imagery treatment group viewed spelling words projected from an overhead transparency. The teacher asked each student to see if the student could still see the image in his or her mind, then to imagine the image displayed on a large outdoor screen, imagine each letter pasted onto the screen with imaginary paste, and to imagine nailing the letters in place with imaginary nails. The computer treatment group viewed a word on a computer screen, and the program prompted the student to type the word. If the student typed the word incorrectly, the computer asked the student to type it again without the word appearing on the screen. Correct responses resulted in "Good" appearing on the screen and

incorrect responses resulted in “Try Again” with the word reappearing on the screen. The auditory treatment group listened to words properly pronounced followed by hearing the words spelled correctly by syllable. Then the teacher led the students in pronouncing and spelling the words along with the taped voice. The kinesthetic [related to sensory perception of movement] treatment group wrote each word on a sheet of paper to the right of a column of spelling words. Thus three of the four treatments had a visual component with the auditory treatment being the only non-visual. In post-test comparisons, the auditory treatment group’s spelling performance and retention was significantly lower than the three groups whose treatments included some form of imagery. There were no differences among the visual imagery, computer and kinesthetic treatment groups on either spelling performance or retention (Sears & Johnson, 1986).

Firstenberg and Rubinstein (2014) promote a type of imagery they refer to as priming in their book, *Extraordinary Outcomes, Shaping an Otherwise Unpredictable Future*. Firstenberg and Rubinstein state that the source of imagery for priming can be externally or internally generated and have an impact on the primer or others. For example, Firstenberg and Rubinstein reference a study Bargh (1994) conducted in which subjects left the room more slowly after reading words associated with old age compared to the control group who did not read words related to old age. Thus the reading of the words associated with old age primed the subjects to act in a manner they associated with old age behavior. Similarly, Kay, Wheeler, Bargh, and Ross (2004) found that participants were more competitive in the presence of a briefcase and more cooperative in the presence of a backpack. Firstenberg and Rubinstein report of one of Rubinstein’s undergraduate studies involving legendary basketball coach John Wooden. The coach gave instructions to two groups of non-basketball players on how to shoot free throws. One group physically practiced for six weeks and the other took no more physical shots but used

mental imagery techniques for the same amount of time. The result from evaluation following mental imagery and actual practice was that both groups improved equally. Firstenberg and Rubinstein state that seeing a smile, particularly one's own when viewed in a mirror – a self-prime, leads to the person feeling more positive through release of dopamine and serotonin and lower levels of cortisol and adrenaline. Cuddy, Wilmuth, Yap, and Carney (2015) report that holding a power gesture, such as the superman pose, for only two minutes resulted in an increase in testosterone and a decrease in cortisol levels. As a result, Firstenberg and Rubinstein recommend that everyone can benefit from a self-priming type of imagery by smiling at themselves in a mirror at least each morning or by going somewhere private to strike a power pose for a couple of minutes prior to an interview, negotiation, competition or other tough situation.

Arousal control/relaxation. Every athlete has an ideal level of arousal, a state of physiological alertness and readiness for action (Psychology Dictionary staff, 2017), that is unique to both the athlete and the situation. “If a person is either under-aroused (sleepy, lethargic, unmotivated) or over-aroused (hyped-up, nervous, distractible), performance will suffer in comparison to when the person functions within his or her optimal range of arousal” (Browne & Mahoney, 1984, p. 613). The most common pictorial representation of the arousal – performance relationship, as shown in Figure 2, is based on the Yerkes-Dodson Law (Yerkes & Dodson, 1908) or the more generically described inverted-U hypothesis (Kidd, 2017). Relaxation can be an approach to help lower an over-aroused state and also a stand-alone technique for promoting overall good health.

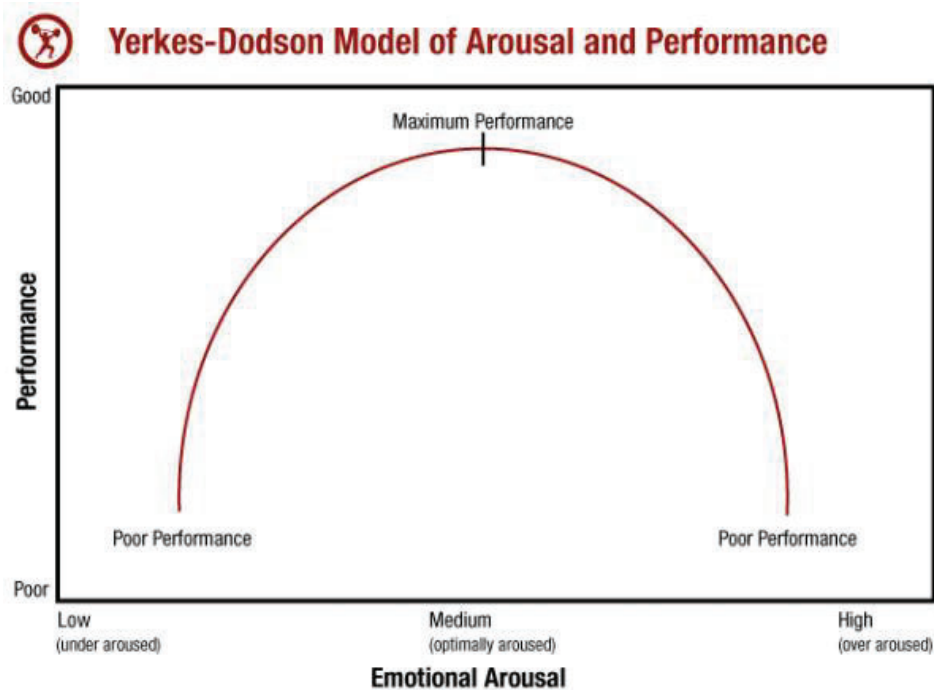
Figure 2. Yerkes-Dodson Model of Arousal and Performance

Figure 2. Yerkes-Dodson Model of Arousal and Performance reflecting various level of performance depending on the performer's level of emotional arousal. From "Maximize Performance Through Controlling Your Arousal Level," by S. Kidd, 2017, retrieved from <https://breakingmuscle.com/learn/maximize-performance-through-controlling-your-arousal-level>.

In a study to test the validity of the inverted U-hypothesis, Waters, Martin, and Schreter (1997) conducted numerical and alphabetical tests at easy and difficult conditions to measure performance ability while using multiple doses of caffeine to represent increasing levels of arousal. The study used ten undergraduate students, after they were screened and cleared for consumption of up to 600 milligrams of caffeine. The students completed tests in eight different sessions with four test cases per session. The four test cases were easy numerical test (ENT), easy alphabetical test (EAT), difficult numerical test (DNT), and difficult alphabetical test (DAT). The subjects performed easy numerical tasks of counting upward by a single digit value beginning at a single digit value such as counting upward by twos beginning at two. An example

of the difficult counting case is counting backward from 700 by sevens. Similarly, participants had to begin at a certain letter in the alphabet and go forward by two letters (easy case) or backward by two letters (difficult case). As shown in Figure 3, there was an increase to a peak number or correct responses, at or near session five, followed by a decrease in number of correct responses. These results indicate that participants reached an optimum arousal level; thus, the results provide general support for the inverted-U relationship. Figure 4 shows relatively linear session to session improvement in numbers of correct responses for each of the four cases for the placebo control group indicating that those taking a placebo did not become over-aroused during the eight sessions as did those consuming caffeine (Waters et al., 1997).

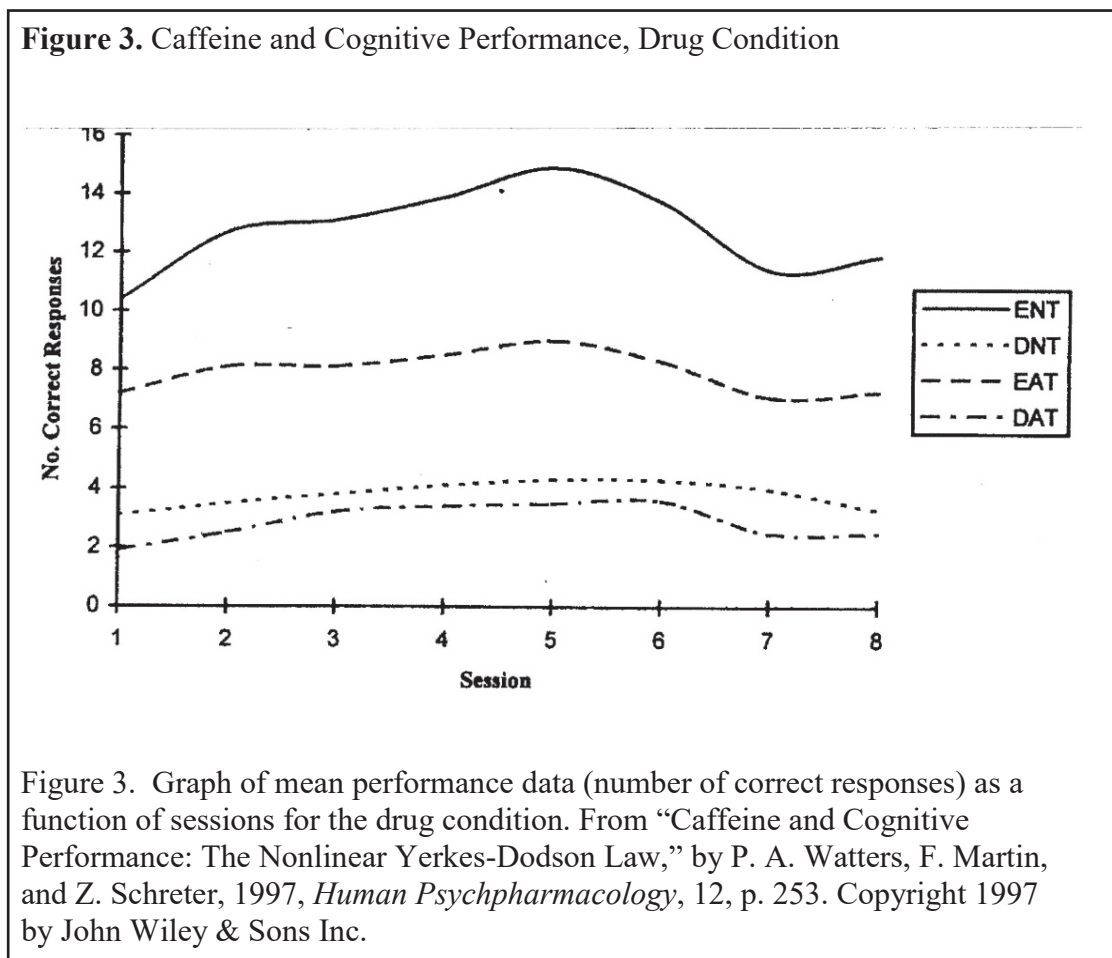


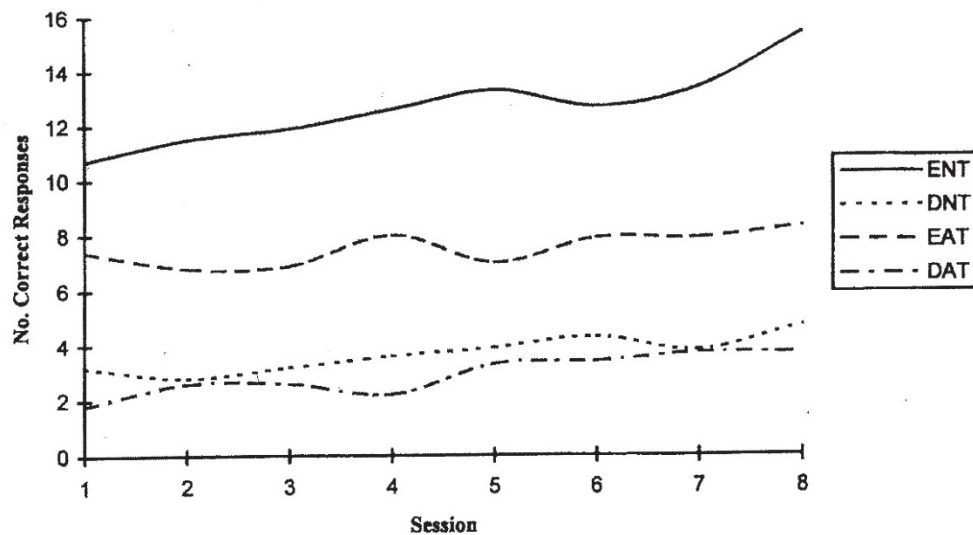
Figure 4. Caffeine and Cognitive Performance, Placebo Condition

Figure 4. Graph of mean performance data (number of correct responses) as a function of sessions for the placebo condition. From “Caffeine and Cognitive Performance: The Nonlinear Yerkes-Dodson Law,” by P. A. Watters, F. Martin, and Z. Schreter, 1997, *Human Psychopharmacology*, 12, p. 254. Copyright 1997 by John Wiley & Sons Inc.

Relaxation is a technique frequently used to reduce arousal level when over-aroused or to otherwise combat undue anxiety or stress (Neil & Thomas, 2014). Relaxation can also provide overall physical and emotional health maintenance benefits such lower blood pressure and better sleep. Relaxation includes physical and emotional strategies such as breathing exercises, progressive muscular relaxation or a combination of tensing and relaxing certain muscles, biofeedback which could involve the athlete sensing overly elevated heart rate as a signal to reduce arousal level, and meditation (Neil & Thomas, 2014).

In a review of Benson’s 1976 book, *The Relaxation Response*, Haynes and Zabel (2004) commented that, though controversial because Benson does not include the spiritual elements of Transcendental Meditation, Benson’s book was published in multiple countries and languages

and “was the first popular, practical book for the lay reader on the health applications of meditation practice” (p. 20). The literature is replete with references to Benson’s work which includes national [e.g., (Bonadonna, 2003) (Hall, 2003)] and international (Sadat Elali, Mahdavi, Jannati, Yazdani Cherati, & Setareh, 2012) examples of applications of and tests of the Benson Relaxation Response. The following paragraphs summarize two studies that investigated the effects of the Relaxation Response: the first based on self-reported measures of health, performance and well-being and the second based on blood pressure measurements.

In the first study, R. K. Peters, Benson, and Porter (1997) randomly divided volunteers into three groups and collected baseline data from the participants over four weeks of filling out daily records and attending biweekly sessions of blood pressure measurements. Group A received instructions and training in a method that produces a relaxation response which included restating “one” during each exhale while attempting to disregard other thoughts; Group B received instruction and training “to sit quietly and try to relax” without focusing “on any one particular thought,” and both groups received instructions “to take two 15-minute relaxation breaks each day” (p. 947). Group C, and the Control Group D, received no instruction. Group D consisted of invited participants. R. K. Peters, Benson, and Porter (1997) compared baseline data against final data for five indices: symptoms, illness, performance, sociability-satisfaction and happiness-unhappiness. The results were that Groups A and B showed greatest improvements and Groups C and D showed least improvement and in order with Group A showing the most improvement for all indices, Group B less, Group C even less, and Group D the least.

The second study, by R. K. Peters, Benson, and J. M. Peters (1997), appeared to use the same set of volunteers, control group, and methods as in the first study. This second study

involved determining relaxation effects on blood pressure. As in the first study, Group A learned a relaxation technique, Group B received instructions to sit quietly, and Group C received no training. Group D consisted of non-volunteers randomly selected to have their blood pressure taken at the beginning and end of the study; whereas, the volunteers in Groups A through C had their blood pressure measured using standardized processes and averaged over the four measurements taken every other Friday during the 12 week study. The study considered percentage change between initial and final blood pressure measurements and the average blood pressure measurements from the first three sessions compared to those from the last three sessions. Group A experienced the largest percentage differences between the first and last sessions. Group B's differences were more moderate, and Groups C and D experienced negligible changes. Similarly, when comparing the differences for the blood pressure averages of the first three sessions and last three sessions, the largest decrease occurred for Group A (relaxation technique), a moderate decrease occurred for Group B (sit quietly) and the smallest decrease occurred for Group C (no instruction).

Both studies imply that the relaxation breaks are beneficial, following the relaxation response is even more beneficial than a more general form of relaxation, and following the relaxation response provides significantly more benefit compared to not taking relaxation breaks. Although it was the case during the two studies, Benson and Corliss (2004) state that it is not necessary to be seated and quiet in order to benefit from the relaxation response. "You can do it while walking, jogging, playing a musical instrument or carrying out simple repetitive tasks such as knitting. Yoga, tai chi, meditation and repetitive prayer are other ways to put yourself in the healthful frame of mind" (Benson & Corliss, 2004, Repetitive Activities section, para. 1).

Walsh (2011) addressed the benefits of relaxation in general and in injury recovery speed. Walsh (2011) based findings on the simple premise: “When the mind enters a state of relaxation, the body follows” (p. 21). Walsh goes beyond simply touting the virtues of relaxation by providing a simplified teaching plan, similar to Benson’s Relaxation Response. The plan begins with informing the athlete of the effects of stress on the person. The effects include “stress on the body (e.g., muscle tension, increased heart rate, body aches, etc.), the mind (e.g., worrisome and distracting thoughts), and the endocrine system (e.g., release of cortisol)” (Walsh, 2011, p. 22). This understanding helps the athlete obtain a sense of control over the recovery process and thus increases the likelihood the athlete will embrace the relaxation techniques. Walsh recommends that the athlete practice relaxation at least twice daily for about 20 minutes per session. The athlete should use rhythmic breathing and repeat a special word, a short phrase or even a sound during each exhale. The athlete should focus on relaxation, but also be aware of distracting thoughts or reverting to shallow breathing such that the athlete can regain focus and proper breathing (Walsh, 2011).

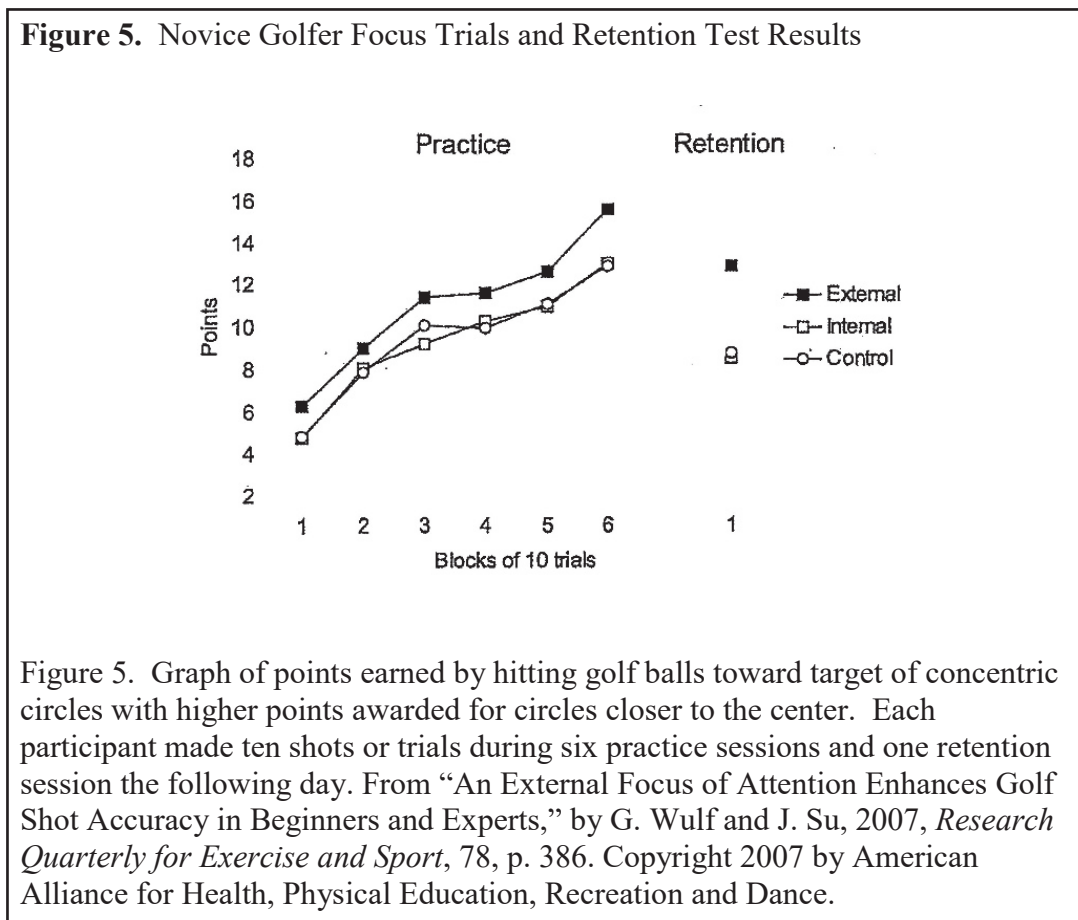
In a study of perceptions of university student-athletes relative to mental skills and other topics, Beauchemin (2014) employed five mental skills from sport psychology: relaxation, imagery, routines, self-talk, and concentration. The students attended a course covering these five mental skills as well as broader mental health, counseling, and performance enhancement topics. Regarding how the participants’ attitudes toward sport psychology changed, 85% reported favorable changes such as having increased interest in sport psychology or increased understanding of the importance of sport psychology. On the other hand, 15% indicated no attitudinal changes. Beauchemin (2014) drew a few primary themes from the data analysis: (a) subjects had a perceived stigma associated with mental health counseling, but perceptions

changed as a result of the outreach; (b) the mental skills had applicability beyond athletics and into the athletes' personal lives; and (c) there was a variation in preferences among the mental skills. Although preferences varied, 72% of the participants included relaxation in their response to the post-course question of "What was most useful for you during these classes?" (Beauchemin, 2014, p. 273).

Attention control/concentration. "In sport psychology, concentration refers to focusing on sensory or mental events coupled with mental effort" allowing some individuals "to selectively process some sources of information while ignoring others" (Jackson, 2014, p. 160). Attention control, or concentration, research has two primary areas of study: 1) "skill failure under pressure, or choking" and 2) "efficacy of external and internal foci of attention during learning and in skilled performance" (Jackson, 2014, p. 160). The literature holds that internal focus [within the body of the performer such as muscle vs. an external focus such as a ball] by expert performers can have a negative effect but might not impact or might even improve performance by novice performers. In addition, the presence of a secondary task tends to reduce novice performance but not impact expert performers (Jackson, 2014). This section provides examples of research studies on external vs. internal foci and on divided focus.

Wulf and Su (2007) conducted studies of golfers applying internal and external focus of attention. Their purpose was to test the theory that instructions toward an external focus of attention, onto the moving article (e.g., the ball), will enhance learning. In their first experiment, novice golfers hit balls toward a target of concentric circles using a 9-iron club. An instructor informed all participants of proper grip and stance prior to a random selection of participants into internal focus, external focus, and control groups. The internal focus group received instructions to focus on the swinging motion of their arms. The external focus group received instructions to

focus on the motion of the club. The control group received no focus instructions. Each group took six sets of 10 shots with repeated focus instructions, or no instructions for the control group, prior to each set. Each of three groups improved accuracy with each set of the initial 60 trials. While the external focus group demonstrated greater accuracy than the other two groups, the difference was not statistically significant. On day two, each group completed another set of 10 shots, but this time with no additional instructions. On this retention test, the external focus group had significantly higher accuracy scores than either the internal focus or the control groups which had similar accuracy scores throughout the initial trials and retention test (Wulf & Su, 2007). Wulf and Su's (2007) results suggest that having an external focus provides retention benefits while having an internal focus does not improve retention. Figure 5 plots results of all six trials and the retention test for each of the three groups.



In their second experiment, Wulf and Su (2007) used six expert golfers who were members of a college golf team. This experiment also used a target of concentric circles, but with smaller radii. These golfers used their own clubs and required no instructions related to grip or stance. A difference in this experiment was that each golfer participated in the external focus, internal focus and control groups based on two starting in each of the groups and then rotating in a round robin fashion. Table 3 contains results that show the external focus groupings had a significantly higher average than the other two groupings (Wulf & Su, 2007). Again, the results indicate that having an external focus improves performance while having an internal focus does not substantially impact performance.

Table 3.

Expert Golfer Focus Experiment Results

	External Focus Groupings	Internal Focus Groupings	Control Groupings
Average Score	1.93	1.29	1.38
Standard Deviation	0.24	0.29	0.28

Note: Adapted from “An External Focus of Attention Enhances Golf Shot Accuracy in Beginners and Experts,” by G. Wulf and J. Su, 2007, *Research Quarterly for Exercise and Sport*, 78, p. 386. Copyright 2007 by American Alliance for Health, Physical Education, Recreation and Dance.

Janelle and Hatfield (2008) conducted a literature review which explored attention control in dynamic environments such as tennis or baseball and more static environments such as marksmanship to link sport and military domains. These studies use sophisticated measuring devices such as instruments to measure visual search, or amount of eye gaze and duration of quiet eye period prior to motor action, as well as electroencephalography (EEG) and magnetic resonance imaging (MRI) neuroimaging devices. In one study by Janelle and Singer (1999)

involving a simulated race car driving scenario, where the subject also had to respond to peripheral cues, considerably more saccades (a small rapid jerky movement of the eye especially as it jumps from fixation on one point to another) occurred and overall driving performance decreased at high vs. low degrees of anxiety for moderate and high level of driving complexity. However, saccades were comparable at both degrees of anxiety for low driving complexity. In another study by Murray and Janelle (2003), performance decreased and measurements indicated that the operator exerted more mental effort in conditions of higher anxiety and higher cognitive load. Janelle and Hatfield (2008) report two major findings from these studies: 1) as anxiety increases, the performer tends to increase search rate and decrease search efficiency, resulting in slower and less accurate motor responses, and 2) the performer can mitigate the impacts of increased anxiety to some degree if capable of and willing to exert more effort or attention to the task when in higher dynamic environments.

Effectiveness of Cognitive Enhancement Techniques

Introduction. The literature contains considerable research and countless studies related to cognitive enhancement techniques from the sport domain and many other domains. While the widespread use of the techniques suggests a belief that techniques are effective, there are also skeptics. This section identifies a few of the findings within the literature related to effectiveness of cognitive enhancement techniques, some favorable and some unfavorable and one scholarly dispute.

Favorable. Zakrajsek, Martin, and Wrisberg (2015) surveyed over 650 certified athletic trainers (ATCs) from major colleges' athletic programs and found that approximately 78% would encourage athletes to use sport psychology consultants for performance-related issues. As shown in the data contained in Table 4, over 50% responded with high support (four or five

points out of a five point scale ranging from 1 = not at all beneficial to 5 = extremely beneficial) for the following sport psychology services that would be beneficial to athletes for: managing anxiety, dealing with pressure, managing emotions, building confidence and improving focus. When combining those responding moderate (three points out of the five point scale or moderately beneficial) and high support, almost 75% were supportive of all of the performance-related services considered in the study.

Table 4.

Ratings of Benefits of Sport Psychology Services

Performance-related services	Low (%)	Moderate (%)	High (%)
Managing anxiety	6.5	19.0	74.5
Dealing with pressure	7.4	29.1	63.4
Managing emotions	10.2	28.8	61.0
Building confidence	11.1	31.7	57.2
Improving focus	11.2	32.5	56.3
Performing as well as in practice	17.5	35.8	46.7
Enhancing performance	20.3	36.0	43.7
Preventing burnout	19.3	38.7	42.0
Communicating with coach	20.9	37.6	41.4
Building team cohesion	24.0	37.3	38.7
Communicating with teammates	25.9	36.4	37.6
Increasing enjoyment	25.9	39.0	35.1

Note: From “Sport Psychology Services in Performance Settings: NCAA D-I Certified Athletic Trainers’ Perceptions,” by R. A. Zakrajsek, S. B. Martin, and C. A. Wrisberg, 2015, *Sport, Exercise, and Performance Psychology*, 4, p. 284. Copyright 2015 by American Psychological Association.

Winter and Collins (2016) go so far as to suggest that sport psychology has developed to the state of recognition as a distinct profession. Criteria for supporting this position are that sport psychology provides an important public service, has a knowledge-based underpinning, has organizational regulation, has a distinct ethical dimension, and has professional autonomy.

In reference to the individual technique of imagery, Gould, Voelker, Damarjian, and Greenleaf (2014) state, citing numerous study results, “research has clearly demonstrated the effectiveness of imagery as a sport psychological change mechanism” (p. 56) along with the caveat, “imagery is like any physical skill in that it requires systematic practice” (p. 77). Gould et al. (2014) further state, imagery is “an effective tool that—when combined with practice and commitment—can help athletes reach their personal and athletic potentials” (p. 78). Even the skeptic, Shermer (2000), acknowledges, “Countless experiments show that groups that receive physical and imagery training on a novel task do better than groups that receive only physical training” (Does Visualization Work? section, para. 2).

In another consideration of an individual technique, Ordonez, Schweitzer, Galinsky and Bazerman (2009a) acknowledge the widespread support for goal setting within the literature, “Goal setting is one of the most replicated and influential paradigms in the management literature” (Ordonez et al., 2009a, Abstract section). While challenging that goal setting is overprescribed and sometimes comes with harmful side effects, Ordonez et al. continue, “Hundreds of studies conducted in numerous countries and contexts have consistently demonstrated that setting specific, challenging goals can powerfully drive behavior and boost performance” (Ordonez et al., 2009a, Abstract section). Weinberg (2104) considered results of three meta-analyses regarding an aspect of Locke and Latham’s (2006) goal-setting theory that more challenging goals result in higher levels of performance than easy goals. Of the 192 studies Weinberg reviewed, 91% supported Locke and Latham’s theory. “Thus, the goal difficulty-specificity relations found in industrial setting provides one of the most consistent and robust effects in the social science literature” (Weinberg, 2014, p. 36).

Unfavorable. On the other hand, there are some who question whether sport psychology techniques actually work. Shermer (2000) considers “conducting a scientific evaluation of the effectiveness of psychological aids on athletic performance a messy business” (Introduction section, para. 7). Shermer questions whether anecdotal evidence of success of these techniques can be supported scientifically due to lack of a control group in many instances or influence of numerous outside variables that might impact results.

Shermer (2000) also challenges to what degree imagery works for athletes and perhaps more importantly, whether it works for all athletes. Shermer notes that based on imagery’s perceived success, many athletes engage in imagery during training and prior to competition. However, Shermer notes that for each gold medalist who benefited from the practice of imagery, there are many more gymnasts who fell off the balance beam or downhill skiers who did not make it down the hill (Shermer, 2000). Staunch supporters, Gould et al. (2014), also acknowledge the limitations of imagery by stating, “Individual athletes will differ in their ability to image. Imagery is not a magical cure for performance woes” (pp. 77-78). Gee (2010) provides another viewpoint in that an individual athlete can use sport psychology to minimize factors such as excessive anxiety or nervousness, self-doubt, and lack of concentration in order to ensure the athlete performs at maximum potential. While it will not make a poor athlete competitive or a decent athlete great, Gee suggests that the application of sport psychology could be a difference maker between two athletes of comparable maximum physiological capability, particularly with respect to precompetitive factors.

In contrast to Weinberg’s (2014) glowing comments regarding overwhelming support for Locke and Latham’s (2006) goal-setting theory noted previously, Ordonez et al. (2009a) challenge the claim of widespread benefits and suggest that “goal setting should be prescribed

selectively, presented with a warning label, and closely monitored” (p. 6). Ordonez et al. attribute goal setting as responsible for Sears, Roebuck and Company’s overcharging of customers, Enron’s collapse, and Ford Motor Company’s safety issues on its Pinto. To prevent overuse or inappropriate applications of goals, Ordonez et al. developed ten questions to consider before establishing goals, as noted in Table 5. Ordonez et al. (2009a) concluded, “Rather than dispensing goal setting as a benign, over-the-counter treatment for students of management, experts need to conceptualize goal setting as a prescription-strength medication that requires careful dosing, consideration of harmful side effects, and close supervision” (p. 14). Ordonez et al. (2009a) even suggested that companies use a warning label which states, “WARNING! Goals may cause systematic problems in organizations due to narrowed focus, increased risk taking, unethical behavior, inhibited learning, decreased cooperation, and decreased intrinsic motivation” (p. 14).

Table 5. Ten Questions to Ask Before Setting Goals

Question to ask before setting goals	Why is this important to ask?	Possible remediation
Are the goals too specific?	Narrow goals can blind people to important aspects of a problem.	Be sure that goals are comprehensive and include all of the critical components for firm success (e.g., quantity and quality).
Are the goals too challenging?	What will happen if goals are not met? How will individual employees and outcomes be evaluated? Will failure harm motivation and self-efficacy?	Provide skills and training to enable employees to reach goals. Avoid harsh punishment for failure to reach a goal.
Who sets the goals?	People will become more committed to goals they help to set. At the same time, people may be tempted to set easy-to-reach goals.	Allow transparency in the goal-setting process and involve more than one person or unit.
Is the time horizon appropriate?	Short-term goals may harm long-term performance.	Be sure that short-term efforts to reach a goal do not harm investment in long-term outcomes.
How might goals influence risk taking?	Unmet goals may induce risk taking.	Be sure to articulate acceptable levels of risk.
How might goals motivate unethical behavior?	Goals narrow focus. Employees with goals are less likely to recognize ethical issues, and more likely to rationalize their unethical behavior.	Multiple safeguards may be necessary to ensure ethical behavior while attaining goals (e.g., leaders as exemplars of ethical behavior, making the costs of cheating far greater than the benefit, strong oversight).
Can goals be idiosyncratically tailored for individual abilities and circumstances while preserving fairness?	Individual differences may make standardized goals inappropriate, yet unequal goals may be unfair.	If possible, strive to set goals that use common standards and account for individual variation.
How will goals influence organizational culture?	Individual goals may harm cooperation and corrode organizational culture.	If cooperation is essential, consider setting team-based rather than individual goals. Think carefully about the values that the specific, challenging goals convey.
Are individuals intrinsically motivated?	Goal setting can harm intrinsic motivation.	Assess intrinsic motivation and avoid setting goals when intrinsic motivation is high.
What type of goal (performance or learning) is most appropriate given the ultimate objectives of the organization?	By focusing on performance goals, employees may fail to search for better strategies and fail to learn.	In complex, changing environments, learning goals may be more effective than performance goals.

Note: From “Goals Gone Wild: The Systematic Side Effects of Overprescribing Goal Setting,” by L. D. Ordonez, M. E. Schweitzer, A. D. Galinsky, and M. H. Bazerman, 2009, *Academy of Management Perspectives*, 23, p. 13. Copyright 2009 by Academy of Management.

The caution from Ordonez et al. (2009a) resulted in significant debate with Locke & Latham (2009a, 2009b) in which journal articles served as the podiums. Although Ordonez et al. recognize that Locke and Latham (2006) identified potential pitfalls of goal setting, Ordonez et al.’s (2009a) critique claimed that Locke and Latham and other advocates for goal setting understate the seriousness of harmful side effects from goal setting. In response, Locke and Latham (2009a) claim that Ordonez and colleagues failed to adhere to expected practices of

behavioral scientists by demonstrating many counts of poor scholarship. Thus the debate extended from one of goal setting to also include what is considered proper scholarship with a response from Ordonez et al. (2009b). The scholarly match of positions seemed to end in an agreement to disagree based on publication of back-to-back papers critical of the other team in the Aug 2009 *Academy of Management Perspectives* (Ordonez et al., 2009c; Locke & Latham, 2009b). By virtue of Locke and Latham's article following that of Ordonez and colleagues, Locke and Latham appear to get the last word and summarize with, "recognizing that our disagreements are not small and we are not sanguine about the possibility of reconciliation" (Locke & Latham, 2009b, Abstract section).

Cognitive Enhancement Techniques Used in the Armed Forces

The Armed Forces recently began limited application of cognitive enhancement techniques, specifically within training programs for Army Special Forces, Navy Seals and Air Force Battlefield Airmen (Robson & Manacapilli, 2014). The Army has expanded adaptation of cognitive enhancement techniques into training programs at the U.S. Military Academy (Center for Enhanced Performance, 2017) and through references in Army-wide doctrinal documents (U.S. Army Training and Doctrine Command, 2014). This section provides summaries of each of these cognitive enhancement training programs and initiatives and includes two assessments by the RAND Corporation (Kelly, Masi, Walker, Knapp, & Leuschner, 2013) (Robson & Manacapilli, 2014).

The RAND Arroyo Center published a 2013 report on the Tactical Human Optimization, Rapid Rehabilitation and Reconditioning (THOR³) Program from the U.S. Army Special Operations Command (Kelly et al., 2013). The THOR³ Program began in 2010 with the objective of increasing physical and mental capabilities for soldiers within the U.S. Army

Special Operations Command (USASOC). The intent was the program would later spread elsewhere within the U.S. Special Operations Command (USSOCOM). The report found that the Army prefers to limit participants in the program to certain Ranger units whereas USSOCOM prefers to extend it to all USASOC soldiers. The program is almost completely decentralized, which the report notes as appropriate for strength and conditioning but perhaps inappropriate for the cognitive enhancement portion. One of the findings from the assessment is the benefits of centralizing coordinator development and cognitive enhancement oversight within the THOR³ headquarters staff. The RAND team found disconnects in THOR³ design and implementation during discussions with Colonels and Lieutenant Colonels. “This finding may indicate a lack of knowledge of cognitive enhancement on the part of the unit-level human performance program coordinators” (Kelly et al., 2013, p. xi). While facilities in general did not meet USSOCCOM standards, strength and conditioning materiel was adequate; however, there was no cognitive enhancement equipment fielded at the unit level. The “mind gym” sport psychology equipment costs over \$300,000 for a “small” 15,000 square foot facility and over \$500,000 for a “large” 40,000 square foot facility. Due to the prohibitively high costs of cognitive enhancement equipment and properly trained specialists for individual units, the study recommended that these expenses be funded at the THOR³ headquarters level. Regarding the training assessment, the USSOCCOM has a generic goal of 20% improvement in all aspects of performance from the THOR³ Program. RAND considers this goal unrealistic, partially due to a lack of tools to properly assess the broad set of specified cognitive enhancement capabilities which include resistance to combat stress, “enhanced observation and cognitive skills, mental toughness, intellectual ability, creativity, and cultural adaptability” (Kelly et al., 2013, pp. 49-50). The RAND report recommends, “USSOCOM should revise the assessment criteria, and develop

appropriate metrics, so that they correspond to best practices in high-level sports” (Kelly et al., 2013, p. xiv). The RAND report finds that “the logic behind the program’s design appears sound” (Kelly et al., 2013, p. xv) although implementation with respect to the cognitive enhancement portion of the program is severely lacking and would benefit from changes in structure in the form of less decentralization and greater oversight and involvement by the headquarters element, as well as from better training of program coordinators (Kelly et al., 2013).

The year following the RAND Corporation’s assessment of the THOR³ program, RAND’s Project Air Force division published a report on stress inoculation training for battlefield airmen, specifically addressing para-rescue (PJs) and combat control specialties, and compared Air Force training to comparable activities within the Army and Navy (Robson & Manacapilli, 2014). The RAND Project Air Force report acknowledged benefits of multi-level screening (general pre-screening, instructor observation, and self-removal by trainee) and identified a three phased approach for stress inoculation training: 1) educate airmen on forms of stressors, physiological and psychological responses to stress, and how those responses impact performance; 2) provide behavioral and cognitive skills training (e.g., attention and concentration, relaxation, overlearning/repetition, imagery rehearsal, and decision making and prioritization); and 3) exposure to stressful environments that simulate operational situations. The report found that while successful in preparing battlefield airmen in some areas such as application of screening measures, stress response education, and opportunities to practice performance under stressful conditions, the Air Force is lacking in providing the necessary behavioral and cognitive skill training, particularly outside of the ad hoc training the assigned psychologist provided to the para-rescue group of airmen (Robson & Manacapilli, 2014).

The RAND Project Air Force study went beyond assessing training the Air Force provides for battlefield airmen to also review training the Navy provides for SEALs and the Army provides for Army Special Forces. During Navy Special Warfare Preparatory School, a Master Chief instructs SEAL candidates on four cognitive/performance enhancing skills. The four pillars are: "... (1) goal setting and segmenting, (2) tactical visualization, (3) arousal control, and (4) self-talk" (Robson & Manacapilli, 2014, p. 22). In later training, SEALs learn focus and concentration techniques. Like the Air Force and Navy, the Army uses pre-screening, based on physical fitness and results from the Armed Services Vocational Aptitude Battery, to eliminate candidates who would likely be unable to handle the expected stressful situations. In addition, Army Special Forces learn skills similar to the Navy SEALs and also incorporate observation and feedback from psychologists and peers from field events and field-representative training. The five cognitive skills from the Army's curriculum include: "(1) building confidence, (2) goal setting, (3) attention control, (4) energy management, and (5) integrating imagery" (Robson & Manacapilli, 2014, p. 25). Table 6 provides a summary of RAND's Project Air Force findings across the services and identifies which of the cognitive skills taught to the para-rescue airmen match with those taught within the Navy to SEALs and within the Army to Special Forces.

Table 6.

Comparison of Skills to Optimize Performance Under Stress

Skill	Air Force PJs	Army Special Forces	Navy SEALs	Definition
Mental skills foundation	✓	✓		Understanding the relationship between performance and psychological states (e.g., thoughts, emotions)
Confidence	✓	✓		Focus on strategies to build, sustain, and protect confidence; a feeling of self-assurance
Goal-setting	✓	✓	✓	Focus on personally meaningful goals supported by core values; breaking larger objectives into manageable tasks
Attention control/ concentration	✓	✓	✓	Emphasis on understanding how attention works and how to control it to enhance focus and concentration
Energy/ arousal control	✓	✓	✓	Practical skills on managing arousal levels and the stress response to meet the demands of the situation and restoring energy
Imagery/ visualization	✓	✓	✓	Mental rehearsal of successful outcomes to build confidence and promote effectiveness
Self-talk	✓		✓	Internal dialogue to guide thoughts, emotions, performance, etc.
Compartment- alization	✓		✓	Dividing or segmenting adverse events or setbacks for later processing

Note: From “Enhancing Performance Under Stress, Stress Inoculation Training for Battlefield Airmen,” by S. Robson and T. Manacapill, 2014, p. 26, Santa Monica. Copyright 2014 by RAND Corporation.

The Armed Forces, particularly the Army, are also embracing cognitive enhancement outside of Special Forces. The 2014 U.S. Army Operating Concept: Win in a Complex World includes human performance optimization in a listing of technology focus areas and first principles (U.S. Army Training and Doctrine Command, 2014). The Army recognizes that “Advances in cognitive, behavioral, and learning sciences will improve critical thinking, increase cognitive and physical performance, foster intuition and social empathy, improve health and stamina, facilitate talent management, enhance leader training, and strengthen unit cohesion” (U.S. Army Training and Doctrine Command, 2014, p. 39). In addition, the United States Military Academy offers a Performance Psychology Program available to all cadets with a

mission to “educate and train cadets in performance enhancement techniques that foster their full development as leaders of character” (Center for Enhanced Performance, 2017, Mission section, para. 1). The program addresses how the interaction between the mental (thoughts and emotions) and the physical (anatomy and physiology) impacts human performance. The program has a foundation of five mental skills: building confidence, goal setting, attention control, energy management, and imagery. The program also addresses self-talk and stress management (Center for Enhanced Performance, 2017).

Chapter 3 – Findings

Introduction

The literature identifies a number of cognitive enhancement techniques used in sport psychology which might be applicable to training for acquisition professionals. This chapter provides a review of the most common techniques found to be: Goal Setting, Self-Talk, Imagery, Arousal Control/Relaxation, Attention Control/Concentration. This chapter also provides findings relative to whether these techniques are effective in general, how the Armed Services apply these techniques, whether these techniques apply to DoD acquisition professionals, and whether DoD should include the techniques in training for acquisition professionals.

Effectiveness of Cognitive Enhancement Techniques in the Sport Domain

Some of the works in the literature review address a particular study while others represent reviews and assessments of numerous studies. While the study by Carboni et al. (2002) did not support effectiveness of cognitive enhancement techniques, imagery in particular, the vast majority of the studies provided favorable results for the application of a single cognitive enhancement technique or multiple techniques in combination. For example Weinberg's (2014) compilation of goal-setting studies reflect over 90% support related to Locke & Latham's (2006) goal-setting theory. In addition, Zakrajsek et al. (2015) reported that approximately 75% of over 600 certified athletic trainers supported sport psychology consultants and related services. However, there are some skeptics. The following paragraphs address skeptical views from Shermer (2000).

Shermer (2000) states that many of the studies in the literature are questionable because the studies were based on survey results or lacked control groups. Shermer notes that there are

challenges in measuring effects of sport psychology techniques due to the lack of control groups and the difficulty in distinguishing cause – effect relationships with respect to athletic performance. According to Visser, Krosnick, and Lavrakas (2000), the use of surveys is a viable approach to scholarly studies, particularly among the social sciences and when coupled with more empirical studies. In addition to data from surveys, the sport psychology literature has extensive use of experimental results and incorporates control groups. Representative examples from the literature include Wulf and Su (2007) and Watters et al. (1997). Moreover, studies are using data collection approaches such as eye measurement devices and neuroimaging tools to better understand mental training applications (Janelle & Hatfield, Visual Attention and Brain Processes That Underlie Expert Performance: Implications for Sport and Military Psychology, 2008). For example, Janelle and Hatfield report of a stress – performance study in which measured increases in brain activity matched reported increases in anxiety and decreases in confidence. Thus, while Shermer's assertion that measurement challenges exist is fair, there are multiple examples that contradict Shermer's claim that results are based on invalid surveys or are lacking control groups or empirical data.

Shermer (2000) also raises an interesting, though anecdotal, point that for every Olympic medalist who used the imaging technique, there are many other Olympians who also employed the technique but were not as successful. One counter to Shermer's position is that while most elite athletes might attempt to apply cognitive enhancing techniques to obtain any possible advantage over other competitors, sport psychology techniques are not sufficient within themselves to overcome major differences in athletic ability (Gee, 2010). Research by Ploszay et al. (2006) provides a qualitative counter to Shermer's idea by demonstrating the effective use of imagery with empirical results published in a scholarly journal. Furthermore, results by Taylor

et al. (2008) contradict Shermer's general claim by finding that all Olympians do not use techniques the same in practice or competition and that there were indeed significant differences between medalists and non-medalists in the application of psychological techniques. In addition, a survey by Zakrajsek et al. (2015) of a large number of certified athletic trainers resulted in over three-fourths stating they would encourage athletes to use sport psychology consultants. This is quite an endorsement since the trainer is responsible for helping prepare athletes for competition at each athlete's highest possible level – and likely the trainers' jobs depend to some degree on the performance and ongoing improvement of the athletes they support.

Thus, the literature provides ample evidence of favorable results through the use of cognitive enhancement techniques, as well as the existence of counter arguments to skeptics. As a result, the question remains of whether athletes experience difficulty in obtaining the desired effects from cognitive enhancement techniques. In some cases, adopting one or more of these techniques might be rather simple. For example, *Industry Week* included a short article by Verespej (1994) intended to provide a simplified summary of Benson's Relaxation Response technique to benefit the casual reader who might need to relax. Verespei (1994) states, "Pick a word, sound, or phrase you like, then sit in a comfortable position, close your eyes, and breathe slowly and naturally for 10 to 20 minutes, silently repeating the word or phrase you've chosen each time you exhale" (para. 1). However, Tenenbaum et al. (2008) note that "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" (p. S24). Thus, the literature suggests that cognitive enhancement techniques are effective and that the application of the techniques might range on a continuum between easy and elaborate depending on the technique, the performer, and the task at hand.

Cognitive Enhancement Techniques Used in the Armed Forces

The degree to which the Armed Forces have embraced cognitive enhancement techniques, and the effectiveness of those programs, can be a factor in whether the Department of Defense would be willing to consider incorporating cognitive enhancement techniques into training for acquisition professionals. A recent example of this leader-follower relationship is the development of the Civilian Education System with tiered, grade appropriate leadership training comparable with leadership training officers receive during their career progression (Office of the Chief of Public Affairs, 2015). Similarly, supervisors now provide Senior Rater Potential Evaluations annually for all Army Acquisition Workforce civilians as has been done for some time as part of evaluations of members of the Armed Forces (U.S. Army Acquisition Support Center, 2017).

The broadest endorsement of cognitive enhancement techniques within the Armed Forces comes from the 2014 U.S. Army Operating Concept: Win in a Complex World. This document reflects a desire to leverage progress in the social (i.e., cognitive, behavioral, and learning) sciences to help improve soldier performance. The Army Operating Concept lists human performance optimization among its technology focus areas and first principles (U.S. Army Training and Doctrine Command, 2014). In a less philosophical and more direct implementation of cognitive enhancement techniques, the United States Military Academy offers a Performance Psychology Program available to all cadets. The program addresses essentially the same cognitive enhancement techniques considered in this study. The program's website references goal setting, self-talk, imagery, and attention control directly and its energy and stress management activities are likely comparable to this study's terminology of arousal control/relaxation (Center for Enhanced Performance, 2017). Another Army effort promoting

cognitive enhancement techniques is the Comprehensive Soldier and Family Fitness program.

Vergun (2014) attributes the following remarks about the program to Lieutenant General Robert Brown, made during an address to the Association of the United States Army's Institute of Land Warfare Medical Forum, "Developing one's concentration skills, visualization and goal-setting really works and makes an 'unbelievable difference,' in cognitive and emotional well-being" (Vergun, 2014, third from last paragraph).

The Marine Corps is also exploring how advances in cognitive enhancement can benefit Marines. Marine Corps University Research Topic Nominations for 2013-2014 include "Cognitive and Physical Augmentation, the Future Marine" as one of its topics to foster "development of bionic, cyborg, mental enhancement, and telepathic capabilities" (Schendler and Trahan, 2013, Topic Description section, para. 1). The Marines followed-up with a less aggressive and more realistic 2014-2015 topic of "Warfighter Performance" focusing just on cognitive skills, which are supported by the sport psychology literature as currently available, and eliminating the more futuristic bionic, cyborg and telepathic capabilities (Simcock, 2014).

The Armed Forces are beginning to more broadly embrace training of cognitive enhancement techniques, as evidenced by Army initiatives and Marine Corps interests. However, two recent RAND Corporation assessments of the Armed Services' programs present conflicting viewpoints. The 2013 assessment of the U.S. Army Special Operations Command's THOR³ Program finds that the cognitive enhancement portion is poorly implemented (Kelly et al., 2013). Alternatively, the 2014 assessment of stress inoculation training for Air Force battlefield airmen with a comparison to Navy SEAL and Army Special Operations training shows a considerable degree of effective cognitive enhancement training among the Services (Robson & Manacapilli, 2014).

The THOR³ Program includes cognitive enhancement as part of its total human performance improvement effort; however, the 2013 RAND report found little evidence of implementation. The RAND Corporation's assessment identifies issues of over-decentralization, lack of well-defined requirements, and high costs of sport psychology specialists and cognitive enhancement equipment (Kelly et al., 2013). Another limiter to the cognitive enhancement portion of the program could be related to program focus or priorities and leader and soldier acceptance. The only mention of cognitive enhancement in an article by Ragusa (2012) on the THOR³ Program in *Government Recreation and Fitness* is that the teams include sport psychology specialists. The article also states that kits developed to be sent with the warfighter included many strength and conditioning aids but nothing for cognitive enhancement (Ragusa, 2012). Perhaps not mentioning cognitive enhancement tools is an oversight on the part of the writer, but not having cognitive enhancement tools in the kits might be attributed to the THOR³ Program leader being a strength and conditioning expert and perhaps emphasizing the physical over mental aspects of the program. Gee (2010) reports a perceived stigma among some athletes and coaches that "equate sport psychologists with other mental health professionals" (p. 388) as a reason that some athletes avoid instruction from sport psychologists. Similarly, a barrier to acceptance of psychological techniques due to a perception of weakness or associated career limitations related to receiving psychiatric help might affect leadership buy-in or soldiers' acceptance of the cognitive portion of the THOR³ Program.

Counter to the lack of implementation of cognitive techniques in the THOR³ Program, a 2014 RAND Corporation assessment found that each of the Services use cognitive enhancement techniques to help optimize Army Special Forces, para-rescue battlefield airmen and Navy SEALs performance under stress (Robson & Manacapilli, 2014). Common techniques used

among the three Services, as shown in Table 6, are goal setting, attention control/concentration, energy/arousal control, and imagery/visualization. In addition, two of the three Services employ mental skills foundation, confidence, self-talk, and compartmentalization.

The two RAND Corporation assessments are indeed contradictory. Since the latter assessment did not reference the prior, the reasons for the different findings are unknown. Regardless of the assessments' findings regarding the degree of implementation of cognitive enhancement elements of the programs, both assessments supported the goals and objectives of the programs and provided recommendations for broader application. The 2014 assessment found that the Air Force did a better job of stress inoculation training with the para-rescue airmen and should extend that level of training to all battlefield airmen, while also incorporating best practices from the Navy and the Army, (Robson & Manacapilli, 2014). Likewise, Kelly et al. (2013) in the 2013 assessment provided this final observation:

The Army should consider conducting further research into a THOR³-like program for reserve-component forces, along with longitudinal research and assessments of how such an initiative could be more useful to broader communities of interest (such as the military medical community and the U.S. Army in general). (p. 62)

Transfer of Cognitive Enhancement Techniques to the Acquisition Domain

The literature confirms that cognitive enhancement techniques can be effective, particularly within the sport domain, and that the Services are at least beginning to endorse the techniques. Thus, this study next considers whether the techniques are transferable from sport, Armed Forces or general psychology domains to the specific domain of DoD acquisition professionals. A special issue of *Military Psychology* explored the relevance of the sport

sciences to learning and performance in the military. Fiore, Hoffman, and Salas (2008) found that “There are potentially far-reaching implications of findings from the sport sciences for other disciplines” (S156). However, Fiore et al. (2008) admit, “Indeed, the bane of researchers in countless domains is the continuing question of ‘yes, but does it generalize to...?’” (p. S156).

Several articles within the literature answer this question by pointing out that these techniques are generally applicable across many domains. Fiore and Salas’ (2008) introduction to the special issue of *Military Psychology* suggests that there might be overlaps in cognitive and other factors that contribute to expert performance among separate domains of study such as chess, music, art, weather, medicine, sport, law enforcement, military, etc. Based on the breadth of this list, the overlap Fiore and Salas reference could likewise extend to numerous other domains including acquisition professionals. Tenenbaum et al. (2008) had similar findings noting that not just athletes, but most everyone, an office worker giving a presentation for example, might use techniques such as self-talk, mental imagery, goal setting and controlled breathing for self-regulation. Similarly, Beauchemin (2014) found “the theme of generalizing the mental skills beyond athletics emerged, as student-athletes identified a variety of ways that they utilize these techniques in other aspects of their lives” (p. 276). Another study found, “Although research on implicit theories originated within an academic context, scholars have extended the theory to additional achievement domains, such as athletics, weight management, and leadership” (Burnette et al., 2012, p. 2).

A primary reason cognitive enhancement techniques extend across multiple domains is that most domains have many commonalities that can serve to inhibit or improve performance depending upon the response of the performer. Jones (2009) notes many similarities between sport and the business world:

Elite sports is a powerful metaphor for business, and there are some striking parallels. Fierce competition, winning by sometimes the smallest margins, achieving goals and targets, establishing long-term and short-term strategies and tactics, hard work, perseverance, determination, teamwork, dealing with success and recovering from failure and setbacks-those are all key challenges in both worlds. (para. 3)

Jones (2009) continues that both athletes and business people must continuously improve performance and develop mental toughness. Jones suggests that managers develop positive and resilient mindsets as each progress toward the top and attempt to stay there. Jones (2009) also recommends managers celebrate even small victories along the way, as do athletes, to help “to remind them why all of the hard work and commitment is worthwhile” (para. 8).

Tenenbaum et al (2008) list five situational variables that can be causes for stress which could lead to choking under pressure: “competition, reward contingency, punishment contingency, ego relevance, and the presence of others” (p. S29). This discussion appears in the special supplement of *Military Psychology* relating aspects of sport psychology which are applicable to the military. Tenenbaum et al. note that both athletes and soldiers must operate in stressful situations. Fiore and Salas (2008) find that “research on situation awareness in military outlets is remarkably similar to many sport psychology papers on anticipation, perceptual-cognitive skills, and tactical decision-making” (p. S5). Ward et al. (2008) also identified commonalities between military and sport domains: “(a) perform in a complex and dynamic environment; (b) utilize a combination of perceptual, cognitive, and motor skills; (c) obtain a tactical advantage over their opponent; (d) act upon partial or incomplete information evolving

over time; (e) work both independently and as a team in an effective manner; and (f) operate under stressful circumstances” (p. S86).

In addressing these parallels, athletes and business people, soldiers and acquisition professionals, and other domains encounter some of the same challenges and opportunities with respect to: goal setting, focus, decision making, adversity, emotional control, confidence, resilience, choking under pressure, practice, competition, stress, anxiety, doubt, internal motivation, etc. By way of example, all domains have the opportunity to set goals whether a sprinter attempting to improve a 100 meter dash time, an individual attempting to lose 20 pounds before summer, or a contract specialist trying to process contract actions one day faster on average. Similarly, most all domains face pressure, stress and anxiety such as an Olympian performing in front of a television audience, a soldier potentially being shot during a fire fight, and a program manager briefing a senior executive where billions of dollars and lives are at stake with a programmatic decision. Regarding focus, a swimmer can lose a race even before hitting the water by failing to focus and respond to the starting signal, a quarterback can miss an open receiver by focusing too much on the primary target, an engineer can make a mathematical error in a critical calculation by allowing distraction to disrupt a continuous train of thought. Researchers have found that the application of cognitive enhancement techniques help mitigate the challenges (such as coping with stress) and enhance the opportunities (such as building confidence). For example Tenenbaum et al. (2008) summarized findings from Hardy, Jones and Gould’s 1996 book, *Understanding psychological preparation for sport: Theory and practice of elite performers*, which identify self-talk, mental imagery, goal setting, and relaxation as the four basic psychological skills athletes use for self-regulation (action to remove differences between a person’s current state and desired state). Tenenbaum et al. (2008) add, “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” (p. S23).

Another reason cognitive enhancement techniques extend across multiple domains is that members of all domains have a common element, a brain which consists of generally the same architecture for all healthy people. People have different personalities. People have different experiences and levels of education. Some people are more creative while others are more analytical. Regardless, none of the literature reviewed during this study reported findings on the impact of cognitive enhancement techniques that depended upon the participants’ intelligence quotient or other brain performance parameters. Thus, by not conducting studies on the effects of sport psychology cognitive enhancement techniques as a function of personality or intellect, the studies to date suggest that cognitive enhancement techniques work within healthy brains independent of person to person brain differences. The following paragraph provides an example.

Rock and Schwartz (2006) in *The Neuroscience of Leadership* point out that researchers have a much better understanding of “human nature and behavior change because of the integration of psychology (the study of the human mind and human behavior) with neuroscience (the study of the anatomy and physiology of the brain)” (para. 3). In addition, Rock and Schwartz point out that brain imaging devices such as positron emission tomography, commonly known PET scans, have helped reveal the nature of neural connections within the brain. An understanding of these connections has helped “researchers develop an increasing body of theoretical work linking the brain (the physical organ) with the mind (the human consciousness that thinks, feels, acts, and perceives)” (Rock & Schwartz, 2006, para. 3). For example, Rock and Schwartz state as fact that neuroscience helps explain why our expectations shape reality and

that attention density, repeated focusing on the same topic, causes new neural connections to form. Thus, cognitive enhancement techniques such as self-talk and imagery can now be understood to be effective, not by what might be considered as anecdotal feedback or questionable data due to the challenge of the measurement, but because the repetition of the techniques helps change how the brain functions by generating new neural connections and changing the person's mental maps of theories, expectations and attitudes.

In summary, the literature supports that cognitive enhancement techniques are effective in the sport domain and are embraced to a degree by the Armed Forces. The techniques are transferable to the acquisition domain, and more generally to most all domains based on neurological commonalities and due to facing a similar set of challenges and opportunities which can be impacted by use of the techniques. The study next considers which of the cognitive enhancement techniques considered (goal setting, self-talk, imagery, arousal control/relaxation, and attention control/concentration) merit inclusion in training for acquisition professionals.

Goal Setting Discussion

Goal setting is perhaps the most portable cognitive enhancement technique, according to Weinberg (2014), whether to the domain of acquisition professionals or elsewhere. Weinberg observed through a comprehensive review of the literature, including theoretical and empirical results that proper goal setting can result in improved performance and personal growth. Weinberg's review covered both the sport domain and industrial settings. Actually, more research has been performed and over a longer period in the industrial and organizational domain than in sport psychology. Regardless of whether the basic principles originated and developed in the industrial or the sport domain, the literature supports goal setting as an appropriate tool for acquisition professionals to use.

While noting that different individuals, task-oriented vs ego-oriented for example, will best respond to a different set of goals, Weinberg (2014) was able to compile a set of goal-setting principles which are listed in Table 7. Despite opposition from Ordonez et al. (2009a), Locke and Latham's (2006) position that specific, challenging goals lead to improved performance forms the basis for this list. While these principles are broadly applicable, Weinberg (2014) points out that "The effectiveness of any goal-setting program relies in large part on the interaction of the coach, exercise leader, or sport psychologist and on the motivations of the specific participants" (p. 50).

Table 7.

Goal-Setting Principles

Goal-Setting Principles

1. Set specific goals.
2. Set realistic but challenging goals.
3. Set both long- and short-term goals.
4. Set goals for practice and competition.
5. "Ink it, don't think it."
6. Develop goal achievement strategies.
7. Set performance and process goals.
8. Set individual and team goals.
9. Provide support for goals.
10. Provide for goal evaluation.

Note: From "Goal Setting in Sport and Exercise," by R. Weinberg, 2014, *Exploring Sport and Exercise Psychology*, Third Edition, p. 37. Copyright 2014 by the American Psychological Association.

Self-Talk Discussion

Self-talk is broadly applicable to multiple domains and exists in multiple forms according to the literature, such as Helmstetter (1982) and Rogleberg and Justice (2103). The literature offers examples of simple self-talk studies of novices in sport situations, assessments of elite

Olympic competitors, and more elaborate studies of written self-talk from business executives. Multiple sets of researchers found that simple positive self-talk phrases such as “I can ...” or “You can do it” lead to significantly better performance compared to negative self-talk or control groups (Hatzigeorgiadis, et al., 2004; Van Raalte & Brewer, 1995). Likewise, executives who used constructive or positive self-talk in letters to their future selves received higher evaluations on leader effectiveness and reported lower job strain (Rogelberg & Justice, 2013). Taylor, et al. (2008) found that “self-talk and emotional control made the most significant contributions to the separation between” (p. 30) medalists and non-medalists regarding practice habits for the 2000 Olympics. In addition, medalists reported higher self-talk and lower negative thinking scores with respect to competition strategies compared to non-medalists. When used to improve perceptions of self-efficacy, self-talk can lead one to set more lofty goals and have greater confidence, motivation and commitment toward completing those goals (Bandura, 1997). Based on these findings and since self-talk is already multidisciplinary in use in organizations, education, sport and clinical psychology (Rogelberg & Justice, 2013), self-talk is the second cognitive enhancement technique that should be included in acquisition professional training.

Trainers have a variety of types and levels of self-talk from which to choose in developing a curriculum. *What to Say When You Talk to Your Self* provides various methods for implementing self-talk and levels of self-talk (Helmstetter, 1982). Hardy and Oliver (2014) provide six dimensions of self-talk. Self-talk can be: overt, audible, instructional self-talk as Serena Williams successfully employed between games in helping her defeat her sister in the 2002 Wimbledon ladies’ singles championship match (R. Williams, 2002); covert, internal, motivational self-talk one might use to begin the day on a positive note (Helmstetter, 1982); or assigned cue words as made famous by 2016 University of Western Michigan coach P. J. Fleck

as he repeated the “Row the Boat” mantra which helped propel the team to an undefeated regular season (Frederick, 2017). An acquisition professional might use self-talk in the form of “I am well prepared” to gain confidence leading up to a presentation. A proposal evaluation team might use the cue word “evaluate” to remind the team that reports should be thorough, clear and quickly prepared so that the team members can return soonest to regular duties. Regardless of the type or level, acquisition professionals should receive instruction on effective use of positive self-talk.

Imagery Discussion

The literature has many studies related to imagery to improve performance of athletes’ motor skills as well as applications in non-athletic domains. Though not in all cases (Carboni et al., 2002), most of the studies showed that use of imagery resulted in improved performance. For example, accuracy of putts improved for golfers following imagery interventions (Ploszay et al., 2006). Likewise, undergraduate non-basketball players improved free throw shooting with the aid of imagery equally to those students who benefited from additional actual free throw shooting practice (Firstenberg & Rubinstein, 2014). In non-sport applications, a group with snake phobias improved in approach behavior after an imagery intervention equally to those who witnessed a demonstrator modeling the approach behavior using a live snake (Minor, 1984). Likewise, spelling bee participants showed improvement from mental imagery equal to improvements from other groups using visual imagery (Sears & Johnson, 1986).

From a performance perspective, the literature suggests that imagery can be a valuable substitute for actual training, whether for sport or non-sport applications; however, use of imagery does not necessarily improve performance beyond other forms of actual practice (Firstenberg & Rubinstein, 2014; Minor, 1984; Sears & Johnson, 1986). Regardless, the

portability of imagery use (for example on a bus or plane going to a competition or meeting, or when actual training sessions are cancelled due to weather or other conflicts) and the potential for lower cost training or for additional repetitions while awaiting training opportunities are compelling for including imagery in training for acquisition professionals. Use of imagery can have additional benefits that are indirectly related to performance improvement. Tenenbaum et al. (2008) credit use of imagery to have positive effects on determination, motivation, self-confidence, as well as arousal control and relaxation. Firstenberg & Rubinstein (2014) credit imagery use for triggering positive physiological effects such as increases in dopamine, serotonin, and testosterone and decreases in cortisol and adrenaline. In summary, the literature supports including imagery as part of the core set of cognitive enhancement techniques taught to acquisition professionals.

Gould et al. (2014) provide recommendations for using imagery. Gould et al. suggest that imagery users receive basic imagery education for general awareness and to set realistic expectations. For example, imagery use is not a “quick-and-easy solution to complex performance problems. In reality, however, developing and refining imagery skills require the same systematic practice as physical skills” (Gould et al., 2014, p.73). Gould et al. further suggest that imagery users involve all senses for more vivid imagery, make images positive and self-enhancing, have both internal and external perspectives, couple imagery with relaxation, apply imaging techniques during practice and competition, and maintain imagery journals (Gould et al., 2014).

Arousal Control/Relaxation Discussion

The Yerkes-Dodson Law is one of the oldest laws in psychology according to Waters et al. (1997). The law, also known as the inverted-U hypothesis, holds that performance increases

as the performer's level of arousal increases from an under-aroused state toward the optimally aroused state; however, further increases in arousal level into the over-aroused state will result in a performance decrease (Kidd, 2017). Tanenbaum et al. (2008) point out in a discussion of Individual Zone of Optimal Functioning that the optimum zone or arousal level not only varies sport to sport but also among athletes in the same sport. Gee (2010) summarized the impact as, "what constitutes too much or too little anxiety is usually task specific and individualized" (p. 393). Since the proper arousal level is necessary for optimum performance and since ideal arousal level varies person to person and situation to situation, the DoD should include arousal control in training programs for acquisition professionals. While being under- or over-aroused results in less than maximum performance, Gee (2010) suggests that over-arousal, particularly due to anxiety, tends to be the greater issue. Thus, the DoD training for acquisition professionals should emphasize relaxation and other techniques that address anxiety.

A coach, supervisor or peer who recognizes some external cues from the performer such as fidgeting, dispiritedness, redness in the face, sweating, or slothfulness could help provide motivation or a calming word; however, that person would have to understand the performer's optimum arousal level for the task at hand. Since each performer is different, two performers about to do the same activity, one extremely calm and the other clearly energized, could both be at their individual optimum arousal levels. While someone else can intervene in order to influence arousal level, this study, and most of the literature, focuses on the performer's self-awareness with respect to arousal control and use of relaxation techniques (Gee, 2010; Neil & Thomas, 2014). Kidd (2017), using a sport context, provides some practical advice, as shown in Table 8, for determining whether the performer is optimally, under-, or over-aroused.

Table 8.

How a Performer Might Feel at Different Levels of Arousal

Condition	The performer might ...
Under-Aroused	feel distracted, be physically ill at ease, feel tired, engage in social distractions, feel more like a spectator than a participant, deviate from planned activities, feel over-confident
Over-Aroused	experience feelings of inadequate preparation, feel uncomfortable, feel overwhelmed, fidget, experience excessive stomach activity, have last minute drama or concerns about a previous injury or the opposition
Optimally Aroused	feel positively excited about the event or training session and its outcome, feel in control, have generated a history of good progress up to this point, be in a pleasant environment or conditions to race or train in, have a plan and the sufficient time to execute it

Note: Adapted from “Maximize Performance Through Controlling Your Arousal Level,” by S. Kidd, 2017, retrieved from <https://breakingmuscle.com/learn/maximize-performance-through-controlling-your-arousal-level>, section heading “Reaching the Optimum Level of Arousal.”

The following cases provide some examples in which an under-aroused athlete, warfighter, or acquisition professional might need to elevate arousal level in order to achieve optimal performance. Janelle and Hatfield (2008) state, “Very high levels of arousal may be beneficial when dealing with gross motor challenges (e.g., fighting a saber-toothed tiger)” (p. S60). In another example, a linebacker in football in a short yardage situation might need to elevate arousal level to be fully prepared for the anticipated violent collision about to occur. Like the linebacker or tiger fighter, a soldier entering a close combat situation might also need to elevate arousal level in order to be optimally prepared. Acquisition professionals can also face situations where elevating arousal to reach the optimum level is necessary, even when the task at

hand does not present a gross motor challenge. For example, a project leader with a calm disposition might need to become more energized and be more charismatic in motivating the project team.

On the other hand, Browne and Mahoney (1984) state that the “ubiquitous problem in athletics is coping with pressure of competition which usually results in anxiety and heightened arousal levels” (p. 613). Browne and Mahoney add that if the anxiety leads to over-arousal, performance could suffer due to increased mental distraction and muscle tension. In these cases, the performer would need to reduce arousal levels. For example, a figure skater nearing competition or a gymnast preparing for a balance beam routine might experience a lack of focus and concentration as well as degraded fine motor skills in this condition. Similar to the gymnast or figure skater, a marksman about to attempt a precision shot against an adversary might also feel anxious and choose to use a breathing technique, as taught to soldiers in basic combat training at Fort Sill (Crawley, 2016), to achieve a lower, more optimal arousal level. An acquisition professional can also face situations such as important briefings, challenging negotiations, or difficult or sensitive conversations in which adrenaline or nervousness levels can increase beyond the person’s ideal arousal level for that engagement. While muscle tension might be somewhat less of an issue for acquisition professionals compared to figure skaters and snipers, a laser pointer’s focus moving aimlessly on a screen due to a quivering hand during a critical presentation could cause decision makers to have a lack of confidence in the presenter and the message. Such a performance could place both the program and the presenter’s career advancement at risk.

As controlling anxiety is crucial, perhaps the training approach for acquisition professionals should leverage RAND Corporation’s recommended stress inoculation training

phases for Air Force battlefield airmen: 1) identify likely sources of stress, how the mind and body respond to stress, and how that response impacts performance; 2) teach relaxation techniques and other skills which aid performance in stressful situations; and 3) provide training that simulates the stressful environment (Robson & Manacapilli, 2014). One relaxation technique, shown in Figure 6, is a simplified version of the technique Benson developed which Walsh (2011) credits with lowering stress, anxiety, heart rate, and blood pressure when applied twice daily for about 10-20 minutes per session.

Figure 6. Benson Relaxation Response

Be in a comfortable position.

Pick a word, phrase, sound, or prayer. You will say this to yourself every time you exhale.

When inhaling, breathe in slowly and through your nose.

Other thoughts will come to mind; that is fine. Re-focus your attention to your word, phrase, sound, or prayer, and those thoughts will pass.

Figure 7. Steps in the Benson Relaxation Response. From “The Relaxation Response: A Strategy to Address Stress,” by A. E. Walsh, 2011, *International Journal of Athletic Therapy & Training*, p. 22.

Attention Control/Concentration Discussion

Much of the sports psychology literature in the area of attention control and concentration relates to applications in dynamic physical environments such as tennis, baseball or race car driving and how the performer deals with distractions (Janelle & Hatfield, Visual Attention and

Brain Processes That Underlie Expert Performance: Implications for Sport and Military Psychology, 2008) or internal vs. external foci such as controlling the trajectory of a golf ball (Wulf & Su, 2007). Faubert and Sidebottom (2012) assert, in a study of perceptual-cognitive training, “One of the most formidable tasks for the brain of an athlete during game play is to perceive and integrate complex moving patterns while allocating attentional resources in different key areas of the dynamic scene” (p. 85). Although acquisition professionals do not face comparable dynamic physical environments, these program managers, financial analysts, engineers, logisticians, contracting officers, and others, face highly dynamic cognitive environments. Such an environment includes constant changes to requirements, individuals within stakeholder organizations, rules and regulations, organizational leadership and support personnel, policies and guidance, budgets, perceptions, and agendas. Thus, acquisition professionals must also be able to focus on tasks to deliver quality products within assigned periods of time. In addition, acquisition professions must deal with distractions such as noise sources, interruptions, personal issues, and a never ending influx of e-mail. As a result, the DoD should include attention control/concentration techniques in training for acquisition professionals.

Outside of the sport domain, the literature supports training for increased concentration. Wolfgramm, Suter and Goksel (2016), for example, found in a study of sixth graders that “concentration can be trained by self-regulation exercises [such as computer based training], as it is necessary to suppress impulses in order to concentrate” (p. 40). Likewise, Mozolic’s (2007) preliminary a 65-75 years old have better concentration, found that “attention training is a potential way to improve sensory processing by reducing susceptibility to distracting stimuli” (p. 11). In contrast to attempting to block out disruptions, clinical psychologist Lipson (2015) finds

that a person can improve focus by accepting that the mind will wander rather than attempting to prevent the wandering. Lipson identifies a repetitive four phase process a worker goes through when attempting to focus: 1) choosing to focus on a certain task, 2) the attention wanders, 3) recognizing the mind has wandered, and 4) choosing to return to focus on the task. Lipson states that by merely acknowledging each phase of this process each time through the loop, the worker will stay focused longer, wanderings will be less far from the chosen focus, and recognition of the wandering and return to focus will happen quicker.

Other non-sport studies involved an anxiety tests and an attention tests of university students prior to an exam. Fernandez-Castillo and Caurcel (2015) found that students with lower levels of anxiety had higher levels of attention and concentration. Thus there appears to be a linkage between arousal control/relaxation to address anxiety and attention control/concentration. Howland (2006) also acknowledged the relationship between arousal control and attention control: “the right level of arousal has a strong impact on attention and emphasizes the need to train coaches and other professionals to understand both arousal and attention” (Arousal section, para. 7). Howland (2006) went as far as to prepare a seminar with workbook to teach both coaches and athletes how to focus attention, manage arousal, and understand mental skills such as “self-awareness, relaxation, self-talk, visualization, and attention-control” (Implementation of the Plan section, para. 3). Similarly, Collins, Dansereau, Garland, Holley, and McDonald (1981), in a study of concentration and test anxiety, found that the combination of relaxation and self-talk, though not either on by itself, resulted in significantly higher test scores compared to the control group. As a result, trainers can be assured that attention-control and concentration training is complementary with previously discussed training of goal setting, self-talk, imagery, and arousal control/relaxation techniques for acquisition professions.

Chapter 4 – Conclusions & Recommendations

Conclusion

This research examined the literature to explore whether cognitive enhancement techniques used in sport psychology are applicable to acquisition professionals, and if so, which of the techniques the DoD should include in acquisition training. The assessment focused on the most common of these sport psychology techniques identified in the literature: Goal Setting, Self-Talk, Imagery, Arousal Control/Relaxation, and Attention Control/Concentration. The literature provides evidence that cognitive enhancement techniques are effective in the sport domain. In addition, the Armed Forces are embracing these techniques through inclusion in training for Special Forces, in courses at the U.S. Military Academy, in research topics generated by the Marine Corps, and in forward looking documents such as the U.S. Army Operating Concept. The cognitive enhancement techniques work within the common brain structure of members of all domains and apply to challenges and opportunities that are shared among sport, Armed Forces, acquisition and other domains. As a result, the literature supports application of the cognitive enhancement techniques from sport and general psychology to acquisition professionals.

Recommendations for Training

The training community should develop coursework to teach goal setting, self-talk, imagery, arousal control/relaxation, and attention control/concentration techniques to acquisition professionals. Locke and Latham's (2016) goal-setting theory and Weinberg's (2014) ten goal-setting principles could form the basis for the goal-setting training. Hardy and Oliver's (2014) listing of six dimensions of self-talk could form the structure of a self-talk course with theoretical underpinning from Bandura's self-efficacy theory (Bandura, 1997). Helmstetter's (1982) *What*

to Say When You Talk to Your Self could be a source for specific instructions on implementing self-talk. Trainers could leverage guidelines and recommendations for imagery use from Gould et al. (2014). The training for arousal control should provide a general understanding that optimum performance occurs at an ideal arousal level and that the ideal level is unique to both the person and the task. Kidd (2017) provided a list of indicators of under-, over- and ideally aroused, reference Table 8, which trainers could use provide to performers as a self-awareness tool. The arousal control training should include techniques the performer can use to either elevate or reduce arousal level. For example, course developers should consider The Benson Relaxation Response (Benson & Corliss, 2004) for inclusion in relaxation training or to lower arousal levels, particularly as created by anxiety. Training for attention control/concentration to overcome disruptions or anxiety could be computer-based (Wolfgramm et al., 2016), simple games (Mozolic, 2007), a combination of mental skills (Collins et al., 1981), or even Lipson's (2015) process in which the person anticipates, rather than actively suppress, disruptions and wondering of the mind.

Recommendations for Future Research

This study addresses only a few of the most widely accepted cognitive enhancement techniques based on sport psychology. There are many other potential psychological techniques that could be explored for cognitive enhancement beyond those from sport psychology. For example, Bostrom and Sandberg (2009) identify some other “forms of mental training, such as yoga, martial arts, meditation, and creativity courses” (Introduction section, para. 5) as well as nutrition and exercise programs that could be considered in future research.

While most of these techniques are intended to be applied to an individual for performance improvement, future research might explore cognitive enhancement at the team

level. For example, Eccles and Tenenbaum (2007) note, “in the extant research on cognitive aspects of sports performance, little attention has been paid to interaction between an individual’s cognition and the social processes and setting associated with the team environment” (p. 265).

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Acronyms

%	Percent
ATC	Certified Athletic Trainer
Avg	Average
DAT	difficult alphabetical test
DNT	difficult numerical test
DoD	Department of Defense
EAT	easy alphabetical test
EEG	electroencephalography
ENT	easy numerical test
MRI	magnetic resonance imaging
PJs	pararescue airmen
PET	positron emission tomography
SEAL	Sea, Air and Land
THOR ³	Tactical Human Optimization, Rapid Rehabilitation and Reconditioning
U.S.	United States
USASOC	United States Army Special Operations Command
USSOCOM	United States Special Operations Command
vs.	versus