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Validity and Reliability of the

Ottawa Mental Skills Assessment Tool (OMSAT-3)

by
Natalie Durand-Bush

THESIS

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ABSTRACT

The Ottawa Mental Skills Assessment Tool (OMSAT) was devised by Salmela and colleagues (1992) to measure a broad range of athletes' mental skills. Bota (1993) empirically tested the first and second versions of the OMSAT and recommended that the instrument be further revised. The purposes of this study were to create an enhanced version of the OMSAT (OMSAT-3), assess its psychometric properties, and determine the relative importance of each mental skill presented in the inventory. The OMSAT-3 was comprised of 85 questions, six of which measured social desirability, and 12 mental skills scales that were regrouped under the following three broader conceptual components: foundations skills, affective skills, and cognitive skills. It was administered to 462 individuals, however only 335 athletes' (175 males and 160 females) scores were included in the analysis. Subjects came from various sports, with hockey, soccer, water polo, basketball, swimming, and baseball being the most predominant ones. Results demonstrated that the scales had acceptable internal consistency, the mean alpha score being .80. Because of the behaviourally-related, situation-dependent nature of the inventory, most of the OMSAT-3 scales did not yield good test-retest reliability estimates. In terms of validity, the OMSAT-3 was found to significantly discriminate between competitive and elite level athletes. The best discriminating scales were Commitment, Stress Control, and Refocusing. When asked to list mental components that were most important and/or useful to their performance, athletes rated "belief / self-confidence" as being the most important one. Draper, Salmela, and Durand-Bush (1995) conducted a confirmatory factor analysis on the second version of the OMSAT and found that the proposed factor model fit the data well. Future researchers need to conduct the same type of analysis with the OMSAT-3 to determine the adequacy of its factor structure.

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CHAPTER I

INTRODUCTION

The field of sport psychology has grown substantially in the last two decades, due in part to an increasing awareness of its importance in the enhancement of athletic performance. Many of today's sport psychology researchers are convinced that mental skills are linked to excellence in sport, and that these skills need to be developed and refined for consistent high level performance (Mahoney, Gabriel, & Perkins, 1987; Orlick, 1986, 1990; Rushall, 1989). Over the years, issues and debates regarding the nature and assessment of mental skills have led scholars to develop various approaches and methods to conduct research (Martens, 1987a).

Psychological tests have played a significant role in sport psychology research. In 1988, Singer wrote about the advantages of using sound psychometric tests to conduct research in this field. In a recent article, Fogarty (1995) informed readers of the increasing, persisting trend to develop and use psychological and sport-specific tests in this domain of research. Of importance was his comment that:

> Insufficient information about the tests being used, inherent weaknesses in self-report measures, and disregard for proper evaluation procedures will undermine attempts to establish a firm theoretical foundation for this new branch of the discipline if corrective action is not taken soon. (p. 161)

Fogarty acknowledged the fact that psychological tests will continue to play a major role in future sport psychology research, however, it was suggested that academics improve the quality of sport inventories by subjecting them to rigorous empirical evaluations. After all, the psychological inventory provides an important quantitative means of assessing individuals'

personal thoughts, feelings and attitudes, and relating these to their external behaviors (Anshel, 1987). Furthermore, psychological tests can be used for purposes such as description of personality profiles, diagnosis and intervention, prediction of performance, and selection and classification of individuals (Singer, 1988). Nideffer (1987) reported some of the important functions of psychological inventories:

> Ideally, psychological tests are designed on the basis of sound theoretical constructs (Rotter, 1973). When this is true, valid instruments can bridge the gap between theory and practice. Under these conditions tests provide the applied researcher with a means of evaluating underlying psychological theory. These same instruments also provide practitioners with a tool for applying theory to their practice. (p. 18)

Anshel (1987) compiled an extensive list of psychological inventories that have been frequently used by sport psychologists in the past 20 years. Of interest is that the general utility, applicability, construct and predictive validity of some of these instruments have been questioned by researchers, and that a need for further developing sound psychometric inventories has been expressed by several authors (Chartrand, Jowdy, & Danish, 1992; Hackfort & Schwenkmezger, 1989; Landers, Boutcher, & Wang, 1986; Summers & Ford, 1990). Chartrand and his colleagues have specifically proposed that psychological instruments concerned with measuring a broad range of mental skills be developed as this type of instrument is severely lacking.

In 1992, Salmela created the Ottawa Mental Skills Assessment Tool (OMSAT), attempting to account for the need for reliable and valid instruments that measure a multitude of mental skills. The OMSAT's conceptual framework was partially based on Orlick's (1992) heuristic model of human excellence, in which mental skills perceived to be critical for excellence

were hierarchically organized around a wheel (see Appendix A). Other research findings pertaining to mental skills and excellence in sport, such as those presented by Anshel (1987), Grove and Hanrahan (1988), Mahoney (1989), Mahoney and colleagues (1987), Seiler (1992), and Vealey (1988), were also considered in the development of the OMSAT.

The first version of the OMSAT (OMSAT-1) comprised 114 items and the following 14 mental skills scales: Goal-Setting, Beliefs, Commitment, Stress Reactions, Fear, Relaxing, Energizing, Imagery, Mental Practice, Focusing, Refocusing, Simulation, Competition Planning, and Team Dynamics. Through preliminary statistical analyses, it was found that the various OMSAT-1 scales reflected acceptable internal consistency, with Cronbach alpha values ranging from .63 to .91 (Bota, 1993). However, when the meaningfulness, clarity, frequency distribution, and item-total correlation of the items were closely examined, it was concluded that the questionnaire needed further refinement and evaluation. Bota thus attempted to create and evaluate a second version of the OMSAT (OMSAT-2). This time, internal consistency values ranged from .78 to .87, and test-retest reliability coefficients varied from .67 to .90.

In an attempt to provide information on its construct validity, the OMSAT-2 was subjected to a confirmatory factor analysis. It was found that the factor structure of the second version fit reasonably well the proposed theoretical factor structure (Draper, Salmela, & Durand-Bush, 1995). Both interesting and promising results have been found so far, however, developing a sound psychometric test takes time and empirical diligence. One cannot conclude after only a few studies that an instrument is reliable and valid. There is still a need to improve the psychometric properties of the OMSAT.

Purpose of the Study

The purpose of this study was threefold. The first purpose was to create an enhanced third version of the OMSAT (OMSAT-3), taking into account the results of Bota's (1993) study. A second purpose was to assess the validity and reliability of the OMSAT-3. The third purpose was to determine the relative importance of each mental skill presented in the questionnaire, as perceived by the athletes participating in the study.

Significance of the Study

Researchers have expressed a need for the development of valid and reliable psychological instruments (Schutz & Gessaroli, 1993) that measure a broad range of mental skills (Chartrand et al., 1992). As previously mentioned, some instruments have been developed and used in the past, but have lacked sound and consistent psychometric properties. The OMSAT was developed with an intention to fill this gap in the literature. After analyzing its psychometric properties, Bota (1993) felt that the OMSAT-2 was a promising tool to measure athletes' mental skills.

From a theoretical perspective, the OMSAT could be used to test and validate Orlick's (1992) Wheel of Human Excellence, and could provide theoretical orientations for other components put forth in the questionnaire. From a methodological perspective, the OMSAT could become a powerful instrument to assess the mental skills of athletes at all levels. Finally, from a practical perspective, the OMSAT has the potential to become a useful intervention and training tool for sport psychologists, as well as anyone who is interested in this dimension of sport. Moreover, it could be used to assess the effectiveness of psychological skills training programs that are being developed and implemented on an ongoing basis.

Delimitations

Subjects in this study were delimited to two levels of participation in sport: elite and competitive. These levels will be defined in a subsequent section. Variables such as age, gender, type of sport and country of origin were not delimited, that is, male and female athletes of different ages, from different countries, participating in different sports were solicited to partake in this study.

Limitations

The use of a questionnaire as a method to collect data is a limitation in itself. Subjective by nature, questionnaires reveal only "what people say they do, or what they say they believe, or like or dislike" (Thomas & Nelson, 1990, p. 263). Sometimes people respond according to what is socially desirable. Nickel (1976) revealed that social desirability is particularly acute in younger subjects. To account for this factor, a social desirability scale was included in the OMSAT-3.

Despite this, it was still difficult to assess whether or not subjects truthfully responded to the OMSAT-3. Some athletes might have purposely rated their mental skills higher to make themselves look more favorable. Others might have completed the questionnaire in a rush without giving it much thought just to "get it done and over with." It is felt that this issue was somewhat controlled for in this study since the researcher, for the most part, administered the questionnaires in person and ensured that the participants clearly understood what was asked of them and took their time to fill out the OMSAT-3. Nevertheless, because the OMSAT-3 is a self-report instrument, the results, particularly the inferences made from the results, have to be interpreted with caution.

The lack of total control over the isolation of the "mental skill" variable from other variables that could have affected an individual's score on the questionnaire must also be considered. For example, the level of one's education might have had an influence on one's ability to effectively use and apply mental skills, and been reflected in one's scores on the questionnaire.

Generalization of any OMSAT-3 result is limited until additional athletes are tested and more data are collected. Furthermore, until the validity and reliability of the OMSAT-3 is replicated and proven consistent, use of this instrument as a teaching and training tool for athletes is limited.

Operational Definitions

Elite athletes. Members of a national sport team or athletes who competed internationally in their respective sport.

Competitive athletes. Athletes who competed on university / college teams or athletes enrolled in local or provincial sport clubs and schools.

Skill. The ability to accomplish something with maximum certainty and a minimum use of time and energy (Guthrie, 1952). A skill can be learned through practice and experience and is therefore trainable (Schmidt, 1991).

Mental skill. An adaptive organized sequence of cognitive processes, developed and rehearsed to produce a desired optimal outcome (Schmidt, 1991).

Reliability. "Refers to the consistency and accuracy of the measurement of the proposed construct and is a necessary, but not sufficient, condition for establishing validity. If reliability is demonstrated, it is necessary to establish test validity" (Ford & Summers, 1992, p. 283).

Validity. It is "whether a test measures what it is purported to measure. Validity can be established in many ways (e.g., criterion-related, content, face), but ultimately it is construct validity that must be demonstrated" (Ford & Summers, 1992, p. 283). According to Landy (1986), "validation processes are not so much directed toward the integrity of tests as they are directed toward the inferences that can be made about the attributes of the people who have produced those test scores" (p. 1186).

Construct validity. "Refers to an evaluation of tests designed to measure hypothetical (but behaviourally-relevant) psychological traits or constructs... Importantly, the test score is not equated with the construct; instead, it is taken to be but one of many indicators of the construct" (Zumbo & Hubley, 1993, p. 35). When testing construct validity, both the theory and the measure are assessed at the same time. Moreover, "construct validity is an ongoing process, of learning more about the construct, making new predictions, and then testing them" (Streiner & Norman, 1989, p. 115).

Face validity. "Indicates whether, on the face of it, the instrument appears to be assessing the desired qualities" (Streiner & Norman, 1989, p. 5).

Content validity. Consists of "a judgment whether the instrument samples all the relevant or important content or domains" (Streiner & Norman, 1989, p. 5).

Criterion validity. The "correlation of a scale with some other measure... a 'gold standard' which has been used and accepted in the field" (Streiner & Norman, 1989, p. 110). There are two types of criterion validity: concurrent validity and predictive validity.

Concurrent validity. The correlation of a new scale with the criterion measure, both of which are administered at the same time (Streiner & Norman, 1989).

Predictive validity. "In predictive validity, the criterion is not available until some time in the future" (Streiner & Norman, 1989, p. 110). The test administrators must await the subjects' future performances to confirm or disconfirm their predictions.

Internal consistency. Measures of internal consistency represent "the average of the correlations among all the items in the measure. There are a number of ways to calculate these correlations, called Cronbach's alpha, Kuder-Richardson, or split halves, but all yield similar results" (Streiner & Norman, 1989, p. 7).

Test-retest reliability. Refers to an instrument's temporal stability. It is assessed through observation of subjects on two occasions separated by some interval of time (Streiner & Norman, 1989).

CHAPTER II

REVIEW OF THE LITERATURE

In this second chapter, an extensive literature review is presented. Several topics related to the effectiveness, assessment, and training of mental skills for sport are synthesized under the following headings: mental skills for enhancing performance; the Wheel of Human Excellence; psychological skills inventories for sport; validity and reliability of inventories used in sport psychology research; and the evolution of the OMSAT-3.

Mental Skills for Enhancing Performance

Through research in the field of sport psychology, it has become evident that mental skills play an important role in achieving excellence in sport (Curtis, 1987; Harris & Harris, 1984; Mahoney et al., 1987; Nideffer, 1985; Orlick & Partington, 1988; Rushall, 1989). Furthermore, there have been many attempts to distinguish those mental skills that are most critical for performance enhancement. Following are some of the skills and techniques that have been identified in the literature.

Goal-setting. Goal-setting is perceived to be an important performance enhancement technique by many researchers (Burton, 1993; Curtis, 1987; Harris & Harris, 1984; Locke & Latham, 1990; Nideffer, 1985; Orlick 1986, 1990; Porter & Foster, 1986; Syer & Connolly, 1989). More precisely, it is believed to help athletes focus attention, remain intense and persistent, increase self-confidence, and control anxiety (Burton, 1993). Burton as well as Gould (1993) suggested that athletes set specific, measurable goals that are difficult but realistic, in order to maximize goal-setting effects. Others have revealed that athletes' performances can be additionally increased if they set short-term and long-term goals (Bell, 1983; Carron, 1984; Harris

& Harris, 1984), as well as performance goals such as increasing the number of successful serves, as opposed to outcome goals like beating an opponent (Burton, 1989).

Bell (1983) emphasized the importance of setting goals for both practice and competition, and setting positive rather than negative goals. Identifying target dates for attaining goals, identifying goal-achievement strategies, recording goals once they have been identified, and seeking feedback for goal evaluation and for support also appeared to be important characteristics of an effective goal-setting program (Gould, 1993). Based on an extensive review of the goal-setting literature, Locke and Latham (1990) concluded that goal-setting seems to work for most subjects, across a variety of tasks and settings.

Goal-setting may be "one of the best performance enhancement techniques available in the behavioral sciences" (Burton, 1993, p. 469), but failure to develop an ongoing commitment to attain set goals may diminish their enhancement capabilities. Orlick (1992) perceived an athlete's level of commitment to be a critical ingredient for success. In fact, commitment is a core element in the Wheel of Human Excellence he proposed, along with the element "belief," which will be discussed later in this section.

Commitment. In order to achieve excellence, individuals must possess or develop a high level of commitment, to the point where one's activity or endeavour becomes the main focus of one's life for a certain period of time (Orlick, 1990). However, being "overly" committed could have detrimental effects on performance. To prevent overtraining, Orlick suggested balancing commitment with appropriate recovery periods and "joyful" activities not related to work.

Researchers have shown that there are several ways to increase one's level of commitment. Having an inherent passion or love for one's sport has led to higher levels of

commitment. Perceiving goals to be worthy and achievable, and believing in oneself have also been characteristics of highly committed individuals (Orlick, 1992). In fact, although goal-setting was not made an explicit core skill in his model of human excellence, Orlick discussed the important role it plays in enhancing athletes' self-confidence and commitment level. Furthermore, according to Harris and Harris (1984), the level of commitment of athletes can be heightened when sacrifices are made, when the time and effort invested is acknowledged and supported, and also when one's commitment is made "public."

In their attempt to explain the attainment of expert performance, Ericsson, Krampe, and Tesch-Römer (1993) proposed a model which postulated that "the primary mechanism creating expert-level performance in a domain is deliberate practice" (Ericsson & Charness, 1994, p. 739). Deliberate practice was defined as an effortful activity that is motivated by the goal of improving performance. Of interest is that unlike play, deliberate practice was perceived as not being inherently motivating and unlike work, it did not lead to immediate social and monetary rewards. Furthermore, the length of time required to reach an expert level in a particular domain was estimated at 10 years or 10,000 hours of deliberate practice. Given the constraints inherent to deliberate practice and the amount of time it takes to master a domain, it was suggested that individuals need to be extremely committed to attain eminent levels of performance (Ericsson, Krampe, & Tesch-Römer, 1993).

Belief / Self-confidence. Another element reported to be extremely important in the achievement of exceptional performance is belief or self-confidence (Gauron, 1984; Harris & Harris, 1984; Nideffer, 1992; Porter & Foster, 1986). As previously mentioned, belief is the other core skill in Orlick's (1992) Wheel of Human Excellence. Orlick reported that:

> The highest levels of personal excellence are guided by belief in one's potential, belief in one's goal, belief in the significance or meaningfulness of one's goal, and belief in one's capacity to reach that goal. (p. 112)

Belief in oneself or self-confidence has been reported to be cyclical and variable. According to Gauron (1984), individuals can believe in themselves more on some days than on others. Orlick (1992) revealed that individuals manifesting high levels of self-confidence often have a solid support network, that is, other people and loved ones who believe in them, and a positive attitude towards their performances. These individuals receive positive and constructive feedback, draw out constructive lessons and regularly experience improvement and successful performances.

It can be seen that commitment and belief in oneself are critical mental perspectives athletes need to develop and maintain in order to achieve high levels of performance. Moreover, it has been seen that goal-setting is an important skill athletes have used to enhance their belief and commitment to excel. Other mental skills inherent to achieving success have also been identified in the literature. One of these skills is the ability to control or cope with stress.

Stress. Stress is an intrinsic component of training and competition. Research has shown that negative reactions to stress or competitive pressure can be detrimental to one's performance, and that conversely, positive reactions to stress, arousal or nervousness can lead to enhanced performance (Rotella & Lerner, 1993). Murray (1989) conducted a study in which athletes were asked about how they viewed pre-competitive arousal. Over 70% of them reported that they enjoyed the nervousness associated with competition, that it helped their performance and that it was a great indicator of readiness to perform. Rotella and Lerner have thus stressed the

importance of developing effective ways to respond to stressful situations that could potentially limit the achievement of athletes' goals.

Much research has been conducted on the topics of stress, anxiety and arousal (viz., Gould & Krane, 1993). Although the three terms have often been used interchangeably in the sport psychology literature, they represent very distinct concepts. Martens (1977) defined stress as:

> a process that involves the perception of substantial imbalance between environmental demand and response capability, under conditions where failure to meet demand is perceived as having important consequences and is responded to with increased levels of A-state [state anxiety]. (p. 9)

Spielberger (1966) made an important distinction between state and trait anxiety. State anxiety was defined as a situation-specific emotional state that reflects perceived feelings of apprehension and tension, with which is associated increased or decreased arousal. Conversely, trait anxiety was defined as a stable behavioural predisposition to perceive many situations as threatening. Individuals with trait anxiety respond to these situations with state anxiety. According to Spielberger, athletes with high trait anxiety are more prone to perceive stressful situations as negative or threatening and consequently, manifest higher levels of state anxiety.

Other researchers have espoused the multidimensionality of anxiety. They divided anxiety into two subcomponents: somatic anxiety and cognitive anxiety (Borkovek, 1976; Davidson & Schwartz, 1976). Somatic anxiety has been associated with perceived physiological arousal such as butterflies in the stomach, sweating, shakiness, and increased heart rate. Cognitive anxiety, on the other hand, has been associated with negative conscious feelings about one's performance

such as worry, fear, doubts or indecision, and an inability to focus attention (Davidson & Schwartz, 1976; Martens, Vealey, & Burton, 1990).

Various theories have been postulated to explain the relationship between arousal and performance, or anxiety and performance (Gould & Krane, 1993). Recent findings have led researchers to believe that the multidimensional theory of anxiety will contribute greatly to the understanding of the anxiety-performance relationship. This theory predicted that cognitive and somatic anxiety affect sport performance in different ways (Burton, 1988; Martens et al., 1990). More specifically, it suggested that there exists a strong negative linear relationship between cognitive state anxiety and performance, and a less powerful inverted-U relationship between somatic anxiety and performance. Gould and Krane raised a need to conduct more research in this area before valid inferences are made from the assumptions of this multidimensional theory of anxiety.

The effects of arousal and anxiety on performance appear to depend on the way individuals initially perceive an event or a stressful situation. Everyone has the option to respond to these types of situations either positively or negatively. According to Selye (1974), an individual who perceives stress to be good or positive experiences "eustress," whereas one who perceives stressful situations to be bad or negative experiences "distress." Rotella and Lerner (1993) revealed that many successful athletes who experience eustress are indeed effective because they tend to view naturally occurring arousal and nervousness in a positive way.

Murphy and Jowdy (1993) found that imagery and mental practice techniques are an important component of stress management. In a study conducted by Lazarus and Folkman (1984), subjects used imagery interventions to become familiar with effective strategies for coping

with stress. In other studies, imagery techniques were successful in reducing different types of anxiety, such as medical anxiety (Miller & Heinrich, 1984) and test anxiety (Wine, 1971), and also in changing sports behavior (Greenspan & Feltz, 1989).

Imagery / Mental practice. The terms "imagery" and "mental practice" have been used interchangeably in the sport psychology literature. Murphy and Jowdy (1993) emphasized the importance of carefully distinguishing the two terms. Corbin (1972) defined mental practice as the "repetition of a task, without observable movement, with the specific intent of learning" (p. 94). Suinn (1983) associated mental practice to a technique which included thinking about an action without visualizing or "feeling" it, talking oneself through the steps of an action, imagining oneself or another individual executing an action, or incorporating auditory, proprioceptive and emotional elements while visualizing the perfect way of doing an action. In his definition, Suinn specified that practicing mentally does not imply that one will engage in imagery or imagery rehearsal.

Suinn (1993) revealed that imagery and mental practice techniques can be used to achieve a variety of goals, such as enhancing correct responses, simulating competitive environments, and as previously mentioned, eliminating anxiety or negative thoughts. Mental practice was reported to have frequent beneficial effects on the learning of a new skill. Feltz and Landers (1983) found that mental practice effects are present in both early and later stages of learning, and may be task specific.

Certain factors are believed to mediate the effectiveness of mental practice; ability was identified as one of them (Murphy & Jowdy, 1993). Individuals who are better imagers, that is, those who can produce clear, real, controlled images, were reported to benefit more from mental

practice than their less able counterparts. Moreover, it was suggested that experienced athletes may benefit more from mental practice than novices (Suinn, 1993).

Mahoney and Avener (1977) found imagery perspective to be another factor having a possible influence on the effectiveness of mental practice. These researchers defined imagery perspective the following way:

> In external imagery, a person views himself from the perspective of an external observer (much like in home movies). Internal imagery, on the other hand, requires an approximation of the real life phenomenology such that the person actually imagines being inside his/her body and experiencing those sensations which might be expected in the actual situation. (p. 137)

According to certain researchers, elite athletes are more likely than non-elite athletes to adopt an internal imagery perspective. Non-elite athletes have been reported to more frequently use external imagery (Mahoney et al., 1987; Rotella, Gansneder, Ojala & Billing, 1980). Due to inconsistent research findings, it is still not clear if one perspective is more effective than the other. Murphy and Jowdy (1993) suggested that researchers investigate whether unique features are associated with the two different perspectives, instead of trying to show that internal imagery is better than external imagery, or vice versa.

Imagery outcome was identified as a third mediating factor of mental practice. Studies have suggested that negative imagery, that is, individuals rehearsing a task with negative outcome, has a debilitating effect on performance (Powell, 1973; Woolfolk, Parrish, & Murphy, 1985). One explanation has been that "negative mental practice affects performance through its impact on dynamic properties of the subjects such as confidence, concentration or motivation" (Murphy

& Jowdy, 1993, p. 230). Athletes should thus incorporate positive imagery in their mental practice, as it is believed to prevent them from focusing on negative images and consequently, maintain consistent performance.

Videotape modeling may be another variable that could increase the effects of mental practice. In their study, Hall and Erffmeyer (1983) showed that basketball players assigned to a relaxation / imagery / videotape modeling group significantly improved their foul shooting percentages compared to other subjects in a relaxation / imagery group. This study suggested that combining imagery rehearsal with videotape observation and modeling may produce enhanced effects beyond those achieved with imagery rehearsal alone.

The use of relaxation in combination with mental practice or imagery rehearsal has been a popular topic of investigation in psychological research. Some have suggested that using relaxation techniques prior to engaging in mental practice often facilitates imagery control (Suinn, 1985; Vealey 1986). Relaxation is an essential step in Suinn's (1984) visual motor behavior rehearsal (VMBR) method, and always precedes imagery rehearsal. Interestingly enough, studies conducted to date have indicated that while relaxation may interact with imagery, it is not a necessary prerequisite to produce imagery effects on performance (Murphy & Jowdy, 1993). One prerequisite factor, however, appears to be practice. Suinn (1993) reported that "using imagery appropriately is a type of mental skill, and adequate skill development is needed for VMBR to be expected to have maximal effects" (p. 507).

Some researchers have viewed imagery rehearsal as a procedure individuals use to optimally arouse or physiologically activate themselves for a given performance (Feltz & Landers, 1983; Schmidt, 1982). However, results of studies attempting to test this theory have been

inconclusive. In some studies, introducing arousal in imagery rehearsal did not help performance. One explanation for this has been that the arousal included in the imagery, when added to the arousal already inherent to imagery rehearsal, increased the activation level beyond an optimal level (Machlus & O'Brien, 1988; Murphy, Woolfolk, & Budney, 1988).

Research has shown that some skills have been used independently of imagery rehearsal or mental practice to achieve optimal arousal levels. Skills like relaxation and energizing have helped individuals attain or maintain optimal arousal levels, and decrease fluctuations in performance (Zaichkowsky & Takenaka, 1993).

Relaxation. Relaxation is a technique often employed by individuals to decrease arousal. Although several different types of relaxation techniques exist, they are all variations of those developed by Jacobson (1929). Zaichkowsky and Takenaka (1993) made the following statement about Jacobson's progressive muscular relaxation technique:

> It is clear that the mastery of Jacobsonian relaxation techniques results in reduced levels of anxiety, muscular tension, and physiological arousal. Research on the efficacy of the specific PMR [progressive muscular relaxation] technique for improving athlete performance, however, is quite sparse. (p. 521)

Effects of relaxation have often been studied in combination with other arousal techniques such as breathing, meditation, and cognitive techniques including imagery and self-talk (Zaichkowsky & Takenaka, 1993). Of the previously mentioned techniques, controlled, deep diaphragmatic breathing has been reported to be one of the most important for regulating arousal (Harris & Williams, 1993).

Relaxation techniques have not only been used to regulate arousal, they have also been used to combat stress, control anger, reduce muscular tension, and promote assertiveness, concentration and confidence (Bell, 1983). Relaxation techniques can be divided into two different categories: "muscle-to-mind" and "mind-to-muscle" techniques (Harris & Williams, 1993). Jacobson's (1929) progressive muscular relaxation, which involves tensing muscle groups before relaxing them, falls into the former category. On the other hand, transcendental meditation would be categorized as a mind-to-muscle technique.

According to Harris and Williams (1993), relaxation skills must be practiced on a regular basis. Although some individuals may take longer than others to develop these skills, the majority of people are able to observe improvement after a couple of weeks of practice. Harris and Williams emphasized the importance of being able to relax completely as well as momentarily. They reported that through deep relaxation, athletes can detach themselves from the environment, allow their central nervous system to regenerate physical, mental, and emotional states, and create a base for learning momentary relaxation. They defined momentary relaxation as the ability to relax quickly for a short period of time. This type of relaxation is perceived to play an important role in the athlete's pre-competition preparation. Moreover, it can be an effective strategy to regain full focus during competition, and to return to a balanced, controlled state of mind after competition.

Energizing. Oftentimes, athletes are underaroused before or during a competition. In these instances, energizing techniques would be most effective to increase their level of arousal and their chances of obtaining a successful performance. Many energizing techniques have been used by coaches and athletes (Anshel, 1990; Harris & Williams, 1993, Martens, 1987b), despite the

limited research on their efficacy (Shelton & Mahoney, 1978; Weinberg, Gould, & Jackson, 1980).

Energizing techniques utilized in the past have included the use of breathing techniques, stretching, music, videos, energizing imagery, energizing verbal cues, goal-setting, pep talks, pre-competitive workouts, as well as visual messages on bulletin boards (Zaichkowsky & Takenaka, 1993). Athletes have also been known to "psych themselves up" by drawing energy from the environment, that is, from the crowd, their opponents, their teammates, the sun, the flag or even from their national anthem. Zaichkowsky and Takenaka have suggested that athletes can also energize themselves by transferring negative emotions such as anger, fear, disgust and contempt into positive emotions or positive performance goals.

It is believed that certain factors have to be considered before arousal-regulating techniques are implemented and used. According to Zaichkowsky and Takenaka (1993), it is important for both coaches and athletes to develop a sense of awareness that will allow them to detect if and when arousal levels need to be altered. Secondly, coaches and athletes need to be aware of the techniques that are most effective for them. Finally, coaches have to realize that there exist individual differences in athletes' responses to arousal-regulation techniques. Thus, techniques should be individualized for the most part.

Attention control / Focusing. Most mental skills and techniques, including goal-setting, relaxing, energizing, imagery rehearsal and mental practice, require excellent attention control or focusing abilities. In fact, researchers have suggested that the ability to consistently attend to relevant tasks and environmental stimuli, which is often referred to in the popular literature as "focusing," is a vital aspect of athletic performance (Boutcher, 1990; Nideffer, 1976a; Orlick,

1990). Over the years, this construct has been studied from various perspectives, including information-processing and social psychology perspectives.

Within the information-processing perspective, attention has been characterized as "the ability to switch focus from one source of information to another and as the amount of information that can be attended to at any one time" (Boutcher, 1990, p. 252). Researchers using this perspective have concentrated their efforts mainly on attentional selection, capacity and alertness (Posner & Bois, 1971).

Selective attention is believed to play a central role in both the learning and performing of sport skills (Boutcher, 1993). It occurs when individuals process certain amounts of information at a particular moment, while other information is screened out or ignored. Research has revealed that selective attention can be voluntary or involuntary, and can take place in a wide variety of behavioural situations (Boutcher, 1993).

Schneider, Dumais and Shriffin (1984) suggested that with practice, attention can be switched from a tedious, conscious process to a smooth unconscious process. These two attentional processes have been termed control and automatic processing, respectively. Specifically, control processing is controlled by the individual, and is used to process inconsistent information. It is a slow, effortful, and capacity-limited process. Boutcher (1993) suggested that in sport, control processing would be activated when decisions are made.

On the other hand, automatic processing was defined by Schneider and his colleagues (1984) as a fast, effortless, unconscious process that is responsible for the performance of well-learned skills. According to Boutcher, automatic processing would be used in sport when athletes have reached an automated level for executing skills, as a result of many years of practice. It is

believed that control and automatic processing play significant roles in sport performance, as all sports require a combination of both types of processes. Athletes not only need to perform skills in an automatic fashion, they are also required to make decisions, and process inconsistent stimuli and new information (Boutcher, 1993).

Attentional capacity is another aspect of attention that has been investigated by researchers. Studies have indicated that there is a limited capacity for processing information at one time, and that this capacity is more limited when individuals are engaged in control processing, than when they are engaged in automatic processing (Boutcher, 1993). Athletes performing multiple tasks or attempting to focus on more than one source of information could thus experience a reduction in their performance. Shriffin (1976) revealed that although control processing may be dominant in the early stages of learning, it will eventually be replaced by automatic processing if skills are to be performed in an effortless and efficient manner.

Arousal is a third aspect of attention that has been examined through an information-processing perspective. Studies have shown that when emotional arousal is increased, people's attentional fields are reduced and their ability to respond to peripheral stimuli may be decreased (Easterbrook, 1959). Boutcher (1993) reported that this attentional-field-narrowing phenomenon may be important to consider in sport performance since many sport skills are performed in aroused states.

Attention has not only been studied from an information-processing perspective, it has also been researched using a social-psychological perspective. Social psychologists have examined automatic functioning to try and explain the relationship between attention and performance (Boutcher, 1993). As previously mentioned, automatic processing was reported to be a fast,

effortless, desirable way of processing information in sport (Schneider et al., 1984). According to Baumeister (1984), however, athletes under competitive pressure often adopt control processes rather than automatic processes to perform well-learned skills. Because indispensable information pertaining to muscle movement and coordination is not present when control processing mechanisms are used, athletes who consciously try to control the execution of skills during competition may experience decreases in performance.

Nideffer (1976b) demonstrated that individual differences exist in people's ability to use different attentional processes. Consequently, he concluded that individuals possess different attentional styles. It was suggested that the attentional demands of any sporting situation will vary along two dimensions: width (broad-narrow) and direction (internal-external). According to Nideffer, a broad external focus is used to focus attention on a wide area of the external environment, whereas a broad, internal focus is adopted to direct attention internally on various strategies and past experiences. In his research, a narrow, external focus was most useful to focus attention on a narrow aspect of the external environment, while a narrow, internal focus was effective for attending to specific images or cognitive cues.

Nideffer (1976b) suggested that one's attentional style, which is relatively stable across situations and over time, may hinder performance if it is not compatible with the attentional style required for a given task or situation. The challenge for an athlete is to match the attentional demands of a sporting environment with the appropriate attentional style. Nideffer developed an inventory called the "Test of Attentional and Interpersonal Style" (TAIS), to measure people's attentional strengths and weaknesses. Ford and Summers (1992) had certain reservations about the psychometric properties of the TAIS, and this will be discussed in a subsequent section.

Distraction control / Refocusing. Researchers have also used distraction theories to try and explain the relationship between attention and performance. They have postulated that individuals lose their focus because certain factors attract their attention to task-irrelevant cues. According to Boutcher (1993), processing task-irrelevant information could explain performance decrements in various competitive and less competitive sport situations. Factors that may cause athletes' attention to be directed to irrelevant stimuli were reportedly unlimited (Nideffer, 1976b). Some of the factors identified in the literature were worry, self-awareness, family members, teammates, coaches, competitors, scores, officials, media, sponsors, relationships, expectations, and changes in performance levels (Orlick, 1990).

Because distractions in sport and in life are numerous, researchers have emphasized the importance of developing "distraction control" or "refocusing" plans. According to Orlick (1986), "refocusing appropriately before, during and after the competition is one of the least practiced but most important skill for high-performance athletes" (p. 49). It is believed that to obtain consistent performance in training and in competitions, athletes must develop the skill of distraction control by practicing it regularly (Curtis, 1987; Orlick, 1986, 1990).

Research findings on the relationship between attention and performance have incited researchers to develop optimal attentional training programs for athletes. In an attempt to help the future development of such programs, Boutcher (1993) suggested that:

> The precursor to successful attentional control during actual performance may be the establishment of a series of behavioral, physiological, and cognitive cues that optimally prime both body and mind for the ensuing skill. (p. 262)

Cues or behaviors that lead to optimal attentional states have interested many scholars. In sport, optimal attentional states have often been termed "peak performance" or "flow" states (Csikszentmihalyi, 1975). Flow states have been associated with positive emotions, extremely focused attention and total connection or oneness with the task at hand (Ravizza, 1984).

Competition planning. Researchers have suggested that planning is an important step in the achievement of peak performance or flow states. Williams (1986) reported:

> Each athlete [has] to learn how to create consistently at competition time the ideal performance state (thoughts, feelings, bodily responses) typically associated with his or her peak performance. Rarely will this occur if precompetition preparation and competition behaviors are left to chance or good and bad breaks. (p. 314)

According to Williams (1986), establishing pre-competition and competition routines not only helps athletes form a consistent approach to performance, it also helps them control their arousal level. It was recommended that athletes organize their internal thoughts, feelings, mental images and external environments in a way that they can maximize their feelings of control, and cope with unforeseen events.

Albinson and Bull (1988) raised the importance of developing individualized pre-competition and competition routines that incorporated both individual and team activities in the case of team sports, and that cover the period from wake-up to the start of the athletic event. Williams (1986) commented on the effectiveness of competition plans that included technical, motivational and affirmation self-talk, arousal and physiological assessment techniques, as well as energizing, parking and tactical cues that help athletes remain focused on specific tasks.

Developing pre-competition and competition plans is a long process that requires constant evaluation and refinement (Orlick, 1986). Williams (1986) indicated that trial-and-error experimentation, combined with consultations with a coach or a mental trainer, may be necessary before athletes establish the most effective pre-competition and competition routines for achieving optimal performance.

Two interesting empirical studies demonstrated the importance of competition planning and other mental skills in high level sports. Orlick and Partington (1988) conducted a study in which 235 Canadian Olympic athletes' mental readiness was assessed through questionnaires and individual interviews. It was found that these elite athletes: (a) possessed high levels of commitment; (b) set clear short- and long-term goals; (c) did imagery and simulation training; (d) focused and refocused under distractions; (e) had an established mental training plan that was used and refined throughout the season; and (f) had clearly established mental plans for competition, which included pre-competition and competition mental plans, distraction control plans and constructive evaluation plans. Orlick and Partington found that between physical, technical, and mental preparation, mental preparation was the only variable to significantly predict the athletes' actual Olympic placings.

Mahoney and colleagues (1987) conducted another study that attempted to uncover some of the mental skills linked to exceptional athletic performance. Based on their work with collegiate and Olympic athletes, they developed the Psychological Skills Inventory for Sport (PSIS), and administered it to 713 male and female athletes. Selected across 23 different sports, these athletes were either competing at an elite, pre-elite or non-elite collegiate level. The authors reported that concentration, anxiety management, self-confidence, mental preparation and motivation were

potentially important in differentiating the skill-level of elite and non-elite athletes. Enlightening as they may appear to be, results of this study have to be interpreted with caution as problems were identified with the validity and reliability of the 51-item questionnaire used to generate these results (Chartrand et al., 1992).

In another study, Grove and Hanrahan (1988) assessed the psychological strengths and weaknesses of 39 interstate and international level field hockey players training at the Australian Institute of Sport using the Self-Analysis of Mental Skills questionnaire (SAMS). The SAMS consisted of two parts and a rank-order format was used for all responses. In the first part, subjects had to rank-order the following six general scales, from what they did best to what they did worst: Concentration, Emotional Control, Self-Confidence, Control of Nervousness / Tension, Use of Imagery, and Planning / Analysis. The second part contained 31 specific items, with five or six of these items appearing under each of the general mental skills scales listed above. Within each scale, athletes had to rank-order the five or six items from best to worst according to their perceived strengths and weaknesses. The individual responses to each item and scale were averaged to obtain an ordinal-level psychological profile of the group of subjects. Subjects ranked "control of nervousness / tension" and "maintaining concentration" as the mental skills they did best, and "use of imagery" and "maintaining self-confidence" as the skills they did worst.

Of interest was that five coaches who had daily contact with these athletes were also asked to rank the same skills as the athletes, based on their perception of the players' strengths and weaknesses. Significant discrepancies were found between the rankings of the athletes and those of the coaches. Coaches perceived athletes to be good at maintaining concentration and self-confidence, while these athletes perceived the opposite. Coaches perceived their players to be

poor at controlling emotions and tension while the athletes reported themselves as being proficient at these skills. Results from Grove and Hanrahan's study have to be interpreted with caution since no evidence was provided on the validity and reliability of the SAMS questionnaire and on the effectiveness of using a rank-order format rather than a continuous scale.

The Wheel of Human Excellence

Orlick (1992) put forth a model entitled "the Wheel of Human Excellence" (see Appendix A). Based on a 20-year consulting career with individuals having excelled in domains such as sports, the performing arts, aerospace, law and medicine, and based on the findings of several studies aimed at uncovering the mental qualities of these exceptional performers, this model was developed to provide a "field-generated framework to help better understand, study, and guide the pursuit of personal excellence" (p. 109). As the name of the model implies, mental skills perceived to be critical for achieving excellence were conceptually organized around a wheel. Mental components such as commitment and belief were listed as the most critical variables for elite performance and were thus situated at the center of the wheel. Other skills like full focus, positive images, mental readiness, distraction control and constructive evaluation formed the periphery or the "spokes" of the Wheel of Human Excellence. Orlick emphasized the importance of refining both central and peripheral components to reach success in sport and any other performance domain.

This model partially formed the conceptual base of the OMSAT. Bota (1993) attempted to empirically test and validate Orlick's model with the OMSAT, by subjecting the tool to conventional psychometric analyses. Results of these analyses will be discussed in the section entitled "Evolution of the OMSAT".

Psychological Skills Inventories for Sport

Many approaches have been developed over the years to assess the nature and effects of mental skills on performance enhancement, and to identify those most critical to sporting excellence. Some of these approaches included the following: consulting with coaches and/or colleagues (Hellstedt, 1987; Silva, 1984), using existing psychological instruments (Mahoney et al., 1987; Nideffer, 1987; Orlick & Partington, 1988; Weinberg, 1987), interviewing athletes (Boutcher & Rotella, 1987; Orlick & Partington, 1988; Ravizza & Rotella, 1982) and observing behaviour in sport settings (Nideffer, 1981; Rushall, 1979). The psychological inventory has received much attention by researchers. In fact, in a review of six prominent sport psychology journals published from 1970 to 1987, Anshel (1987) identified 128 psychological inventories that have been devised throughout the years to assess over 30 different mental components related to sport.

The Test of Attentional and Interpersonal Style (TAIS) developed by Nideffer (1976b) is one of the inventories reported in Anshel's (1987) study. As previously mentioned, the instrument has been used to predict individuals' performances based on their attention characteristics and capacities. Another inventory is the Sport Competition Anxiety Test (SCAT), which was created by Martens (1977) to measure competitive state anxiety in adults and children. Martens, Burton, Vealey, Bump and Smith (1982) then expanded the SCAT and created the Competition State Anxiety Inventory (CSAI-II), which has also been used to assess people's state anxiety in sport situations, but this time from a multidimensional perspective. Another inventory identified in Anshel's study is the Self-Analysis of Mental Skills (SAMS), which, as already mentioned, provides scores on a series of specific mental skills regrouped under six general categories that

include concentration, emotional control, self-confidence, control of nervousness / tension, use of imagery, and planning / analysis (Grove & Hanrahan, 1988). The Psychological Skills Inventory for Sports (PSIS) has been frequently used to conduct research in sport psychology. It was developed by Mahoney and his colleagues (1987) to measure a wide range of mental skills, such as anxiety, concentration, self-confidence, mental preparation and team emphasis. Finally, another frequently used inventory that was identified by Anshel is the Profile of Mood States (POMS). Researchers have used this tool to obtain scores on tension, depression, anger, vigor, fatigue, and confusion and more recently, to identify the "iceberg profile" in competitive athletes (Morgan, O'Connor, Ellickson, & Bradley, 1988).

Following in Anshel's (1987) footsteps, Ostrow (1990) developed the "Directory of Psychological Tests in the Sport and Exercise Sciences," which includes 175 tests as opposed to the 128 tests that were identified in Anshel's catalogue. It was advised that the difference in number of tests not be taken as a direct index of the growth in test development between the two research periods, however, Ostrow's review did include some tests that were overlooked in Anshel's list. Moreover, the fact that the two researchers used different classification systems made it difficult to establish direct comparisons.

Fogarty (1995) made important comments on the use of psychological tests in sport settings. He stated that:

> Many of the tests appear to be new, often developed for the purpose of a single study. Furthermore, because most of these new tests are not fully validated, they are not released for commercial publication and consequently do not find their way into the major

distribution channels.... More importantly, they are not subjected to the formal review processes which most commercial tests have to undergo. (p.167)

Certainly, there are some exceptions to this statement. In a recently published article, a group of researchers presented the results of a study designed to validate a new scale measuring intrinsic motivation, extrinsic motivation and amotivation. Pelletier and colleagues (1995) provided explicit, detailed information on the validity and reliability of The Sport Motivation Scale. However, psychometric properties of psychological tests are not always found in the literature.

Anshel's (1987) catalogue of tests and Ostrow's (1990) Directory of Psychological Tests in the Sport and Exercise Sciences showed some evidence of certain tests' validity and reliability, however, it was mostly through independent studies that the empirical status of these psychological tests became evident. Chartrand and his colleagues (1992), as well as Ford and Summers (1992) are some of the researchers that attempted to uncover the psychometric properties of widely used tests like the TAIS (Nideffer, 1976b) and the PSIS (Mahoney et al., 1987). Results of their studies are discussed in the following section.

Validity and Reliability of Inventories Used in Sport Psychology Research

The construction and validation of psychological tests is undoubtedly a very important methodological component of research. Schutz and Gessaroli (1993) reported that many weaknesses stem from the process of developing and validating tests, and that such weaknesses usually lie in the misapplication, misunderstanding, or misinterpretation of statistical procedures and analyses. The process of validating a test is ongoing; both the test scores and the theory behind the inferences that are made from these test scores must be validated (Zumbo & Hubley,

1993). According to Ford and Summers (1992), the reliability and validity of tests need to be continually assessed because "they provide important criteria for judging test quality" (p. 283). Hackfort and Schwenkmezger (1993) astutely noted that the validity of instruments significantly depends on such factors as openness, honesty, accurate self-evaluation, and also the self-awareness of respondents.

Some of the psychological inventories that have been used to conduct research in sport have failed to demonstrate acceptable psychometric properties after being evaluated by other researchers (Chartrand et al., 1992; Gauvin & Russell, 1993; Hackfort & Schwenkmezger, 1989; Landers et al., 1986; Schutz & Gessaroli, 1993; Summers & Ford, 1990).

In one particular study, it was demonstrated that the Psychological Skills Inventory for Sport (PSIS) had several psychometric problems. Indeed, Chartrand and his colleagues (1992) reported that the internal consistency of the PSIS's scales is poor and its factor structure is questionable. These authors have not only indicated that "there is still a need for instruments that assess a broad range of psychological skills possessed by athletes" (p. 405), but also that "currently, there is a need for process- and outcome-related research on psychological skills training programs, and reliable and valid instruments are required to assess the effectiveness of these interventions" (p. 412).

In another study, Ford and Summers (1992) evaluated the factorial validity of Nideffer's TAIS. Their analyses showed that many of the TAIS's subscales had "insufficient factorial validity" as well as "poor discriminant validity" (p. 283). After reviewing research on the TAIS, Landers (1985) concluded that the inventory appears to measure the narrow-broad dimension but

not the internal-external dimension. In addition, no evidence was found to suggest that the TAIS is a good predictor of sport performance.

Results from these assessment studies and from Anshel's (1987) and Ostrow's (1990) extensive reviews of psychological inventories demonstrated that *valid* and *reliable* instruments that target the assessment of a wide range of mental skills are lacking. This led researchers at the University of Ottawa to develop the OMSAT. Of importance was that the OMSAT be constructed based on sound theoretical principles and legitimate statistical measures.

The Evolution of the OMSAT

The OMSAT was initially created by Salmela (1992) and a group of graduate students at the University of Ottawa. The OMSAT's conceptual base evolved from Orlick's (1992) Wheel of Human Excellence (see Appendix A) and also from findings related to important performance components in sport psychology (Anshel, 1987; Grove & Hanrahan, 1988; Mahoney, 1989; Mahoney et al., 1987; Orlick & Partington, 1988; Ostrow, 1990; Seiler, 1992). One of the suggestions made over the years was that the terminology used to describe psychological constructs has not been consistent among researchers and practitioners (Seiler, 1992). In order to rectify this problem, Seiler recommended that researchers and practitioners clarify the terminology by using a more systematic, theoretical and cooperative approach, and by incorporating a language that consumers could understand. This issue was an important consideration in the development of the OMSAT (Bota, 1993).

A substantial body of research in sport psychology has focused on the identification of mental skills for performance enhancement, though it now appears that psychological skills training and evaluation have also become an integral part of this research (Brewer & Shillinglaw,

1992; Gould, Hodge, Petlichkoff, & Simons, 1990; Grove & Hanrahan, 1988; Vealey, 1988). In her attempt to outline future directions for psychological skills training (PST), Vealey revealed that PST should (a) target populations other than elite athletes, (b) move beyond education to implementation, (c) differentiate between psychological skills and methods, and (d) facilitate the theory / practice relationship by conducting research on PST programming and evaluation.

In light of what has just been said, the OMSAT was developed with an intent to distinguish and measure various psychological skills that are currently being used by athletes to enhance performance. It was purposely created so that it could be used to not only assess the skills of elite athletes but also those of developing, lower level athletes. The OMSAT was also devised with the idea that it could potentially be used by sport psychologists for practical assessments and interventions, as well as for research purposes to provide information on the effectiveness of psychological skills training programs and issues such as the prevalence or mastery of particular mental skills among certain levels, sports, or populations of athletes.

Once again, the OMSAT is a questionnaire devised to assess a broad range of mental skills that athletes of various levels might possess. Based on a thorough review of the literature, Salmela (1992) initially identified 14 mental skills as being important for exceptional performance in sport. These skills thus formed the framework of the OMSAT, and following Seiler's (1992) suggestion, were regrouped under five larger categories: foundation skills (beliefs, commitment, goal-setting); affective skills (stress reactions, fear, relaxation, energizing); cognitive skills (imagery, mental practice, focusing, refocusing); competition skills (simulation, competition planning); and team dynamics. The 14 mental skills scales comprised 114 questions that were

scored on an always-never 5-point Likert scale. The Likert scale also included a "don't know" option.

One of the purposes of Bota's research with the OMSAT questionnaire was to subject it to conventional statistical analyses to determine its validity and reliability. The OMSAT-1 yielded acceptable reliability estimates. Internal consistency values ranged from .63 to .91. However, Bota analyzed in detail each and every item comprised in the questionnaire. After having investigated the meaningfulness, clarity, and frequency distribution of the items, as well as the item-total correlations, it was concluded that some questions were: (a) unclear, (b) including multiple questions, (c) not adding any new information to the questionnaire, and (d) frequently responded to with 'don't know'. Furthermore, it was concluded that a shorter format of the questionnaire would be advantageous.

This led Bota (1993) to construct a new version of the OMSAT, the OMSAT-2. This version was reduced to 12 mental skills scales and 71 items. The Team Dynamics scale was dropped as the inventory was developed to measure skills of athletes from both individual and team sports, and the Simulation scale was combined with the Mental Practice scale. Subsequent analyses on the OMSAT-2 indicated that the inventory was a potentially reliable psychometric measurement tool. Internal consistency values ranged from .78 to .87, and test-retest reliability coefficients varied from .67 to .90. Bota didn't conduct a factor analysis on the first and second versions of the OMSAT. As a result, he stated that although the instrument appeared to be reliable, it was not guaranteed to be entirely valid. Results of his research only provided partial support to the OMSAT-2's validity.

Other interesting results found in Bota's study pertained to the assumptions underlying Orlick's (1992) heuristic Wheel of Human Excellence. As previously mentioned, Orlick's perspective has been that belief and commitment are the most critical mental components for achieving excellence. From an empirical standpoint, the OMSAT supported this assumption. Results, however, suggested that goal-setting also be made an explicit central skill in Orlick's model; goal-setting, in addition to belief and commitment, was one of the best discriminating scales between different levels of athletes (Bota, 1993).

Draper, Salmela and Durand-Bush (1995) recently provided more information on the OMSAT-2's validity. The theoretical structure of the OMSAT-2 was tested using a confirmatory factor analysis with the program LISREL. Three factors were postulated in the model. The first factor, named "Foundation skills" comprised the items that formed the Goal-Setting, Commitment and Belief / Self-Confidence scales; the second factor was a measure of affective skills and included the items regrouped under the Stress Control, Fear Control, Relaxation and Energizing scales; finally, the last factor, entitled "Cognitive skills," consisted of the items that made up the Imagery, Mental Practice, Focusing and Refocusing scales.

Results indicated that measures of overall fit for the model were good. LISREL produced a chi-square value of 11.5 with 41 degrees of freedom ($p = 1.00$). The goodness of fit and adjusted goodness of fit indices were .996 and .994, respectively. The root mean square residual was .5311. According to Jöreskog and Sörbom (1989), the goodness of fit and adjusted goodness of fit indices provide the best evidence to conclude whether the fit of a model is adequate. Large chi-square values reflect a bad fit whereas small ones reflect a good fit. Furthermore, Cuttance (1987) suggested that models with adjusted goodness of fit indices below .80 are inadequate and

that acceptable models are above .90. It was thus concluded from this study that the factor structure of the OMSAT-2 was adequate. As Zumbo and Hubley (1993) reiterated, validating an instrument is an ongoing process. Despite these promising results, the OMSAT-2 needed to be further refined and evaluated.

CHAPTER III

METHODOLOGY

Subjects

A total of 462 subjects participated in this study. It is important to note that although 462 individuals completed the questionnaire, only 335 subjects' scores were included in the analysis. One hundred and eleven (111) subjects did not completely fill out one or more of the scales on the questionnaire and were thus dropped out of the analysis. The OMSAT-3 included six questions that measured social desirability, thus the 16 subjects whose scores on the social desirability scale exceeded two standard deviations from the overall mean of social desirability scores (M = 25.15, SD = 5.31) were also excluded from the analysis.

Subjects were divided into one of the following two groups based on their level of participation in sport: an elite group and a competitive group. The elite group consisted of 147 subjects, more precisely 77 males and 70 females, whereas the competitive group comprised 188 subjects, 98 of whom were males and 90 were females. Subjects were aged between 9 and 42 years and the mean age was 19.62 years.

Participants in this study came from various sport disciplines. More specifically, 35 different sports were represented (see Appendix B for a detailed outline), with hockey (n=56), soccer (n=39), water polo (n=37), basketball (n=34), swimming (n=33), baseball (n=23), rowing (n=17), fencing (n=13), and karate (n=10) being the most common ones. Not only did subjects in the sample practice different sports, they also had different countries of origin (see Appendix C). The sample included athletes from 20 different countries, 305 of whom were from Canada, 6 were

from the United States, 3 were from the Czech Republic, another 3 were from England, 2 were from China, 2 other athletes were from Slovakia, and finally there was 1 athlete representing each of the remaining 14 countries (Scotland, Netherlands, Taiwan, Salvador, Trinidad, Malaysia, Maroc, Jamaica, Nigeria, Lithvania, Domenica, Lebanon, Vietnam and Belgium).

An attempt was initially made to include an equal number of male and female athletes, an equal number of elite and competitive athletes, and an equal number of athletes in each sport. Because of environmental and time constraints, the researcher realized that this goal would be hard to achieve. The final sample consisted of nearly an equal number of males and females and an equal number of elite and competitive athletes. However, the attempt to include an equal number of athletes in each sport was not entirely successful. Despite this, the subject sample size was appropriately large and representative of the athletic population.

The following populations were sought to answer the OMSAT-3 questionnaire: (a) athletes on university / college teams; (b) athletes enrolled in local, provincial and national sport clubs and schools; and (c) athletes on national and international teams competing on the world circuit. To recruit subjects, the researcher and other collaborators contacted coaches and sport administrators from teams, clubs and schools, by telephone or by mail in order to explain the purpose of the project and request the athletes' participation. A letter of approval complying with the requirements of the Faculty of Health Sciences Human Research Ethics Committee (1993) was given to all authorities (see Appendix D), and duly signed before procedures for the administration of the OMSAT-3 questionnaire were undertaken.

Instrument

Description of the OMSAT-3. The instrument used in this study was the OMSAT-3 (see Appendix E). The OMSAT-3 was devised to assess a broad range of mental skills and more specifically to obtain information on each athlete's perceived competence in the various mental skills included in the questionnaire.

The OMSAT-3 included 12 mental skills scales regrouped under the three following broader conceptual components: (a) foundation skills (goal-setting, belief / self-confidence, commitment), (b) affective skills (stress control, fear control, relaxation, energizing), and (c) cognitive skills (imagery, mental practice, focusing, refocusing, and competition planning). The inventory comprised 85 questions, 6 of which were designed to measure social desirability. These six questions were camouflaged throughout the questionnaire and intended to provide information on the tendency of individuals to give answers that were socially acceptable. Examples of these questions are: "There have been times when I was jealous of my opponents' success / great performances," "If I could sneak someone in for free to see me compete, I would probably do it," and "There have been occasions when I have taken advantage of someone."

Each question in the OMSAT-3 was answered on a strongly disagree to strongly agree 7-point Likert scale. At the end of the questionnaire, subjects were asked to rank in order of importance 4 of the 12 mental skills they felt were most important / useful to their performance. Furthermore, the OMSAT-3 contained an introductory page which provided instructions for completing it. Demographic questions pertaining to the subjects' age, sex, sport discipline, country of origin, current and highest level of participation in sport, and highest level of education were also included on this page (see Appendix E).

Development of the OMSAT-3. The first step in developing the OMSAT-3 consisted of revising, adding or deleting items in the questionnaire based on past research findings, including empirical studies and existing psychological inventories, as well as expert opinions and results of the pilot-test. The OMSAT-3 was test-piloted with professors, graduate students, and a class of fourth year undergraduate sport psychology students, some of whom were competitive athletes. Without necessarily filling out the questionnaire, these individuals were asked to read each question attentively, and to comment on the wording and clarity of the items and scales. They were also asked to comment on the comprehensibility of the instructions, as well as the overall content, structure and format of the inventory. Feedback from these individuals helped considerably to improve the quality of the questionnaire.

Following are specific methodological issues that were considered in the development of the OMSAT-3. Items that were ambiguous, contained jargon terms, or asked two or more questions at the same time were eliminated or reworded. According to Streiner and Norman (1989), negatively worded items that use words such as "not," "rarely," "never," or words with negative prefixes, should be avoided as they tend to have lower validity coefficients than positively worded ones. The researcher thus avoided using these types of items in the questionnaire. Items were also made as short as possible, since these authors reported that item validity coefficients decrease as the number of letters in items increase.

Face validity, content validity and social desirability were other factors considered in the development of the OMSAT-3. Items were devised to have face validity so that their meaning and relevance would be self-evident. In terms of content validity, scales were reviewed to ensure they had enough items and adequately covered the domain under investigation. The validity of an

instrument can be jeopardized when subjects' responses are affected by social tendencies (Streiner & Norman, 1989). For example, if subjects in this study would not have responded to items truthfully and only answered what they thought researchers, coaches or sport psychologists wanted them to answer out of fear of being labeled inferior, being denigrated, and even rejected from a team, then results of the OMSAT-3 would be falsified. On a more global scale, results of this type would imperil researchers' attempts to establish valid theories and measures for conducting research. To account for this important testing issue, six items (see questionnaire items 12, 18, 20, 34, 47 and 57 in Appendix E) were included in the OMSAT-3 and were used to eliminate subjects who scored very high or very low on social desirability.

Response scale. The next step in the development of the OMSAT-3 entailed devising an appropriate response scale. A continuous judgment scale that provided direct quantitative estimates of the subjects' perceived mental skills abilities was selected for the OMSAT-3. More specifically, a 7-point Likert scale framing responses on a strongly disagree to strongly agree continuum was chosen to replace the 5-point Likert scale that included a never to always continuum, in the first and second versions of the OMSAT.

The latter adjectival scale (always - never) was replaced with the former one (strongly disagree - strongly agree), as "never" and "always" were viewed as inappropriate response choices for many of the statements in the OMSAT-3. Furthermore, the previous 5-point scale was expanded to a 7-point scale as a result of Streiner and Norman's (1989) suggestion that additional categories be included at the ends of a scale because of the tendency raters have of not using its extreme positions. In this way, the researcher was more or less assured that at least five categories

would be used. In any case, it was suggested that a minimum of 5 to 7 and a maximum of 10 to 15 categories be included in a Likert scale.

According to Streiner and Norman (1989), another way of dealing with potential "end-aversion bias" or the reluctance of some people to use the extreme categories on a scale, is to avoid using absolute statements at the end points. Adjectives such as "strongly agree" and "strongly disagree" were thus chosen for the extreme points of the OMSAT-3 Likert scale, instead of adjectives like "totally agree" and "totally disagree."

Streiner and Norman (1989) reported that subjects sometimes have the tendency to give positive responses to questions, and a way to correct this "acquiescence bias" is to include items that are keyed in a negative direction in addition to those keyed in a positive direction. The four following OMSAT-3 scales were consequently designed to be scored in the reverse order: Stress Control, Fear Control, Focusing, and Refocusing. Examples of questions in the Stress Control and Fear Control scales are "Being evaluated by others makes me very anxious," and "I am afraid to make mistakes," respectively. Note the difference in the following examples of questions keyed in the positive direction that were taken from the Goal-Setting and Imagery scales: "I set daily training goals," and "I find it easy to create mental images." Inevitably, subjects' answers to both the first and latter set of examples of questions would have different meanings.

Regardless of the direction in which the items were intended to be answered, subjects were allowed the choice of remaining neutral in their responses. This was one of the reasons an odd number of categories (N=7) were included in the Likert scale. The fourth point on the scale was neutral and had as its adjective "don't agree / don't disagree" (see scale in Appendix E).

Translation. The OMSAT-3 was translated into French (see Appendix G) once it was completed, as it was anticipated that many of the subjects partaking in the study would be francophones. Throughout this procedure, the researcher was more concerned with translating the items in a way they would convey the same meaning in both languages, than translating them word for word. In order to ensure the meaning of the items was respected and the language employed was of high quality, the translated version was test-piloted with professors, athletes, graduate and undergraduate students who were fully bilingual and knowledgeable about the domain under study.

A parallel back-translation procedure (Vallerand, 1989) in which the original instrument is translated into the target language and then translated once again into the original language without the help of the original instrument, was not used in this study. This could perhaps be the object of another research endeavour. Nevertheless, because of the simplicity of the items in the OMSAT-3, for example, "I set long-term goals in my sport" was translated to "Je me fixe des buts à long terme dans mon sport," the inventory was believed to have been accurately translated and subjects were given the opportunity to fill out the English or French version. Of the 335 participants, 204 completed the English questionnaire and 131 completed the French one.

Procedure

Athletes were mainly recruited by means of coaches and sport administrators. Subjects willing to participate received a letter of information (see Appendix F) explaining the purpose of the study, issues related to anonymity and confidentiality of the results and the process of assessing validity and reliability of the OMSAT-3. In this letter, potential benefits for both the

athletes and the field of research in sport psychology were outlined. Subjects were advised that there would be very little discomfort, harm and risk involved in the study.

The researcher made arrangements with the authorities to administer the OMSAT-3 in person. In some instances, the researcher traveled out of town to meet teams of athletes. In a few instances, the inventory was mailed to authorities and athletes because they lived too far away. In these cases, the researcher arranged to have a coach administer it and return it in a prestamped envelope. Some of the mature athletes who did not have access to a coach, filled out and returned the questionnaire themselves. Subjects, coaches and authorities were given the opportunity to ask questions at all times during their involvement in the study. Collaborators in this study, that is, colleagues and graduate students who had access to athletes, also helped with the administration of the OMSAT-3.

A total of 44 subjects participated in the test-retest portion of the study. The retest was necessary for the evaluation of test-retest reliability, and took place within two weeks of the initial testing.

Data Analysis

All OMSAT-3 scores were entered in Microsoft Word's Access database program. An SPSS program for Windows was used to obtain descriptive statistics, to verify the internal consistency of the scales and their test-retest reliability, to do a multivariate analysis of variance as well as a discriminant analysis, and finally, to obtain athletes' mean ratings of the most important / useful OMSAT-3 scales. More details on the data analysis procedures can be found in the following section.

CHAPTER IV

RESULTS

Results of the various types of analyses conducted with the OMSAT-3 are summarized and presented under the following headings: descriptive statistics, internal consistency / test-retest reliability, multivariate analysis of variance / discriminant analysis, and relative importance of OMSAT-3 scales. The detailed analysis and interpretation of the results appear in Chapter V.

Descriptive Statistics

One way of ascertaining the normality of scores is to look at the standard deviation and variance, as well as the skewness and kurtosis values of each item. One can also assess normality by comparing the mean, median and mode of the items and determining if these are approximately equal. See Appendix H for information on the distribution of individual OMSAT-3 items, scale, and conceptual component scores.

At the item level (see Table H1 in Appendix H), the highest and lowest means were 6.23 and 2.88, and were associated with questions 43 and 20, respectively. Thirty-three (33) out of the 85 questions, thus 39% of the questions, had either a skewness or kurtosis value exceeding 1.00 or -1.00. Out of those 33 questions, 11 of the questions (33%) had skewness or kurtosis values between 1.10 and -1.10. At the conceptual level, (see Table H3 in Appendix H), skewness and kurtosis values were all within 1.0 and -1.0, which is the criteria for data to be considered normal (Schutz & Gessaroli, 1993).

Mean scale scores of both elite and competitive athletes who participated in the study are presented in Figure 1 (see Appendix I for more details). Both groups of athletes scored highest on the Commitment scale (M = 5.98 and 5.53 respectively, out of a possible 7), the Belief / Self-

Confidence scale (M = 5.73 and 5.46 respectively), and the Goal-Setting scale (M = 5.57 and 5.37 respectively). Elite athletes obtained the lowest scores on the Relaxation scale (M = 4.46), while for competitive athletes, lowest scores were obtained on the Refocusing scale (M = 4.17).

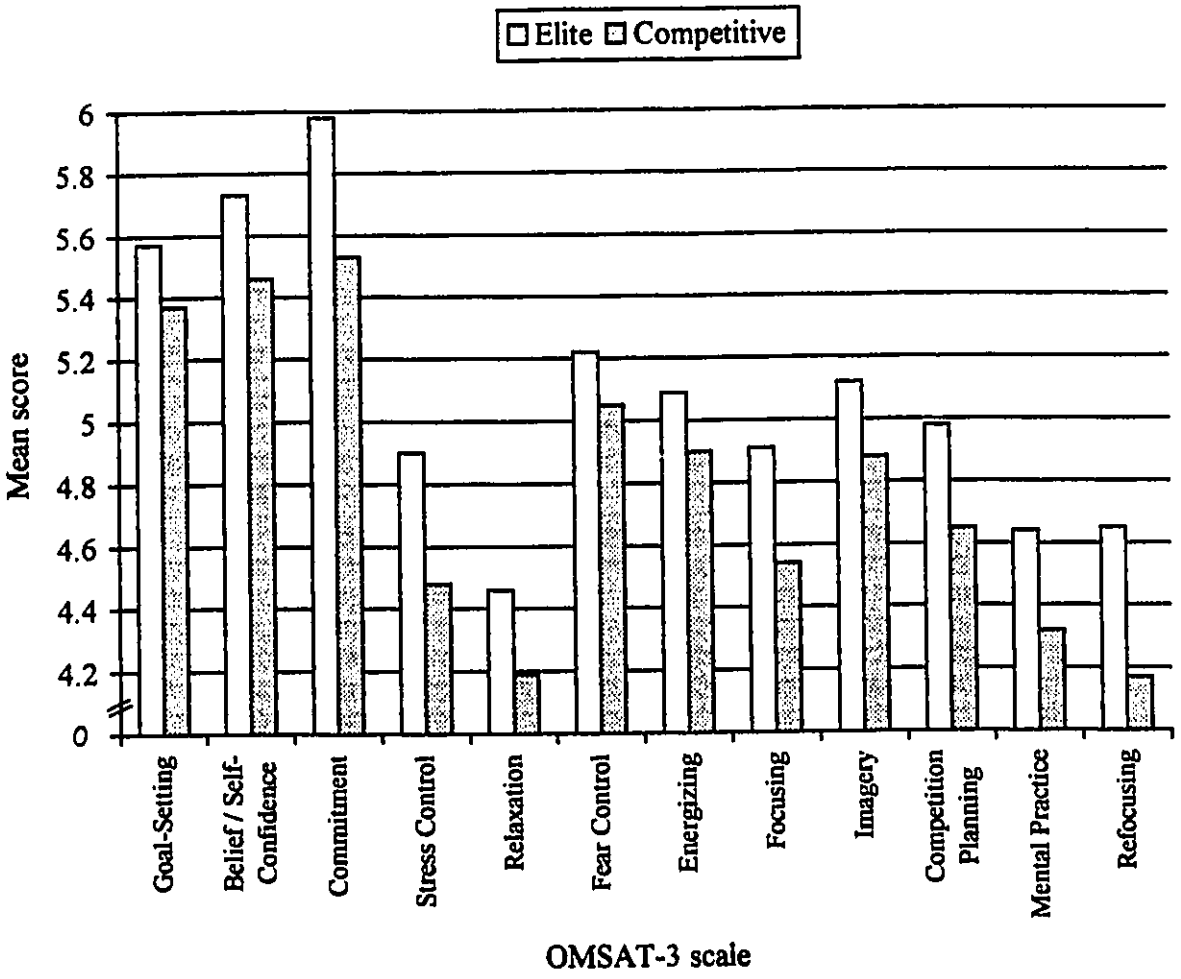

Figure 1. Mean scale scores of elite versus competitive athletes.

As previously mentioned in the methodology section, the OMSAT-3 scales were regrouped under the three broader conceptual components: Foundation skills, Affective skills, and Cognitive skills. Most of the analyses were conducted at the scale level and at the conceptual component level. The mean OMSAT-3 broader conceptual component scores are presented in

Figure 2. The highest scores were associated with the Foundation skills component (M = 5.59), while the lowest scores were reflected in the Cognitive skills component (M = 4.65).

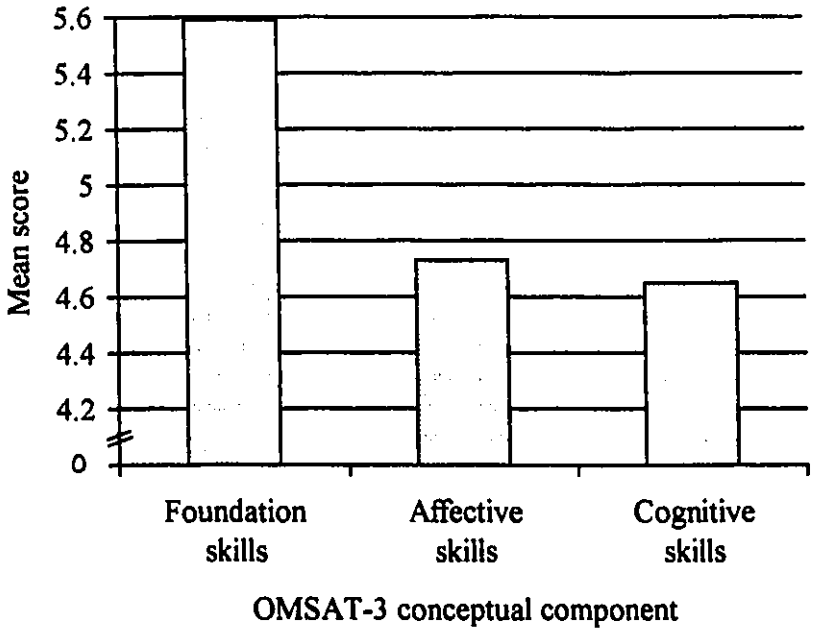

Figure 2. Mean conceptual component scores.

Correlation coefficients were provided in addition to descriptive statistics to determine the relationship between the OMSAT-3 scales. Pearson correlation coefficients of the 12 scales are presented in Table 1. Results indicate that the highest correlated scales were Imagery and Mental Practice (r =.60), Goal-Setting and Commitment (r =.57) and Focusing and Refocusing (r =.50). The lowest correlations were between the Fear Control and Mental Practice scales (r = .02), the Goal-Setting and Fear Control scales (r = -.03), as well as the Competition Planning and Refocusing (r = -.04), and Competition Planning and Fear Control (r = -.04) scales.

Table 1

Pearson Correlation Coefficients of the OMSAT-3 Scales

	1	2	3	4	5	6	7	8	9	10	11	12
1[a]	1.0											
2[b]	.42**	1.0										
3[c]	.57**	.46**	1.0									
4[d]	.05	.37**	.07	1.0								
5[e]	.31**	.41**	.30**	.35**	1.0							
6[f]	-.03	.12**	-.08	.48**	.09	1.0						
7[g]	.34**	.32**	.34**	.20**	.37**	.04	1.0					
8[h]	.13*	.38**	.28**	.48**	.24**	.42**	.25**	1.0				
9[i]	.21**	.26**	.26**	.26**	.43**	.10	.30**	.31**	1.0			
10[j]	.39**	.25**	.29**	.14*	.33**	-.04	.34**	.11*	.26**	1.0		
11[k]	.39**	.41**	.43**	.17**	.46**	.02	.36**	.30**	.60**	.49**	1.0	
12[l]	.06	.35**	.13*	.53**	.34**	.46**	.14*	.50**	.23**	-.04	.14*	1.0

Note. [a] Goal-Setting. [b] Belief / Self-Confidence. [c] Commitment. [d] Stress Control. [e] Relaxation. [f] Fear Control. [g] Energizing. [h] Focusing. [i] Imagery. [j] Competition Planning. [k] Mental Practice. [l] Refocusing.

*$p < .05$. **$p < .01$.

Internal Consistency / Test-Retest Reliability

Another important step in constructing and validating a psychological test is determining the reliability or internal consistency of its scales, as well as the temporal stability or test-retest reliability of the instrument. Information pertaining to these empirical testing procedures is presented in the following sub-section.

According to Schutz and Gessaroli (1993), "An essential criterion in the development of scales in a psychological inventory is that items that are used to calculate scores for a particular scale should all measure the 'same thing'" (p. 913). Calculating internal consistency estimates is one way of assessing the adequacy of items in a scale.

Measures of internal consistency such as the Cronbach alpha coefficient are good indices of reliability. However, another type of measure that provides important information on the stability of a test over time is test-retest reliability. In order to assess test-retest reliability, the test is administered on two occasions separated by some interval of time, usually 2 to 14 days (Streiner & Norman, 1989). Information regarding the reliability and temporal stability of the OMSAT-3 is summarized in Figure 3. For specific information, see the table in Appendix J in which are presented in the columns from left to right: (a) internal consistency estimates of the OMSAT-3 scales if individual items are removed, (b) item-total correlations, (c) internal consistency estimates of the OMSAT-3 scales if all existing items are included, and (d) test-retest reliability coefficients.

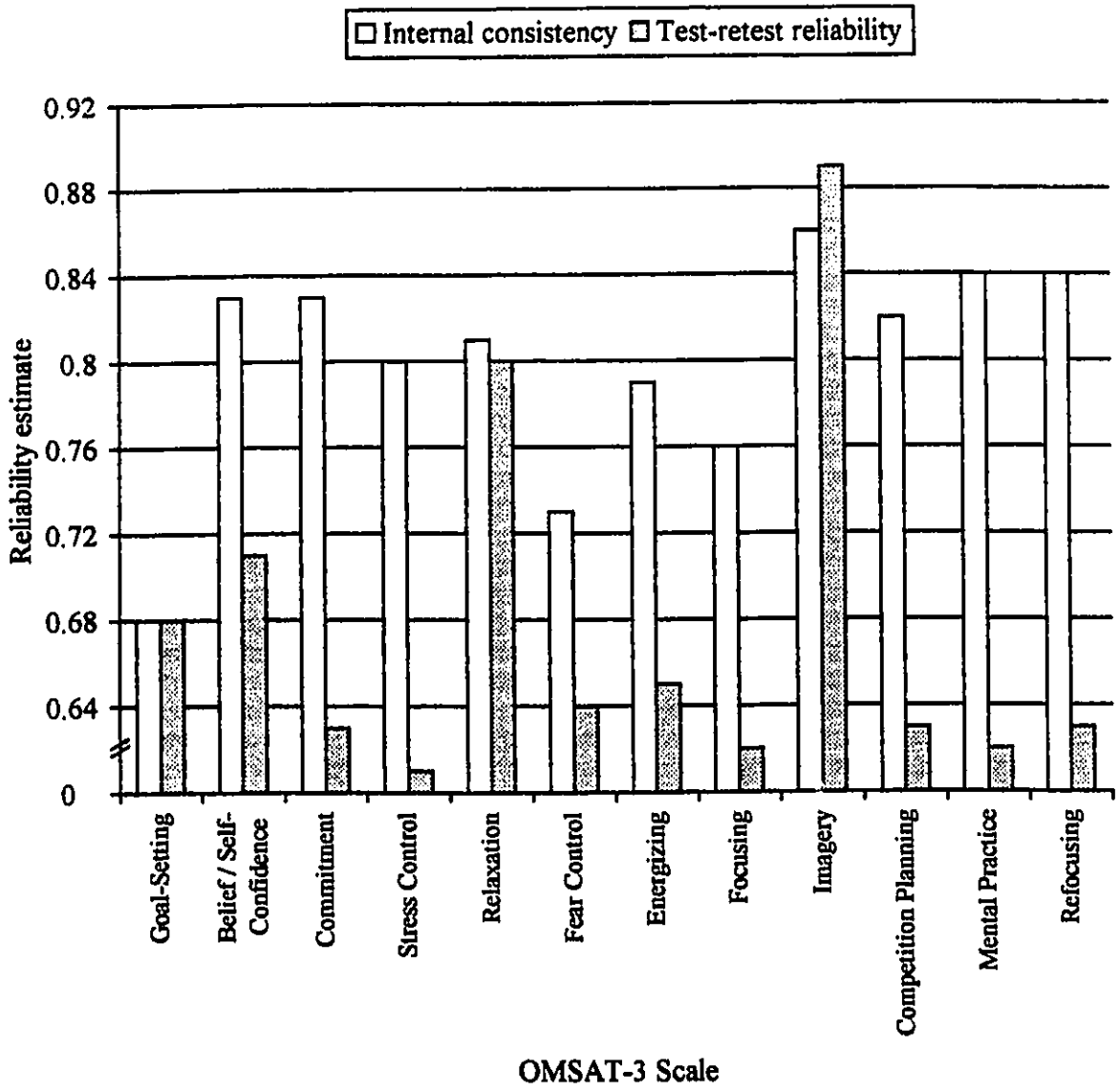

Figure 3. Internal consistency and test-retest reliability estimates of the OMSAT-3 scales.

Internal consistency estimates of the OMSAT-3 scales varied from .68 to .86. The Goal-Setting scale had the lowest alpha value (α = .68), whereas the Imagery scale had the highest one (α = .86). The mean alpha score for the OMSAT-3 scales was .80. Test-retest coefficients ranged from .61 to .89, with the Imagery scale having the highest value (r = .89) and the Stress Control scale the lowest value (r = .61). The mean test-retest correlation was .68. Questions 12, 18, 20,

34, 47 and 57 formed the social desirability scale and were thus not included in the estimates of reliability.

In addition to assessing the reliability of the OMSAT-3 scales, reliability estimates were calculated for the OMSAT-3 conceptual components. The internal consistency values for these components are presented in Figure 4 (see Appendix K for specific values). All alpha values exceeded .80, with the Cognitive skills component having the highest value (α = .89). The mean alpha value for the OMSAT-3 conceptual components was .87.

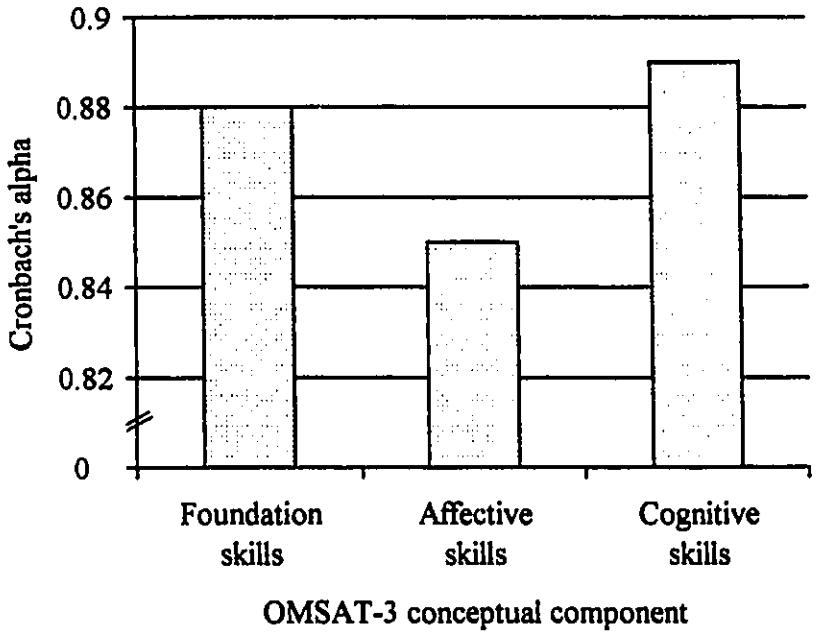

Figure 4. Internal consistency estimates of the OMSAT-3 conceptual components.

Multivariate Analysis of Variance / Discriminant Analysis

According to Streiner and Norman (1989), another method used to assess the validity of an instrument is called construct validation by extreme groups. This method involves administrating the test to two groups of individuals, whereby one group is expected to score

significantly higher on the instrument than the other group. Streiner and Norman revealed that although using this type of design to establish validity may be important, it is by no means sufficient. Nevertheless, it was pointed out that it is minimally necessary for a scale to be able to differentiate between individuals who have a given skill and those who do not have it.

The OMSAT-3 was administered to two groups of athletes: an elite group and a competitive group. Although not as extreme as the case in which the OMSAT-3 would have been administered to athletes and non-athletes, the two groups in this study differed. They were comprised of athletes who competed at different levels. It was hypothesized that athletes competing at higher levels would have superior mental abilities and would have thus scored higher on the questionnaire than their counterparts competing at lower levels. The OMSAT-3 would not be used in practice to discriminate between elite and less elite athletes, however, a multivariate analysis of variance (MANOVA) was conducted to determine if the instrument could differentiate between the two groups of athletes. Results of the MANOVA are presented in Table 2.

Results indicated that there is a significant difference between the elite group and the competitive group of athletes on the set of dependent variables (12 OMSAT-3 scales), $F(12, 322) = 3.97, p < .000$. Furthermore, an overall multivariate effect size of .60 was calculated using Cohen's (1977) equation. This suggested that group membership accounted for approximately 60% variance in the OMSAT-3 scale scores.

When the results of a multivariate test are significant, such as in this case, the following step is to determine the relative contribution of each dependent variable, that is, the OMSAT-3 scales. One procedure designed to provide such results is a discriminant analysis (Schutz, Smoll, & Gessaroli, 1983).

Table 2

Results of the Multivariate Analysis of Variance (MANOVA)

Test name	Value	Exact *F*	Hypoth. *df*	Error *df*	Sig. of *F*
Pillais	.13	3.97	12.00	322.00	.00*
Hotellings	.15	3.97	12.00	322.00	.00*
Wilks	.87	3.97	12.00	322.00	.00*
Roys	.13				

A discriminant analysis was thus performed on the items, on the scales, as well as on the broader conceptual components of the OMSAT-3, to determine which items, scales and conceptual components best discriminated between the elite group and competitive group of athletes. Based on the computation of discriminant functions, the discriminant analysis also yielded predictions of group membership. According to the best linear function, subjects were classified into groups and percentages of correctly classified cases were obtained. Results of the discriminant analysis are presented in Table 3.

The three best discriminating questions between the elite group and competitive group were question 16 (corr = .42) "I am willing to sacrifice most other things to excel in my sport," question 17 (corr = .40) "I am committed to becoming an outstanding competitor," and question 26 (corr = .33) "I feel more committed to improve in my sport than to anything else in my life," all of which were part of the Commitment scale.

Table 3

Discriminant Analysis Results

Variables[a]	Size of correlation	% of cases correctly classified
	OMSAT-3 questions	
Q16	.42	
Q17	.40	
Q26	.33	
Q3	.33	
Q83	.30	
Q77	.27	
Q10	.27	**80.30**
Q1	.26	
Q82	.25	
Q84	.25	
Q21	.24	
Q58	.24	
Q30	.24	
Q66	.22	
Q55	.22	
	OMSAT-3 scales	
Commitment	.78	
Stress Control	.51	
Refocusing	.51	
Focusing	.46	
Belief / Self-Confidence	.43	
Mental Practice	.38	**65.37**
Competition Planning	.36	
Goal-Setting	.35	
Relaxation	.31	
Imagery	.26	
Energizing	.23	
Fear Control	.20	

Table 3 - *continued*

Variables[a]	Size of correlation	% of cases correctly classified
	OMSAT-3 conceptual components	
Foundation skills	.89	
Cognitive skills	.79	**62.69**
Affective skills	.67	

Note. [a] variables were ordered by size of correlation within the discriminant function.

Evidently, at the scale level, the best discriminating scale was Commitment (corr = .78), followed by the Stress Control, and the Refocusing scales with correlations of .51. At the conceptual level, Foundation skills were found to best discriminate between the two groups of athletes. The best percentage of correct classification was 80.30% at the item level.

Relative Importance of the OMSAT-3 Scales

In addition to determining the psychometric properties of the OMSAT-3, another purpose of this study was to assess the relative importance of each mental skill presented in the questionnaire, as perceived by the athletes participating in the study. To this end, subjects were asked to rank in order of importance 4 of the 12 mental skills presented in the questionnaire, they felt were most important / useful to their performance. The athletes' ratings of the four most important / useful OMSAT-3 scales, as well as the frequency and percentage of subjects per rank are presented in Table 4. For a detailed breakdown of elite versus competitive athletes' ranks of the OMSAT-3 scales, and the frequency and percentage of subjects per rank, see Appendix L.

Within Rank 1 in Table 4, athletes (53.3%) rated Belief / Self-Confidence as being the most important / useful mental component to their performance. However, Goal-Setting and Commitment were also perceived as being important mental components as 16.4% and 13.7% of the subjects respectively rated these as being most important. For 6.3% of the athletes, Focusing was the most important skill. A mere 22% of the athletes rated Focusing as being the second most important / useful skill to their performance. Of interest is that 20.3%, 17.6% and 11.5% of the athletes identified Belief / Self-Confidence, Commitment and Goal-Setting, respectively, as being their second most important / useful skill. Focusing was rated as the third most useful skill for 23.3% of the athletes, and fourth most useful skill for 14.3% of them.

Table 4

Athletes' Ratings of the Four Most Important / Useful OMSAT-3 Scales

	Rank of OMSAT-3 scales							
	Rank 1		Rank 2		Rank 3		Rank 4	
	Scale	*f* (%)	Scale	*f* (%)	Scale	*f* (%)	Scale	*f* (%)
Scales rated in order of importance	Belief / Self-Confidence	176 (53.3)	Focusing	74 (22.4)	Focusing	77 (23.3)	Focusing	47 (14.3)
	Goal-Setting	54 (16.4)	Belief / Self-Confidence	67 (20.3)	Energizing	38 (11.5)	Energizing	35 (10.7)
	Commitment	45 (13.7)	Commitment	58 (17.6)	Goal-Setting	37 (11.2)	Imagery	34 (10.4)
	Focusing	21 (6.3)	Goal-Setting	38 (11.5)	Commitment	35 (10.6)	Refocusing	32 (9.8)

Note. In order to fully understand what was asked of the athletes, the last page of the OMSAT-3 in Appendix E should be consulted.

CHAPTER V

DISCUSSION

Descriptive Statistics

Distribution of the data. Results concerning the distribution of individual OMSAT-3 item scores did not reveal any abnormal values (see Table H1 in Appendix H). The mean, median and mode of the items were close on the average, with these statistics having at most, a difference of two digits between them, for example, mean = 4.00, median = 5.00 and mode = 6.00. Item 10 in the Commitment scale had the lowest standard deviation and variance (*SD* = .83, variance = .69), whereas item 34, which was part of the Social Desirability scale, had the highest (*SD* = 2.04, variance = 4.17).

Skewness and kurtosis values of the OMSAT-3 items were not strikingly high which indicates that the data approached normality. The lowest skewness and kurtosis values were .02 and .01 respectively. The former was associated with item 46, the latter with items 20, 47 and 63. Items 47 and 63's kurtosis value was -.01. Item 43 in the Fear Control scale had the highest skewness and kurtosis values of -1.99 and 4.20 respectively. Attention should perhaps be paid to this item in the future.

It was found that 33 of the 85 items (39%) had either a skewness or kurtosis value exceeding 1.00 or -1.00. However, in taking a closer look, it was discerned that 20 of those 33 questions (61%) had either a skewness or kurtosis value within 1.20 and -1.20. Moreover, 11 of those 33 questions (33%) had either a skewness or kurtosis value within 1.10 and -1.10. Thus it can be said that only 13 out of the 85 questions (15%) in the OMSAT-3 had a skewness or kurtosis value exceeding 1.20 or -1.20. Schutz and Gessaroli (1993) suggested that data be

considered normal if most of the items have skewness and kurtosis values within 1.0. In light of what has been presented in the two previous paragraphs, it is concluded that the data is reasonably normal.

The means in the second column of Table H1 in Appendix H represent the means of the subjects' scores on the items. Subjects on the average scored highest on item 43 "I find it difficult to train because of the fear involved in my sport" ($M = 6.23$), item 10 "I believe I have the personal capacity to reach my goals" ($M = 6.18$) and item 23 "I give 100% effort in competition, whether I am ahead or behind" ($M = 6.18$). Note that item 43 was scored in the reverse order as it was part of the Fear Control scale, which was keyed in a negative direction to correct for potential acquiescence bias (Streiner & Norman, 1989). Thus, this high mean value indicates that subjects in this sample did not have difficulties training because of fear.

Results also suggest that athletes generally believed they could accomplish anything they set out to do. The fact that they reported giving 100% effort in competition at all times is an indication that they were highly committed individuals. Orlick and Partington (1988) found similar results with Canadian Olympic athletes who participated in the 1984 Olympic Games in Sarajevo and Los Angeles. It was reported that the most successful interviewed athletes in their study were seriously committed individuals who believed in themselves and had determination to accomplish their specific goals. Moreover, it can be seen from these high item mean scores that the athletes in this sample possessed important elements of excellence that were identified by Orlick (1992).

According to Orlick, being committed to excel through the good times and the bad, and believing in one's ability to succeed and reach personal goals are fundamental elements athletes need to perfect to achieve exceptional performance. Ericsson and his colleagues (1993) also

demonstrated the essence of developing high levels of commitment to overcome effort and motivational constraints associated with daily deliberate practice. Commitment is simply indispensable in the pursuit of expert performance as achieving such a goal generally requires a minimum of 10 years or 10,000 hours of intense, deliberate practice.

Interestingly enough, subjects scored the lowest on item 20 "I always practice what I preach" ($M = 2.88$), which was part of the Social Desirability scale, item 76 "My mental practice is planned (i.e., it's at a specific time each day, or I know in advance what I will rehearse and for how long)" ($M = 3.02$), and item 57 "No matter who I'm talking to, I am always a good listener" ($M = 3.17$), which was also part of the Social Desirability scale.

The database in the present study was set up so that high scores on the OMSAT-3 items reflected appropriate or theoretically correct behaviours and conversely, lower scores reflected less appropriate or less theoretically correct behaviours. Because items 20 and 57 were part of the Social Desirability scale and athletes scoring high (i.e., 6 or 7) on this scale were seen as potentially giving a social desirable answer, their scores on these items were inverted. For example, if athletes scored 6 on the item, then the researcher entered a 2 in the database, if they scored 5, then a 3 was entered, a score of 1 was replaced with a 7, 2 was replaced with 6 and vice versa, but 4 remained 4, as it was a neutral score. This consequently produced the low observed means. The fact that subjects initially scored high on items 20 and 57 suggests that they always practiced what they preached and they perceived themselves as being good listeners when talking to people. Athletes may have been genuine in their answers, but we must consider the fact that they also may have tended to be socially correct.

The other item that yielded a low mean (item 76) was very specific and included detailed information in brackets that could have confused the subjects. In taking a closer look at this question, it is now apparent that it was asking more than one question. Subjects may have had a specific time of day for mentally rehearsing their sport but they might not have had a plan of what they were exactly going to rehearse. It is recommended that this question be revised in the next version of the OMSAT.

Distribution scores were not only computed for items in the OMSAT-3, they were also calculated for the OMSAT-3 scales as well as for the broader conceptual components. Results of the distribution of the OMSAT-3 scale scores are presented in Table H2 in Appendix H. Of particular interest are the mean scale scores of elite and competitive athletes depicted in Figure 1. Results indicated that both elite and competitive athletes scored highest on the Commitment, the Belief / Self-Confidence and the Goal-Setting scales. Once again, it appears that athletes participating in this study were very committed individuals, possessed high levels of self-confidence, and set goals that guided their pursuit of exceptional performance. The Commitment, Belief / Self-Confidence and Goal-Setting scales formed the foundation skills component of the OMSAT-3 and were perceived as being the three most important mental components for reaching top level performance.

The fact that athletes scored highest on these three previously mentioned scales provides support to Orlick's (1992) model in which commitment and belief were conceptualized as core elements of human excellence. Although not made an explicit element in the wheel, goal-setting was also perceived by Orlick as an important underlying skill athletes need to develop. He suggested that athletes must first *believe in* and be *committed to* their set goals. Burton (1993)

was also convinced of the importance of goal-setting. He demonstrated that establishing goals helped athletes increase their levels of self-confidence and commitment, and had positive effects on their control of attention and anxiety. Contrary to Orlick, Bota (1993) proposed that goal-setting be made an explicit skill in the model of excellence, as it was found to be the second most significant variable after commitment to discriminate between elite and recreational athletes and elite and competitive athletes in the validation of the OMSAT-2. Further evidence as to why goal-setting should be made a distinct element in any model of excellence will be provided in the following sub-sections.

The above results were somewhat different than those found in Grove and Hanrahan's (1988) study, in which the psychological strengths and weaknesses of 39 interstate and international level field hockey players training at the Australian Institute of Sport were assessed using the Self-Analysis of Mental Skills questionnaire (SAMS). When asked to rank-order the following six general scales, Concentration, Emotional Control, Self-Confidence, Control of Nervousness / Tension, Use of Imagery, and Planning / Analysis, subjects ranked Control of Nervousness / Tension and Concentration as the mental skills they did best, and Use of Imagery and Self-Confidence as the skills they did worst. Contrary to these findings, athletes in the present study scored fairly low on the Stress Control and Focusing scales, which are comparable to Grove and Hanrahan's Control of Nervousness / Tension and Concentration scales respectively, and scored high on the Belief / Self-Confidence scale, which is comparable to Grove and Hanrahan's Self-Confidence scale.

The differences in these results could be due to several factors. For instance, athletes in the latter study came from the single sport of field hockey, and came from Australia. Secondly,

the sample was much smaller and homogeneous than the sample used in the present study. Moreover, the psychometric properties of the SAMS were not provided by the authors, thus making it impossible to ascertain if the results and inferences were reliable and valid. The fact that items on the OMSAT-3 were responded to using a Likert scale and those in the SAMS were rank-ordered made it more difficult to make justifiable comparisons.

Overall, subjects in the present study obtained the lowest scale scores on the Social Desirability scale ($M^a = 4.04$) and on the Relaxation scale ($M^a = 4.31$, see Table H2 in Appendix H). The Social Desirability scale may have yielded the lowest scores, however, the mean of 4.04 (out of the 7-point Likert scale) indicates that on the average, subjects were not too high or too low on social desirability. This provides some evidence that items were responded to with honest intentions. The lower mean score on the Relaxation scale suggests that athletes in the sample had more difficulty relaxing than setting-goals or developing a deep sense of commitment towards their sport. Relaxation was an inherent component of the Mental Readiness factor in Orlick's (1992) Wheel of Human Excellence. However, it was not included in Grove and Hanrahan's (1988) SAMS questionnaire nor in that of Mahoney and colleagues' PSIS (1987), both of which were used to assess psychological skills believed to be relevant to exceptional athletic performance.

At the broader conceptual level, athletes obtained the highest scores on the Foundation skills component (see Figure 2). This is once again an indication that athletes in this sample believed in and possessed key elements for success in sport. Subjects obtained lower scores on the Cognitive skills and Affective skills. This may in part be due to the fact that some of the skills in these components like imagery, mental practice, competition planning, and relaxation are more

difficult and take more time and commitment to perfect, or perhaps they were just not a priority for the athletes in this sample.

Correlation coefficients. Another way of describing scales is to look at their relationship or the way they correlate together. Correlation coefficients of the OMSAT-3 scales are presented in Table 1. The highest correlated scales were Imagery and Mental Practice (r = .60). This is very logical since imagery is usually an integral part of mental practice (Suinn, 1983). It has been demonstrated in the literature that these two skills have often been studied together, and that in some cases, the two terms have been used interchangeably (Murphy & Jowdy, 1993). Murphy and Jowdy have clearly raised the importance of distinguishing the two skills.

It was found that individuals who are better imagers, that is those who are more proficient at doing imagery, benefit more from mental practice than their less able counterparts (Suinn, 1993). It is thus logical that individuals scoring high on imagery would also score high on mental practice and vice versa. It was also suggested that experienced athletes benefit more from mental practice than novices. This was indeed the case for subjects in the present study, as mean scale scores reported in Appendix I show that elite athletes scored higher than competitive athletes on both the Imagery and Mental Practice scales.

Other highly correlated scales were Goal-Setting and Commitment (r = .57) which were both part of the Foundation skills component. Obviously, athletes who are committed will invest time into goal-setting. Conversely, as Orlick (1992) suggested, setting-goals and perceiving them as worthy and achievable can lead to higher levels of commitment. The significant relationship between these two scales was highly predictable because fundamentally, athletes need to be

committed to something; they need to be committed to their goals, to their mission, to moving in a set direction.

Focusing and Refocusing were also highly correlated scales (r = .50), and in fact, research has shown that focusing and refocusing are directly related components (Boutcher, 1993). Distraction theories have been used in the past to try and explain the relationship between attention control / focusing and performance. These theories have postulated that individuals lose their focus because certain factors attract their attention to task-irrelevant cues. Athletes constantly face distractions in sport and in life and it is believed that to obtain high levels of performance, they have to be able to not only focus their attention on task-relevant information, but to refocus when distractions shift their attention to non-relevant stimuli (Boutcher, 1993).

The lowest correlations were between the Fear Control and Mental Practice scales. The correlation coefficient of .02 suggests that there is practically no relationship between these two mental skills. Thus the fact that athletes mentally practice their sport has nothing to do with the amount of fear or the way they cope with fear in their sport. Low negative correlations were also found between the Fear Control and Goal-Setting scales (r = -.04), as well as the Fear Control and Competition Planning scales (r = -.04). This may be due in part to the fact that Fear Control was part of the Affective skills component, and Goal-Setting and Competition Planning were part of the Foundation and Cognitive skills components respectively.

In terms of the conceptual components, all three scales (Goal-Setting, Belief / Self-Confidence and Commitment) forming the Foundations skills component were highly correlated. This provides further evidence that goal-setting should be considered as another core skill athletes need to develop and refine for consistent high level performance. Scales within the Affective skills

component were also significantly correlated, except for the Fear Control scale that was not correlated with the Relaxation (r = .05) and Energizing (r = .04) scales. Attention definitely needs to be paid to the Fear Control scale. Of concern is also that Stress Control correlated highly with scales in the Cognitive skills component, that is, with Focusing (r = .48) and Refocusing (r = .53). Relaxation correlated highly with Imagery (r = .43) and Mental Practice (r = .46) which is logical because relaxation is often used as a precursor to imagery rehearsal and mental practice (Suinn, 1993). Relaxation was also significantly related to Competition Planning (r = .46), which can also be explained by the fact that athletes who plan for competitions feel more prepared and consequently more relaxed and in control.

Fear Control may not have been highly correlated with some of the scales within its conceptual component, however, it was highly related to the Focusing (r = .42) and Refocusing (r = .46) scales in the Cognitive skills component. Energizing was as highly correlated with scales in other conceptual components as with scales within its own component. This indicates that one, the use and practice of this skill is highly dependent on that of other cognitive and fundamental skills, two, there is an overlap between items forming this skill and those forming skills that are part of other conceptual components, or three, there is simply a strong naturally occurring relationship between the skill of energizing and other skills presented in the OMSAT-3.

Because of the general implicit interactions that exist between mental skills, as well as between mental skills and behaviours with which they are associated, it was expected that many of the OMSAT-3 scales would be related. However, it was anticipated that scales would, on one hand, correlate highly with the other scales within the same conceptual component, and on the other, correlate less with scales found in the other two conceptual components. Yet it was just

demonstrated that some of the OMSAT-3 scales, including Relaxation, Fear Control and Energizing, correlated higher with some of the scales in the Foundation skills and Cognitive skills components than with scales within their own Cognitive component. It is suggested that a confirmatory factor analysis be conducted on the higher conceptual structure of the OMSAT-3 to determine if scales load on their appropriate conceptual factor / component.

Scales forming the Cognitive skills component were all significantly correlated, except for the Competition Planning and Refocusing scales (r = -.04). This latter finding was interesting because Orlick and Partington (1988) found in their study that the best athletes in their sample, that is, Olympic medalists and World champions, engaged in extensive competition planning which consisted of developing and refining a pre-competition plan, a competition focusing plan, a competition refocusing plan, as well as a post-competition evaluation plan. One might have thus expected the Competition Planning and Refocusing scales to be more correlated.

Orlick and Partington did mention that planning for distractions was a strategy that was consistently employed by the most successful athletes in their sample. However, those who were less successful needed to improve that part of their competition planning. In taking a closer look at the items in the Competition Planning scale, it was found that not one item specifically asked athletes if their planning included the development of a refocusing plan. Perhaps this type of question should be included in a subsequent version of the OMSAT as it was found to be a distinct element of excellence among the best athletes in the world. Furthermore, the development and refinement of an evaluation plan was also reported to be a critical step in achieving and maintaining excellence, and only one item in the OMSAT-3 related to this issue (item 70). It is

suggested that more items be devised in the future to target the important skill of evaluating training and competitions in sport.

Two other scales within the Cognitive skills component, Mental Practice and Refocusing, had a lower correlation coefficient (r = .14) compared to the other correlations within this component, however, this correlation was significant at the .05 level. Mental Practice correlated highly with the three other scales within this component, with Focusing (r = .30), Imagery (r = . 60), and Competition Planning (r = .49). It is important to note that Mental Practice was also strongly related to scales in the Foundation skills component, that is, with Goal-Setting (r = .39), Belief / Self-Confidence (r = .41), and Commitment (r = .43). Furthermore, Competition Planning was found to correlate better with Goal-Setting (r = .30), Relaxing (r = .33), and Energizing (r = .36) than with scales within the Cognitive skills component. Once again, the fact that some scales correlate better with scales in other conceptual components than with those within their own component raises certain questions about the conceptual structure of the OMSAT-3.

Draper and his colleagues (1995) obtained very good indices of fit when a confirmatory factor analysis was performed on the OMSAT-2. This suggested that the conceptual structure of the OMSAT-2 was adequate. A confirmatory factor analysis needs to be conducted on the OMSAT-3 as results of this analysis will provide more information on potential problems with the conceptual structure of this version.

Interesting comparisons can be made with the findings of Chartrand and his colleagues (1992) who attempted to provide more information on the psychometric properties of the PSIS (Mahoney et al., 1987). The PSIS contained 45 items designed to measure the following six

psychological skills related to athletic performance: Anxiety Control, Concentration, Confidence, Mental Preparation, Motivation, and Team Emphasis. As opposed to the magnitude of the correlations found between the OMSAT-3 scales, Chartrand and his colleagues found low positive relationships between the PSIS scales. Of interest is that the correlation coefficients between the PSIS Confidence and Concentration scales (r = .37) and between the OMSAT-3 Belief / Self-Confidence and Focusing scales (r = .38) were almost exactly the same. The correlation between the PSIS Anxiety Control and Concentration scales and Anxiety Control and Confidence scales were .35 and .30 respectively. Correlation coefficients between comparable OMSAT-3 scales were .48 and .37 respectively, thus proving to be slightly different.

The highest correlation coefficient found between the PSIS scales was .37 whereas it was .60 for the OMSAT-3 scales. The low relationship between the PSIS scales appeared to indicate that it measured six relatively different constructs. However, results of a six-factor confirmatory factor analysis revealed that the factor structure of the PSIS was not consistent with the six-scale model initially proposed by Mahoney and his colleagues (Chartrand et al., 1992).

The magnitude of some of the correlations between certain OMSAT-3 scales suggests that there may be measurement redundancy or low discriminant validity. However, it is important to consider that because conceptual links exist between the mental skills scales presented in the OMSAT-3, particularly between the scales within a given component, it is logical that the scales were correlated. Furthermore, when filling out the OMSAT-3, athletes may have perceived skills within components as more homogeneous than discrete, and may have had the tendency to respond to these skills in a similar fashion.

Nideffer (1990) also obtained high correlations between the TAIS attentional subscales in many of his studies and argued that subscales measuring different conceptual components of the same phenomenon should be statistically related. Ford and Summers (1992), in their analysis of the TAIS, reported that "the differential validity of the subscales, however, must be demonstrated to conclude that statistical dependence is a result of natural relationships between the components of attentional style" (p. 291). Differential or discriminant validity of scales or subscales should be demonstrated with any new type of psychological test. This issue will be further addressed in the Multivariate Analysis of Variance / Discriminant Analysis section.

Differential / discriminant validity was demonstrated with the Competitive State Anxiety Inventory (CSAI-2; Martens, Burton, et al., 1990). It was reported that its somatic and cognitive dimensions correlated, .55 on average, but that items were only placed on a scale if they correlated less with scales other than their own. It was thus concluded that the large interscale correlation in the CSAI-2 was due to natural covariation. Ford and Summers (1992) argued that it is more "difficult to defend the differential validity of the TAIS attentional subscales because items designed to measure one construct measure other subscales unintentionally better" (p. 292). Nideffer (1990) should have perhaps adopted a similar statistical approach to that of Martens' and his colleagues and placed items in a subscale only if they correlated less with subscales other than their own. However, going back to Nideffer's (1990) argument, it is important to note that in his case, the highly correlated subscales were measuring one construct, that is, attention, and it thus appeared logical for the subscales to be somewhat highly correlated.

In the present study, the OMSAT-3 intended to measure three different constructs (i.e., Foundation skills, Affective skills and Cognitive skills) and it was anticipated that the scales within

each construct / conceptual component would be related but not to the point that there would be redundancy in the measurement. The question remains: How high can a correlation be before it is deemed too high? The fact that several scales in the OMSAT-3 were significantly correlated is an issue that will need to be addressed in the future.

Internal Consistency / Test-Retest Reliability

Internal consistency. Reliability of the OMSAT-3 scales was assessed via internal consistency estimates, using Cronbach alphas. It can be observed in Figure 3 and more specifically in Appendix J, that internal consistency estimates varied from .68 to .86. Goal-Setting was the least reliable scale whereas Imagery was the most reliable one. Interestingly enough, reliability estimates of the OMSAT-2 ranged from .78 to .87, with Focusing having the lowest internal consistency estimate, and Stress Control having the highest (Bota, 1993). Goal-Setting had an internal consistency coefficient of .81 in the OMSAT-2 while Imagery had a coefficient of .84, which is comparable to the one found in the OMSAT-3. The mean alpha score was .80 for the OMSAT-3 scales and slightly higher, .83, for the scales in the OMSAT-2. See Appendix M for a comparison of the internal consistency scale estimates of versions 2 and 3 of the OMSAT.

It is important to note that more subjects were involved in Bota's study (N=486) than in the present one (N=355). Furthermore, the sample was less homogeneous in Bota's study, that is, elite, competitive as well as recreational athletes were solicited, whereas only elite and competitive athletes participated in the present one. This could have had an effect on the internal consistency estimates as well as on the discriminant analysis results that will be discussed subsequently.

Nunnally (1978) established the minimum criteria for internal consistency at .70. It can be concluded that aside from the Goal-Setting scale which yielded an alpha value of .68, the OMSAT-3 scales reflected acceptable internal consistency. Of course the idea is to improve scales so that they generate the highest alpha values possible. One way of identifying items that affect internal consistency is to look at corrected item-total correlations (CIT). Kline (1980) recommended a minimum CIT of .20 for adequate construct measurement. Items in the OMSAT-3 were thus revised to see if they met this criteria. It can be seen in Appendix J that item 8 "My goals are aimed at improving end results more than at learning and developing abilities" in the Goal-Setting scale had a low CIT (.12) and that all other items had CITs well above .20. The internal consistency estimate would be increased to .73 if item 8 would be deleted from the scale. It is thus recommended that this item be dropped until it is further revised.

All other items in the remaining 11 OMSAT-3 scales had CITs above .40 and were thus deemed to adequately measure the various constructs. The only two other instances in which the alpha level of an OMSAT-3 scale would be increased if an item was deleted, were if item 62 "When I do imagery, I see myself as if I was watching a video" in the Imagery scale was deleted (the scale alpha would increase from .86 to .87), and if item 70 "After a competition, I draw out lessons from my performance to plan for my next training" in the Competition Planning scale was deleted (the alpha would increase from .82 to .83). Obviously, these increments would be small. Because items 62 and 70 had considerably high CITs, .43 and .45 respectively, and were perceived to provide important information about the underlying ability, it is suggested that they be kept as part of the scales. Streiner and Norman (1989) reported that item validity coefficients

increase as the number of letters in an item decrease, thus, question 70 could be reworded to "After a competition, I draw out lessons from my performance."

Internal consistency estimates of the OMSAT-3 scales were much higher than those obtained by Chartrand and his colleagues (1992) with the PSIS scales and those found by Ford and Summers (1992) with the TAIS subscales. With the exception of the Confidence scale (α = .85), which had a comparable alpha coefficient to that of the OMSAT-3 Belief / Self-Confidence scale (α = .83), the internal consistency estimates of the PSIS scales were considerably below .70. They were: Anxiety Control (α = .59), Concentration (α = .52), Mental Preparation (α = -.34), Motivation (α = .62), and Team Emphasis (α = .53). As with the PSIS scales, all coefficients of the TAIS subscales, except that of the "Overloaded by external stimuli" subscale, were below the minimum criteria of .70 suggested by Nunnally (1978); coefficients ranged from .57 to .69.

Internal consistency estimates were also computed for the OMSAT-3 broader conceptual components (see Figure 4 / Appendix K). Alpha values were .88 for Foundation skills, .85 for Affective skills and .89 for Cognitive skills, and the overall mean was .87. All conceptual components demonstrated good internal consistency and it can be concluded that at the conceptual level, the OMSAT-3 is a very reliable inventory.

Test-retest reliability. Many researchers recommend that the reliability of an instrument not only be assessed via internal consistency estimates, but that it also be assessed by way of test-retest correlation coefficients to determine stability over time (Streiner & Norman, 1989). Forty-four subjects participated in the test-retest portion of this study. Retest occurred within two weeks of the initial testing and subjects were asked to fill out the OMSAT-3 the same way they

originally completed it. The test-retest estimates of the OMSAT-3 scales were modest to high, indicating that the OMSAT-3 had questionable temporal stability. Correlation coefficients ranged from .61 to .89, with Stress Control having the lowest coefficient and Imagery having the highest. The mean test-retest correlation was .68, and only 3 out of the 12 OMSAT-3 scales had correlation coefficients over .70 (see Appendix J).

Test-retest estimates of the OMSAT-2 scales were much higher. The Relaxation scale had the lowest correlation coefficient (r = .67) while the Commitment scale had the highest (r = .89). Ten of the 12 scales had estimates over .70 and 5 of them had correlations exceeding .80. The mean test-retest correlation for the OMSAT-2 scales was .78 (see Appendix M for a comparison of the test-retest estimates of the OMSAT-2 and OMSAT-3 versions).

There is a logical explanation for having obtained lower correlation coefficients with the OMSAT-3 scales. In Bota's (1993) study, subjects who participated in the test-retest design were 64 students taking a class in the School of Human Kinetics at the University of Ottawa. Students in this undergraduate class might have been current or past athletes at the time, but there is no way of ascertaining this. Bota used an interval time of nine days between test and retest. Compared to subjects in Bota's study, individuals who were retested in the present research were elite and competitive athletes currently training and competing at the time of their participation. Some subjects reported that they played a game or competed in an event between the initial and second testing, but more importantly, some commented directly on the questionnaire that their responses changed from one testing to the other as a result of doing extensive mental preparation prior to their event. Others commented that their responses in the retest changed because of the results of the competition they attended in between the testing period.

Indeed, test-retest reliability estimates of the OMSAT-3 scales could not have been expected to be high. This behaviourally or situation based inventory was designed to measure mental skills, for the most part, through external behaviours. Most of the mental skills assessed with the OMSAT-3 are not traits and are inherently unstable and tied to situations. For example, athletes' ability to mentally practice their sport was measured through behaviourally-related items such as "I mentally practice my sport on a daily basis," and "I can mentally practice my performance wherever I am." Some of the mental skills and related behaviours in the OMSAT-3 perceived to be cyclical or variable in nature included belief / self-confidence. For example, one's level of self-confidence or belief in oneself can vary considerably from one day to another, and also from one sporting event to the next (Gauron, 1984).

Related to self-confidence is an individual's level of commitment, which can also vary throughout an entire athletic season. It was reported that athletes who believed in themselves and believed in their ability to achieve set goals were more committed to their pursuits, and went to great lengths to reach their goals (Orlick, 1992). Orlick and Partington (1988) found that athletes in their study possessed extremely high levels of commitment which led them to do everything required to excel, including developing and refining mental skills such as imagery, focusing, competition planning and refocusing. Having said this, it is evident that there exists a strong relationship between the mental skills postulated by Orlick (1992), as well as between those skills presented in the OMSAT-3. Consequently, athletes' level and practice of one skill could affect their level and practice of several other skills, that is, highly confident athletes could be totally committed to refining their relaxation, imagery and focusing skills at the beginning of the season,

whereas the same athletes, two months later, could be feeling down, less confident, and thus less committed to developing and practicing the same mental skills.

For example, an elite athlete in the present study wrote on his retest questionnaire that "After having filled out this questionnaire for the second time, it is very clear to me that the majority of the items were consciously answered in a different way from the first time to the second time. I have therefore been tremendously influenced by the events (particularly the sporting ones) in which I have participated when answering these questions." On the initial testing, this subject obtained a mean of 5.67 and 4.78 on the Belief / Self-Confidence and Commitment scales respectively. When retested, this subject scored higher on the same two scales. Mean scale scores had increased to 5.83 and 5.78 respectively. It is important to note that in between the two testings, this subject won the Canadian Championships in his sport, and it was therefore not surprising that his level of self-confidence and commitment had increased. This reflects the fluctuating nature of developing skills in relation to situational outcomes.

It was thus concluded that the OMSAT-3 is more a state or situation oriented inventory that will yield different scores depending on the "time" athletes fill it out. Because it is anticipated that athletes' responses will vary with the various training and competitive phases they go through in a year, it is recommended that the reliability of the OMSAT scales not be assessed entirely upon test-retest coefficients, and that profiles of the strengths and weaknesses of athletes be considered a reflection of the skills and practices for that period of time. From a practical perspective, sport psychologists and coaches using the OMSAT-3 for assessing and training mental skills need to consider that the profile of an athlete obtained at the beginning of a season may not be the same as the one attained during the high competitive season.

Of course, test-retest reliability estimates of the OMSAT-3 would probably be higher if researchers in the future would use similar subjects to those solicited by Bota (1993). However, in the present situation, the OMSAT-3 was developed to assess the mental skills of athletes and not students (it is not to say that the inventory could not be adapted for other populations), and to assess athletes' current level of skills and practices, regardless if these skills have varied with time and experience.

Multivariate Analysis of Variance / Discriminant Analysis

Multivariate Analysis of Variance. It was previously mentioned that it is important to demonstrate the differential validity of an inventory, particularly if scales are highly correlated, to conclude that the statistically significant relationships between scales or constructs are naturally occurring (Ford & Summers, 1992). A multivariate analysis of variance (MANOVA) was conducted on the OMSAT-3 scales to see if there were significant differences between the elite and competitive athletes' scores and also to determine how much variance in the mental skills scores could be accounted for by group membership.

The MANOVA results presented in Table 2 reveal that there was a significant difference between the elite and competitive groups on the set of dependent variables, that is the 12 OMSAT-3 scales, $F(12, 322) = 3.97$, $p < .000$. These differences can also be ascertained by comparing the mean scale scores of elite athletes and competitive athletes (see Figure 1). Results showed that on average, elite athletes scored higher than competitive athletes on all 12 OMSAT-3 scales. This finding suggests that athletes competing at higher levels possessed more refined mental skills than athletes competing at lower levels. It supports Orlick and Partington's (1988)

inferences that the best athletes in the world have better mental abilities and make more use of these mental abilities than lower ranked athletes.

The overall calculated multivariate effect size was .60, which suggests that group membership accounted for approximately 60% of the variance in the OMSAT-3 scale scores. This effect size is noteworthy however there is still 40% of the variance that is unexplained. Factors such as age, sex, sport, level of education, and even country of origin may have been responsible for some of the unaccounted variance.

As expected, a significant MANOVA was also obtained with the OMSAT-3 conceptual components, $F(3, 331) = 9.47$, $p < .000$, suggesting that there was a significant difference between elite and competitive subjects' overall scores on the Foundation, Affective and Cognitive skills components. Furthermore, group membership accounted for 35% of the variance in the OMSAT-3 conceptual component scores. It can be concluded thus far that the OMSAT-3 demonstrated differential validity. It is now important to determine which scales were most responsible for this differentiation between elite and competitive athletes.

Discriminant analysis. The significant MANOVAs were followed by a discriminant analysis to determine which of the OMSAT-3 items, scales and conceptual components discriminated best between the elite and competitive groups of athletes. Results of the discriminant analysis can be found in Table 3.

At the item level, it was found that the three best discriminating questions between the elite group and competitive group were question 16 "I am willing to sacrifice most other things to excel in my sport," question 17 "I am committed to becoming an outstanding competitor," and question 26 "I feel more committed to improve in my sport than to anything else in my life," all of

which were part of the Commitment scale. This is not surprising since, as it has been mentioned before, researchers have found that elite athletes are extremely committed individuals who are willing to do almost anything to become the best, even if this means sacrificing everything else that is important to them for a certain period of time (Ericsson et al., 1993; Mahoney et al., 1987; Orlick, 1992; Orlick & Partington, 1988).

Question 3 "I set difficult but achievable goals" in the Goal-Setting scale was also a good discriminating item, which suggests that elite athletes set goals, but not any type of goal; they set challenging goals that they believe they can achieve. Both Burton (1993) and Gould (!993) revealed through their research how important goal-setting was to performance enhancement, and more importantly, how crucial it was for athletes to set specific, measurable, difficult but realistic goals in order to maximize their effects. The fifth best discriminating item was item 83 "If I start losing, I find it hard to come from behind to win," in the Refocusing scale. Elite athletes in this study had better refocusing skills than their less elite counterparts, and more specifically, they had the ability to redirect their attention on the task at hand when faced with important distractions, in order to come out of the competition victorious. Orlick and Partington (1988) found similar results in their study. They reported that the ability to refocus under distractions varied considerably among elite athletes, compared to the other skills that were assessed through the interviews and questionnaires. Their comment was that:

> Those athletes who performed at their highest level consistently had excellent strategies for getting back on track quickly when things didn't go well, or when faced with distractions. Those who were less consistent appeared to need more work in this area to improve the consistency of their high level performance. (p. 117)

Refocusing has been identified as an important skill athletes need to refine to achieve exceptional performance (Curtis, 1987; Orlick, 1992; Orlick & Partington, 1988) and it is thus recommended that the Refocusing scale and its corresponding items not be modified in the OMSAT-3.

Mahoney and colleagues (1987) also performed a discriminant analysis on the items of the PSIS and found similar results. In fact, the second and fourth best discriminating items in their inventory were related to Commitment and read the following way: Item 50 "My sport is my whole life" and item 47 "Right now, the most important thing in my life is to do well in my sport." This further supports the importance of including items that tap this fundamental element of excellence in multiscale inventories. Interestingly enough, the best discriminating item in the PSIS was item 3 "I often dream about competition" which was part of the Mental Preparation scale. Items related to mental preparation were included in the OMSAT-3, however, none of them were comparable to this one found in the PSIS. An item of this sort could perhaps be included in a future version of the OMSAT.

The third best discriminating item in the PSIS was item 37 "When I mentally practice my performance, I see myself performing - just like I was watching a videotape." Item 62 in the OMSAT-3 was very similar to item 37 in the PSIS and was not found to be a good discriminator between elite and competitive athletes in the OMSAT-3. Finally, the fifth best discriminating item in the PSIS was item 11 "I am seldom so tense that it interferes with my performance" in the Anxiety measurement scale, which can be compared to item 28 in the OMSAT-3 Stress Control scale, which was not found to discriminate well between the two groups. In any case, the discriminant analysis conducted on the OMSAT-3 items yielded a model that correctly classified 80.30% of the subjects into their respective groups.

Evidently, at the scale level, the best discriminating scale in the OMSAT-3 was Commitment, followed by the Stress Control and the Refocusing scales. The three least discriminating scales were Fear Control, Energizing, and Imagery. Once again, we see that Fear Control does not provide remarkable amounts of significant statistical information in the OMSAT-3. Imagery might not have been an excellent discriminating scale, however, Mental Practice was among the top six scales.

In taking a look at the univariate *F*-tests of the 12 OMSAT-3 scales that were provided with the MANOVA output (see Appendix N), it can be seen that 5 out of 12 scales significantly discriminated between the two groups of athletes. Of course, when interpreting the significance of these *F*-tests, a Bonferoni correction was done to protect the type I error rate, that is the alpha level of .05 was divided by 12 because there were 12 tests, and the new alpha level of .004 was used as the criteria to determine if the *F*-tests were significant. It can be seen in Appendix N that the Belief / Self-Confidence, Commitment, Stress Control, Focusing and Refocusing scales had *F* values below .004 and were successful in differentiating between the two groups of athletes.

Mahoney and his colleagues (1987) did not provide information on the discriminant ability of the scales in the PSIS and it was thus impossible to make comparisons at this level. They did mention, however, that the individual item analysis, stepwise discriminant analysis, stepwise regression, all-possible-subsets regression, and factor and cluster analyses performed on the PSIS suggested "six possible themes of differentiation between elite and nonelite athletes" (p. 192). What needs to be taken into consideration is that when they initially did their item analysis, they used Hotelling's T^2 statistic to test the hypothesis that there were no differences in the mean responses of the four groups in their sample, (elite, pre-elite, non-elite athletes, and sport

psychologists). Although this wasn't entirely clear in the article, it appears that they conducted a series of 2-group MANOVAs on these groups, in which case they would have had to have done a Bonferoni correction to protect the alpha level, but because they failed to mention this, it is impossible to determine how "significant" their results really were.

Furthermore, after having found significant T^2 s between the elite / non-elite groups, the elite / pre-elite groups and the elite / sport psychologists groups, Mahoney and colleagues followed up by conducting 51 independent sample *t*-tests for each significant pair of groups, that is, they performed a total of 153 *t*-tests to determine which items significantly differentiated between the groups. This is probably the worst possible statistical route they could have taken because the experimentwise error rate was immensely inflated by doing so many *t*-tests (Schutz, Smoll, & Gessaroli, 1983). To protect this error rate, the authors would have had to divide the alpha level by 153, which they apparently failed to do. Consequently, the inferences made from these results must be interpreted with great caution. The discriminant analysis and all-possible-subsets regression, however, appeared to have been appropriately conducted and those comparisons made with the OMSAT-3 appeared to have been based on statistically sound results.

Results of the discriminant analysis performed on the OMSAT-3 scales can be compared to those found by Bota (1993) with the OMSAT-2. The three best discriminating scales between elite and competitive athletes in Bota's study were Commitment, Goal-Setting and Belief / Self-Confidence. It can be seen that Commitment was consistently the best discriminating scale. Belief / Self-Confidence was the third best discriminating scale in Bota's study while being the fifth one in the present study. Regardless of these minor differences in rank order, this scale was still a significant discriminating scale in the present study and was perceived to provide important

information on a fundamental element athletes need to possess to achieve high levels of excellence.

What is interesting is that Goal-Setting, which was the second best discriminating scale in Bota's study, was found to be the eighth best discriminating scale in the OMSAT-3. One hypothetical explanation for this is that item 8, which is in the OMSAT-3 Goal-Setting scale and not in the OMSAT-2, was found to have a very low item-total correlation and thus significantly affected the alpha level of this scale. Internal consistency results show that the alpha level of the Goal-Setting scale would be increased from .68 to .73 if item 8 were deleted, and it was suggested that the item be dropped until further investigation. It is believed that mean scores on this scale would have been different if item 8 had not been included in the scale or if it had been worded differently, and that consequently this scale would have demonstrated better discriminating validity.

It is not entirely clear at the moment why item 8 did not correlate well with the other items in the Goal-Setting scale, however, there is the possibility that the item should have been scored in the reverse order. Research has shown that it is better to set performance goals rather than outcome goals (Burton, 1993), however, in this case, a high score on item 8 signified that athletes set more outcome goals than performance goals. Since scores were inputted in the database so that a high score reflected an "appropriate" or "theoretically correct" behaviour and vice versa, perhaps it would have been wise to invert athletes' scores on this item. This is an alternative researchers should explore in the future.

Also of interest is that Energizing and Fear Control, which were the worst discriminating scales in the OMSAT-3, were respectively the fourth and fifth best discriminating scales in the

OMSAT-2. Once again, the item-total correlation of the items comprising these scales in the OMSAT-3 were all well over .20 and in all cases, if items were deleted, the alpha value of the scale would decrease. The correlation matrix in Table 1 indicated that the Fear Control scale in the OMSAT-3 was not significantly related to several of the other scales, and in fact, this was a similar case in the OMSAT-2.

It is very difficult at this point to ascertain the significance of including this scale in future versions of the OMSAT. In one instance it was found to discriminate well between athletes and in another, it wasn't. In both cases, it was found to have weak correlations with other scales in the inventory, however, the scale yielded acceptable levels of internal consistency. This scale has not been found in any of the other multidimensional inventories discussed so far, but this does not mean that it is not an important skill athletes need to develop to achieve high level performance.

Another explanation for the inconclusive results could be that the scale is sport-specific, that is, it applies more to athletes involved in sports like gymnastics, alpine skiing, luge, bobsleigh and whitewater kayaking, in which fear is a major factor in training and competition. Yet, items in that scale such as "I am afraid to lose" and "I am afraid to make mistakes" apply to any athlete, not only to those participating in fearful sports. It is suggested that future researchers re-examine the literature to further assess the impact this skill has had on athletic performance.

Another possible alternative would be to combine the Fear and Stress Control scales together as they were highly statistically correlated. The logic of reducing these two scales to one could be theoretically justified by the fact that stress and fear are often inseparable concepts. Similar affective and physiological responses are often observed when individuals experience fear

and stress. There is a strong possibility that as athletes experience more fear, they also experience more stress and vice versa.

The discriminant analysis performed at the scale level generated a linear function that only correctly classified 65.37% of the subjects in their appropriate groups. At the conceptual level, this value was even lower; the percentage of correctly classified cases was 63.58. This indicates that the best model yielded by the discriminant analysis was at the item level and that group membership is best predicted when several items are considered.

It can also be noted that at the conceptual level, all three components were found to significantly discriminate between elite and competitive athletes, with Foundation skills (which included the Commitment, Belief / Self-Confidence *and* Goal-Setting scales) being the best discriminating component. This provides more evidence that these three skills are the mental cornerstones of excellence in sport.

The OMSAT-3 demonstrated discriminant validity. However, not all 12 scales were found to significantly differentiate between elite and competitive athletes. As a result, it is suggested that until further research is conducted, the statistically significant relationships found between some of the OMSAT-3 scales not be perceived as entirely naturally occurring (Ford & Summers, 1992). In other words, it cannot be concluded at this point that the observed statistical dependence between some of the OMSAT-3 scales is a result of natural relationships existing between the mental skills these scales were designed to measure.

Relative Importance of the OMSAT-3 Scales

In addition to determining the psychometric properties of the OMSAT-3, another purpose of this study was to assess the relative importance of each mental skill presented in the

questionnaire, as perceived by the athletes participating in the study. To this end, subjects were asked to rank in order of importance 4 of the 12 mental skills presented in the questionnaire they felt were most important / useful to their performance. Table 4 presents the athletes' ratings of the four most important / useful OMSAT-3 scales, as well as the frequency and percentage of subjects per rank of importance.

Out of the 12 possible scales, athletes in this study rated Belief / Self-Confidence as the skill most important or useful to their performance. In fact, both elite (21.2%) and competitive (32.1%) athletes (see Appendix L) rated this mental component as the most important one. The second scale that was ranked as most important / useful was Goal-Setting; 16.4% of the athletes (8.2% of elite athletes and 8.2% of competitive athletes) felt that setting goals was more important than any other mental component in their sport. Commitment was the third scale that was rated as most important or useful, with 7.0% of elite athletes and 6.7% of competitive athletes assigning it this rank. Finally, Focusing was perceived by 6.3% of athletes (3.0% of elite athletes and 3.3% of competitive athletes) as the mental skill most important or useful in their sport.

The four above mentioned scales, Belief / Self-Confidence, Goal-Setting, Commitment, and Focusing, were also ranked by some athletes as the second most important or useful mental skill in their sport. Of interest was that there were as many athletes who ranked focusing as the second most important / useful skill as there were who ranked it as the third most important / useful skill. Even then, 14.3% of athletes ranked focusing as the fourth most useful skill to their performance. Focusing was thus the top ranked second, third, and fourth most important / useful skill (see Table 4).

The most interesting columns in Table 4 are definitely columns 2 and 3, under Rank 1. Not only did statistical analyses from Bota's (1993) and the present study reveal that the three most important mental skills were belief / self-confidence, commitment, and goal-setting, but the athletes themselves rated these skills as most important. The fact that athletes scored highest on the Commitment scale, followed by the Belief / Self-Confidence and Goal-Setting scales, and rated these scales as being most important / useful to their performance definitely provides support to the OMSAT-3's validity. In fact this can be seen as a type of concurrent validity, whereby athletes' scores on the OMSAT-3 correspond to their overall ratings of importance.

The fact that results found with the OMSAT-3 are similar to those found by several other researchers (Ericsson et al., 1993; Mahoney et al., 1987; Orlick, 1992; Orlick & Partington, 1988) is an indication that the OMSAT-3 is a valid instrument capable of measuring and detecting differences in importance / usefulness of mental skills, as well as differences in levels of athletes. Not all 12 OMSAT-3 scales were found to significantly discriminate between elite and competitive athletes, however, 5 of them were and furthermore, all 3 conceptual components demonstrated discriminant validity.

It was concluded in Orlick and Partington's (1988) study that crucial elements of success for the best athletes in the world were (a) total commitment, (b) quality training that included daily goal-setting and imagery training, and (c) quality mental preparation for competition that entailed developing a pre-competition plan, competition focusing and refocusing plans, and a post-competition evaluation plan. Similarly, it was found by Mahoney and his colleagues (1987) that the top level athletes in their study (a) were more confident, (b) were better able to focus before and during competition, (c) were less anxious, (d) had better internally-focused imagery

abilities, and (e) were more committed to excelling in the sport, than competitive athletes in lower ranks.

Results from this study point to similar conclusions. Elite athletes scored on average higher than competitive athletes on all OMSAT-3 scales. Athletes scored highest on the Commitment, Belief / Self-Confidence and Goal-Setting scales, indicating that these mental skills were important in their pursuits of exceptional performance. Moreover, these same three skills were rated by the athletes themselves as most important or useful to their performance. Focusing was also ranked as an important skill in the achievement of excellence. Finally, the fact that Commitment, Stress Control, Refocusing, Focusing, and Belief / Self-Confidence were all statistically significant scales in differentiating between elite and competitive athletes indicates that these mental skills are important elements of success.

CHAPTER VI

CONCLUSION

Towards a more valid and reliable OMSAT. The purposes of this study were (a) to create an enhanced third version of the OMSAT, (b) assess the validity and reliability of the OMSAT-3, and (c) determine the relative importance of each mental skill presented in the questionnaire, as perceived by the athletes participating in the study. These purposes have been fulfilled and another step towards the development of a valid and reliable OMSAT has been completed.

Results of this study have confirmed that (a) the OMSAT-3 scales have acceptable internal consistency, (b) scores on the OMSAT-3 are not stable in time and will most likely vary according to various training and competition demands athletes face throughout an athletic season, (c) the OMSAT-3 can significantly discriminate between elite and competitive level athletes, and (d) the Commitment, Belief / Self-Confidence, and Goal-Setting scales in the Foundation skills component are statistically and theoretically speaking, the most important scales in the OMSAT-3.

However, problems with certain items and scales have been identified and it is recommended that future researchers return to the literature to assess the significance of including certain items, particularly the one identified in the Goal-Setting scale that was responsible for considerably decreasing the alpha level, and also including the Fear Control scale. Significant correlations were found amongst many of the OMSAT-3 scales and one way of ensuring construct validity would be to place scales within a conceptual component only if they correlate less with conceptual components other than their own (Ford & Summers, 1992).

It is suggested that future researchers conduct a confirmatory factor analysis on the OMSAT-3. According to Schutz and Gessaroli (1993), there are two types of factor analysis that are currently being used by sport psychology researchers to assess the validity of psychological tests. When using an exploratory factor analysis:

> Each decision regarding the number of factors [to keep] or the interpretation of the results is solely dependent upon the observed item (variable) intercorrelations based on data from the sample; nowhere is it necessary for any possible theoretical explanation to be taken into account. Of course, at the end of the analysis the researcher may attempt to match the interpretation of the "best" factor solution with some theory. (p. 911)

However, researchers developing psychological inventories often have, as in this case, a pre-determined set of items. They wish to assess the factor structure underlying the responses to the items. Specifically, when the development of items in a questionnaire is theory-driven, there is a need to determine "if the items in the inventory are measuring the same factors as suggested from the theory used as the basis of the questionnaire" (Schutz & Gessaroli, p. 911). Items in the OMSAT-3 were written for specific constructs, for example, goal-setting, stress control, and imagery, thus, following Schutz and Gessaroli's suggestion, it is recommended that a confirmatory factor analysis be performed on the OMSAT-3.

According to Schutz and Gessaroli (1993), researchers attempting to run a factor analysis with items that are scored on an ordinal scale such as a Likert scale, are faced with a problem, as a fundamental assumption of factor analysis is that the items be normally distributed. One way to handle this problem is to "treat the Likert data as being responses on a continuous scale and then perform the factor analysis as usual" (p. 913). Schutz and Gessaroli revealed that this does not

seriously affect the factor analysis results if there are at least five categories in the Likert scale and if the data are not highly skewed.

Items in the OMSAT-3 scale were scored on an ordinal Likert scale, however, there were seven categories in the scale. Schutz and Gessaroli (1993) recommended that if a Likert scale contains at least five categories, the following step in determining which estimation procedure to use in the confirmatory factor analysis is to check the distribution of the items. It was suggested that if nearly all the items have skewness and kurtosis absolute values within 1.0, a factor analysis using a common estimation procedure such as maximum likelihood is appropriate (Muthen & Kaplan, 1985).

Conversely, if the Likert scale is comprised of at least five categories but the items are highly skewed, it was recommended that Browne's (1984) Asymptotically Distribution Free (ADF) or Muthen's (1984) Categorical Variable Methodology (CVM) estimation procedures be used in the factor analysis. Schutz and Gessaroli recommended using Structural Equation Modeling programs such as EQS (Bentler, 1985) or LISREL (Jöreskog & Sörbom, 1989) to conduct a confirmatory factor analysis, as these programs provide the above mentioned estimation procedures. The skewness and kurtosis values of the OMSAT-3 items presented in Table H1 of Appendix H suggested that the data was reasonably normal. It is therefore recommended that a maximum likelihood estimation procedure be used when the confirmatory factor analysis is conducted on the OMSAT-3.

It would be noteworthy to determine in the future if the age, gender, type of sport (i.e., team vs. individual and closed vs. open) as well as the country of origin had a significant effect on the athletes' scores on the OMSAT-3. Future researchers should assess the OMSAT-3's validity

by correlating the scales with other similar scales or inventories that have been used and accepted in the field. The predictive validity of the OMSAT-3 could be assessed with a sample of elite athletes who are going to the Olympics for example. Their scores on the OMSAT-3 could be used to predict their rankings at the Olympics, and once the event is over, predicted rankings could be compared to actual ones. Another interesting way the OMSAT-3 could be validated would be to ask coaches to predict their athletes' scores on the various scales by asking them to fill out the OMSAT-3 the way they think their athletes would, or coaches could be asked to rank-order the scales the way they think the athletes would.

There are various potential uses for the OMSAT-3 inventory and as it has been mentioned previously, there is a need for this type of instrument in the field of sport psychology. It is important that more research be conducted with the OMSAT-3 so that it is shaped into a statistically and conceptually sound tool that will help researchers test models and theories, help sport psychologists evaluate and develop appropriate mental training programs, and finally help coaches and athletes monitor the development of mental skills, that is, the development of tangible elements of success.

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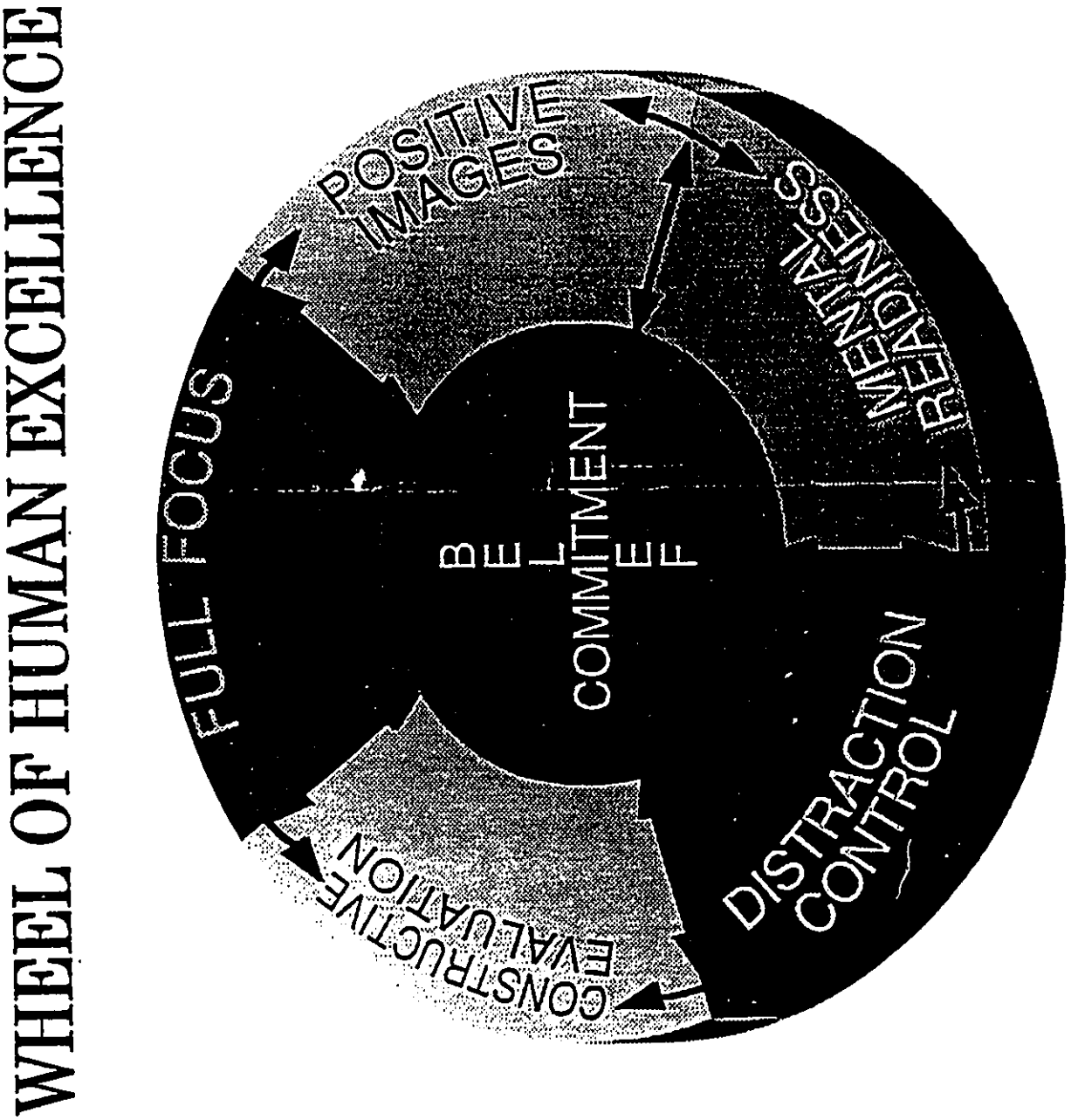
APPENDIX A

The Wheel of Human Excellence (Orlick, 1992)



APPENDIX B

Frequency of Subjects per Sport

Sport	No. of subjects	
	Males	Females
Athletics	-	3
Badminton	2	4
Baseball	23	-
Basketball	19	15
Bobsleigh	2	-
Canoe slalom	1	-
Competitive aerobics	-	2
Cross country skiing	1	1
Cross country running	-	2
Fencing	9	4
Field hockey	-	1
Figure skating	-	1
Gymnastics	1	8
Hockey	55	1
Judo	2	-
Karate	5	5

Appendix B - *continued*

Sport	No. of subjects	
	Males	Females
Kayak slalom	1	-
Luge	2	-
Race walking	1	2
Racquetball	1	-
Ringette	-	7
Rowing	3	14
Rugby	-	1
Soccer	9	30
Squash	1	-
Synchronized swimming	-	3
Swimming	14	19
Table tennis	6	3
Taekwondo	-	1
Tennis	4	2
Ultimate	-	1

Appendix B - *continued*

Sport	No. of subjects	
	Males	Females
Water polo	10	27
Wheelchair basketball	-	2
Whitewater kayaking	2	-
Windsurfing	1	-

APPENDIX C

Frequency of Subjects per Country

Country of origin	No. of subjects
Canada	305
Scotland	1
China	2
Netherlands	1
Taiwan	1
England	3
Salvador	1
Trinidad	1
Malaysia	1
Maroc	1
Czech. republic	3
Jamaica	1
USA	6
Nigeria	1
Lithvania	1
Domenica	1
Slovakia	2

Appendix C - *continued*

Country of origin	No. of subjects
Lebanon	1
Vietnam	1
Belgium	1

APPENDIX D

Letter of Approval

Dear coach / representative,

We are in the process of refining and validating a mental skills inventory for sport entitled "The Ottawa Mental Skills Assessment Tool (OMSAT)". The OMSAT is an 85 item questionnaire devised to measure a broad range of athletes' mental skills (goal-setting, focusing, ability to cope with stress, etc.).

In order to verify the validity and reliability of this questionnaire, we would like to administer it to a sample of approximately 500 male and female athletes, representing various sports and different levels of participation. The information obtained from this data will enable us to meet our research objectives. Subjects will be identified and referred to by a number throughout the study to ensure the confidentiality and anonymity of all participants. If athletes wish to receive feedback on their personal profile once the study has been completed, they simply have to fill out their name and address in the space provided at the end of the questionnaire and a copy will be sent to them.

In accordance with the Faculty of Health Sciences ethical procedures, the responses to the questionnaire will remain confidential. All data will be stored in locked files. Inferences will be made on the results obtained from the group data only and not on individual differences, so that full confidentiality and anonymity remain. The thesis will be written in such a way as to conceal the identity of all participants. Once the thesis has been accepted, the raw data will be destroyed. Upon completion of the study, a summary report will be made available to every participant who requested it.

It has been our experience that the completion of the questionnaire is a pleasant and educational task that takes approximately 20 minutes, and that it is often beneficial in improving an athlete's understanding of his / her sport performances. There is very little risk, harm and discomfort involved in the process.

All the scores obtained from the completed questionnaires will be entered into a computer in order to conduct statistical analyses. Athletes' input into this test will thus enable us to assess the validity and reliability of this instrument.

We believe that this extensive study will contribute to the advancement of research in the field of sport psychology. Thus, many athletes could benefit from it. If this questionnaire proves to be valid and reliable, it could become a powerful tool to help athletes assess their current level of mental skills. It could become a very useful intervention and training tool for consultants and coaches as well.

We believe athletes will find this questionnaire interesting and worth completing. The athletes' participation in this study is voluntary, but their responses would be extremely helpful and greatly appreciated. They could help us reach a better understanding of the relationship that exists between mental skills and performance.

Signing this letter would indicate that you support this research and give the athletes who are interested, permission to participate in this study.

As a coach and/or representative of this club / school / organization,
I give the athletes who are interested in becoming subjects,
consent to participate in this research project.

Signature _____ Date _____

Please feel free to contact us anytime for more information.

Natalie Durand-Bush or **Dr. John Salmela**
University of Ottawa
School of Human Kinetics
125 University Private
Ottawa, ON, K1N 6N5
tel: (613) 241-1269 or (613) 562-5800 ext. 4247

Dr. Frank Reardon
Chair of the Faculty of Health Sciences -
Human Research Ethics Committee
Faculty of Health Sciences, University of Ottawa
451 Smyth Road, Ottawa, ON, K1H 8M5
tel: (613) 787-6705

APPENDIX E

OMSAT-3 - English Version

OTTAWA MENTAL SKILLS ASSESSMENT TOOL (OMSAT)*

DEMOGRAPHICS

Identification number *(last four digits of your telephone number)* _____

Age _____

Sex _____

Country of origin _____

Sport discipline _____

Current level of participation in your sport (please check one):

I represent my sport within my region / city _____

I represent my region / city in my province / state / territory _____

I represent my province / state / territory in my country _____

I represent my country in the world _____

Highest level of participation in your sport (please check one):

I have represented my sport within my region / city _____

I have represented my region / city in my province / state / territory _____

I have represented my province / state / territory in my country _____

I have represented my country in the world _____

Highest level of education (please check one):

Secondary School _____ University / undergraduate level _____

College _____ master's level _____

doctorate level _____

Just as different athletes have various strengths and weaknesses in technical ability and physical capacity, they also differ in their mental skills. The OMSAT is designed to help us better understand your relative strengths and weaknesses in the area of mental training for sport and enables us to propose tailor-made mental skills training programs for athletes like you.

The following pages contain a number of statements related to mental skills that a number of high level athletes claimed influenced their performances. Rate each of the statements in terms of your **present** level of mental skills and practices, and not in terms of what you would **like** or **think** your level of mental skills and practices should be at. Please remember that the OMSAT can only be of use if items are answered honestly. Rest assured that results will be kept confidential and anonymous and will strictly be used for research purposes.

Use the seven point scale below and circle the appropriate number for each of the statements in the questionnaire.

Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

Think of the most recent performances in your sport, whether in training or competition, while responding to the questionnaire.

* The OMSAT was created by Dr. John H. Salmela, Jordache Bota and Natalie Durand-Bush, in collaboration with Stuart Barbour, Jennifer Cox, Steve Howlett, Kyoko Imaj and Wang Run Ping, School of Human Kinetics, University of Ottawa, 1992.

1. Goal-Setting

Read this first! Goal-setting is the process by which you establish objectives or goals that provide you with a direction or a means for accomplishing what you set out to do.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
1.	I set long term goals in my sport.	1	2	3	4	5	6	7
2.	I set daily training goals.	1	2	3	4	5	6	7
3.	I set difficult but achievable goals.	1	2	3	4	5	6	7
4.	My goals push me to work harder.	1	2	3	4	5	6	7
5.	I set goals to improve daily aspects of my performance.	1	2	3	4	5	6	7
6.	My goals are specific.	1	2	3	4	5	6	7
7.	I have told others my exact goals.	1	2	3	4	5	6	7
8.	My goals are aimed at improving end results more than at learning and developing abilities.	1	2	3	4	5	6	7

2. Belief / Confidence

Read this first! Believing in yourself is synonymous with being confident that you can accomplish your goals and overcome difficult situations.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
9.	I believe that I am a mentally tough competitor.	1	2	3	4	5	6	7
10.	I believe that I have the personal capacity to reach my goals.	1	2	3	4	5	6	7
11.	I believe that I can succeed in my chosen activity in spite of any obstacles I encounter.	1	2	3	4	5	6	7
12.	There have been times when I was jealous of my opponents' success/great performances.	1	2	3	4	5	6	7
13.	I am confident in most aspects of my performance.	1	2	3	4	5	6	7
14.	I act confidently even in difficult sport situations.	1	2	3	4	5	6	7
15.	After a poor performance, I still believe in myself.	1	2	3	4	5	6	7

3. Commitment

Read this first! Commitment provides the intensity and dedication you require to achieve your desired goals.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
16.	I am willing to sacrifice most other things to excel in my sport.	1	2	3	4	5	6	7
17.	I am committed to becoming an outstanding competitor.	1	2	3	4	5	6	7

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
18.	There have been occasions when I have taken advantage of someone.	1	2	3	4	5	6	7
19.	I am determined to never give up in my sport.	1	2	3	4	5	6	7
20.	I always practice what I preach.	1	2	3	4	5	6	7
21.	I work hard to correct my mistakes in training.	1	2	3	4	5	6	7
22.	I give 100 percent, whether my practice is going well or not so well.	1	2	3	4	5	6	7
23.	I give 100 percent effort in competition, whether I am ahead or behind.	1	2	3	4	5	6	7
24.	I make sure that I get something out of every training session.	1	2	3	4	5	6	7
25.	I push hard in training even if it hurts.	1	2	3	4	5	6	7
26.	I feel more committed to improve in my sport than to anything else in my life.	1	2	3	4	5	6	7

4. Stress Control

Read this first! Stress occurs when you feel nervous, worried or uncertain about something. Reactions to stress can be positive or negative.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
27.	Being evaluated by others makes me very anxious.	1	2	3	4	5	6	7
28.	I experience performance problems because I am too nervous.	1	2	3	4	5	6	7
29.	My body tightens unnecessarily in competition.	1	2	3	4	5	6	7
30.	I compete better in practice than I do in competition.	1	2	3	4	5	6	7
31.	I find that big crowds get me worried and nervous in competition.	1	2	3	4	5	6	7
32.	I tend to look at stress as being a bad thing.	1	2	3	4	5	6	7
33	I find it difficult to control my stress level in training.	1	2	3	4	5	6	7
34.	There have been occasions when I felt like smashing things.	1	2	3	4	5	6	7
35.	My competitors make me nervous in competition.	1	2	3	4	5	6	7

5. Relaxation

Read this first! Relaxation is a skill that can allow you to free your muscles of tension, lower your heart rate and control your focus of attention.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
36.	I find it easy to relax.	1	2	3	4	5	6	7
37.	I find it easy to relax quickly.	1	2	3	4	5	6	7
38.	I can consciously decrease the tension in my muscles.	1	2	3	4	5	6	7
39.	I can relax effectively during appropriate moments in a competition.	1	2	3	4	5	6	7
40.	I often practice relaxation techniques.	1	2	3	4	5	6	7
41.	I use relaxation to calm my mind.	1	2	3	4	5	6	7

6. Fear Control

Read this first! Fear can arise when you perceive situations to be dangerous, when you are faced with potentially worrisome events or when you lose control of a situation.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
42.	There are a number of things in my sport which are potentially dangerous and make me afraid.	1	2	3	4	5	6	7
43.	I find it difficult to train because of the fear involved in my sport.	1	2	3	4	5	6	7
44.	I am afraid to lose.	1	2	3	4	5	6	7
45.	I find it hard to gain control of things to reduce my fears.	1	2	3	4	5	6	7
46.	I am afraid to make mistakes.	1	2	3	4	5	6	7
47.	If I could sneak someone in for free to see me compete, I would probably do it.	1	2	3	4	5	6	7

7. Energizing

Read this first! Energizing yourself is the opposite of relaxing. It is a skill that allows you to increase your physiological and mental states in situations where a boost of energy is needed.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
48.	I can easily activate myself before a competition if I find myself too relaxed or down.	1	2	3	4	5	6	7
49.	I have an effective method of getting my energy level up when I am tired in training.	1	2	3	4	5	6	7
50.	I have an effective method of getting my energy level up when I am tired in competition.	1	2	3	4	5	6	7
51.	I can easily activate myself up to an optimal level where my performance is at its best.	1	2	3	4	5	6	7

8. Focusing

Read this first! Focusing or "concentrating" is the ability to direct and maintain attention on what is required to perform.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
52.	I lose my focus during daily training.	1	2	3	4	5	6	7
53.	I lose my focus during important competitions.	1	2	3	4	5	6	7
54.	I find it difficult to concentrate in certain training situations.	1	2	3	4	5	6	7
55.	During critical situations in competition, my thoughts become a blur.	1	2	3	4	5	6	7
56.	When fatigued, I find it difficult to focus.	1	2	3	4	5	6	7
57.	No matter who I'm talking to, I am always a good listener.	1	2	3	4	5	6	7
58.	I have difficulty finding effective strategies that will help me remain focused during competition.	1	2	3	4	5	6	7

9. Imagery

Read this first! Imagery or "visualization" is the ability to create images and feel actions in your mind.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
59.	I find it easy to create mental images.	1	2	3	4	5	6	7
60.	I find it easy to change images in my mind.	1	2	3	4	5	6	7
61.	My mental images are vivid and clear.	1	2	3	4	5	6	7
62.	When I do imagery, I see myself as if I was watching a video.	1	2	3	4	5	6	7
63.	When I do imagery, I see what I would see as if I was actually playing or performing.	1	2	3	4	5	6	7
64.	I can feel the movements I normally execute when I am doing imagery.	1	2	3	4	5	6	7
65.	I often see myself winning a game or an event.	1	2	3	4	5	6	7

10. Competition Planning

Read this first! Planning for a competition involves setting some time aside to think and plan things you want to do before, during and after a competition.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
66.	I plan a regular set of things to do before a competition.	1	2	3	4	5	6	7
67.	I plan a regular set of things to think about before a competition.	1	2	3	4	5	6	7
68.	I plan a regular set of things to do during a competition.	1	2	3	4	5	6	7

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
69.	My plan includes certain cue words or action words that I say to myself in competition.	1	2	3	4	5	6	7
70.	After a competition, I draw out lessons from my performance to plan for my next training.	1	2	3	4	5	6	7

11. Mental Practice

Read this first! Mental practice is the planned use of your imagery skills. It involves setting aside time and space to rehearse a performance or segments of a performance in your mind.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
71.	I mentally practice my sport on a daily basis.	1	2	3	4	5	6	7
72.	I mentally practice my sport with maximum performance in mind.	1	2	3	4	5	6	7
73	I mentally practice for critical situations in competition.	1	2	3	4	5	6	7
74.	I can easily mentally practice an entire skill.	1	2	3	4	5	6	7
75.	I can mentally practice my performance wherever I am.	1	2	3	4	5	6	7
76.	My mental practice is planned (i.e., it's at a specific time each day, or I know in advance what I will rehearse and for how long).	1	2	3	4	5	6	7
77.	In training, I put myself into situations which could occur in competition.	1	2	3	4	5	6	7
78.	In training, I like to create high levels of stress similar to competition.	1	2	3	4	5	6	7
79.	I like to create situations in training in which I have to come from behind to win.	1	2	3	4	5	6	7

12. Refocusing

Read this first! Refocusing is the ability to quickly regain an effective focus in the face of distractions.

		Strongly Disagree	Disagree	Somewhat Disagree	Don't Agree / Don't Disagree	Somewhat Agree	Agree	Strongly Agree
80.	I dwell upon mistakes during training.	1	2	3	4	5	6	7
81.	I find it hard to get a mistake or a bad call off my mind during competition.	1	2	3	4	5	6	7
82.	Unexpected events or mistakes lead to other mistakes when I compete.	1	2	3	4	5	6	7
83.	If I start losing, I find it hard to come from behind to win.	1	2	3	4	5	6	7
84.	I have difficulty finding effective strategies to help me refocus after being distracted.	1	2	3	4	5	6	7
85.	I find it hard to regain control of myself after getting angry or upset during a performance.	1	2	3	4	5	6	7

List four (4) mental skills out of the 12 mental skills presented below, you feel are most *important* and / or *useful* to your performance. List these four mental skills in order of importance, where 1 = most important and 4 = least important.

Mental Skill
1. Goal-setting
2. Belief / Confidence
3. Commitment
4. Stress Control
5. Relaxation
6. Fear Control
7. Energizing
8. Focusing
9. Imagery
10. Competition Planning
11. Mental Practice
12. Refocusing

→

Four (4) most important / useful mental skills listed in order of importance
1.
2.
3.
4.

Comments

_____

_____

_____

_____

If you wish to receive some feedback on your mental skills profile, please fill out the following and a copy of your profile will be sent to you.

Name _____

Address _____

_____

_____

Thank you for your collaboration

APPENDIX F

Letter of Information

Dear Athlete,

We are in the process of refining and validating a mental skills inventory for sport entitled "The Ottawa Mental Skills Assessment Tool (OMSAT)". The OMSAT is an 85 item questionnaire devised to measure a broad range of mental skills (goal-setting, focusing, ability to cope with stress, etc.).

In order to verify the validity and reliability of this questionnaire, we would like to administer it to a sample of approximately 500 male and female athletes representing various sports and different levels of participation. The information obtained from this data will enable us to meet our research objectives. As you will notice on the front page of the questionnaire, subjects will be identified and referred to by a number throughout the study. This ensures the confidentiality and anonymity of all participants. If you wish to receive feedback on your personal profile once the study has been completed, you can do this by filling out your name and address in the space provided at the end of the questionnaire and a copy will be sent to you.

In accordance with the Faculty of Health Sciences ethical procedures, the responses to the questionnaire will remain confidential. All data will be stored in locked files. Inferences will be made on the results obtained from the group data only and not on individual differences, so that full confidentiality and anonymity remain. The thesis will be written in such a way as to conceal the identity of all participants. Once the thesis has been accepted, the raw data will be destroyed. Upon completion of the study, a summary report will be made available to every participant who requested it.

It has been our experience that the completion of the questionnaire is a pleasant and educational task that takes approximately 20 minutes, and that it is often beneficial in improving one's understanding of their sport performances. There is very little risk, harm and discomfort involved in the process.

All the scores obtained from the completed questionnaires will be entered into a computer in order to conduct statistical analyses. Your input into this test will thus enable us to assess the validity and reliability of this instrument.

We believe that this extensive study will contribute to the advancement of research in the field of sport psychology. We believe that many athletes could benefit from your help. If this questionnaire proves to be valid and reliable, it could become a powerful tool to help athletes assess their current level of mental skills. It could become a very useful intervention and training tool for consultants and coaches as well.

We believe you will find this questionnaire interesting and worth completing. Your participation in this study is voluntary, but your responses would be extremely helpful and greatly appreciated. You could help us reach a better understanding of the relationship that exists between mental skills and performance. The club / school / organization to which you are affiliated (if you are affiliated to one) has granted us the permission to solicit you as a subject. Filling out this questionnaire would indicate that you freely consent to participate in this study.

Please contact us at any time for more information.

Natalie Durand-Bush or **Dr. John Salmela**
University of Ottawa
School of Human Kinetics
125 University Private
Ottawa, ON, K1N 6N5
tel: (613) 241-1269 or (613) 562-5800 ext. 4247

Dr. Frank Reardon
Chair of the Faculty of Health Sciences -
Human Research Ethics Committee
Faculty of Health Sciences, University of Ottawa
451 Smyth Road, Ottawa, ON, K1H 8M5
tel: (613) 787-6705

OMSAT-3 - French Version

INVENTAIRE DES HABILETÉS MENTALES (OMSAT)*

DONNÉES DÉMOGRAPHIQUES

Numéro d'identification (*quatre derniers chiffres de votre no. de téléphone*) _____

Âge _____

Sexe _____

Pays d'origine _____

Discipline sportive _____

Niveau actuel de participation dans votre sport (s-v-p cochez une case):

Je représente mon sport dans ma région _____

Je représente mon sport dans ma province / état / territoire _____

Je représente ma province / état / territoire dans mon pays _____

Je représente mon pays dans le monde _____

Plus haut niveau de participation atteint dans votre sport (s-v-p cochez une case):

J'ai représenté mon sport dans ma région _____

J'ai représenté mon sport dans ma province / état / territoire _____

J'ai représenté ma province / état / territoire dans mon pays _____

J'ai représenté mon pays dans le monde _____

Plus haut niveau d'éducation atteint (s-v-p cochez une case):

École secondaire _____ Université / 1er cycle _____

Collège / Cégep _____ 2e cycle _____

3e cycle _____

Comme les athlètes ont différentes forces et faiblesses au niveau de leurs habiletés techniques et leurs capacités physiques, ils varient aussi au niveau de leurs habiletés mentales. L'OMSAT est un outil qui nous permet de mieux comprendre vos forces et vos faiblesses dans le secteur de l'entraînement mental pour le sport et nous aide à développer des programmes d'entraînement mental appropriés pour des athlètes comme vous.

Les pages suivantes présentent un nombre d'affirmations reliées à certaines habiletés mentales qui influencent la performance de plusieurs athlètes de haut niveau. Évaluez chaque question en fonction de votre niveau et pratique d'habiletés mentales *actuels* et non en fonction du niveau et pratique que vous *désirez atteindre*. Veuillez s'il-vous-plaît vous souvenir que l'OMSAT sera seulement utile si vous répondez aux questions honnêtement. Soyez assuré que vos résultats demeureront confidentiels et anonymes et serviront seulement pour des fins de recherche.

Pour chaque affirmation dans le questionnaire, utilisez l'échelle ci-dessous et encerclez le chiffre qui correspond le plus à ce que vous ressentez ou vivez.

Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
1	2	3	4	5	6	7

Réfléchissez à vos performances les plus récentes dans votre sport, soit en situation d'entraînement ou de compétition, en répondant à ce questionnaire

* L'OMSAT fut créé par Dr. John H. Salmela, Jordache Bota et Natalie Durand-Bush, en collaboration avec Stuart Barbour, Jennifer Cox, Steve Howlett, Kyoko Imaj and Wang Run Ping, École des sciences de l'activité physique, Université d'Ottawa, 1992.

Veuillez bien noter que le masculin employé tout au long de ce questionnaire comprend aussi le féminin.

1. Établissement des buts

Lisez ceci en premier! L'établissement de buts est un processus par lequel vous vous fixez des objectifs qui vous fournissent une direction ou un moyen d'accomplir ce que vous désirez faire.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
1.	Je me fixe des buts à long terme dans mon sport.	1	2	3	4	5	6	7
2.	Je me fixe quotidiennement des buts pour mes entraînements.	1	2	3	4	5	6	7
3.	Je me fixe des buts difficiles mais réalisables.	1	2	3	4	5	6	7
4.	Mes buts me poussent à travailler plus fort.	1	2	3	4	5	6	7
5.	Je me fixe des buts pour améliorer des aspects quotidiens de ma performance.	1	2	3	4	5	6	7
6.	Mes buts sont spécifiques.	1	2	3	4	5	6	7
7.	J'ai discuté de mes buts spécifiques avec d'autres personnes.	1	2	3	4	5	6	7
8.	Mes buts sont plutôt orientés vers les résultats que vers l'apprentissage et l'amélioration de mes habiletés.	1	2	3	4	5	6	7

2. Croyance / Confiance

Lisez ceci en premier! Croire en vous-même est synonyme d'avoir confiance que vous pouvez réaliser vos buts et surmonter des situations difficiles.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
9.	Je crois que je suis un compétiteur avec beaucoup de force mentale.	1	2	3	4	5	6	7
10.	Je crois que je suis capable d'atteindre mes buts.	1	2	3	4	5	6	7
11.	Je crois que je peux réussir dans mon sport en dépit de tous les obstacles que je rencontre.	1	2	3	4	5	6	7
12.	Il y a eu des occasions où j'ai été jaloux de la réussite de mes adversaires.	1	2	3	4	5	6	7
13.	Je suis confiant vis-à-vis la plupart des aspects de ma performance.	1	2	3	4	5	6	7
14.	J'agis avec confiance même dans des situations sportives difficiles.	1	2	3	4	5	6	7
15.	Après une performance médiocre, je crois toujours en moi-même.	1	2	3	4	5	6	7

3. Engagement

Lisez ceci en premier! L'engagement vous fournit l'intensité et le dévouement nécessaires pour réaliser vos buts.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
16.	Je suis prêt à sacrifier beaucoup de choses pour exceller dans mon sport.	1	2	3	4	5	6	7
17.	Je suis engagé à devenir un athlète remarquable.	1	2	3	4	5	6	7
18.	Il y a eu des occasions où j'ai pris avantage de quelqu'un.	1	2	3	4	5	6	7
19.	Je suis déterminé de ne jamais lâcher jusqu'à ce que j'atteigne mes objectifs.	1	2	3	4	5	6	7
20.	Je pratique toujours ce que je prêche.	1	2	3	4	5	6	7
21.	Je travaille fort pour corriger mes erreurs en entraînement.	1	2	3	4	5	6	7
22.	Que mon entraînement aille bien ou non, je me donne à 100%.	1	2	3	4	5	6	7
23.	Je donne 100% de moi-même lors des compétitions, que je sois premier ou dernier.	1	2	3	4	5	6	7
24.	Je m'assure de retirer quelque chose de chaque entraînement.	1	2	3	4	5	6	7
25.	Je fonce lors des entraînements même si c'est pénible.	1	2	3	4	5	6	7
26.	Je suis déterminé à m'améliorer dans mon sport plus que dans tout autre chose dans ma vie.	1	2	3	4	5	6	7

4. Contrôle de l'anxiété / stress

Lisez ceci en premier! Le stress peut se manifester lorsque vous êtes nerveux, inquiet ou incertain de quelque chose. Les réactions au stress peuvent être positives ou négatives.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
27.	Être évalué par les autres me rend très anxieux.	1	2	3	4	5	6	7
28.	Ma performance souffre car je suis trop nerveux.	1	2	3	4	5	6	7
29.	Mon corps se contracte inutilement en compétition.	1	2	3	4	5	6	7
30.	J'obtiens un meilleur rendement dans les entraînements qu'en compétition.	1	2	3	4	5	6	7
31.	Je trouve que les foules me préoccupent et me rendent nerveux.	1	2	3	4	5	6	7
32.	J'ai tendance à percevoir le stress comme étant une chose négative.	1	2	3	4	5	6	7
33.	Je trouve cela difficile de contrôler mon niveau de stress pendant les entraînements.	1	2	3	4	5	6	7
34.	Il y a eu des occasions où j'aurais aimé démolir ce qu'il y avait autour de moi.	1	2	3	4	5	6	7
35.	Mes compétiteurs me rendent nerveux en compétition.	1	2	3	4	5	6	7

5. Relaxation

Lisez ceci en premier! La relaxation est une habileté qui peut vous permettre de libérer la tension dans vos muscles, diminuer votre battement de coeur et contrôler votre focus attentionel.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
36.	Il m'est facile de relaxer.	1	2	3	4	5	6	7
37.	Il m'est facile de relaxer rapidement.	1	2	3	4	5	6	7
38.	Je peux consciemment diminuer la tension dans mes muscles.	1	2	3	4	5	6	7
39.	Je peux relaxer efficacement à certains moments appropriés pendant une compétition.	1	2	3	4	5	6	7
40.	Je pratique souvent des techniques de relaxation.	1	2	3	4	5	6	7
41.	J'utilise la relaxation pour me calmer mentalement.	1	2	3	4	5	6	7

6. Contrôle de la peur

Lisez ceci en premier! La peur peut survenir lorsque vous percevez des situations comme étant dangereuses, lorsque vous faites face à des évènements inquiétants ou lorsque vous perdez contrôle d'une situation.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
42.	Il y a plusieurs choses dans mon sport qui sont dangereuses et qui me font peur.	1	2	3	4	5	6	7
43.	Je trouve cela difficile de m'entraîner parce que j'éprouve souvent des sentiments de peur.	1	2	3	4	5	6	7
44.	J'ai peur de perdre.	1	2	3	4	5	6	7
45.	Je trouve cela difficile de prendre le contrôle afin de diminuer mes peurs.	1	2	3	4	5	6	7
46.	J'ai peur de faire des erreurs.	1	2	3	4	5	6	7
47.	Si je pouvais faire entrer quelqu'un gratuitement pour venir voir ma compétition, je le ferais probablement.	1	2	3	4	5	6	7

7. Énergisation

Lisez ceci en premier! L'énergisation est l'opposé de la relaxation. C'est une habileté qui vous permet d'augmenter votre état physiologique et mental lors de situations où un "boost" d'énergie est requis.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
48.	Je peux facilement m'activer avant une compétition si je suis trop relaxé.	1	2	3	4	5	6	7
49.	J'ai une méthode efficace pour élever mon niveau d'activation quand je suis fatigué lors des entraînements.	1	2	3	4	5	6	7

	Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
50. J'ai une méthode efficace pour élever mon niveau d'activation lorsque je suis fatigué en compétition.	1	2	3	4	5	6	7
51. Je peux facilement m'activer jusqu'à un niveau optimal où ma performance est à son meilleur.	1	2	3	4	5	6	7

8. Concentration

Lisez ceci en premier! La concentration est une habileté qui permet de diriger et de maintenir votre attention sur ce qui est nécessaire pour réaliser une tâche ou une performance.

	Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
52. Je perds ma concentration pendant les entraînements quotidiens.	1	2	3	4	5	6	7
53. Je perds ma concentration pendant des compétitions importantes.	1	2	3	4	5	6	7
54. Je trouve cela difficile de me concentrer dans certaines situations en entraînement.	1	2	3	4	5	6	7
55. Lors de situations critiques en compétition, mes pensées deviennent brouillées.	1	2	3	4	5	6	7
56. Lorsque je suis fatigué, j'ai de la difficulté à me concentrer.	1	2	3	4	5	6	7
57. Peu importe à qui je parle, j'écoute toujours avec patience et sympathie.	1	2	3	4	5	6	7
58. J'ai de la difficulté à trouver des stratégies efficaces qui vont m'aider à rester concentré pendant les compétitions.	1	2	3	4	5	6	7

9. Imagerie mentale

Lisez ceci en premier! L'imagerie mentale ou la "visualisation" est une habileté qui vous permet de créer des images et de ressentir des mouvements / actions dans votre tête.

	Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
59. Je trouve cela facile de créer des images dans ma tête.	1	2	3	4	5	6	7
60. Je trouve cela facile de changer les images dans ma tête.	1	2	3	4	5	6	7
61. Mes images mentales sont claires et précises.	1	2	3	4	5	6	7
62. Lorsque je fais de l'imagerie mentale, je me vois comme si j'étais entrain de regarder un vidéo.	1	2	3	4	5	6	7

		Fortement en désaccord	En désaccord	Quelque peu en desaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
63.	Lorsque je fais de l'imagerie mentale, je vois ce que je verrais comme si j'étais réellement entrain de jouer ou d'exécuter mes mouvements.	1	2	3	4	5	6	7
64.	Je peux ressentir les mouvements que je fais normalement quand je les visualise.	1	2	3	4	5	6	7
65.	Je me visualise souvent entrain de gagner une joute ou un évènement.	1	2	3	4	5	6	7

10. Planification des compétitions

Lisez ceci en premier! La planification d'une compétition nécessite que vous mettiez du temps de côté pour penser à et planifier ce que vous voulez faire avant, pendant et après une compétition.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
66.	Je planifie une série de choses spécifiques à faire avant une compétition.	1	2	3	4	5	6	7
67.	Je planifie une série de choses à penser avant une compétition.	1	2	3	4	5	6	7
68.	Je planifie une série de chose à faire durant la compétition.	1	2	3	4	5	6	7
69.	Mon plan inclut certains mots-clés que je me répète en compétition.	1	2	3	4	5	6	7
70.	Après une compétition, je retire des éléments clés de ma performance afin de planifier mon prochain entraînement.	1	2	3	4	5	6	7

11. Pratique mentale

Lisez ceci en premier! La pratique mentale incorpore vos habiletés à visualiser les choses. C'est un processus qui nécessite que vous réserviez du temps et un espace pour pratiquer mentalement votre performance ou des segments de votre performance.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
71.	Je pratique mon sport mentalement à tous les jours.	1	2	3	4	5	6	7
72.	Je pratique mentalement mon sport en ayant en tête une performance maximale.	1	2	3	4	5	6	7
73.	Dans ma pratique mentale, j'incorpore des situations critiques auxquelles je dois faire face en compétition.	1	2	3	4	5	6	7
74.	Je peux facilement pratiquer une habileté dans sa totalité.	1	2	3	4	5	6	7
75.	Je peux pratiquer mentalement ma performance peu importe où je suis.	1	2	3	4	5	6	7

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
76.	Ma pratique mentale est planifiée (ex., je pratique à un moment précis à chaque jour, ou je sais à l'avance ce que je vais pratiquer et pour combien de temps).	1	2	3	4	5	6	7
77.	Pendant mon entraînement, je me mets dans des situations qui peuvent survenir en compétition.	1	2	3	4	5	6	7
78.	Pendant mon entraînement, j'aime créer des niveaux de stress élevés semblables à ce que je dois faire face en compétition.	1	2	3	4	5	6	7
79.	Pendant mon entraînement, j'aime créer des situations dans lesquelles je dois "venir de l'arrière" pour gagner.	1	2	3	4	5	6	7

12. Re-concentration

Lisez ceci en premier! La re-concentration est une habileté qui vous permet de regagner rapidement votre focus attentionel lors de distractions.

		Fortement en désaccord	En désaccord	Quelque peu en désaccord	Pas en accord / Pas en désaccord	Quelque peu en accord	En accord	Fortement en accord
80.	Je pense beaucoup à mes erreurs pendant mon entraînement.	1	2	3	4	5	6	7
81.	Je trouve cela difficile d'oublier une erreur ou un mauvais jugement lors d'une compétition.	1	2	3	4	5	6	7
82.	Des situations ou des erreurs imprévisibles m'amènent à faire d'autres erreurs en compétition.	1	2	3	4	5	6	7
83.	Si je commence à perdre, je trouve cela difficile de venir de l'arrière pour gagner.	1	2	3	4	5	6	7
84.	J'ai de la difficulté à trouver des stratégies efficaces qui m'aideraient à me re-concentrer après une distraction.	1	2	3	4	5	6	7
85.	Je trouve cela difficile de reprendre contrôle sur moi après avoir été en colère ou frustré durant une performance.	1	2	3	4	5	6	7

Parmi les 12 habiletés mentales présentées ci-dessous, énumérez-en quatre (4) qui sont à votre avis, les plus *importantes* et/ou *utiles* à votre performance. Veuillez inscrire ces quatre habiletés mentales en ordre d'importance où 1 = la plus importante et 4 = la moins importante.

Habileté mentale
1. Établissement des buts
2. Croyance / Confiance
3. Engagement
4. Contrôle de l'anxiété / stress
5. Relaxation
6. Contrôle de la peur
7. Énergisation
8. Concentration
9. Imagerie mentale
10. Planification des compétitions
11. Pratique mentale
12. Re-concentration

→

Quatre (4) habiletés mentales les plus importantes / utiles à ma performance
1.
2.
3.
4.

Commentaires

_____

_____

_____

_____

Si vous désirez recevoir de l'information au sujet de votre profile d'habiletés mentales, s'il-vous-plaît indiquez votre nom et adresse et il nous fera plaisir de vous en envoyer une copie.

Nom _____

Adresse _____

_____

_____

Merci de votre coopération

APPENDIX H

Distribution of Individual OMSAT-3 Item, Scale, and Conceptual Component Scores

Table H1

Distribution of Individual OMSAT-3 Item Scores

Question	*M*	*Mdn*	Mode	*SD*	Variance	Skewness	Kurtosis
1	5.95	6.00	7.00	1.24	1.53	-1.71	3.44
2	5.28	5.00	6.00	1.25	1.57	-.98	1.04
3	5.81	6.00	6.00	1.12	1.26	-1.29	2.33
4	6.13	6.00	7.00	1.02	1.03	-1.44	2.56
5	5.55	6.00	6.00	1.19	1.41	-1.08	1.36
6	5.69	6.00	6.00	1.10	1.21	-.91	1.11
7	4.67	5.00	6.00	1.77	3.14	-.47	-.82
8	4.54	5.00	4.00	1.71	2.94	-.35	-.76
9	5.58	6.00	6.00	1.19	1.42	-1.16	1.54
10	6.18	6.00	6.00	.833	.694	-1.32	3.41
11	5.93	6.00	6.00	1.04	1.08	-1.11	1.29
12	4.79	5.00	6.00	1.80	3.23	-.80	-.37
13	5.39	6.00	6.00	1.18	1.39	-1.26	2.15
14	5.29	5.00	6.00	1.27	1.62	-.97	.92
15	5.10	5.00	6.00	1.40	1.96	-.86	.39
16	5.75	6.00	7.00	1.34	1.79	-1.28	1.33

Table H1 - *continued*

Question	*M*	*Mdn*	Mode	*SD*	Variance	Skewness	Kurtosis
17	5.88	6.00	6.00	1.10	1.23	-1.06	1.14
18	3.73	4.00	4.00	1.84	3.37	-.04	-1.19
19	5.85	6.00	6.00	1.15	1.32	-1.24	1.87
20	2.88	3.00	3.00	1.19	1.42	.54	-.01
21	5.98	6.00	6.00	.914	.835	-.86	.63
22	5.43	6.00	6.00	1.24	1.53	-.79	.44
23	6.18	6.00	7.00	1.05	1.10	-1.53	2.30
24	5.67	6.00	6.00	1.03	1.06	-.72	.27
25	5.90	6.00	6.00	1.06	1.11	-1.05	1.14
26	4.87	5.00	7.00	1.73	2.98	-.52	-.63
27	3.57	3.00	3.00	1.64	2.70	.46	-.83
28	4.42	4.00	6.00	1.74	3.04	-.15	-1.13
29	4.79	5.00	6.00	1.63	2.64	-.47	-.72
30	4.85	5.00	6.00	1.82	3.31	-.58	-.78
31	5.28	6.00	7.00	1.68	2.84	-.82	-.31
32	4.46	5.00	6.00	1.82	3.30	-.29	-1.01
33	5.38	6.00	6.00	1.61	2.60	-.96	.06
34	4.48	5.00	6.00	2.04	4.17	-.43	-1.16
35	4.60	5.00	6.00	1.69	2.85	-.23	-1.07

Table H1 - *continued*

Question	*M*	*Mdn*	Mode	*SD*	Variance	Skewness	Kurtosis
36	4.69	5.00	5.00	1.50	2.24	-.48	-.61
37	4.12	4.00	5.00	1.59	2.52	-.15	-.92
38	4.47	5.00	5.00	1.52	2.31	-.44	-.72
39	4.77	5.00	5.00	1.41	1.99	-.74	-.12
40	3.45	3.00	2.00	1.72	2.96	.24	-1.01
41	4.37	5.00	5.00	1.73	3.01	-.47	-.83
42	5.28	6.00	7.00	1.77	3.12	-.86	-.41
43	6.23	7.00	7.00	1.13	1.29	-1.99	4.20
44	4.54	5.00	6.00	1.89	3.58	-.28	-1.19
45	5.40	6.00	6.00	1.38	1.89	-.82	-.06
46	4.18	4.00	3.00	1.78	3.16	.02	-1.09
47	5.19	6.00	6.00	1.79	3.20	-.95	.01
48	5.19	5.00	6.00	1.31	1.72	-.81	.37
49	4.63	5.00	5.00	1.42	2.01	-.43	-.41
50	5.09	5.00	6.00	1.31	1.72	-.72	.13
51	5.02	5.00	5.00	1.36	1.84	-.49	-.31
52	4.59	5.00	6.00	1.48	2.19	-.28	-.87
53	5.50	6.00	6.00	1.44	2.07	-1.02	.32

Table H1 - *continued*

Question	*M*	*Mdn*	Mode	*SD*	Variance	Skewness	Kurtosis
54	4.18	4.00	3.00	1.61	2.60	.19	-1.12
55	5.27	6.00	6.00	1.51	2.27	-.90	-.02
56	3.89	4.00	3.00	1.67	2.77	.11	-1.08
57	3.17	3.00	2.00	1.66	2.74	.55	-.74
58	4.76	5.00	6.00	1.59	2.52	-.57	-.58
59	5.12	6.00	6.00	1.64	2.67	-.91	-.16
60	5.00	5.00	6.00	1.56	2.43	-.81	-.18
61	4.93	5.00	6.00	1.63	2.64	-.72	-.50
62	4.55	5.00	6.00	1.86	3.46	-.48	-1.04
63	5.13	6.00	6.00	1.67	2.80	-.97	-.01
64	4.79	5.00	5.00	1.61	2.58	-.59	-.45
65	5.40	6.00	6.00	1.52	2.31	-1.01	.42
66	4.97	5.00	6.00	1.43	2.06	-.65	-.22
67	4.74	5.00	6.00	1.41	1.98	-.55	-.38
68	5.00	5.00	6.00	1.51	2.28	-.83	-.04
69	4.39	5.00	5.00	1.79	3.20	-.29	-.98
70	4.88	5.00	6.00	1.66	2.75	-.77	-.34
71	3.78	4.00	2.00	1.76	3.10	.16	-1.12

Table H1 - *continued*

Question	*M*	*Mdn*	Mode	*SD*	Variance	Skewness	Kurtosis
72	4.76	5.00	6.00	1.64	2.70	-.57	-.70
73	4.89	5.00	6.00	1.58	2.50	-.78	-.19
74	4.51	5.00	5.00	1.57	2.48	-.47	-.59
75	4.53	5.00	6.00	1.77	3.12	-.43	-.97
76	3.02	2.00	2.00	1.79	3.21	.67	-.72
77	5.29	6.00	6.00	1.36	1.86	-.1.00	.62
78	4.63	5.00	5.00	1.59	2.53	-.42	-.64
79	4.73	5.00	5.00	1.55	2.40	-.57	-.25
80	3.84	3.00	3.00	1.71	2.92	.29	-1.10
81	4.13	4.00	3.00	1.77	3.14	.08	-1.23
82	4.43	5.00	6.00	1.62	2.62	-.21	-.96
83	4.91	5.00	6.00	1.59	2.53	-.57	-.54
84	4.57	5.00	6.00	1.63	2.66	-.33	-.92
85	4.42	5.00	6.00	1.75	3.06	-.31	-1.03

Table H2

Distribution of the OMSAT-3 Scale Scores

Scale	Mean of subjects' sum of scores (*M*)	*Mdn*	Mode	*SD*	Variance	*M* / no. of questions per scale[a]
Goal-Setting	43.62	44.00	45.00	5.93	35.12	5.45
Belief / Self-Confidence	33.47	34.00	35.00	5.14	26.36	5.58
Commitment	51.51	52.00	55.00	7.04	49.53	5.72
Stress Control	37.33	37.00	39.00	8.80	77.38	4.69
Relaxation	25.86	26.00	22.00	6.76	45.65	4.31
Fear Control	25.63	26.00	27.00	5.60	31.39	5.13
Energizing	19.93	20.00	23.00	4.23	17.85	4.98
Focusing	28.19	29.00	27.00	6.26	39.21	4.70
Imagery	34.91	37.00	37.00	8.45	71.41	5.01
Competition Planning	23.98	25.00	28.00	5.96	35.47	4.80
Mental Practice	40.15	40.00	40.00	9.65	93.11	4.46

Table H2 - *continued*

Scale	Mean of subjects' sum of scores (*M*)	*Mdn*	Mode	*SD*	Variance	*M* / no. of questions per scale[a]
Refocusing	26.29	26.00	30.00	7.50	56.30	4.38
Social Desirability scale	24.24	24.00	27.00	4.63	21.43	4.04

Note. Scale scores were computed by adding subjects' scores on each item within the scales.

[a] Scores in this column were obtained by dividing the mean of subjects' sums of scores found in the second column by the number of questions in the given scale. This was done so that subjects' scores could be compared across the 12 scales.

Table H3

Distribution of the OMSAT-3 Conceptual Component Scores

Conceptual component	*M*	*Mdn*	Mode	*SD*	Variance	Skew-ness	Kur-tosis	*M*[a]
Foundation skills	128.60	131.00	138.00	14.73	217.00	-.63	.30	5.59
Affective skills	108.75	110.00	112.00	17.48	305.63	-.07	-.26	4.73
Cognitive skills	153.52	155.00	151.00	25.41	645.62	-.09	-.07	4.65

Note. [a] Mean in second column divided by number of questions per component.

APPENDIX I

Mean Scale Scores of Elite Athletes Versus Competitive Athletes

Scale	Mean scale score	
	Elite group	Competitive group
Goal-Setting	5.57	5.37
Belief / Self-Confidence	5.73	5.46
Commitment	5.98	5.53
Stress Control	4.90	4.48
Relaxation	4.46	4.19
Fear Control	5.22	5.05
Energizing	5.09	4.90
Focusing	4.91	4.54
Imagery	5.12	4.88
Competition Planning	4.98	4.65
Mental Practice	4.64	4.32
Refocusing	4.65	4.17

APPENDIX J

Internal Consistency and Test-Retest Reliability Estimates of the OMSAT-3 Scales

Scale / question	Alpha level if item is deleted (α)	Item-total correlation	Internal consistency / scale alpha (α)	Test-retest reliability coefficient (*r*)
Goal-Setting				
Q1	.65	.38		
Q2	.62	.52		
Q3	.64	.45		
Q4	.64	.49	**.68**	**.68**
Q5	.65	.39		
Q6	.64	.43		
Q7	.65	.41		
Q8	.73	.12		
Belief / Self-Confidence				
Q9	.80	.59		
Q10	.81	.57		
Q11	.80	.59	**.83**	**.71**
Q13	.79	.66		
Q14	.78	.67		
Q15	.81	.56		
Commitment				
Q16	.80	.64		
Q17	.80	.66		
Q19	.82	.47		
Q21	.81	.57		
Q22	.81	.57	**.83**	**.63**
Q23	.83	.39		
Q24	.81	.56		
Q25	.81	.57		
Q26	.82	.53		

Appendix J - *continued*

Scale / question	Alpha level if item is deleted (α)	Item-total correlation	Internal consistency / scale alpha (α)	Test-retest reliability coefficient (*r*)
Stress Control				
Q27	.79	.43		
Q28	.76	.63		
Q29	.76	.59		
Q30	.79	.45	**.80**	**.61**
Q31	.77	.56		
Q32	.78	.52		
Q33	.79	.43		
Q35	.78	.47		
Relaxation				
Q36	.76	.61		
Q37	.75	.66		
Q38	.76	.61	**.81**	**.80**
Q39	.78	.52		
Q40	.80	.48		
Q41	.79	.52		
Fear Control				
Q42	.70	.45		
Q43	.69	.52	**.73**	**.64**
Q44	.70	.46		
Q45	.65	.60		
Q46	.68	.51		

Appendix J - *continued*

Scale / question	Alpha level if item is deleted (α)	Item-total correlation	Internal consistency / scale alpha (α)	Test-retest reliability coefficient (*r*)
Energizing				
Q48	.78	.51		
Q49	.73	.62	**.79**	**.65**
Q50	.69	.68		
Q51	.74	.58		
Focusing				
Q52	.73	.48		
Q53	.70	.58		
Q54	.73	.48	**.76**	**.62**
Q55	.73	.47		
Q56	.74	.46		
Q58	.72	.53		
Imagery				
Q59	.82	.73		
Q60	.83	.70		
Q61	.81	.82		
Q62	.87	.43	**.86**	**.89**
Q63	.84	.59		
Q64	.83	.67		
Q65	.86	.49		

Appendix J - *continued*

Scale / question	Alpha level if item is deleted (α)	Item-total correlation	Internal consistency / scale alpha (α)	Test-retest reliability coefficient (*r*)
Competition Planning				
Q66	.78	.63		
Q67	.75	.71		
Q68	.76	.68	**.82**	**.63**
Q69	.78	.61		
Q70	.83	.45		
Mental Practice				
Q71	.81	.61		
Q72	.81	.63		
Q73	.81	.65		
Q74	.80	.68		
Q75	.82	.56	**.84**	**.62**
Q76	.83	.46		
Q77	.83	.47		
Q78	.83	.47		
Q79	.83	.41		
Refocusing				
Q80	.83	.51		
Q81	.80	.67		
Q82	.79	.71	**.84**	**.63**
Q83	.83	.53		
Q84	.81	.63		
Q85	.81	.63		

APPENDIX K

Internal Consistency Estimates of the OMSAT-3 Conceptual Components

Conceptual component	Internal consistency estimate (α)
Foundation skills[a]	.88
Affective skills[b]	.85
Cognitive skills[c]	.89

Note. [a] Foundation skills were made up of the Goal-Setting, Belief / Self-Confidence and Commitment scales. [b] Affective skills included the Stress Control, Fear Control, Relaxation and Energizing scales. [c] Cognitive skills were comprised of the Focusing, Imagery, Mental Practice, Refocusing and Competition Planning scales.

APPENDIX L

Elite Versus Competitive Athletes' Ranks of the OMSAT-3 Scales, According to Perceptions of Importance / Usefulness to Their Performance

Scale	Rank of OMSAT-3 scales							
	Rank 1		Rank 2		Rank 3		Rank 4	
	Elite *f* (%)	Competitive *f* (%)	Elite *f* (%)	Competitive *f* (%)	Elite *f* (%)	Competitive *f* (%)	Elite *f* (%)	Competitive *f* (%)
Goal-Setting	27 (8.2)	27 (8.2)	15 (4.5)	23 (7.0)	16 (4.8)	21 (6.4)	12 (3.6)	17 (5.2)
Belief / Self-Confidence	70 (21.2)	106 (32.1)	38 (11.5)	29 (8.8)	8 (2.4)	15 (4.5)	6 (1.8)	11 (3.3)
Commitment	23 (7.0)	22 (6.7)	28 (8.5)	30 (9.1)	20 (6.1)	15 (4.5)	14 (4.3)	15 (4.6)
Stress Control	4 (1.2)	2 (.6)	7 (2.1)	14 (4.2)	16 (4.8)	10 (3.0)	8 (2.4)	17 (5.2)
Relaxation	1 (.3)	5 (1.5)	7 (2.1)	16 (4.8)	8 (2.4)	8 (2.4)	11 (3.3)	15 (4.6)

Appendix L - *continued*

Scale	Rank of OMSAT-3 scales							
	Rank 1		Rank 2		Rank 3		Rank 4	
	Elite *f* (%)	Competitive *f* (%)	Elite *f* (%)	Competitive *f* (%)	Elite *f* (%)	Competitive *f* (%)	Elite *f* (%)	Competitive *f* (%)
Fear Control	2 (.6)	1 (.3)	6 (1.8)	6 (1.8)	6 (1.8)	9 (2.7)	5 (1.5)	6 (1.8)
Energizing	5 (1.5)	2 (.6)	3 (.9)	5 (1.5)	10 (3.0)	28 (8.5)	17 (5.2)	18 (5.5)
Focusing	10 (3.0)	11 (3.3)	27 (8.2)	47 (14.2)	34 (10.3)	43 (13.0)	21 (6.4)	26 (7.9)
Imagery	1 (.3)	3 (.9)	6 (1.8)	8 (2.4)	11 (3.3)	16 (4.8)	19 (5.8)	15 (4.6)
Competition Planning	1 (.3)	3 (.9)	3 (.9)	-	2 (.6)	6 (1.8)	5 (1.5)	9 (2.7)
Mental Practice	2 (.6)	-	3 (.9)	1 (.3)	6 (1.8)	7 (2.1)	14 (4.3)	16 (4.9)
Refocusing	-	2 (.6)	3 (.9)	5 (1.5)	9 (2.7)	6 (1.8)	14 (4.3)	18 (5.5)

APPENDIX M

Internal Consistency and Test-Retest Reliability Estimates

of the OMSAT-2 and OMSAT-3 Scales

Scale	Internal consistency (α)		Test-retest reliability (*r*)	
	OMSAT-2	OMSAT-3	OMSAT-2	OMSAT-3
Goal-Setting	.81	.68	.82	.68
Belief / Self-Confidence	.81	.83	.78	.71
Commitment	.86	.83	.89	.63
Stress Control	.87	.80	.81	.61
Relaxation	.84	.81	.67	.80
Fear Control	.86	.73	.70	.64
Energizing	.80	.79	.76	.65
Focusing	.78	.76	.69	.62
Imagery	.84	.86	.85	.89
Competition Planning	.80	.82	.74	.63
Mental Practice	.83	.84	.83	.62
Refocusing	.82	.84	.75	.63

APPENDIX N

Univariate *F*-Tests of the 12 OMSAT-3 Scales

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	*F*	Sig. of *F*
Goal-Setting	212.14	11516.47	212.14	34.58	6.13	.014
Belief / Self-Confidence	229.33	8576.02	229.33	25.75	8.90	.003
Commitment	1360.09	15181.63	1360.09	45.59	29.83	.000
Stress Control	955.33	24888.56	955.33	74.74	12.78	.000
Relaxation	216.44	15029.97	216.44	45.14	4.80	.029
Fear Control	63.56	10420.54	63.56	31.29	2.03	.155
Energizing	45.24	5916.18	45.24	17.77	2.55	.111
Focusing	405.58	12690.19	405.58	38.11	10.64	.001
Imagery	232.87	23617.26	232.87	70.92	3.28	.071
Competition Planning	217.89	11628.96	217.89	34.92	6.24	.013
Mental Practice	661.60	30437.64	661.60	1.40	7.24	.007
Refocusing	689.15	18113.77	689.15	54.40	12.67	.000