Theory of Attentional and Personal Style vs. Test of Attentional and Interpersonal Style (TAIS)

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Numerous investigators have emphasized how important it is for both researchers and applied practitioners in the field of performance psychology to have a sound theoretical base that guides their work (Moran, 1996; Abernethy, 1993; Druckman & Swets, 1988). This is especially true in the cognitive area where Moran maintains that "research on concentration in athletes has been conducted largely in a theoretical vacuum (pg. 235)." The reason often given for the failure to of investigators to have a theoretical bases for their hypotheses is the belief that there is an absence of well developed theories to study cognitive skills like attention, concentration, and information processing in sport (Masters & Lambert, 1989; Boutcher, 1992).

I would like to argue that there is a very well developed theoretical framework for examining the relationship between cognitive processes, emotional arousal, and performance. A theory that explains far more about those psychological factors that lead to "choking" on the one hand, and entering the "zone" or "flow" state on the other, than any other theory in psychology. A theory that leads to testable, performance relevant, predictions. That theory, is the Theory of Attentional and Interpersonal Style and was first introduced in 1976 (Nideffer, 1976a).

If the theory is indeed better than other performance relevant theories, then why aren't researchers and practitioners using it, and/or even aware of it? I believe there are three reasons. The first reason has to do with the fact that the theory has not been communicated as clearly as it should have been. Different parts or theoretical constructs have been presented in different articles. Second, the theory has been changing with constructs being clarified and new constructs added in response to on going research. The third reason, and perhaps the most important one is that both researchers and practitioners have failed to separate the theory of attentional and interpersonal style from the test of attentional and interpersonal style. This can be seen most clearing in the following quotes from Moran (1996).

"At first glance, the theory of attention developed by Nideffer (1976a; 1976b) appears to be one of the most comprehensive cognitive models in contemporary sport psychology. In particular, it seems to account for many attentional phenomena (e.g., individual differences in concentration skills) in an elegant, parsimonious and plausible manner." Moran - Pg. 142

The above quote begins a section on measuring attentional processes in athletes, in Moran's book on The Psychology of Concentration in Sport Performers. Moran moves from that introduction to a review of research that was designed to assess the validity of The Test of Attentional and Interpersonal Style (TAIS) and draws the following conclusion. Note that the conclusion talks about the validity of the theory, not the inventory.

"Overall, therefore, empirical evidence indicates that although Nideffer's theory of attentional style has substantial face validity, its construct validity is questionable." Moran Pg. 149

It seems clear that confusion that exists within the literature between the theory of attentional and interpersonal style and the test of attentional and interpersonal style. To the extent that confusion keeps people from using the theory to guide research, independent of TAIS, it is not in the interest of the advancement of the field (Nakamura & Csikszentmihalyi, 2001). The purpose of this paper is to: 1) Separate the theory from the instrument; 2) Provide a complete and up to date description of the theory; and 3) Provide evidence for the validity and utility of the theory as it relates to performance in general and to sport psychology in particular.

The Theory vs. The Test

The theory of attentional and interpersonal style was developed to provide a framework for understanding and predicting the conditions under which individuals would, and would not, be able to perform up to their potential. The theory has relevance to both physical (execution of a motor skill) and mental (decision making, problem solving) performance in virtually any performance arena.

The test of attentional and interpersonal style (TAIS), is a 144 item paper and pencil, self-report questionnaire that was designed to measure the concentration skills, and inter and intra-personal characteristics that the theory suggests are critical determinants of performance. TAIS measures twenty conceptually different concentration skills and intra and interpersonal characteristics. Considerable research has been conducted on TAIS and has been reviewed by a number of authors (Cox 1985; Druckman & Swets, 1988; Moran, 1996; Abernethy, Summers & Ford, 1998).

The reviews of TAIS related research indicate questions have been raised relative to the construct validity of the six TAIS scales that measure attentional processes. For the most part, these questions have resulted from factor analytic studies that have attempted to demonstrated the statistical independence or orthogonality of the different attentional dimensions measured by TAIS (Van Schoyck & Grasha, 1981; Landers, 1982; Vallerand, 1983; Dewey, Brawley, & Allard, 1989). Although Nideffer (1990) has identified some critical methodological problems associated with the use of factor analysis in this way, reviewers continue to raise questions about the construct validity of the attentional scales, though they support the use of the instrument as a diagnostic tool to help individuals identify the attentional problems that may be affecting their performance (Abernethy, Summers, & Ford, 1998).

Based on the limited number of studies to date, empirical evidence for the construct validity of TAIS's ability to independently measure an external and an internal focus, is weak. More research needs to be conducted, and/or certain scales on TAIS need to be revised to better reflect the independent contributions of the external and internal dimensions of concentration. That fact aside, however, one cannot draw conclusions about the theory based on research that seems to demonstrate that the tool designed to measure the theoretical constructs may be lacking in construct validity.

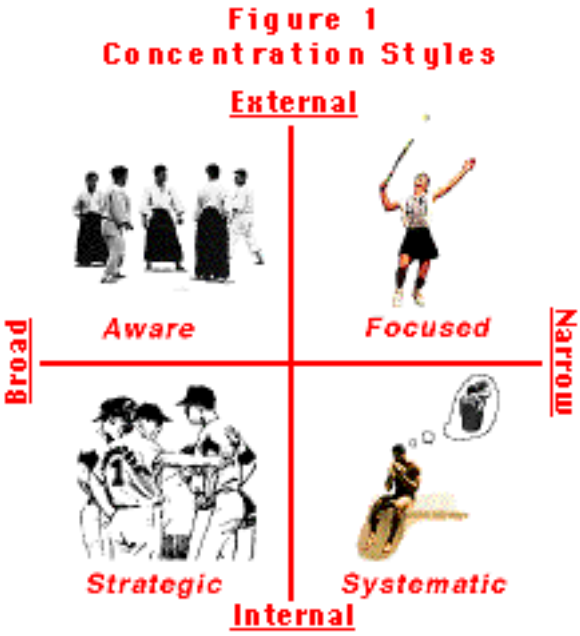
For TAIS to be used to test the theory of attentional and interpersonal style, the attentional constructs measured by the inventory, would have to be valid. If the instrument doesn't measure what it says it measures, it can't be used to call the theory into question.

If you can't challenge the validity of the theory of attentional and interpersonal style on the basis of research on TAIS, then how should the theory be evaluated? Snyder and Abernethy (1992), provide the answer when they describe the characteristics of good theories. Based on their description, the theory of attentional and interpersonal style should be evaluated on the basis of it's ability to : "(a) provide accurate and economical (parsimonious) accounts of known facts within a field, (b) explain phenomena through the identification of causal links between variables rather than merely describe the phenomena, and (c) produce directly deducible predictions that can be supported by empirical testing (p. 7)."

In the next few paragraphs, I will outline the key elements of the theory, and indicated when these were most clearly described in the psychological literature. I will also show how the theory measures up to the criteria provided by Snyder and Abernethy (1992).

The Theoretical Constructs

1. Focus of attention, or focus of concentration shifts along two dimensions, a dimension of width (broad to narrow), and a directional dimension (internal or external). Conceptually, you can think of these as two intersecting dimensions which result in four different attentional styles of focuses (Nideffer, 1976a). These are shown in Figure 1.



You use a broad-external focus when you need to be environmentally aware and ready to react automatically and/or instinctively to something going on around you. You also use this type of

focus to gather external information which you then consciously analyze. You use a broad-internal focus of concentration to analyze, strategize, and plan. This is accomplished by taking information from the environment and comparing it to information you have stored in long term memory, to then develop a plan or strategy that will help you sometime in the future. You use a narrow-internal focus of concentration to systematically rehearse information (e.g., a dive, a putt), or to assess and manipulate your own internal state in some systematic way (e.g., to mentally check your breathing rate, systematically reduce muscle tension, etc.). You use a narrow-external focus to actually perform some physical (e.g., hit a ball), or interpersonal (ask a question or confront an issue) task.

Evidence for the validity of the dimensions of width and direction of one's focus of attention comes from both experiential/observational sources, and empirical data. Given the suspicions that some researchers have relative to experiential data, perhaps a couple of comments about the utility of this type of information are in order. First, there are a great many accepted scientific theories, among them Newton's theory of gravity, Einstein's theory of relativity, and Darwin's theory of evolution, that lack empirical proof and/or where the nature of the constructs make it difficult if not impossible to directly measure them. Those theories, however, explain data in a logical rational way. Those theories also lead to testable hypotheses which then indirectly test the theory. We can see that objects fall, but we don't see gravity. We infer the existence of gravitational forces on the basis of the fact that objects fall to the ground in predictable ways.

Although we can use certain physiological techniques to provide very general information about cognition, the information provided by those measures is extremely limited. For the most part, we still have to draw conclusions about concentration skills and other cognitive processes based on indirect observations, and subjective experience. Even with this limitation, however, there are times when experiences across individuals are so consistent that the validity of the construct or hypotheses appears obvious. That would seem for example, to be the case with respect to the dimensions of width and direction of attentional focus.

The dimension of width has been generally accepted by researchers (Cromwell, 1968; Wachtel, 1967; Posner, 1990; Best, 1995; Eysenck & Keane, 1995). These same investigators support the notion that attention can be directed internally or externally. Indeed that fact seems so obvious that Eysenck (1993) says, "we all know that we can choose between attending to the external environment or to the internal environment."

Empirically, Landers, Wang & Courtet (1995), used a dual task paradigm to demonstrate that focus of attention narrows (e.g., peripheral awareness decreases), as the time for reacting to the primary task gets closer. They showed that as alertness to the primary task increases, subjects become both slower in their response to peripheral stimuli and less accurate. Hatfield, Landers, and Ray (1984), and Hatfield and Landers (1987), suggested that an increase in alpha activity on the left side of the brain, and continued activation on the right side of the brain in experienced shooters just prior to firing indicated both a narrowing of attention, and a shift to an external focus.

Lacy (1967) has suggested that heart rate acceleration and deceleration can provide an indication of the shifting of one's attentional from an external focus to an internal focus. Heart rate

deceleration indicating an external or environmental focus, and heart rate acceleration indicating an internal focus. This is an interpretation that has been supported by the work of Boutcher & Zinsser (1990). These investigators noted that experts in various closed skill sports showed more cardiac deceleration just prior to execution on good trials than they did on poor trials (e.g., putting in golf).

With respect to TAIS as a measure of the theoretical constructs of width and direction of attentional focus, both Landers (1982) and Ford (1996) through the use of factor analysis procedures concluded that the inventory measured the dimension of width (broad to narrow), but questioned it's ability to independently measure the internal and external dimensions of focus. Additional support for the construct validity of the width dimension comes from differences in the dominant attentional characteristics of world class athletes, when compared to high level business executives. World class athletes tend to be dominated by a narrow focus of concentration, whereas business executives are dominated by a broad-internal focus of concentration (Nideffer, Sagal, Lowry, & Bond, 2001). Nideffer argues that the difference between these two groups is consistent with the requirements of their respective performance arenas. Business executives must engage in a lot of planning and strategic thinking. If they narrow their focus too much, they will become lost in details and lose sight of the "big picture." Athletes on the other hand need to be able to focus concentration, to avoid distraction, and to perfect their skills and abilities to the point that they can be executed automatically, without conscious thought or guidance.

In summary, there is both subjective and empirical evidence to support the notion that focus of concentration shifts along a dimension of width, and a dimension of direction. The next construct in the theory of attentional and interpersonal style attempts to deal with the shifting of one's focus of concentration along those dimensions.

2. Individuals have preferred attentional styles, though the average person can develop all four attentional styles, and under most conditions, can shift his or her focus along both attentional dimensions in response to the changing demands of performance situations (Nideffer, 1976a).

There is a tremendous amount of empirical evidence which shows that people are capable of selectively attending (e.g., shifting their focus of concentration along these attentional dimensions to focus on task relevant cues). Studies which show that attentional skills as measured by self-report inventories improve with age (Mahoney, Gabriel, & Perkins, 1987; Nideffer, 1993), studies that show a relationship between what is attended to, and the level of performance of the individual, and studies that demonstrate individuals are capable of learning different strategies designed to improve concentration and performance. Several authors provide extensive reviews of this research including (Abenethy 1987; Abernethy 1993; Moran, 1996).

With respect to the notion that different individuals have different preferred styles of attending, the data is largely observational, and/or comes from individual case histories. We are all familiar with people who seem to be so analytical (broad-internal focus) that they pay little attention to the world around them. The absent minded professor is a classic example. Likewise, most of us know individuals who seem to react almost instinctively to things going on

around them, individuals who get into trouble repeatedly, because they fail to adequately analyze situations before they react. Clinically, we have labels for individuals that reflect dominant cognitive style differences. The obsessive personality is an individual who is dominated by an internal focus of concentration. The hysterical person on the other hand seems to be overly responsive to environmental cues and fails to take the time necessary to anticipate the consequences of various actions.

In the clinical examples I just presented I identified extreme behaviors, but more subtle preferences exist for the average person. Most of us have only to look to our own experience to see that we feel more comfortable and/or spend more time either interacting with our environment (external focus) , or with our thoughts and feelings (internal focus). In a similar way, we differ with respect to the number of activities (breadth of activity and focus) we engage in on a daily basis.

In spite of our individual styles, our theory also maintains that the average person can make required or performance relevant shifts in concentration under most conditions. This hypotheses would certainly seem to be consistent with day to day observations of people's behavior.

Conceptually, it's easy to see that our very survival depends upon our ability to shift our focus of concentration along the two dimensions described earlier. The ability to problem solve requires an individual to shift attention internally, to recall past information and experiences so that these can be compared to an immediate external situation or issue. Then, based on those comparisons and on the perceived demands of the immediate situation or problem, the individual makes a prediction about the best course of action to take, and acts about that decision. We engage in this process when we cross a busy street, when we respond to a question on an examination. Thus shifting from an external focus to an internal focus for the average person is as easy and natural as breathing. In a similar way, we act to broaden and narrow our focus of concentration in response to changing demands. A seamstress who wants to thread a needle, develops a very narrow focus of concentration. When you read a book, you narrow your focus and engross yourself in the content inhibiting other sensory input. The average hitter in baseball has little difficulty broadening his focus of concentration to get a signal from the coach, and then narrowing his focus as the pitcher goes into his wind up. Likewise, the average golfer can use a broad external focus of concentration to assess course conditions and her ball position relative to the hole. Then shift to a broad-internal focus to analyze the information to select a club. Then shift again, to a narrow internal focus to mentally rehearse the shot, and finally shift to a narrow external focus as she addresses the ball and prepares to swing.

If the average person can match the attentional demands of performance situations most of the time, then what difference does it make if that individual has attentional skills that are more highly developed in one area than another? I believe it means two very important things. First, it means that individuals who have a dominant attentional style will operate more easily and comfortably in performance situations that play to their strength, than they will in situations that do not play to their strength. Second, it means that other, mediating variables (e.g., arousal) will play a critical role in determining when individuals will and will not perform well. Let me discuss both of these points in a little more detail.

One of the key factors in determining success has to do with our ability to maintain the level of motivation necessary, and to make the "sacrifices" required to be successful in our particular performance arena. For the elite athlete, that may mean hours and hours of training and repetition, doing the same things over and over again until they are perfect. It would be hypothesized that an athlete who has an attentional style that lends itself to repetition and the perfection of skills, would find it easier to maintain motivation, and less of a sacrifice, to put in the hours of training required to be the best, than an athlete who has a much broader focus of concentration. Athletes with a broader style of concentration would, over time, find themselves distracted, and they would find themselves resenting the sacrifices that they would have to make to be the best in their sport.

The importance of being able to develop and maintain a narrow focus of concentration has been emphasized by numerous writers and researchers (Orlick, 1990; Lykken, 1998; Ravizza, 1977; Loehr, 1984; Garfield & Bennett, 1984). Support for the ability to focus concentration in sport comes from research on the attentional and interpersonal characteristics of world champion and Olympic medalists. In this study, an analysis of athletes scores on TAIS indicated that the ability to focus concentration was the dominant style for Olympic medalists and world champions. Not only that, but focus of concentration differentiated medalists from other elite level performers, and also separated athletes with two or more Olympic medals or world championships from single medalists (Nideffer, Sagal, Lower, & Bond, 2001).

To conclude this first point about an individual's dominant or preferred style. The fact that an athlete's preferred style is something other than narrow, wouldn't necessarily rule him/her out of becoming an Olympic medalist. What it would suggest, however, is that the odds against this happening are greater. It would also suggest that finding ways of maintaining motivation and focus, while avoiding burn out, will be a bigger challenge than it would be for an athlete who is dominated by a narrow focus of concentration.

The second point I want to discuss has to do with the notion that under normal conditions individuals are able to shift concentration and selectively attend to task relevant information. If this is true, then under what conditions would we expect to see performance differences between individuals based on their attentional style. The theory maintains that there are at least two sets of circumstances which should lead to the identification of individual and/or group differences.

First, everyone makes mistakes from time to time. What the theory would suggest is that over long periods of time, if you examine the pattern of "spontaneous" mistakes that an individual makes, you will find that a bigger percentage of them will be related to their dominant concentration style. If someone followed me around for a month, and charted my mental or cognitive errors, a bigger percentage would be due to over-analyzing, than to a failure to think before reacting, and/or to the tendency to become too narrowly focused and fail to consider all of the relevant information.

Second, if you want to make between group comparisons over shorter time periods and/or performance cycles, then you need to do something to increase the likelihood that individuals will make mistakes, like manipulating arousal. You can see the importance of this in studies using a dual-task paradigm to identify differences between athletes as a function of skill level.

Parker (1981), used a dual task paradigm to compare the throwing and catching skills of netball players of different levels. The primary task was throwing and catching, and the secondary task was the detection of visual cues in the periphery (simulating awareness of other players on the field). Although there may well have been differences in the throwing and catching skills of athletes of different skill levels, the primary task wasn't sufficiently challenging enough to show that. There were, however, differences on the secondary task which showed that more experienced players had greater awareness of peripheral cues. Parker suggests that because catching and throwing skills were more highly developed in advanced athletes, that gave them more freedom to split attention. They did not have to be as focused on the primary task as the less skilled players. The theory of attentional and interpersonal style would suggest the same thing. Individuals who have more highly developed skills may not differ from other individuals on "primary" experimental tasks, unless something is done to make that task more demanding (e.g., by increasing arousal level), and/or unless the individual is challenged to multi-task (e.g., as in the dual task paradigm).

In summary, there appears to be empirical support for the notion that individuals have preferred attentional styles, and good observational support for the notion that under most conditions the average person is capable of shifting his or her focus of concentration in response to the changing demands of performance situations. When taken together, these two assumptions have important implications for both research and practice in the performance enhancement area. An individual's dominant attentional style is predicted to have implications for long term success and motivation, as well as implications for the types of spontaneous errors the individual will be most likely to make. Because the average individual has the ability to matching the concentration demands of most performance situations, the manipulation of other factors (e.g., emotional arousal) becomes important if one hopes to show between group differences in performance.

3. Different performance situations place different demands on the four attentional styles, and require different amounts of shifting between the four different styles (Nideffer, 1976a).

Abernethy (1993), in discussing the different attentional requirements of different sports noted the following,

"Comparisons of the attention demands of a diverse range of sport tasks (volleyball, tennis, 100 m sprinting, and hurdling) by Castiello and Umilta (1988), demonstrate the presence of a high degree of specificity in the demands different athletic events place upon human attentional capacities and resources, indicating among other things the need for a database on the patterns of attention within specific sport tasks. To date research evidence as to categorization is lacking (p. 142)."

The fact that different performance situations require different concentration skills may be so intuitively obvious to researchers, that it generates little research interests. The differences which are obvious to coaches, players, and researchers within sport, are even great when you compare athletic activities with those which require more of an internal focus.

During competition, when performance counts the most, most sport situations require very little in the way of an internal focus. Athletes practice basic skills and strategies to the point that these can be executed without conscious thought. When that's the case, the athletes focus of concentration can be almost exclusively external. The shifting that does occur involved shifting between a broad-external focus (e.g., on a fast break in basketball) to a narrow-external focus (e.g., to drive to the basket and shoot). Contrast that with performance in many academic situations and/or business environments. In these settings, focus of attention may be almost exclusively internal. Shifting that occurs as one engages in problem solving and/or decision making is from a broad-internal focus (e.g., to analyzed and plan) to a narrow internal focus (e.g., to define and follow the steps required to solve a problem).

In summary then, although there is relatively little in the way of empirical research to support this construct, the observational and experiential evidence of it's validity is over over-whelming.

4. As arousal increases, shifting breaks down, attention begins to narrow involuntarily and becomes more internally focused (Nideffer, 1976a).

Once again, there is plenty of anecdotal and experiential evidence to support the idea that attention narrows as emotional arousal and/or fatigue increase. At times, this narrowing can become so dramatic that individuals will tell you that they develop tunnel vision. Darkness in the periphery of the visual field makes it seem as if the individual is looking through a tunnel. Some world class athletes have actually used this narrowing of the field of vision as a signal to tell them how hard they could train. The harder they work more restricted the field of vision (smaller the tunnel), they would lose consciousness as the tunnel closed completely.

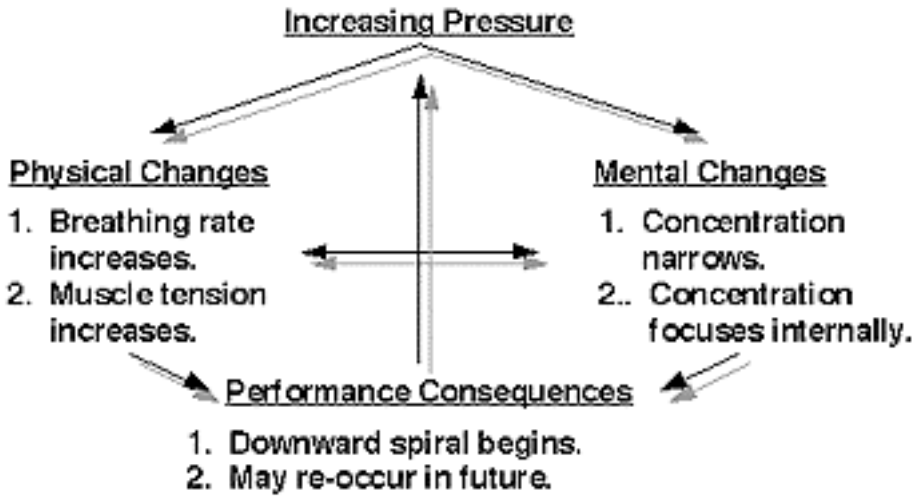
Most of us have had personal experiences where increasing arousal (e.g., in a test) has interfered with our ability to recall information that we had learned. Then too, most of us have had times when negative feelings and/or self-doubts have kept us from paying attention to things going on around us. Experiences like these, and research on the relationship between emotions and concentration led Easterbrook (1959) to talk about the impact arousal has on "effective cue utilization."

According to Easterbrook, increasing arousal results in a narrowing of attention, thereby reducing the attentional resources available to attend to task relevant cues. If arousal is moderate, and the number of task relevant cues is not excessive, the performance can be facilitated by arousal. If arousal gets too high, however, the individual begins to have difficulty attending to task relevant cues.

Eysenck (1992), explains the inability to focus on task relevant cues under conditions of high arousal by says suggesting that anxious people's attentional focus is 'primed' to detect any signs of the stimuli which they fear." This would be consistent with the notion that under stress there are involuntary biochemical changes which create the "fight" or "flight" response in human beings. Heart rate, respiration rate, blood pressure, and muscle tension levels all increase. Pupils constrict and concentration narrows as the individual focus on the cues that are threatening. It's the individual's appraisal of these cues (e.g., whether they are or are not threatening) that becomes critical in determining performance.

Empirical evidence of the narrowing of attention with increasing arousal comes from studies using the dual task paradigm. These studies show that as effort increases (e.g., the importance of the primary task increases), sensitivity to peripheral cues decreases (Abernethy, 1993). Additional evidence comes from the relationship between measures of anxiety like the State-Trait Anxiety Inventory and the Taylor Manifest Anxiety Scale, and measures of attentional distractibility and excessive narrowing (Nideffer, 1976a).

It was the relationship between increasing emotional arousal, physiology, and cognitive processes that let to the development of Figure 2 which attempts to explain what happens when individual's "choke" or get caught in a downward performance spiral, making one mistake after another (Nideffer, 1986; 1989).



If you follow the diagram, situational factors have an impact on emotions. As the importance of a situation increases, there is a corresponding tendency for emotions to increase. Increasing emotions lead to changes in physiology (e.g., increased heart rate, muscle tension, respiration rate), and to cognitive changes (a narrowing of ones focus of concentration). These changes are involuntary, a part of our biogenetic make up. The purpose is to prepare us to react to the challenge.

What becomes critical at this point is the individual's cognitive assessment of the situation. If the performer feels confident, then he/she maintains enough control over arousal and concentration to be able to focus attention on task relevant cues. If confidence is lacking, then attention becomes focused on those cues that are threatening the individual. Many of the threatening cues are internal, resulting from the individuals interpretation of the meaning of the physiological changes that have occurred. The athlete who lacks confidence interprets increased muscle tension as an indication that "I am tying up." That is a threatening thought which adds to increase arousal even more. Negative interpretations are offered for other physiological changes. In response to the pounding heart the athlete may think "I'm choking." Again, arousal increases. This creates a feedback loop between cognitive processes (focus of attention) and physiology. Thoughts act to increase the physical symptoms associated with emotional arousal and these act

to distract the athlete even more. Unable to attend to the task, performance deteriorates, raising more anxiety, etc.

It's not hard to see how the changes that occur lead to performance problems both with respect to execution (e.g., because muscles tighten and co-ordination and timing are interfered with), and decision making (e.g., because the individual loses awareness of critical task relevant cues, and/or is unable to organize them well enough to make timely decisions). We would hypothesize that under enough pressure, even the greatest performers in the world would "choke." That does not deny the fact, however, that some individuals seem to perform much better under highly stressful and/or emotional conditions than others. That fact, causes us to search for the factors that contribute to the differences we see between performers, with respect to their ability to cope with pressure.

What Determines An Individual's Ability to Perform Under Pressure?

There are at least four factors that would appear to explain the differences we see in various individuals ability to perform in highly stressful and/or threatening situations. These include: 1) Biogenetic differences; 2) The individuals awareness of and ability to use "chunking" strategies to minimize attentional demands; 3) The extent to which performance has been over-learned and "automated," and; 4) The level of confidence the individual has in their ability to cope with the situation.

The idea that genetic factors or "hardware" differences between individuals can account for things like a person's ability to cope with pressure is not popular within the sport psychology field. Both Abernethy (1993), and Moran (1996) maintain that the majority of empirical evidence supports the idea that it is "software differences" (e.g., the fact experts use early cue and/or have more efficient ways of organizing and identifying task relevant cues) which are attributable to learning, and not "hardware" differences that separate experts from novices.

Although a great deal of behavior can be modified through learning, that does not preclude the importance of genetic factors, especially at the extremes of the performance continua. Nor does it mean as David Lykken (1998) points out, that some of the "software" differences identified by others aren't also partially determined by genetics (e.g., the ability to focus concentration, and/or to identify and store information in unique ways).

"Every acknowledged human genius seems to have had at least a good general intelligence together with an assortment of other gifts or attributes which, in mutually facilitating cohabitation, led to the extraordinary achievements that are the ultimate basis for classification into this special category. One of the ingredients in the recipe for genius, and which I believe may be as essential as general intelligence, is an exceptional degree of mental energy, permitting protracted periods of intensely focused concentration on the project at hand (p. 18)."

Support for a genetic component comes from Eysenck (1988) who points out that there are attentional differences between individuals who score high on measures of trait anxiety. Speilberger (1966) noted that differences in peoples level of trait anxiety had an effect on the level of arousal required before performance was interfered with. Test re-test studies examining

changes in athletes attentional abilities over time showed that highly talented athletes are much more capable of narrowing their focus of concentration than non athlete age mates from as early as eleven years of age. These differences continue through late adolescence and into early adulthood (Nideffer et. al., 2001).

The importance of being able to focus concentration and avoid distractions is one of the most critical skills an athlete can have, and/or develop (Orlick, 1990; Singer et. al. 1991). Authors who have identified the skill sets associated with an athlete's ability to have a "peak" performance, or get into the "zone", identify the ability to narrow one's focus of concentration as a critical element (Ravizza, 1977; Loehr, 1984; Garfield & Bennett, 1984). Kerr and Cox (1991) provided some empirical support for this notion by showing that skilled squash players were more capable of narrowing their focus of attention than less successful players.

Again, I want to emphasize that this does not say that learning isn't important. There is evidence to show that individuals can learn cognitive strategies which improve their ability to concentrate. As one approaches the extremes of human performance however, success depends on a combination of factors including both learning and genetics.

With respect to learning, reviews of the experimental literature appear to indicate that one of the key differences between highly skilled performers and less skilled performers is their ability to "do more with less information." Studies of eye movements suggest that highly skilled performers make fewer fixations but hold those fixations longer than novices (Abernethy, 1993). Studies that have occluded part of the visual field and then asked performers to predict player positions or the outcome of a situation (e.g., where a ball will be hit) show that expert performers make better use of early cues than less skilled players (Abernethy & Russell, 1987). Starkes & Allard (1993) demonstrated that skilled athletes could reconstruct complex structures e.g., positions of players in briefly presented slides when structured game situations than novices. Indeed, much of the research suggests that skilled performers are more efficient processors of information, not because they can deal with more information, but because they are able to pay attention to less information. They know what the critical cues are and because of that, and because the amount of information they process is reduced, they are less affected by an increased narrowing of attention.

A third way of improving your ability to perform under pressure involves practicing until you can perform without having to consciously think about it. Shiffrin and Schneider (1977) described two types of attention. The first they refer to as controlled processing. That's the type of concentration that I would call conscious processing. This type of concentration is demanding in that you must work to focus on the right things, and as Shiffrin and Schneider say it's serial in nature, slow, and volitional. They contrast controlled or conscious processing with automatic processing which they describe as involuntary or mindless. This type of concentration seems to occur without effort and is parallel in that you can be consciously involved in other things while you are automatically processing information. You can see this at work when driving a car. You can be so caught up in a conversation that you are not consciously attending to your driving. You turn, accelerate, slow down, all without conscious effort.

At elite levels in sport, developing skills to the point that they can be performed with conscious thought is critical for two reasons. First, there are many times within the performance situation where you don't have time to think (e.g., trying to recover after losing an edge in a downhill ski race). Even more importantly, however, is the fact that by overlearning and automating performance you free up attentional processes and reduce the likelihood that increasing arousal will interfere with performance.

Finally, level of confidence in the ability to cope with a situation plays a major role in an athlete's ability to perform well under pressure. Increasing arousal will cause attention to narrow. When that happens it's critical that limited attentional resources be focused on task relevant cues. Confidence in one's ability to cope with a situation is what allows the person to either ignore, or put a positive spin on the physiological noise that develops. A confident athlete won't interpret a high level of arousal as a signal that he or she will fail. Again, researchers agree that one of the most critical differences between successful and unsuccessful performers is their respective levels of confidence (Mahoney & Avner, 1977; Meyers, Cooke, Cullen, & Liles, 1978; Highlen & Bennett, 1979; Gould, Weiss & Weinberg, 1981; Highlen & Bennett, 1983; Mahoney, Gabriel, & Perkins, 1987).

In summary, there is considerable observational, experiential, and empirical evidence to support the notion that concentration narrows as arousal increases. Given that this narrowing is involuntary, we are left to explain the fact that it seems to negatively affect the performance of some athletes less than others. I have suggested four reasons for the differences between performers which include, biogenetic differences, greater ability to identify and focus on task relevant cues and ignore irrelevant ones, more highly practiced (overlearned) responses, and greater levels of confidence.

I believe it's important to emphasize that the relationship between increasing arousal and a narrowing of one's focus of attention, is a reciprocal one. Reciprocal in that what an individual focuses their concentration on can affect arousal, either raising it, or lowering it. I would hypothesize that it is this fact which is the active ingredient in any psychological intervention technique. The challenge for the coach or the psychologist who is attempting to help an athlete reduce arousal consists of: 1) Identifying performance relevant cues that will not increase arousal (e.g., by reminding the athlete about doubts relative to outcome), and; 2) building the athlete's confidence. I should emphasize that confidence is important from an outcome standpoint, but confidence need not be self-confidence (though that would be best). Confidence can be placed in the technique, in the coach and what he/she says, and/or in the sport psychologist.

5. The perception of the passage of time is dependent upon the amount of shifting that occurs between an external and an internal focus (Nideffer, 1992).

One of the commonly reported phenomena associated with "choking" as it's been defined here, is the feeling of being rushed. More often than not, athletes will tell you that they felt as if they didn't have enough time to prepare and/or react. Things just seemed to be happening too

quickly. That feeling has also been frequently reported by individuals in other performance situations when they have been anxious. Although there is little empirical data to support these subjective impressions relative to the passage of time, the frequency with which they are reported is sufficient to give them some credibility.

Interestingly, the feeling of being rushed, of not having enough time, is the exact opposite of the kinds of feelings athletes associate with peak performances, or those times when they enter the "zone." Typically, athletes indicate that time seems to slow down when they are in the zone. They have all the time in the world to respond and feel completely confident and in control (Ravizza, 1977; Loehr, 1984). The differences in the experience of the passage time can occur within the same athlete. Thus an athlete who chokes will tell you that he/she felt rushed. That same athlete, after a peak experience, will tell you that time was slowed down. The obvious question is "what is it about these two different experiences that can account for this particular alteration in one's perception?"

It is that question which led to the hypotheses that an individual's perception of the passage of time is related to the frequency of shifting between an external and an internal focus of concentration. Athlete who enter the zone will tell you that they are focused on the present, the here and now. They are totally immersed in their performance. Using Shiffrin and Schneider's (1977), terms concentration is occurring automatically, without any effort on their part. In other words there is no, or very little, conscious processing going on. Their focus is almost exclusively external.

Now, contrast that external focus for the athlete who is in the zone with the narrow, internal focus that develops when the individual's anxiety gets the best of him. When confidence is low, and arousal is high, there are a lot of internal distracters both physiological (e.g., racing heart) and cognitive (self-doubts). The athlete who is choking is not focused on the present, instead he is recalling past failure experiences, linking those experiences to existing thoughts and feelings, and anticipating failure. Mentally, the athlete is all over the place, spending very little time attending to task relevant external cues. Processing is not automatic.

Conceptually, one way to think about these two experiences is to think of your brain as a camera that's capable of taking 60 pictures a second. Now, imagine that you are a hitter in baseball facing a pitcher who's fast ball reaches the plate one second after it's released from the pitcher's hand. Theoretically, if you are totally focused on the present, and all of your concentration is on the ball, your camera brain can take sixty pictures of the ball between the time it leaves the pitcher's hand and the time it arrives at the plate.

Now, think of an average day at the plate. You settle into the batter's box and the pitcher goes into his windup. As he starts his delivery you find yourself thinking "curve". It's a conscious thought and takes a couple of frames out of the movie that is being created. As a result of this tiny distraction you pick up the ball a fraction of a second after it leaves the pitchers hand. As you track it and begin your swing, you realize that you're timing is slightly off, again, a conscious awareness and you make a conscious adjustment in your swing to compensate. For arguments sake, lets say that the amount of conscious thinking that occurs during an average at bat, results in your camera brain taking 40 pictures of the ball as it approaches the plate.

Now, think about a peak experience, where there is no conscious processing and/or no internal distractions, and imagine that your camera brain has managed to take 60 pictures of the ball instead of forty. Suddenly, you seem to have an additional 1/3 of a second within which you can respond to the ball. That can be contrasted with the choking experience. When you choke, you have an increase in the number of internal distractions and/or competing thoughts and feelings. Instead of your usual 40 pictures your brain gets 20. The time you have to prepare has been cut in half, and you feel rushed!

The hypotheses seems to make sense, and helps to explain the experiences of choking and of being in the zone, but is it the shifting from an internal to an external focus, or something else? One alternative hypotheses might be that it might be related to of the amount of stimulation that is occurring, rather than shifting of attention. I rejected that hypotheses for two reasons. First, we don't experience an increase in activation and total stimulation when we sleep, yet time seems to pass very quickly when we are asleep. Second, there are some very interesting differences between an athlete's experience of being "in the zone," and the experience of the "flow state" as described by Csikszentmilhalyi (1985; 1990). The hypotheses suggesting that the passage of time is associated with the amount of internal to external shifting that goes on would appear to be consistent with those differences.

Zone vs. Flow state - Similarities and Differences

If you compare descriptions from individuals who have been in the zone with descriptions of the flow state you'll notice the following. For both states, processing of information, and reacting to it, is for the most part automatic, seemingly effortless. In both states individuals feel confident and in control (Williams & Krane, 1998). Finally, and perhaps most importantly, in both instances individuals have been extremely well prepared prior to the experience. The athlete has trained and developed his or her physical skills to the point that they can be performed automatically. The individual who enters a flow state is thoroughly familiar with his or her subject matter and has thought extensively about the different elements that all seem to come together to create the flow experience.

In terms of differences, the athletes attentional focus is almost exclusively on the environment, with very little if any conscious analyzing going on in response to the performance itself. In the flow state, the focus is almost exclusively internal. The individual is caught up in his or her thoughts and ideas, interacting with these, rather than the environment. Now look at the descriptions of time that are associated with both states. With an external focus and the zone, time is slowed down. In the flow state, Csikszentmilhalyi (1985; 1990) talks about a "loss of a sense of time."

Authors, problem solvers, and inventors who have entered the flow state will tell you that they lost all sense of time. They became immersed in the problem and the next time they looked at a clock (external focus) several hours had passed. Those hours seemed like minutes and although the process of writing, designing, or problem solving seemed effortless, the individual may notice after looking at the clock that she has perspired heavily. Reading and/or reviewing the product that came out of that experience the person is often amazed at the quality of the work

and on occasion will feel as if someone else must have written it. Lykken (1998) in his chapter on "the genetics of genius," cites many examples where individuals seemed to stay in that state without eating or sleeping for days.

In summary, although there is little or no empirical evidence to demonstrate that the perception of the passage of time is associated with internal to external attentional shifts, experiential data appears to provide some support for this hypotheses. The association of attentional shifting with the passage of time, also helps to explain why there is a sense of time being slowed down when athletes are in the zone, and a sense of time being lost, when the flow state is experienced. This would suggest that these are two very different states, and that the flow state is not a precursor for entering the zone (Jackson and Roberts, 1992).

6. Both the flow state and the zone, are dependent upon an individuals ability to move smoothly between physiological and cognitive transition points (Nideffer, 1992; 1997).

The importance of practice and of over learning a response in order to perform up to one's potential, and to perform when "the pressure is on," has been emphasized by coaches for years. We know that repetition frees the mind from conscious attention to details, and makes the act of performing easier (Huey, 1968). As a result, tens of thousands of athletes put in hours and hours of time developing their skills. In spite of all this practice, the experience of entering the zone is relatively infrequent and we must ask ourselves, why? Put another way, given all that practice, what is it that interferes with automatic processing frequently enough to keep the athlete out of the zone?

Norman (1968) suggests that the "pertinence" of information that is received by sensory receptors is quickly assessed, almost in a pre-attentive or pre-conscious way, based on the performers past experience, and the contextual knowledge of similar situations. Incoming signals selected for further analysis (conscious attention) would be determined on the basis of overall level of memory activation from joints and current sensory analysis, and those that are pre-determined to be of importance by the athlete.

Perhaps another way of thinking about that is to consider two bits of data as being relevant to an athlete who is actively performing. The first bit of data has to do with performance expectations. The athlete enters a performance with certain expectations and concerns. These expectations and concerns predispose the athlete to see certain events as significant, leading to conscious attention. For example, a doubt about one's ability to compete head to head with another individual makes cues which are consistent with that belief more powerful. The athlete looks for those signals and when he finds them, spends conscious time attending to them. Thus, anytime the athlete's "ego" gets involved in the performance situation, it interferes with automatic processing of information. Somehow, to enter the zone, and/or to get into a flow state, the individual has to forget about him or herself. Instead of evaluating performance, the athlete becomes the performance in a non evaluative way. This is an extremely difficult attitude for most athletes to develop. Most of us are far too concerned about how we are performing and about what others are thinking of our performance, to get into the zone.

The second bit of information that becomes important, especially for sport and for the zone (not for the flow state), is the physiological feedback the athlete receives. How much information is the athlete getting and when? What I would hypothesize is that highly skilled athletes receive easily recognized patterns of stimulation every time their body movement about their center of mass changes. Those patterns of stimulation are instantly processed by the athlete in a yes or no fashion, yes meaning things are proceeding according to plan and no conscious attention (e.g., to adjust movement) is required, and no meaning just the opposite.

Why would I suggest that this stimulation occurs in conjunction with the movement of the individual's body about his or her center of mass? There are several reasons. First, we know that with repetitive movements (e.g., a swimming stroke, a runners stride on a flat surface), athletes often lose awareness of what is going on and seem to get, and/or need, very little feedback from their body. Second, we know that body movement around one's center of mass plays a crucial role in the timing of one's performance, and in terms of the power generated during the performance. Thus, it is at these transition points that the athlete is most likely to get patterns of stimulation that signal the need for adjustments. Finally, research on the role breathing plays in performance and health (Fried, 1990), and the emphasis that the martial arts and eastern philosophies place on being centered (Reed, 1992), all emphasize the importance that one's center of mass has to performance.

To use a simple analysis, a diver about to execute a front dive, receives a burst of stimulation as she begins her approach on the diving board. The pattern signals that everything is okay. As the diver reaches the point where she takes a hurdle step and jumps up into the air, she receives another pattern of stimulation. Included in the pattern is both visual and kinesthetic information that tells her what her body position is in relationship to the board. If this information is as expected, no adjustments are required and the diver moves through the transition point without any conscious thoughts or adjustment in body position. If on the other hand, the pattern says something is wrong the diver analyzes it. The speed with which that analysis takes place, and adjustments are made will depend upon the experience of the diver. For a novice, their may be the recognition that they are too close to the end of the board and have too much of a forward lean. That awareness may lead to panic as the diver may not know how to correct the problem. An expert may sense the problem and pull back slightly so that conscious processing is measure in fractions of a second. As the diver reaches the top of the dive and begins to alter body position, another pattern of stimuli is assessed, and so on, with each change in the individual's movement around his or her center of mass.

What becomes most critical for the performer is what happens very early in the performance sequence. If an adjustment has to be made early in the dive, it increases the likelihood that other adjustments will have to be made. On the other hand, for the experienced diver the reverse is true. If the hurdle step is perfect, the likelihood that everything else will follow increases dramatically. In point of fact, the hurdle step is rarely perfect.

All of this reinforces the importance of practice, and of a willingness on the part of the athlete to perfect basic skills. Those athletes dominated by a narrow focus of concentration are going to find it easier to put in the time to accomplish this, than athletes who get bored easily and are constantly seeking new challenges.

What are the transition points associated with the flow state?

I am going to suggest that thought processes, like movement sequences, have natural transition points. We organize thoughts like we organize movement, and the ability to shift smoothly from one thought or concept to the next is a function of both the way we are "hard wired," and "practice." In the early developmental stages of sport performance, we practice the different movements associated with a particular activity. We consciously talk ourselves through them, and we work on making the transition from one motor sequence to the next. In the early developmental stages of problem solving or writing, we do the same thing, only here we work with ideas. Once we have a couple of ideas down, we work on the links or the logical connections between them. Lykken (1998), in talking about the concepts of mental energy and focus points out just how important the basic preparation is to inspiration and/or creation and flow presents the following.

"On reading Hereditary genius, by his cousin, Francis Galton, Charles Darwin wrote: 'You have made a convert of an opponent in one sense, for I have always maintained that, excepting fools, men did not differ much in intellect, only in zeal and hard work; and I still think (this) is an eminently important difference.' Thomas Edison, too, believed that genius was ninety-nine percent perspiration and one per cent inspiration and he 'often work(ed) as many as 112 hours a week.' (McAuliffe, 1995). Isaac Newton, asked how he made his remarkable discoveries, replied: 'I keep the subject constantly before me and wait until the first dawning's open little by little into the full light' (Andrade, 1956)." p. 31

It is advanced preparation, always keeping the subject before you, that paves the way for the flow state, for the seemingly automatic creation of an idea or an artistic expression. As the immersion in the creative process begins, you lose all awareness of self (ego loss), there is no conscious questioning of the accuracy of what you are doing. Ideas, images, sounds, and thoughts, that you have had begin to come forth in a very connected free flowing way. No demand is placed on you to "search" your memory for information, it simply presents itself at the appropriate moment.

Reading Lykken's descriptions of Genius, it becomes clear that at the extremes, there are indeed biogentic factors that play a critical role in the creative process. That does not prevent the rest of us from what we can learn from exceptional performers. Personally, it has always been easier for me to enter a flow state, than it has been to enter the zone. I attribute this to the fact that my concentration strength is my analytical ability. As an athlete, I have too many thoughts going on, I spend too much time inside my head trying to predict what will happen next, to allow myself to mentally let go. On the other hand, my constant questioning helps me practice and prepare for the flow state when I sit down to write or problem solve.

I am a person who squeezes every bit of information I can out of a fact or piece of data that catches my interest. I don't have to discipline myself, or consciously remind myself to generate hypotheses about some observation, or to challenge those hypotheses. If someone told me that Joe was great at performing under pressure, I would automatically ask myself "Is that true?" "Why is it true?" "When wouldn't it be true?" The answers to those questions would be

compared to pre-existing thoughts and ideas relative to performance under pressure which is a topic of great interest to me. The information would then be filed away for future use. I believe that going through that process, testing information and challenging it from different directions lays the groundwork for a flow experience because it frees you from the need to consciously problem solve once you start to write. The problem solving has already been done.

Flow experiences for me have occurred under two different sets of circumstances. More often than not, I prepare for them. If I am going to write a book, I'll get an idea and think about it for a while (perhaps a week), then I'll create a topical or chapter outline. That may take a few hours. Once I have the outline, I'll just think about it for another week, checking to make sure that it seems to flow logically, beginning to think about the content of the individual chapters to see what overlap there is. Then, I will create very systematic chapter outlines. Each outline may take several hours. Then, as with the outline for the entire book, I'll just think about the logical flow of each chapter questioning the connections between points, challenging the conclusions. The length of time that I may sit on the outlines and just "keep them in front of me" may vary tremendously. With my first book, I sat on the outline for two years. With others, it's been weeks.

When I get ready to write, I remove all possible sources of external distraction. I clean my office and get everything organized the way I want it. I shut off phones and/or write when everyone else is sleeping (e.g., 3 or 4 in the morning). When I finally sit down to write, the thoughts just tumble out and it's all I can do to keep up. As an aside, I might add that I believe the fact that I am more of an introvert than an extrovert makes this process easier for me, and contributes to my enjoyment of it.

The second set of circumstances which contribute to my getting into a flow state seem to be tied to intense emotional experiences that are very personal. I am an introspective individual, constantly trying to understand my own behavior as well as the behavior of others. Like most people, there are a lot of things I do, that I don't fully understand. I know that when things happen that leave me with unanswered questions, those questions don't get lost, somehow they get filed away (Don't ask me how and don't ask me if the filing system is the same as everyone else's, I have no idea!). Then, every once in a while something will happen that serves as a trigger or key. I'll have an experience that will almost magically link a bunch of unanswered questions, pulling them together and providing understanding that I might have been searching for, for years. Often, when I sit down to describe what's happened, the feelings that have been tied up with the questions come pouring out with the words as they are typed. It can be mildly upsetting to others to walk past someone who is sitting at a word processor at three in the morning with tears of joy or sadness streaming down his face. I should emphasize, that the tears when they are there are not judgmental or evaluative, they simply reflect the feelings of the moment. It's after I leave the flow state, that evaluation of the experience takes place.

In summary, there is little in the way of empirical data to support the concept of transition points. Especially as it relates to flow state experiences, I have relied very heavily on intuitive, introspective, thought processes. Individuals like Nisbett & Wilson (1977), and Posner (1973) have raised serious questions about the accuracy of individual's introspection's. I wouldn't disagree with their concerns. Yet, it is introspective processes that lead to the generation of

testable hypotheses. You, the reader need to decide if my introspection's are consistent with your experiences, and whether or not they can be tested.

7. Performance relevant intra, and interpersonal characteristics are important predictors of both the particular situations a given individual will experience as emotionally stressful, and of the types of behaviors they will rely most heavily on when emotionally stressed (Nideffer, 1981).

Knowing that individuals have particular concentration strengths and/or relative weaknesses is interesting, but not particularly useful unless we can predict when that person will make mistakes and when he or she will perform well. When for example will the analytical person be most likely to over analyze? Since the average person has little trouble matching the concentration demands of most performance situations, situational, and intra and interpersonal characteristics become important mediators in predicting the conditions under which an individual will make mistakes.

In addition to what to know when individual's will make cognitive or mental errors (e.g., narrow too much, become distracted), we want to know how that error is likely to affect the individual's behavior. After all, it's the actual behavior of the individual that we see, not the cognitive processes which occur inside the person's head. How will the overly analytical individual respond to a mistake? Will he become more aggressive, or will he back off and become tentative? The answer to this question is dependent upon the interaction between the thought processes of the individual and situational and interpersonal variables.

Norman (1968) clearly recognizes that cognitive processes don't occur in a vacuum. His pertinence based model of attention emphasizes that experience and attitudes help to determine the salience of cues and what will and will not be attended to. In spite of the verbal recognition of the importance of situational and intra and interpersonal variables to performance, researchers in sport psychology have largely ignored the intra and interpersonal scales measured by TAIS. In effect, they have conducted their research as if the individual's mind existed independently of his or her body and/or of the situation (e.g., emphasizing cognitive variables and ignoring the impact and inter-relationship that these cognitive variables have with intra and interpersonal processes) .

Lykken (1998), would be one of the first people to point out that there are positive correlation's between many cognitive and intra and interpersonal characteristics. He makes the point that virtually all psychological traits or characteristics can be shown to have heritabilities that range between 25 and 75 percent. He also points out that psychological traits of interest to the researcher (e.g., focused attention) are polygenic meaning they are determined by the combined activity of many polymorphic genes. For example, my ability to focus attention and to get into the flow state when writing may be dependent upon focus, good analytical thinking, introversion (freeing me from social distractions), and a critical nature. These attributes interact with the environment to determine whether or not I achieve the flow state. Simply put, human performance is complex enough that we aren't likely to do a very good job of predicting it unless we take into account some of these interactions, between cognitive and interpersonal processes, and environmental situations.

I would like to suggest that it is situational variables interacting with the intra and interpersonal characteristics of the athlete, that allow an applied sport psychologist to determine the accuracy of a subjects explanation for a mental error. I would further argue that it is the interaction of all of these variables that will allow the sport psychologist to accurately predict the conditions under which individuals will and will not perform effectively. Finally, I'll maintain that any intervention program that hopes to be effective, will seek to control cognitive and interpersonal processes, as well as the situational conditions that elicit inappropriate behavior. It's only when you bring the cognitive aspects of the theory together with the interpersonal aspects that you begin to experience it's richness and utility.

The theory assumes that both cognitive and interpersonal process have both state and trait components. The more extreme an individual's score on a particular characteristic, the more resistant that behavior is to the disruptive influences of increasing arousal. This is consistent with Hull's drive theory (Hull, 1951). That can be positive if the behavior is a behavior that is required by the performance situation (e.g., analyzing and problem solving), it can be negative, however, if the presence of that behavior acts to interfere with performance (e.g., paralysis by analysis). Thus, individuals cognitive and interpersonal behaviors become more predictable as arousal increases.

The theory also assumes that there is a reciprocal relationship between dominant cognitive and interpersonal characteristics and arousal. When important performance situations require attributes that are less highly developed, and/or when situations that are emotionally important to an individual don't allow them to use their more highly developed skills, they become even more aroused.

Let me describe some of my more dominant attentional and interpersonal characteristics to illustrate how they lead to predictions about they types of situations I would and would not perform well in, and how they help to predict my cognitive and behavioral mistakes (e.g., the specific things that need to change for me to improve).

I have very good analytical skills and take pride in my ability to problem solve, strategize, and plan. I am also a person who likes to be in control, is highly confident, and makes quick decisions. I am also physically and intellectually competitive. Interpersonally, I am more of an introvert than extrovert, and tend to be more challenging and confrontive of myself and others, than I am supportive. That's how I describe myself on The Attentional and Interpersonal Style (TAIS) inventory, and that's how I see myself.

The theory says that I will perform best in situations that match my strengths, and that I will have problems when there are mismatches. Thus, we would predict that I will perform best when I can take charge, use my problem solving skills, and confront issues quickly and directly. I will feel stressed and have difficulty concentrating when I have to follow the orders of someone else (and disagree with them), and/or when I can't move ahead when I feel ready to do so. Let's put all of that into a situational context. Suppose I am a baseball player and I have a coach tell me to bunt, when I think I should hit away. Chances are, the conflict that will create because of my confidence in my analysis of the situation and my need for control is that I'll paralyze myself with all of the thinking that will go on, at least for the first couple of pitches.

When I make a mistake, for example taking a strike because I was over thinking on a pitch, how will I react to it? Given the high self-confidence, competitiveness, and confrontive style, we would predict that anger will take over. I'll become more aggressive when that happens, I'll be more likely to swing at a bad pitch, and or, to get out in front of the pitch.

Is that me? If someone were to observe my behavior is that what they would see. If so, then the actual behavior and their observations consensually validate my scores on TAIS. I was able to describe myself accurately, and the information does allow others to anticipate possible performance issues and my reactions to problems. They can then use that information to design an intervention program that will deal with the cognitive components (e.g., over thinking), the interpersonal/situational components (e.g., conflict with the coach), the emotional component (e.g., anger), and the physical response (e.g., rushing and getting out in front of the pitch).

Although researchers on TAIS have focused on the attentional scales and ignored the interpersonal scales, there is a great deal of empirical evidence supporting the relationship between a broad range of interpersonal characteristics (e.g., extroversion, introversion) and performance. There is also a great deal of empirical evidence supporting the validity of a broad-range of psychological tests for measuring these characteristics. For a review of this research and for a comparison between the predictive validity of psychological tests and medical tests like cat-scans, pap smears, etc., see the article by Meyer, et. al. (2001).

Discussion

The theory of attentional and interpersonal style has considerable empirical, observational, and experiential validity. The theory provides a clear, compelling, and researchable explanation for individual differences in the ability to perform under pressure. It can describe what happens when individuals "choke" and enter a downward performance spiral. It describes the conditions required to enter that optimal performance state in sport often referred to as "the zone." It describes some of the critical differences between optimal performance characteristics associated with the zone, and flow states. Finally, the theory highlights the interaction between situational factors, intra and interpersonal characteristics, cognitive abilities, and performance. In other words, the theory helps you see human performance as an integration of mind and body within a situational context.

The Test of Attentional and Interpersonal Style (TAIS), was developed to measure the cognitive, intra and interpersonal characteristics the theory says are important predictors of performance. The goal behind the development of the instrument was to provide practitioners with a tool that they could use to compare an individual's performance relevant skill sets (relative strengths and weaknesses) with the demands of specific performance situations. For example, to see how well an individuals pattern of scores on the attentional and intra and interpersonal scales fit with the skill sets required to become a world class shooter, or to sell a particular product line. Then, using information collected from TAIS, service providers would be able to assist individuals in developing programs to improve performance and/or minimize mistakes.

Interestingly, reviewers like Moran (1996), and Abernethy, Summers, and Ford (1998) have concluded that TAIS is a useful tool for identifying concentration issues, and then developing performance enhancement programs for individuals. At the same time, however, they have suggested that TAIS has limited research utility, because it doesn't appear to be able to separately measure attention along the internal to external dimension. The scales measuring direction of focus are so highly inter-correlated, that they are not separated from each other through statistical procedures like factor analysis.

Recognizing the practical utility of an inventory on the one hand, while denying it's ability to measure what it is supposed to measure seems inconsistent. Oh, it's consistent with what we see in the field. Practitioners use tools that they and their clients find extremely helpful, in spite of the fact that researchers often describe those tools (based on their research) as invalid and useless. But, we would hope that research would be correlated with and support the activity of the practitioner.

The split between the day to day experience of practitioners and the data provided by researchers has existed as long as the field has existed, but what does it mean? Does it mean that tests are indeed invalid and that all practitioners are doing is being emotionally supportive and relying on placebo effects? Does it mean that human performance is complex enough that the research being conducted is inappropriate and/or irrelevant? Or, as most of us suspect, does it mean that the truth falls someplace between these two extremes?

Researchers, editors, and reviewers, are the gate keepers of our knowledge. The information that finds it's way into print has a profound impact on the future of the field. What gets into print is what we teach to future researchers and practitioners. What gets into print, is what guides the research process (Nakamura & Csikszentmihalyi, 2001). If skilled practitioners and observers of human behavior can recognize and identify reliable performance relevant characteristics, then why doesn't the research literature support them? If researchers are accurate in their assessment of the value of psychological tests, then why don't practitioners abandon their use? Are the respective differences in the lens that researchers and practitioners use to view the world so different that comparing research to practice is like comparing apples to oranges? They may be, and I am concerned that unless researchers can gain a greater understanding of, and appreciation for, the lenses used by the practitioner, the research literature will seriously slow the development of the field.

I believe there are four factors which contribute to the disconnect between the perceptions of practitioners and researchers: 1) A lack of objectivity and a bias against the use of psychological tests on the part of many researchers; 2) A tendency to ignore and/or fail to recognize the complexity of human performance, thereby selecting the wrong statistical tools, and drawing inappropriate conclusions from their data, and; 3) A failure to understand the difference between testing and assessment as it relates to the identification and development of talent.

Researcher Bias

In one way or another, we all have emotional and intellectual biases, and these biases affect the things we say and do. Based on my reading of the research literature as it applies to the

validation of assessment techniques, however, I believe there are a couple of specific biases that are shared by numerous researchers. These include the following:

- Self-report inventories are invalid, because subjects respond in socially desirable ways, and/or lie.
- Self-report inventories are invalid because subjects are incapable of accurately describing themselves.

Let's look at the notion that self-report inventories lack validity because the data gathered from individuals can't be trusted. There are two common concerns. First, there are concerns about subject's response sets and their motivation to respond honestly. Social desirability, and/or the desire for a particular outcome (e.g., to be selected to a team) may cause a subject to exaggerate strengths and minimize weaknesses, and in some cases try and fake good, or bad. That notion led Cratty (1983), to suggest that coaches could gather as much information from athletes by simply asking them a few questions, as they could by interpreting data from a psychological test.

Are response sets an issue? Of course they are, and as I've indicated elsewhere, both researchers and practitioners need to do everything they can to identify and/or control response sets (Nideffer, 1987; Nideffer & Sagal, 2001). By detecting and controlling response sets, we can increase the accuracy with which test information describes the individuals relative strengths and weaknesses (within subject comparison) and how the subject's scores compare to other groups or individuals (between subject comparisons).

Interestingly the notion that data collected from an interview (e.g., questioning an athlete) is somehow more valid and reliable and less susceptible to response set influences and/or faking than test data, is not supported by the literature. Meyer et. al. (2001) tell us that inaccuracies resulting from patients who are often poor historians and/or biased presenters of information, can be better identified by psychological tests than they can from an interview. They go on to point out that often it is response style characteristics that help to identify the real issues for an individual.

The second concern relative to the usefulness of self-report data comes from Nisbett and Wilson (1977), and Posner (1973; 1978), who have argued that introspection's about consciousness are notoriously inaccurate and sufficiently prone to situational bias to make the relationship between self-reported consciousness and behavior an unreliable one. Specifically, Nisbett and Wilson argue that when individuals report on their own cognitive processes, they do it on the basis of implicit, a priori causal theories, rather than any true introspective analysis.

This argument is one that Moran (1996), Abernethy (1993), and Abernethy, Summers, and Ford (1998), have all used to call into question the validity of the attentional scales measured by TAIS. The following quotation from Moran (1996) refers to his earlier presentation of the Nisbett and Wilson argument, using it to discount all self-report measure.

"Perhaps more damaging than the preceding criticisms, however, is the issue of the validity of a key assumption of self-report assessment techniques. As I have indicated earlier, self-report measures of concentration assume that people can evaluate their own attentional processes. But

is this assumption valid? Research on 'meta-attention' (i.e., people's knowledge of, and control over, their own attentional pro-cesses; indicates that people are often poor judges of their own concentration skills (p. 149)."

Does the criticism of Nisbett and Wilson apply to all self-report measures? Does the criticism apply to TAIS? Let's be clear about what Nisbett and Wilson are saying. They are suggesting that when you ask an individual to provide you with an explanation for their behavior, they do it by relying on some a priori theory or hypothesis. Let's say I believe that hypnosis can help me focus my concentration. I get hypnotized prior to a competition, and happen to perform well. Chances are, if you ask me to explain my performance, I'll tell you that it was because I was hypnotized. The fact that I was hypnotized is a bit of data that may or may not be associated with my performance, but my hypothesis about the relationship between hypnosis and performance causes me to argue that hypnosis was responsible.

I am going to argue that even if we do rely on either explicit and/or implicit theories or hypotheses, that does not necessarily invalidate our report. Before doing that, however, I would like to point out that most self-report inventories don't ask you "why" you behaved a particular way. TAIS does not ask you why you failed to shift, or why you are capable of developing a broad internal focus of attention, or why you are extroverted. Most self-report inventories ask you to describe your behavior, or ask you to provide an estimate as to the frequency with which a particular behavior occurs. For example, TAIS asks you how often you get distracted by the sights and sounds around you. Note, that is not asking you why you got distracted. Interestingly, Moran points out that Nisbett and Wilson (1977) don't equate the inability of subjects to give a reliable answer to questions about the underlying reasons for their behavior, with questions about what they do and/or do not pay attention to.

"Although this critique of introspection challenges the validity of self-report measures, it falls short of discrediting people's accounts of their own attentional processes. For example, Nisbett & Wilson (1977) were convinced that 'an individual may know that he was or was not attending to a particular stimulus.'"

The criticism of Nisbett and Wilson doesn't apply to self-report inventories like TAIS that ask individuals to describe their behavior. The criticism of Nisbett and Wilson, is better applied to the interpretations that researchers give to their research findings. Researchers ask research questions, and interpret research results on the basis of either implicit or explicit apriori theories. Does that fact automatically call their research and interpretations into question? Does the fact that you use previous experience to help you organize and predict your world automatically mean that we can't trust your hypothesis? I don't think so!

Again, I am not arguing with the suggestion that because people are biased, and because people make predictions and interpret behavior on the basis of previous experience, we should be cautious about blindly accepting as fact, everything they say. I am arguing, however, with the tendency to use that fact as a blanket indictment of psychological tests. I am also arguing with the tendency of some researchers and reviewers to allow the apriori hypothesis that self-report data is inaccurate to cause them to lose objectivity either ignoring, discounting, and/or distorting data that is inconsistent with their belief.

Science advances through the generation of hypotheses, and some individuals are more capable of generating hypotheses that prove to have reasonable validity than others. Executives in corporations live and die on the basis of their ability to make accurate predictions about future business. It can be argued, that one of the critical differences between individuals who are successful in attaining their goals and objectives and those who are not, is self-awareness. Those individuals who are more self-aware, and better able to predict how others will respond to them, are more successful. Those individuals who are more self-aware are more capable of finding performance arenas that play to their strength. Those individuals are better at introspection and their psychological test data tends to be consistent with the behavior observations and impressions of others.

Shouldn't we expect individuals to vary in terms of their ability to accurately describe themselves? Individuals differ on every other physical and cognitive dimension. Does it mean that a test is invalid because the accuracy of self-evaluation differs across subjects? No, but that fact, combined with the fact that response set influences also affect test scores, does mean that the relationship between the scores of groups of subjects on predictor variables, will never be perfect.

The Complexity of Human Performance

Response sets act to reduce the predictive validity of psychological tests, and so does the complexity of human performance. As I've pointed out elsewhere (Nideffer, 1990), successful performance on the part of an athlete, a business executive, a student, or anyone for that matter, is the result of that individual's ability to use a large number of highly inter-correlated skills and abilities. Effective decision making for example requires the interplay of several cognitive variables. The individual has to be able to shift attention, to identify and attend to relevant external and internal cues, to reduce and/or eliminate distractions, and to have the information processing capacity necessary to make the decision in the time allowed. The individual also has to be willing to take the risk's associated with making a decision. That may mean being willing to confront and challenge others (e.g., to fire an employee, to criticize a team mates performance), being willing to take control and/or assume a leadership role, and having confidence in one's ability. If you test a group of high level decision makers on all of these variables you will find that each of them correlates with decision making, and that almost all of them correlate with each other.

In spite of the fact that we recognize that performance is a complex process, researchers design predictive validity studies using a very small number of variables to predict some performance criterion. Using decision making as an example, there can be many reasons for less than optimal performance. One individual may miss some of the task relevant external cues, another may get distracted, another may fail to attend to some internal cues, one may lack the confidence to act, another may not take the challenge so seriously, etc. Without designing studies to take these individual differences into account, researchers end up assigning differences to the error terms in their statistical analyses and end up with validity coefficients that account for a very small percentage of the variance in subjects scores (Eysenck and Keane, 1990). It is this fact that

caused Meyer et. al. (2001) to assert that researchers need to set more realistic goals with respect to the size of correlation's between single predictor variables and some criterion measure:

"psychologists studying highly complex human behavior should be rather satisfied when they can identify replicated univariate correlation's among independently measured constructs that are of the magnitude observed for antihistamine effectiveness (r=.11) or criminal history and recidivism (r =.18)."

The intercorrelation of cognitive variables with each other, and with intra and interpersonal characteristics like, self-confidence, competitiveness, intellectual expression, the need for control, extroversion, and the expression of positive feelings, also creates problems for researchers attempting to use factor analysis to validate the independence of these constructs within a given test (Matarazzo, 1972; Nideffer, 1990). Factor analysis can be a very useful tool for identifying the two to five factors or patterns of scores in muli-dimensional cognitive and interpersonal tests like The Wechsler Adult Intelligence Scale (Matarazzo, 1972), the Minnesota Multiphasic Personality Inventory (Dahlstrom, Welsh, & Dahlstrom, 1975), and the Test of Attentional and Interpersonal Style (Nideffer, 1981). Because of the expected intercorrelations between conceptually independent scales (e.g., self-esteem and freedom from distraction), and because of the influence that subject's response sets like social desirability have on answers, it is unreasonable to expect the factor structure to reflect all of the individual scales that make up the inventory.

Testing vs. Psychological Assessment

Thus far, I have suggested that the disconnect between researcher's appraisals of the validity of psychological tests, and the practitioners belief in their utility and validity, can be attributed to: 1) Pre-conceived opinions that bias research design and data interpretation, and; 2) A lack of sensitivity to the complexity and cognitive and intra and interpersonal connectedness of human performance. The results of which, is to reduce the size of validity coefficients, and lead to questionable conclusions based on research findings (e.g., the notion that factor analysis should replicate the conceptually independent scales contained in multi-dimensional psychological measures). Perhaps the biggest disconnect of all, however, comes from the fact that researchers are focused on tests as independent predictors of performance, whereas practitioners see tests as one part of a much broader assessment process.

Researchers within the field of psychology, behave as if a test, or a test scale, in and of itself, should be capable of predicting performance. Practitioners realize that tests or test scales provide behavioral samples. Those samples, when added to, and/or consensually validated by, a great many other pieces of the puzzle, including past history, behavioral observations, response sets, interviews, data from other tests, and situational factors (e.g., the personality characteristics, expectations, demands, etc. of others who interact with and influence the individual), are all combined to predict performance. Using TAIS as an example, individuals at the Australian Institute for Sport (AIS) find it very helpful because it provides direction for them. It helps them generate hypotheses about possible issues and to then expand the assessment process to either validate and/or invalidate their initial hypotheses by comparing scores on TAIS to all of the other sources of data.

Implications for Practice and Research

The fact that self-report measures are susceptible to response set and response style influences, and the fact that subject's self-awareness varies considerably means that the validity of an individual's test scores cannot be taken for granted. For this reason, tests, in and of themselves, should never be used to make critical decisions about an individual (e.g., to hire them, to select them, to promote them, etc.). That does not mean, however, that test information cannot be a very valuable addition to any decision making process. The key here is that the ultimate decision is based on a very thorough assessment process. A process that involves looking at performance relevant behaviors using a variety of measures, under a wide range of situational/environmental conditions.

With respect to research on self-report psychological measures, there are several things we need to keep in mind. First, we need to do as much as we can to control and/or account for response sets. Second, we need to realize that the failure of research designs to account for individual differences increases the error variance in our research. That means we must test large numbers of subjects to get reliable between group differences, and the amount of variance we account for will be small. Third, we must recognize the intercorrelation of many performance relevant characteristics means we cannot rely on tools like factor analysis to provide us with confirmation for the independence of the constructs we are measuring. Let me use the construct of an external and an internal focus of attention as an illustration.

When TAIS was first developed, items were written to reflect all four attentional styles, broad-external, broad-internal, narrow-external, and narrow-internal focuses. Item analysis of the data revealed that the narrow-external items correlated as highly with the total narrow external focus score, as they did with the total narrow internal focus score, and vice versa. The narrow items weren't discriminating between an internal and an external focus and for this reason they were combined into one narrow score (Nideffer, 1976a). The same was not true for the broad-external and broad-internal items. Here, the items in the two scales correlated more highly with their own scale score than they did with other scale scores. Thus, the item analysis procedures supported two independent scales, one measuring a broad-internal focus and the other measuring a broad-external focus. That did not mean that the items and/or the two scales were not correlated with each other, because they were. Good analyzers of information are more often than not, good assessors of the things going on around them. They need to be, because that information is often critical to their analysis.

Factor analytic studies of TAIS have failed to come up with separate external and internal factors and for this reason, investigators have questioned the validity of the inventory. There are two reasons for this. First, as indicated the two types of concentration are highly correlated, and should be. Second, the first two factors that get extracted from the vast majority of psychological measures account for most of the variance in test scores, and are directly reflective of response style/set influences. When you are feeling good about yourself, and about life, you tend to evaluate things in a generally positive way. This causes you to exaggerate strengths and minimize weaknesses. If an inventory has several scales where high scores are clearly seen as

positive, these will cluster together into the first factor. When the inventory has scales where high scores are clearly seen as negative, these will cluster together into the second factor. The third factor that gets extracted from most personality tests will usually reflect extroversion and introversion. By this time, enough of the variance is accounted for that one is unlikely to separate the internal, external dimension on TAIS, especially since that dimension is reflected in only two of the twenty scales on the inventory.

Practitioners, because they are involved in assessment, not testing, trust the ability of TAIS to reliably differentiate between an individual's ability to develop a broad-external and a broad-internal focus of concentration. They trust it, because they compare what the TAIS scales suggest against their behavioral observations of the individual, the reports of others, as well as the individual's actual performance history.

From a research perspective, you need to adopt some other strategies for assessing the validity of the external and internal dimensions. You might for example use single study designs that allow you to look at a subjects behavior over time and across situations. You might compare the scores of two groups of subjects. One group consisting of individuals that others have described as "in their head" and unaware of their surroundings and the environment, a second group that is described as "environmentally aware and sensitive to people and their feelings." Although both groups could have high scores on the internal focus of attention, you would certainly expect the first group to score much lower on external awareness.

Summary

Researchers and reviewers have used the results of studies designed to assess the validity of The Attentional and Interpersonal Style (TAIS) Inventory, to challenge the validity of the Theory of Attentional and Interpersonal Style. In this paper I have pointed out the inappropriateness of that conclusion and provided support for the validity and utility of the theory. With respect to issues related to TAIS, I have attempted to draw attention to some of the differences between the ways researchers and practitioners view psychological test data. These differences help to explain why practitioners can have confidence in a psychological inventory that researches may feel is lacking in validity. The resolution of these different views can only occur when researchers begin to design studies that recognize the complexity of human performance, and take into account critical individual differences, instead of consigning them to the error term in their statistical formula.

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