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Training Strategies for Concentration

"*What you can see in your mind, believe in your heart, you can achieve."*

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Concentration is essential for performing one's best. The major component of concentration is the ability to focus one's attention on the task at hand and thereby not be disturbed or affected by irrelevant external and internal stimuli. External stimuli may include an audience booing, music, bad officiating calls, and unsportsmanlike behavior from opponents. Internal stimuli include distracting body sensations and thoughts and feelings such as "My heart is exploding in my chest", "I'm really tired," "Don't be nervous," "the pain isfierce," "My opponents is bigger and better,"and "I blew it!"

Although external and internal stimuli appear to be separate categories, they continually affect each other. Almost every external event will trigger thoughts and an emotional shift in the athlete and a corresponding change in the responses of the body. Similarly, a change in one's thoughts and feelings changes to what one attends and how one attends. Because this interaction occurs all the time, coaches and sport psychologists must train athletes to cope with these changes under pressure situations such as a major competition. Unless concentration skills have been mastered, performance will almost always suffer. Failure to develop or employ concentration skills has been the downfall of many athletes. According to Cox (2003), few areas in sport psychology are as important to the overall performance as the area of concentration or attention.

For example, a gymnast lost her poise and concentration and performed very poorly when she saw another competitor fall in the same event she was about to compete. Similarly, during the fifth game of a critical volleyball match the visiting team completely lost its composure when the home crowd began stamping their feet and clapping in unison whenever the away team was serving the ball, and a closely contested game with an 8-8 score ended 8-15 in favor of the home team. These examples illustrate the potential for distractions in a competitive environment. The ability not to react to or be disturbed by or recover from distractions such as these is achieved when athletes learn how to control their thoughts and appropriately focus their attention.

Many other performers, such as surgeons, artists, writers, and musicians, can equally achieve this kind of high level concentration. For example, Walsh and Spelman (1983) reported that conductor Carlos Kleiber never noticed the earthquake rattling a giant chandelier when he was conducting Strauss's *Der Rosenkavalier* at La Scala. He was concentrating that intently! These examples illustrate how elite performers tend not to be disturbed by external factors, a skill not yet acquired by many developing performers.

Paradoxically, trying to concentrate is also not concentrating. Concentration means focusing, not forcing, one's attention on a task. At times this may be perceived as shielding ourselves from stimuli that might penetrate and disturb our focus of attention. Active shielding by itself would be a distraction. Thus, concentration is the learned skill of not reacting to or being distracted by irrelevant stimuli. Concentration also means being totally in the here and now--in the present. When our minds drift into the past or future, we are not as effective in our present performance. The ability to concentrate is a skill, and like any other skill it can be developed and improved through practice. We either learn to decrease attention to irrelevant stimuli or increase attention to relevant stimuli. In this process we learn selective awareness—the skill of paying attention to relevant stimuli and ignoring irrelevant stimuli. In addition, when we become distracted, previous concentration training enhances our ability to rapidly refocus our attention on the task at hand without continuing to feel or think about the disturbance.

In chapter 18, Nideffer and Sagal identified the different types of attention or concentration that seem to be required in athletic situations. These types were described along two dimensions: broad versus narrow and internal versus external. The most appropriate type of focus, or attentional style, depends upon the sport skill, the demands of the specific situation and the skill level of the athlete. In concentration training, knowing what to focus on is as critical as knowing how to control one's focus. Athletes may have excellent concentration skills but if they are focusing on the wrong things, the skills is not useful. Additionally, they must know when to switch from one attentional style to another in a very short time period. Fortunately, the brain is capable of responding in milliseconds (one thousands of a second) and extremely complex skills can be done almost instantaneously if switching attention is practiced correctly a sufficient number of times.

SUMMARY OF HOW TO ENHANCE ATTENTION

WHAT	WHEN	HOW TO
Intention	Before every drill	Repeat purpose (e.g., fast, smooth, strong, maximum)
Narrow focus	Need single focus or specific details	Use cue words/pictures
Broad focus	See entire field	Look ahead, see movement at periphery
Open awareness or no focus	Skill is automatic	Open & see all or nothing-go fuzzy
Increase arousal	Attention is drifting	Hyperventilate/quick sharp movements
Decrease arousal	Hyper/too aroused	Slow breathing-6 breaths/min from diaphragm

What to Focus on When Learning or Practicing

Coaches/athletes need to know not only where and what they need to attend to within different sport situations, but also which drills/games need to be devised to allow athletes the opportunities to **practice** the sport's situation specific attentional skills. Once the skills have been learned in a relatively stress-free environment, the coach needs to add

additional challenges in order for athletes to practice them in an over-load situation. An example of how important the need to know what to focus on can be demonstrated by this **priming** practice:

For one minute scan the room or court and find everything that is green…. Now close your eyes and describe how many things in the room are blue.

You may not remember any. The same effect occurs in sport. If we are 'primed' to look for something, we are more likely to see it, and see it in more detail.

Coaches should not assume that athletes automatically know where and how to look when they tell them to 'pay attention'. Coaches need to transmit to players specifically upon what they want the athletes to focus, then create drills whereby the players experience doing the drills using different attentional strategies in order to find the one that best suits them. For example, in basketball most coaches would agree that focusing on the knees or center of an opponent that one has to guard is better than watching the head as the person since s/he can fake more easily with the head. Give players practice in first watching the knees or center while the opponent tries to 'sell' the guard by moving the ball or body parts. Then ask the guard to watch the center and the ball. Then add in that they have to yell whether or not there is a cutter or a screen. In addition, one can ask the athlete to alternate focusing on the knees and center and then on the head and experience which approach feels better and gives better results.

A coach can use different colored balls and the player has to place the green ball in one part of the field/court and the yellow in another area. Or ,place numbers or different colors on a ball or puck and have the athlete yell out the correct answer as the ball/puck approaches them as one way to enhance narrow focus (since they have a tendency to become aroused with approaching objects or tasks to attend to, remind them to relax the shoulder muscles and keep the knees bent so they are in a position to move) . The coach can then progress to having the player yell the number on the ball as well as yell the signal (hand up or down) from the goalie, setter, or opponent at the net. This is an example of practicing 'switching' attention very quickly from broad to narrow. As athletes become more skilled, the coach can fine-tune drills to be more game like. For example, if the spin of the ball is important, the coach can color one half of the ball (tennis, volleyball, soccer, etc) and the player can more easily see the spin on the ball. Then colored balls are to be hit with one technique or to one location while uncolored balls are hit differently or somewhere else.

However, in other sports such as running or swimming where the reaction time or out of the blocks is so important, the specific attentional instructions are not so clear cut. Namely, some athletes have faster movement times out of the blocks by focusing on the sound of the gun (external focus) while others react faster by focusing on their movements(internal focus), and other are faster when they 'go blank'(no focus). Try all possibilities and get accurate feedback (reaction time and correct take off) to determine what is best for each athlete in the specific situations, and make sure to test it at competitions as reactions often differ between practice and stress-filled conditions. Even more difficult are sports that involve interactive teams where strategies are dependent upon teammates and opponents. For example, in basketball telling a novice

guard that s/he is to first look for the open post players and then to the cutters before looking for a shot may overload the player, especially if they have less skill—a skill level where all they did in the past was 'get the ball and shoot'. The player may become indecisive, not do anything or take too long to look so that the shot is no longer possible. Players learn these attentional strategies from 'experience' but a coach can speed up the learning process by first knowing and communicating what attentional focuses are important in specific sport situations. In the above example, the athlete can mentally practice at home the sequence that the coach is prescribing until it becomes automatic. Then, the athlete can practice opening their awareness to maintain focus on their 'spot' for the shot and yet see movement in the periphery of their attention field in the area of the post and the cutter. The coach needs to devise drills that provide practice in these types of situations. The more the practice, the faster the recognition and reaction.

In a team sport, a coach can enhance the experience of staying focused but open to picking up important information by making a game of FREEZE out of many sport situations. During practice the coach can randomly yell FREEZE; players immediately stop, close their eyes and then the coach asks the players or a selected player where everyone was on the floor and where was the ball or puck. Alternatively, the coach could put blinkers on a player who then has to rotate the head to see other people. One basketball guard became known as Dr D for superior defensive skills. After initially experiencing failure to maintain contact with cutters using a more broad focus, he practiced constant head rotations to see everything on the court. The additional activity of 'being busy' also helped lessen his tendency to become anxious. He was too busy to worry!

One exercise that we have found helpful with more experienced athletes is to 'walk the walk' with the athlete through their competitive event and do it at least **twice**. This works exceptionally well for closed skill sports such as gymnastics and running, but it can also be valuable in segments of open sports such as shooting in basketball or soccer. The first time you 'walk' with the athlete they explain in detail what they are doing in each segment of the event (most athletes think in terms of segments, beginning, middle or end, specific distances, or scores, etc). Then write down key words or feelings for each of the segments. Often athletes have already developed key words or feelings that cue them as to the necessary action. The first time you do this, the athlete will generally repeat what they 'think' they are suppose to be doing or what the coaches tell them to do. The second or third time you walk with them, they begin to come up with better words or comments about what they are really thinking or doing. A few athletes can not tell you anything, which if they are performing well, you do not change. If they are not performing consistently well, then more in-depth work needs to be done. Often excessive anxiety is a component of the performance. Sometimes you can locate words, feelings or attention that occur when the technique or action typically breaks down during this stage of the event. For example, a sprinter in the last 20 meters uses the words 'pushing towards the tape" or 'looking for the other runners' may explain why the athlete is slowing down at the finish line. 'Pushing' may result in tightening of upper body which changes stride length and posture and slows the runners down (which may or may not be readily observable to a coach or seen on film) while looking for others may cause similar problems in changing the body. Instead, the sprinter should attend to actions that

maintain speed such as keeping the hands up and shoulders relaxed or focusing on 'motoring' past a spot beyond the finish line.

A 'long distance' competitor such as marathon runners may need only to periodically 'check in' with their heart rate to determine that it is within an acceptable range or develop sensitivity as to when it is 'too high' and then readjust their work level. An athlete in a 'tremor' related sport such as shooting or archery needs to learn the 'feel' when there is too much tremor from either their heart beat or muscles and wait for it to stabilize before shooting. Both need to be sensitive to heart rate but need different types of heart rate awareness. If arousal control is central to your performance, see how to manipulate breathing to control arousal later in this chapter.

Attentional drills practiced outside the sports areas may also help athletes experience different attentional styles or switch from one style to another. For example, a player has to yell the color of the flash card in the center of the room while also yelling the color of the flash card of the person crossing the room as well as the color of the flash card at the end of the room and then report the number on the blackboard which is much smaller (narrow beam). With practice athletes learn to open their awareness (broad beam) and then quickly switch to a narrow beam focus. A player can practice such strategies when watching game videos, waiting to play, or mentally rehearsing where individuals are in specific situations on the court.

What to focus on when competing

All sports have some internal information that is essential for good performance but most sports have specific internal sensations that provide cues necessary for good performance. Paying attention to your body responses or internal cues may be what is needed when you are learning a skill but, skilled athletes perform better when they focus on external cues such as the desired effect, that is, first across the finish or the ball to the back corner (Beilock, et al, 2002 ; Perkins-Ceccato, Passmore, & Lee, 2003; Singer, Lidor & Cauraugh, 1993;Wulf, et al 2002;Crews & Landers,1993; Konttinen, Lyytinen, & Konttinen, 1993; Salazar, Landers, Petruzzello, Han, Crews, & Kubitz, 1990). For example, a beginning golfer may need to be aware of their swing mechanics or force while a skilled golfer would focus on where to hit the drive or the ball dropping into the cup. If focusing on the desired outcome creates anxiety in the athlete, they may prefer to focus (saying, seeing, doing) on the 'cue' or activity that enhances their performance at that moment (e.g., 'hands up' in a sprint, or 'pull' in swimming when tiring) since it generally creates less judgment and anxiety. Experiment and see which works best for you. We suggest that athletes quickly scan their ideal performance state before performance to assure they are at the correct level as our experience is that when in highly stressful situations, athletes are not innately aware that their arousal level is often too high.

Attentional awareness exercises

The following attentional exercises include practices in switching from broad to narrow and from external to internal. The specific use depends on the nature of the sport situation and what helps the athlete best to attend to the physical skill necessary at that time. Some

athletes prefer to remain totally focused on internal physiological actions while others prefer switching between internal self-talk for motivation and self talk for action cues.

Intention leads to attention

Intentions are psychological processes that affect our effort and attention and consequentially affect our physiological responses. Goal setting is one example of intention. We would suggest that equally important is the 'intent' behind **every** drill, skill and movement. The intent does not have to be an outcome but rather a qualitative emphasis. Actors are aware of how their 'intent' affects how the audience perceives their portrayal of specific moods or people. The person's intend affects his/her performance even when trying to maintain maximum effort (Latash & Jaric,1998; Theodoraakis, Laparidis & Kioumourtzoglou,1998;Thill, Bryche, Poumarat & Rigoulet, 1997). Try the following exercise to see for yourself.

> Choose a simple skill such as leaping or tossing a ball. Do the skill the first time with the 'intent' being the perfect speed of the movement Next repeat the identical movement pattern but with the 'intent' being the perfect rhythm of the skill. Also do this skill while you activate the feelings of happiness or sadness. Notice the changes in the quality of the movement.

Focus on What you Want

Please focus on what you want, not what you do not want. For example, if I were to ask you to <u>not</u> focus on the large blue bunny that I saw in my back yard, as there are no blue bunnies and thus you can't see a blue bunny, what would you see? What we think is what will more likely occur. For example, a four year old carries a glass of juice across the carpet to her mother. Her mother says, "Don't spill it". In almost all cases, the child will now spill the juice. It would be much better if the mother had said, "Look how easily your are carrying the glass." These examples illustrate that what we see and say to ourselves provides direction to how we think and feel. Thus, as a pitcher, if I know the batter hits high fast balls, I would see, say and think of a low placement.

Energy and Focussed Attention

- Have students pair up and stand facing each other. One student will extend his right arm with the palm facing up and rest their wrist on the other student's right shoulder.
- The student with the extended arm will use their strength to keep their arm straight while the other student slowly uses their strength using both hands to bend the arm downward at the elbow. Note: Palm must be up to prevent elbow injury.
- Begin again and this time the student with the extended arm will keep the arm relaxed, continuing to breathe regularly and imagine that their arm is like a stiff fire hose spraying energy out of their hand against the wall.

- Once the student with extended arm signals that he is now imagining the energy spraying, the other student will begin slowly increasing force on the elbow trying to bend it.

In most cases, as long as the student with the extended arm continues to breathe, keeps the arm relaxed and visualizes the energy flowing, the arm will not bend easily as compared to not using the imagery. This exercise demonstrates the power of a focused mind to direct energy and create great strength. It also teaches an important principle that relaxation of the body is necessary in order to direct and maintain the flow of energy in the body.

Imagery and Focused Attention

Have the students pair up with one person facing the wall but more than arms length away. The person extends one arm straight out, palm down and resists the partner who will use both hands and force the arm down while the first person resists. Do this two or three times to get a feeling of the strength of the first person.

Have the first person do two 10 second breathing cycles (20 seconds), and then imagine, in as much detail as possible, reaching out just as they did before but they are to grab a bar that is on the wall. When the person feels they have extended their arm fully and have a firm grip on the bar on the wall, they nod to the second person. The second person then uses both hands again and feels the amount of force necessary to push the arm down. a couple of deep breaths, relax.

For most people the change in resistance is significant and powerful. How changing what one focuses on truly does change the body.

Broad focus

There are times when an athlete needs to maintain a broad focus such as a goalie watching a play develop as it heads toward the goal. Or a player on the field bringing the ball down and watching for teammates or opponents. With practice an athlete learns to maintain sufficient attention to the ball or puck and also 'scan' the field or court. Practice the following to expand broad attentional focus.

Awareness while driving
As a passenger in a car, become aware of the license plate of the car in front of you and at the same time be aware of what is occurring on both sides of the road. See road signs, other cars, etc. With practice you can 'scan' what is coming and still be able to 'focus' on an aspect of the care in front of you.

Widening arm vision
Extend both arms in front of you with both thumbs up and approximately 4 inches apart. See both thumbs and whatever is the 'main focus' in the distance as well. See the 'main 'focus in as much detail as you can. As you maintain that focus, begin to slow move both extended arms to the side. Continue to see the 'main' focus as well as both thumbs. Do this in a passive manner. Relax and repeat two or three times. Many athletes report not

only feeling able to see the 'main' display clearly but both thumbs, and also feeling more relaxed.

Get centered

Focus on your breathing for a few breaths. As you exhale (let the air out) release all the muscle tension you can locate in your chest, shoulders and neck. Now make the time to exhale longer than the time to inhale. Just like a roller coaster, the air comes in, pauses at the top, then you let go and the air effortlessly rolls out for a longer time than it took to get it in. Notice how the abdominal region rises as the air comes in, and how it gently falls as the air goes out. It is as if the breathing is being done for you and you are a mere spectator.

Specific sport broad open example

This time attend to all the events that occurred in the blocks at your last 100 meter race. Attend to them as if you were merely watching them unfold on television. You can be aware of all the runners, the spectators, officials, light, sounds, sight of the blocks, color of the track and any other external event that you notice. Let all this information in and then let it go. Now attend to all of the internal information you had while getting ready in the blocks: Awareness of your limbs, posture, muscle sensations and any other thoughts and feelings that you had. Now allow them to let go. Now passively allow all those external events to merge with the internal events as you prepared yourself in the blocks. Allow whatever happens to happen. Attend to it and then let it all drop out. Experience the entire scene of everyone getting into the blocks as if it were a pleasant movie with sounds and colors as you sit back and observe. Allow it to just be there and let it go. Await the gun and react.

Specific sport narrow internal example

Review a past fast start out of the blocks, preferably from a film Then review in your mind and with your senses of going to the blocks and see if this is the script you still want. Then test it to see if it does get you out quickly and in the correct position. Preferably, use movement time equipment in the blocks as well as a video camera to make sure the start is not only fast but brings you out in the proper position. If equipment is not available, a coach with a good eye can observe your position and speed and the athlete can incorporate the feelings about the speed and position of the start. Now attend to all the sensations from inside your body as you start to get into the blocks. Become aware of your breathing. Is it fast or slow or at the just right level of a fast start? Are the shoulders and chest and neck muscles released? As you prepared to place your back foot into the block, do the muscles in that leg feel properly stretched? The position of your foot on the block feels secure? The script continues using the cue words and sensations that the athlete needs to feel comfortable and ready in the blocks. Cue words generally become fewer with experience and may only be necessary on a few occasions when anxiety levels are high or a mechanical error has crept into the routine. The objective is to pair the mechanics of a correct start with a specific word or feeling such that you can reproduce it on demand.

Open Awareness

What is termed a broad, open focus' in sport is similar to what is called 'non-directive' in meditation. The objective is to allow information from the senses to come in but to not react nor judge them. Let the thoughts or sensations be there and then let them recede from awareness. This takes practice and while meditators suggest 20 minutes twice a day, we recommend that athletes begin by practicing one minute of open awareness 10 times a day.

In a comfortable position, open your awareness to all the events that are occurring this minute in this place: You may be aware of the lights, sounds, air currents, sense of other people, etc. Allow them to be in your awareness, but do so in a passive way. Now focus your awareness to all the events that are occurring in your body at this moment in time. Be aware of the position of your body, the joint angles, the pressure of the chair/couch, the temperature of your hands, and the thoughts and feelings that may running through your mind. Allow all this internal information to be there, it is not important, it is merely information. Allow all the external information to merge with the internal information. Allow this information to gently drop off by letting it come in and letting it go out.

Slow down movements.

Slow down a movement by a factor of 10 or slower. Experience the movement as if you were moving through molasses. For example, if you are a runner very, very slowly go through one arm motion (correct motion using right and left arm with the appropriate leg movements). First assess your body posture, your head position, the location of the weight in your feet and the located of the arms. Take a minute or two to absorb the feeling of this pre-movement position. Then feel the shift in the weight on your feet, change in knee position, changes in postur as you think of moving. As you begin very slowly to make your first move and note how your arms begin to move. As you begins very slowly to move one of your arms forward, sense where are your shoulders (down we hope), and feel where your second arm is moving and how this is related to the beginning lift of your leg. Check if you sub-consciously started to hold your breath as you began the first movement. The entire beginning to actually completing movement using both your arms/legs should take at least five minutes. After you finish, write down what senses and body parts that you experienced. Make sure you return to 'normal speed' when you are actually practice your sport.

Normal speed with internal attentional focus

If you are a runner go through one arm motion (correct motion using right and left arm with the appropriate leg movements) at your normal running speed. Lock onto one sensation that is related to good technique and focus your attention on that sensation for the next few drills. First assess your body posture, your head position, where the weight is on you feet, where your arms are located. If your shoulders remain relaxed throughout the run, you can obtain more flexibility, thus more distance/speed, which should translate

into faster arm/leg speed without 'tying up' and you reduce the amount of effort expended. Before beginning to practice, focus on releasing the tension in your shoulders... think or say 'let go' again as it generally takes twice as long before we totally release residual tension. Keeping a good running posture, move your arms in the correct running technique while remaining standing in one place. Feel your shoulders staying down and loose. Feel the muscles pulling your arms forward and backward. Focus on the feeling of looseness in your shoulders and rhythm in your arm pull up and back. Make sure your arms are coming to the proper height each time in a relaxed but powerful manner for 1-2 minutes. Take a break. Now regain your posture for running, close your eyes and focus again on the looseness of your shoulders and the sensations of the correct technique of your arms coming forward and back. Have a partner give you feedback after 1-2 minutes on your technique. Do this at the beginning of practice and at a time when you are fatigued with feedback from a partner if you change from your proper technique. Now go to the track and assess your body posture, your head position, where the weight is on you feet, where the arms are located. Release the tension in your shoulders, think or say 'let go' again. Begin a run focusing only on the sensations of how your arms feel as you move down the track with the proper arm motion. After several trials of doing this drill alone, have another runner come from behind and pass you while you practice maintaining the loose shoulders and correct arm movement. Observe how you react. Are you changing your technique? This type of drill can be individualized for the skill that needs the most work, such as one that breaks down during fatigue or stress. Closing your eyes generally enhances the internal sensations while music or auditory cues can assist in making the skill more rhythmical (use humming or singing through a skill suc as a pommel horse competitor).

In the remainder of this chapter we provide specific strategies and techniques that coaches and sport psychologists can use to train better concentration control in athletes. These strategies are divided into two sections: strategies to control distracting external factors and strategies to control internal distractions. The categorization is somewhat arbitrary, because external and internal stimuli continually affect each other. Because of this interaction, strategies in one category may be equally effective in correcting apparent lack of concentration in the other category.

External Factors: Strategies to Keep Concentration

Athletes need to be trained not to react (orient) to irrelevant external stimuli. In a competition these stimuli are situational factors that coaches often expect the athletes to have learned by trial and error to control in previous competitive experiences. This "previous experience" strategy for developing concentration control has obvious limitations and false assumptions. Coaches need to realize that athletes can be systematically trained before a competition to be situationally independent. The concept underlying training is based upon Pavlovian conditioning. The novelty of the competitive environment, compared to the practice environment, tends to reduce performance. Through training, the novelty of the competitive environment can be minimized. In short, athletes need to experience simulated competition training in which they practice their physical skills while being exposed to many possible external stimuli that can occur during a real competition. This training follows similar procedures used by NASA and U.S. Air Force astronauts and pilots to cope with emergencies. For example,

during flight training pilots practice dead stick landings, pulling out of spins, recovering from stalls, and so forth. For athletes, strategies that reduce the novelty effect upon performance by conditioning an appropriate response include dress rehearsal practice, general simulation of competition experiences, and mental rehearsal of concentration training. Also tell the athletes to expect some unusual event to occur that was not planned for and be ready with a 'coping plan' on how to solve the situation.

Strategy 1: Dress Rehearsal

Dress rehearsal is a particularly effective strategy for sports such as gymnastics, diving, synchronized swimming, and figure skating. Dress rehearsal is based on the concept that ease in skillful competitive performance is unconsciously conditioned by the external and internal stimuli that surround athletes during practice. The greater the number of different stimuli presented during competition as compared to practice, the more likely the performance quality will decrease. Stimuli can include things such as the athletes' uniforms, background illumination, announcers' voices, and music. Ironically, to make a good impression during the competitive event, athletes usually wear uniforms or costumes different from the ones they wear during practice. This means that an unconscious stimulus (the practice uniform) associated with the performance of the skill (response) is not elicited during the competition. Wearing a different or new uniform is a new stimulus and may inhibit performance. This may be one reason some athletes tend to perform better during practice than during competition. Such athletes need to practice their complete competitive routines during practice in the same uniform they wear during actual competition. Dress rehearsal needs to be conducted frequently after athletes have mastered a new skill and are practicing the while routine for performance. This concept is important for any performer. For example, Mark Braustein, who was a violist with the Cleveland Orchestra, reported that he felt somewhat uncomfortable performing in his tuxedo in the orchestra after having practiced in his jeans at home. When he started dress rehearsal at home wearing his tuxedo, he was able to concentrate more, feel more at ease, and improve his playing during concerts.

The reverse of this strategy can also be applied when an athlete is in a slump. In this case the athlete ceremoniously discards his/her uniform and thereby symbolically disconnects from the slump associations and now practices with a new uniform. The athlete is metaphorically and ritualistically reborn. A coach can ritualistically change a warm-up or the order of performance. Athletes and coaches should not lose sight of the fact that these 'rituals' are not the underlying reasons for non-performance. Often it is more productive for the coach and athlete to maintain their traditional patterns with an understanding that performance is typically not linear but rather up and down.

Strategy 2: Rehearsal of Simulated Competition Experiences

Simulated competition experiences enable athletes to become so familiar with the stimuli associated with competition that they are no longer distracting. This is the same concept that underlies dress rehearsal practice. Athletes are trained to concentrate and dissociate from the disruptive stimuli. Research (Orlick & Partington,1988) involving a study of Olympic athletes demonstrated the importance of reducing distractions. They

reported that the ability to control distractibility was closely associated with superior performance at the Olympic Games.

In gymnastics, athletes might rehearse their routines in practice while a loud tape recording of a previous meet is played over the public address system. This tape would include another gymnast's four exercise music, audience applause, and so on. A similar example for team sports such as football, basketball, and volleyball would be holding the week's practice before an away gave with the public address system loudly playing hostile crowd noises and the opposing team's flight song. Such exercises reduce the effect of meet-induced novelty, which tends to interfere with performance, and make the competitive experience seem just like practice workouts. We assume that a good example of not preparing for an extremely angry crowd was Zola Budd's slipping to seventh-place finish after a strong lead during the 3000-meter finals in the 1984 Olympics. The thunderous booing of the hostile crowd must have demoralized her after the accident with Mary Decker from the United States.

When using this strategy, coaches and sport psychologists should over train athletes by including simulated practice of the worst possible scenario, such as having a basketball player ready to take a free throw shot and then having to wait the length of a time-out before shooting, and then call another time out. "Wet ball" drills in football are based on the same concept. Many psychologically astute coaches turn the sprinklers on before practice and then soak the ball between plays when preparing for a football game during which rain is likely. Just as learning a physical skill takes time, learning the mental control of concentrating on the task while not reacting to external stimuli takes many hours of training. While realistic simulators are being developed for sport, wise coaches can simulate many of the situations by judiciously 'springing' novelty situations in practice. Athletes generally look forward to these challenges as long as they provide an opportunity for learning and are not used to punish or embarrass the athletes.

Strategy 3: Mental Rehearsal

Most performers report that **visualization (mental rehearsal)** is an important ingredient in their success. Many discover this process serendipitously. A systematic training program was organized by Suinn (1988) who developed visual-motor behavioral rehearsal (VMBR) for Olympic biathlon, alpine, and Nordic skiers. He reported impressive perceived results. Scientific findings confirm that skilled performers using mental rehearsal programs such as VMBR perform better than control groups (see Chapter 16).

Using mental rehearsal to practice concentration and to learn not to react to purposely induced external distractions is another useful strategy for athletes. Obviously, athletes can only benefit from this strategy after they have learned relaxation and imagery skills. Such a strategy might involve having athletes form pairs in which one member of the pair relaxes and mentally rehearses his sport while the other member attempts to distract the performer from the mental rehearsal. The distraction can be anything except touching. After this type of mental rehearsal, the coach or sport psychologist might have the athlete rate his achieved concentration on a 0-6 scale. Thereafter the athletes reverse roles. In a study involving members of the national rhythmic gymnastic team (Schmid & Peper,

1982), the gymnasts practiced this pair distraction exercise daily for 5 days. On the first and fifth days they were asked to rate their concentration while mentally rehearsing their routine with a partner who attempted to distract them. They reported a significant increase in their concentration from the first day to the fifth day. Through this type of exercise, athletes learn how to detach and dissociate themselves from external distractions and resulting unwanted internal reactions (stimuli) while focusing on the task of mentally rehearsing their sport. Unestahl (1983), in his Basic Mental Training program, uses dissociation and detachment exercise. He teaches athletes to screen out distractions either by building a mental wall around themselves, a wall that cannot be penetrated, or by accepting the distraction but not judging it. Let it pass by and continue on its way.

Just as coaches or sport psychologists can train athletes to use mental rehearsal to attain concentration, they can also train athletes to use mental rehearsal to regain concentration. For example, as soon as athletes realize their concentration has been disrupted by external factors such a crowd noises, they should stop themselves, take a deep breath to relax, and then bring their attention back by mentally rehearsing what they should be doing next.

Burns (1993) uses the words TIC and TOC to assist in remembering to switch attention from non-productive to productive thoughts, feelings or actions to Simply stated, any self-statement, thought or idea that is irrelevant to what you need to be doing **right now** (task irrelevant or off target) is a TIC, and should be immediately recognized. Then you need to switch to a task relevant (one that focuses you upon either the positive outcome or actions needed to move toward that outcome) or a TOC , In both sport and non-sport situations, become aware of TIC's and immediately make them TOC's.

The utility of attentional control training has been demonstrated in a study by Ziegler (1994) with four collegiate soccer players. A series of attentional shift drills werepracticed, and all players significantly improved their attentional focus.

These strategies can all be employed during regular physical practice sessions. Athletes are responsive to them and especially enjoy being involved in generating the distracting stimuli.

Internal Factors: Strategies to Stay Centered

The coach or sport psychologists must train the athlete's mind to exert control, because concentration inhibits distraction. Lapses in concentration invite fear and self-doubt, and the resulting worry and anxiety lead to further increases in lack of concentration, thus creating a vicious cycle that ultimately lead to failure. The effect of internal factors becomes more pronounced in high-pressure situations. As an analogy, consider what would happen if someone were to ask you to walk on a board 4 inches wide, 15 feet long, and 9 inches above the ground (like a practice beam in gymnastics). You would be able to do this without hesitation just by concentrating on the task of walking across the board. However, if the board were 60 feet off the ground, you might become paralyzed by the fear of falling. Such fear inhibits performance and increases the possibility of falling. Ironically, there is no difference in the physical skill required. The difference is in your psychological response to the perceived stressful event, and as a result, your attention is on trying not to fall instead of attending to walking across the beam. In addition, if you

had previously fallen off a beam, then every time you thought about it or related the experience to someone you are most likely and unknowingly rehearsing and reinforcing all the cognitive and motor events that led to failure.

Similar psychological processes occur during competition. For example, a field-goal kicker who normally hits his short kicks during practice may react quite differently during competition when he attempts to kick a short field goal and there are only a few seconds left on the clock and his team is behind by 1 point. He is even more likely to fear "blowing it" if he has recently missed a kick in a similar circumstance. One professional football player, while kicking under such a high-pressure situation, described the goal posts as look as they had narrowed to less than a foot apart. It does not take much insight to figure out what happed to his kick!

One way to improve concentration is to reduce self-doubt and competitive anxiety and their resulting physical manifestations (i.e., increased arousal). (Arousal and cognitive control techniques are discussed in Chapters 15 and 17.) Unless an athlete has control over internal dialogue, his or her focus of attention will not be congruent with good performance, let alone peak performance. In addition to the specific arousal and cognition techniques found in the preceding chapters, in our work with performers we have found the following strategies helpful in controlling internal dialogue and facilitating concentration and performance.

Strategy1: Attentional Cues and Triggers

Athletes can use verbal and kinesthetic cues to focus their concentration and to retrigger concentration once it has been lost. These cues can help athletes center their attention on the most appropriate focus within the task at hand and thus help them avoid distracting thoughts and feelings (Schmid, 1982)). Similar observations have been confirmed by Nideffer (1981, 1987), who reported case histories in which athletes benefited from centering by using task-relevant cues.

Generally, it is best to find cues that focus on positives rather than negatives, the present (current or upcoming meets) rather than the past or future, and the process (proper form or execution) rather than the score or outcome. During a television interview on Greg Louganis, the Olympic diving champion, gave some excellent examples of effective attentional cues. He said, "I picture my dive as the judge will see it, then as I see it." In his forward three-and-one-half somersault dive, he uses the following word cues: "Relax, see the platform, spot the water, spot the water, spot the water, kick out, spot the water again." This helps him to concentrate and focus on the dive. Consequently with his power to concentrate, he obtains a maximum result with a minimum of effort. Coaches and sport psychologists should work with athletes to help them establish effective verbal, visual, and kinesthetic cues for triggering concentration. Such cues must be individualized, however. What is effective for one athlete may not be effective for another. Similarly, some athletes perform best with frequent cues and others with very few cues.

Strategy 2: Transforming Failure into Success

Many athletes report that they commonly lose concentration after making a mistake. One way to deal with this problem is to train athletes to transform failure into success. This is a cognitive habit by which athletes mentally rehearse successful performance after a failure. As soon as possible after making an error (learning is only possible when errors occur), athletes should mentally rehearse executing the same skill perfectly rather than dwelling on the error. One component of successful performance is to avoid self-judgment or blaming others, which disrupts concentration, and to refocus on the performance. The power of not focusing upon the failure and just taking the challenge is illustrated by Lasse Viren during the Munich Olympic Games (Benagh, 1976). He won the 10,000-meter race and broke the world record despite the fact that he fell flat on his face and another runner ran over him. Even though he was down for three full seconds, he got up, composed himself, ran, and came in first. Many others would have given up because they would have assumed that they would be defeated. When an error occurs, an accident happens ,remember to use the TIC-TOC method. Move quickly from task irrelevant to what you need to be doing right now to get back on track for a successful outcome- TIC TOC

More harmful than making a performance error is ruminating on the failed event. Each time athletes recite (verbally or mentally) a previous failure, they condition their mind to make the failure the preferred motor pattern. The verbal retelling to others or the chronic rumination on why one made a mistake is a type of global visual-motor behavior rehearsal in which one is training the mind to perform the same failure behavior again. When time permits, instead of reciting the error, the athletes might ask: "What was the problem?" "How could I have performed differently in the same situation?" or "What other skills do I need?" Then the athletes can mentally rehearse the previous conditions leading to the error but now change their behavior so that they imagine themselves performing the skill perfectly.

The coach or sport psychologist can also encourage athletes to do the same thing after and injury. When concerned friends and others ask what happened, athletes should avoid recounting the accident and instead of focus on describing a perfect performance the next time. For example, after a 16-year-old downhill skier ran off the course and was seriously injured, her skiing improved remarkably when she stopped telling other people how she got injured. Whenever people asked her what happened, she acknowledged that she had gotten injured and then continued to describe how she would now ski the race successfully. (When she felt herself going too fast, she would sink down into her skis and continue to breathe while setting the edges as she was going through a gate.) As she talked, she unconsciously rehearsed how to react successfully to the conditions under which she had previously fallen (Peper, Gibney & Holt, 2002).

Strategy 3: Maintaining Arousal at the Optimum Level

As arousal indirectly affects attention, judgment and memory, it is important to be aware of and able to control one's level of arousal. This is a complex task as arousal occurs in many physiological systems and each sport task needs to be assessed as to what system needs to be under conscious control. For example, a marathon runner's performance is probably not adversely affected by sweaty hands but sweaty hands may impede

performance in gymnastics or wrestling. Following are examples of awareness and control training for arousal.

Breathing Training

Research (Bernardi et al, 2000; Song & Lehrer, 2003), has demonstrated that learning to breath at about six breaths per minute improves cardio-respiratory synchrony and helps to calm the mind. Breathing should come from the diaphragm (stomach moves out as you inhale) with the shoulders and chest muscles stay down and relaxed. You count in for three seconds as the air is coming in, let go and let the air come out as you count for six or seven seconds. The focus is only very gentle non-efforting exhalation. This skill is critical when you become 'too hyper', or your mind becomes scattered and you can't concentrate, such as when under high stress. If your arousal is too low and your mind drifts, such as during long practices, you need to activate. If you have no asthma, epilepsy or lung disorders, you could breath quickly (puppy pant) for only 10-15 seconds, Warning: Stop immediately if you become dizzy. Sometimes jumping up and down and doing short quick arm movements helps to elevate your heart rate and you can than more easily 'lock on' to the task (for more activation exercises see (for detailed instructions see: Peper, 1990 or Wilson & Cummings, 2002).

Biofeedback monitoring

At one time it was thought that physiological systems (heart rate, sweat response, blood flow, temperature, single motor units, etc) were under sub-conscious control and not amenable to awareness nor control. Now we know that is not true as individuals are now trained to control their physiology through biofeedback. Biofeedback is the use of instruments to measure physiological systems and feed that information back to the athlete in either a visual display or through changes in sound (for more details go to the websites *www.aapb.org* or *www.bfe.org*).

The coach or sport psychologist can use biofeedback instruments to monitor and train athletes to improve their arousal control. It can be used in conjunction with other mental training skills to (1) illustrate how thoughts affect the body and performance, (2) monitor physiological arousal, (3) identify stressful components of the athletic performance during imagery rehearsal, and (4) facilitate concentration training (Peper & Schmid, 1983-1984). Following are four exercises that show how biofeedback can be used to train each of the aforementioned purposes.

Exercise 1: Thoughts affect body. . An increase in autonomic arousal usually results in an increase in seating and skin conductance (electrodermal activity-EDA). An EDA unit reflects this change by increasing the pitch of the sound when conductivity and arousal increase, and decreasing the pitch when conductivity and arousal decrease . This feedback can be used to show that thoughts and feelings affect our performance. That is, each though has a corresponding physiological effect—a concept of which many athletes are unaware. We often illustrate this concept in a group meeting in which the athlete holds a portable EDA device (Thought Technology, Ltd) as we ask the athlete to think of an anxiety-provoking event or we whisper something to him or her such as, "You just

blew your routing." Each time the person thinks of an embarrassing or anxiety-provoking situation the pitch of the sound increases. After demonstrating the EDA feedback device, we ask athletes to use it to experience how their thoughts and feelings affect their physiological state. This helps them to identify and stop disturbing thoughts and feelings, as well as to restructure their self-talk from negative to positive.

Exercise 2 ***Regulating arousal level*** The EDA device is held while the athlete practices breathing at the six breaths per minute or thinks of arousing thoughts. They are often amazed at how quickly and dramatically their sweat response goes down with relaxed breathing or up with 'focused' attention. The individual effects of the different types of relaxation and arousal can be explored with theusing the instrumentation. This allows the person to create an effective prescription of what to practice for enhancing and lowering arousal into the ideal performance state.

Exercise 3*: Facilitating mental rehearsal.* With the help of the biofeedback, athletes can more rapidly identify stressful, anxiety-provoking events or cues during imagery rehearsal of their routine or athletic event. In the case of the rhythmic gymnasts, some of their subjective experiences associated with the increased EDA feedback occurred during a hoop routine include thoughts such as, "On a toss or catch that was risky", "just when I was about to do a toss that I frequently miss", and when I thought, "I've got to make it!' so I tensed up just before the routine began." Most gymnasts who used EDA feedback reported that it was helpful in learning to reduce their arousal during mental rehearsal. In fact, many of the gymnasts reported that within 2 weeks they had learned to inhibit the EDA feedback tone during imagery rehearsal

Exercise 4: ***Enhancing concentration training.*** EDA feedback can be used to facilitate concentration learning in an enjoyable dyadic practice similar to the one described earlier under the mental rehearsal strategy. In this practice athletes again form pairs, with one member of each pair mentally practicing some competitive situation while receiving EDA feedback. Simultaneously, the other partner attempts to distract and arouse her/him so that there will be a change in the EDA feedback signal. After 2 to 5 minutes of practice, the athletes reverse roles. Athletes enjoy this competitive practice and at the same time learn awareness of their own internal cues of anxiety, as well as strategies to control their EDA response through passive attention and relaxed breathing. Through this competitive practice, they learn the ability to detach and dissociate from external distractions and unwanted internal stimuli while focusing on the task.

- It is important to note that EDA is a useful biofeedback tool with many athletes but not all athletes respond in this physiological way nor is the sweat response equally important for all sports Other readily available biofeedback devices and uses include: Electromyography or muscle monitoring assists in helping athletes gain awareness and control of the necessary muscle tension in specific muscles. This is crucial to some activities such as running or swimming where unnecessary and unnoticed tension in the shoulders slows down the athlete.
- Heart rate biofeedback can assist the athlete in locating the heart rate zone wherein they are working at the maximum level but without risking hitting the wall.

- Temperature biofeedback that can measure a tenth of a degree change can also be used to assess autonomic changes. As individuals become more aroused or stressed, the temperature in the hands and feet generally becomes lower. While not as sensitive as a sweat response for autonomic arousal, it is less expensive and available at electronic stores. It illustrates very nicely the changes in blood flow, especially notable when a person practices the 6 breaths per minute. Maintaining low muscle tension and good blood flow is also essential for speeding up physiological recovery, which is necessary so the athlete can produce maximum effort day in and day out. More importantly, athletes can learn to increase their peripheral temperature- a process that often facilitates relaxation after heavy training and healing after an injury. Most people can rapidly learn to increase their temperature 5-6 degrees Farenheit and when they see the temperature change, they also now know that they have more control (Peper and Gibney, 2003). Paradoxically, passive attentions usually works much quicker than active striving to increase peripheral hand temperature. When an athlete consistently 'tries too hard' temperature biofeedback can be used to learn to 'try easier'

Strategy 4: Increasing Focusing and Refocusing Skills

Focus training teaches performers to gently hold their attention on a predetermined task and, if the attention wanders, to gently bring the attention back. As Landers, Boutcher, and Wang (1986) state, failure to develop refocusing skills has been the downfall of many athletes. The key to avoiding these pitfalls is to perform in the present; this is, focus awareness in the "now" rather than the past or future. One must learn how to pass quickly from negative thoughts to a constructive performance focus. The dynamics of this strategy are similar to those of meditative practices, such as Raja yoga meditation in which a person focuses on a mantra and each time the attention wanders from the mantra the person gently guides the attention back to it. Using a similar approach the following exercises can help performers improve their focusing skills.

Mindfulness. Sit quietly, close your eyes, and see how long you can focus on a single thought. For many activities this is very important. As Chris Evert (1988), a world-class tennis player, reported: "From the beginning, I realized you have to take one point at a time and lock into a kind of concentration zone…If I concentrated, I could win a lot of points in a row while opponents were thinking about other things." One can begin to enhance locking in by focusing in the sport location. Some tennis players practice 'locking in' by focusing only on their strings prior to a serve and then transfer this narrow focus to what they need to be doing in the next moment. For serve reception I focus on the ball coming off the racket or for serving, I focus on what is necessary for me to execute my ideal serve (cue word, feeling of power, looking at spot where ball is to go, etc).

One pointing. Look at an action photo or an object from your sport. For example, if your sport is baseball, softball, or tennis, you might focus on the ball. If distracting thoughts enter your mind, bring your attention back to the ball. Don't shut out the thoughts of continue to explore the disruptive thoughts or feelings. Just gently bring the attention back to the ball. This can also be done with watching a second hand on a watch tick each

second off for one minute. How many times did you lose your concentration? What happens if you see the hand move and say tic at the same time for one minute? Some people with busy brains need to occupy both sides of the brain with visual and verbal cues. Have athletes practice these two exercises daily for five minutes and chart their progress. Get them to time how long they can focus their attention on a single thought or on the picture. It is our experience that these home practices help athletes eliminate their concentration-breaking thoughts. Another similar exercise to practice focus training is Benson's relaxation response described in chapter 15.

Grid exercise. Another training exercise for practicing focusing ability is the grid exercise (Harris & Harris, 1984). This exercise necessitates having a 10-by-10 block grid with each block containing a two-digit number ranging from 00 to 99 (see Figure 19-1 for a sample grid). The purpose of this exercise is to scan the grid and within a given time (usually one minute) find and put a slash through as many numbers as possible in numerical sequence starting with number 00. The same form can be used several times by starting with a number just higher than the highest number reached on the first attempt. New grids can be developed easily by simply relocating the numbers. According to Harris and Harris, athletes who have the ability to concentrate, scan, and store relevant cues will usually score in the upper 20s and into the 30s during a one-minute times trial. Those who cannot disregard everything except the task at hand do poorly. Try doing the grid immediately after you have done some relaxation exercises such as slowing your breathing, releasing your muscle tension, etc. Then repeat the exercise after you have done a series of quick sharp movements that elevate your heart rate '(shadow box, Simon says, etc). Nideffer would predict that most people would narrow with the arousal exercises and perform better. Our experience with hundreds of students concurs with this but it is not true for all people. Each athlete needs to find the optimum arousal level of all the various situations in her/his sport

After initial practice, you can increase the difficulty of the exercise by creating distractions such as loud noises and verbal harassment to see if the performer can block out everything and concentrate fully on the grid. Besides training focusing skills, Harris and Harris report that this exercise has been used extensively in Eastern Bloc countries as a precompetition screening device for current level of concentration ability. Athletes are selected for competition on the basis of their performance.

*** Insert page 325 this is the grid***

Video games. There are many new video games that increase reaction speed, hand-eye coordination, and concentration. For example, Michele Mitchell, the 1984 and 1988 Olympic silver medalist in women's platform diving, attributed her consistent performance to good concentration enhanced by playing computer video games. As she said: "It helped me to be in the present." The advantage of the video games is that momentary lapses in concentration will result in immediate feedback—you *lose*. Practice these games in an arcade or at home on the personal computer. Since most games only involve hand movements, it is helpful if you can find a game with a slower speed. You then play the game but must first move both feet before you hit the keyboard with your hands. Some newer Gameboys have foot controls which would be better for sports where

total body movement is important. The more sport specific movement you can make, the more likely it will transfer to your sport setting. With boxers for example, we have incorporated a specific right or left punch or a right or left block reaction time board that was attached to a brief time display (1 /100 or 1/1000 of a second) of another boxer throwing a punch. Within a few weeks of practice the lower skilled boxers were almost as fast and accurate at seeing a punch as the Olympic level boxers

Strategy 5: Developing Performing Protocols

Many athletes develop the ability to tune in to their ideal performance state by associating concentration with certain performance rituals. Preset behavioral protocols should be established during warm-ups, practice, and the actual competition. These protocols should be designed to cue both the body and mind. It will take time to help each athlete identify his or her own ideal pre-performance concentration routine. Once a definite routine is developed, it should be practiced consistently. Over time these protocols will serve automatically to trigger the focused concentration athletes need for good performance. This is illustrated by the behavior of Eberhard Glenger, a world champion on the horizontal bar.

> To compete Glenger stood up, put on his suspenders, adjusted his gymnastic pants and slippers, chalked up, put on his hand guards, placed his warm-up jacket on his shoulders, turned his back to the competition apparatus, and concentration on the upcoming routine with his eyes closed. This ritual did not vary from event to event or from preliminaries to finals. (Salmela, 1976)

Systematic pre-competitive behaviors enhance performance by getting the athlete ready for the task at hand. The authors, working with two synchronized swimmers initially observed that their pre-competition protocol was not well thought out. For example, when one swimmer put on her nose clip, it irritated the other swimmer and triggered thoughts about non-task related matters. After helping them analyze, plan, and carry out with minute detail their pre-competition protocol, the authors observed that the swimmers had increased their focus on the task at hand. Similarly, Boutcher and Crews (1987) demonstrated that the use of a pre-shot concentration routine can improve putting performance of female golfers. Finally, if attention lapses, performers can use their personal idiosyncratic protocols to refocus their attention. The small procedural steps are the triggers for concentration on the task.

Assessing and Training the Brain through EEG

Our current understanding of the influence of attention and concentration on performance and how to train it has depended largely upon actual behavioral observations, interview data, case studies, and self-report of performers. Ways to directly measure the brain activity, using electroencephalography (EEG), may now be used to determine how we attend to information from the outside display and how we attend or process information internally (for a review see Wilson & Gunkleman,2000).

Early work finding on the relation ship between EEG and sport suggested that volleyball players who had good concentration during the stress of competition, as assessed by the coaches, had different EEG profiles than those who were not as able to concentrate

(Wilson, Ainsworth & Bird, 1984). Research by Landers group (Salazar et al, 1990, Crews and Landers ,1993) found EEG differences in several sports and attributed these differences to either arousal or attentional demands. One noteworthy study ( ) showed that when archers were trained to quiet a part of their mind through EEG training, their archery scores improved, and remained that way at a post-study test.

Rossi and Zani (1990) noted that EEG taken during actual performance, indicated different e brain functioned depending upn the athlete's sport activity. Fontani, Voglino and Girolami(1996) noted EEG differences in sports thought to represent different attentional demands (broad focus for-basketball had a different EEG pattern than that for a narrow-focus in swimming). Knottinen and Lyytenen (1992) used EEG to distinguish between arousal demands and attention demands in different types of shooting sports. They also noted that the task, the strategy, skill and experience all affected the brain processing. This degree of complexity of the brain suggests that EEG training will have to be individualized!

Researchers (Kerick,Iso-Ahola and Hatfield ,2000: Loze, Collins and Holmes,2001: Deeny et al, 2003) have continued to look at shooting performance and EEG assessment. In general results suggest that there is less cognition, that is, the shooter thinks less, if they are more highly skilled. Additionally, there is less thinking during good, versus poor, shots. To confirm our experience, once skilled, don't think, just do!

Sterman (1995) reports EEG changes were related to flight performance of pilots in laboratory and actual flying and was able to distinguish when pilots take 'micro-breaks' in the heat of the fighting action probably in order to regenerate. It is natural for someone to take a 'micro-break' but these are accomplished in a fraction of a second and the pilot (or athlete) knows when to take the break. One does not pay continuous attention for a two hour competition or even 5 minutes. We move in and out rapidly. Knowing when to not attend is as important as when and what to attend to in order to avoid fatigue.Specific EEG training may enhance performance. For example, Strack (2004) reports improvements in baseball players after performance enhancement training including EEG. Sime (2004) reports using EEG to assist team as well as individual university sport athletes to maximize their performance. Wilson and Thompson, (2003) use EEG feedback to assess and train professional tennis players and golfers to improve their ability to focus and to maintain the focus for longer time periods.

While elite musicians definitely showed that the learned changes from EEG training were accompanied by improvements in their actual music performance(Egner & Gruzelier, 2003). This improvement was above and beyond the typical imagery/relaxation/cognition training that was also provided. This research needs to be done with elite athletes using their performance in stressful competition as the criterion of success. Much remains to be done on what part of the brain should be trained, how long to train the brain and who would most benefit from the training.

While athletes report feeling different within a few sessions, it is believed that approximately 20 sessions are necessary to anchor the desired brain state. The cost of units, technical sophistication and proven programs are rapidly advancing and we are optimistic that 'attention trainers' will be take home items for athletes in the near future

just as heart rate monitors now are. We do caution that it is a complex skill that requires sophisticated equipment and a knowledgeable EEG trainer. Buyer Beware!

Summary and Conclusion

In summary, concentration is the ability to direct one's full attention to appropriate cues in the present task instead of being controlled by irrelevant external or internal stimuli. Most top athletes have developed their own mental strategies for doing this. These strategies are often perceived as a component of natural athletic ability. In fact, they are not totally innate; they are skills that athletes acquire through regular practice of attention control training. However, due to genetic makeup, early life experiences and different opportunities of training the mind, every athlete will have individual attentional strengths and weaknesses and the ability and time necessary to learn different attentional styles will vary among athletes. The consistent control over one's attentional focus before and during competition can be improved through practice, just as any difficult physical skill is learned.

The ability to control thoughts, arousal, and attentional focus appears to be the common denominator in the concentration of winning competitors. For example, an Olympic gold medal winner reported that her goal was to perform to the best of her ability. Specifically, she reported: "I went out to perform and not worry about my scores. In fact, it helped me more not to know my scores at all. That way I didn't have anything to worry about…I didn't care what anyone else was doing and I didn't want to know at all" (Botkin, 1984). She won by 0.050 of a point because she did not focus on winning. She was able to hold on to the present and to focus on her routine while the girl was who leading the competition all three days lost her composure and made major faults in her last routine.

Many other athletes also report that peak performances occurred when they eliminated all thoughts about winning and focused instead on the process--the task at hand. This type of mental control allows athletes to be in the present. They do not ruminate. To achieve consistency in performance, athletes need to develop and practice these mental skills in practice sessions and then practice them in competitive settings. For some, the performance becomes so automatic, they report becoming 'brain dead' and not remembers, just doing! Such a mental preparedness program should follow these steps to better concentration in order to achieve peak performance:

1. Learn personal strategies to attain optimal arousal for performance.
2. Learn to practice with a positive attitude and specified intention.
3. Learn and practice the attentional strategies that are necessary for skill and strategies in your particular sport.
4. Learn which attentional focus is best for you and how to switch focus.
5. Associate concentration with certain triggers such as cue words or feelings. Practice finding TIC's and making them TOC's.
6. Focus on the positive behaviors or outcomes.
7. Develop protocols or rituals to trigger concentration when you 'lose it'.

Study Questions

1. Describe the potential interaction between external and internal stimuli in distracting a performer.

2. Describe a technique for helping athletes experience and distinguish among Nideffer's four attentional styles.
3. Briefly describe and give one example each of how dress rehearsal, rehearsal of simulated competition, and mental rehearsal can be effective strategies to keep concentration.
4. How can attentional cues and triggers be used to either initially focus or retrigger concentration?
5. Provide an example of how the technique of "turning failure into success" might be used and a brief description of why the strategy might be effective.
6. Describe the three techniques that use electrodermal feedback to stay centered.
7. Briefly describe the four exercises under the section "increasing Focusing and Refocusing Skills."
8. Provide two examples of when and how developing performing protocols might be used to improve concentration.

References

Benagh, J. (1976). *Incredible Olympic feats*. New York: McGraw-Hill.

Bernardi, L., Sleight, P., Bandinelli, G., Cencetti, S., Fattorini,L., Wdowczyc-Szulc, J., & Lagi, A. (2001), Effect of rosary prayer and yoga mantras on autonomic cardiovascular rhythms: Comparative study. British Medical Journal. 323,1446-1449.

Botkin, M. (1994). Olympic gold makes topping oh so sweet. In *The 1984 Four Continents Rhythmic Sportive Gymnastics Championships Program*, pp. 4-5. Indianapolis, IN: USGF.

Boutcher, S. H., & Crews, D. J. (1987). The effect of a preshot attentional routine on a well-learned skill. International Journal of Sport Psychology *18*, 30-39.

Braunstein, M. (1991, October 21). *Interested in achieving peak performance?* Lecture/demonstration at San Francisco State University, San Francisco.

Burns, D. (1993). *Ten Days to Self Esteem*. New York: Wm Morrow.

Cox, R. H. (1994). Sport psychology: Concepts and applications. Dubuque, IA: Brown.

Crews, D.J. & Landers, D.M., (1993). Electroencephalographic measures of attentional patterns prior to the golf putt. Medicine and Science in Sport and Exercise. 25: 116-126.

Egner, T. & Gruzelier, J.H. (2003). Ecological validity of neurofeedback: modulation of slow wave EEG enhances musical performance. Neuroreport. 14,1221-4.

Evans, J.R. & Abarbanel, A. (1999). Quantitative EEG and Neurofeedback. New York: Academic Press.

Evert, C. (1988). Concentrated effort. *World Tennis*, *36* (3), 29-30.

Fontani, G., Voglino, N., & Girolami, L., (1996). EEG frequency variations during a test of ttention in athletes. International Journal of Sport Psychology, 17: 68-78.

Harmony, T. (1996). EEG delta activity: An indicator of attention to internal processing during performance of mental task. International Journal of Psychophysiology, 24, 161-171.

Harris, D. V., & Harris, B. L. (1984). The athlete's guide to sports psychology: Mental skills for physical people. New York: Leisure Press.

Konttinen, N., & Lyytinen, H., (1993). Brain slow waves preceding time-locked visuo-motor performance. Journal of Sports Sciences. 11:257-266.
Konttinen, N., Lyytinen, H., & Konttinen, R., (1993). Brain slow potentials reflecting successful shooting performance. Research Quarterly for Exercise & Sport. 66:64-72.
Landers, D. M., Boutcher, S. H., & Wang, M. Q. (1986). A psychological study of archery performance. Research Quarterly for Exercise and Sport, *57*, 236-244.
Landers, D.M., Petruzzello, S.J., Salazar, W., Crews, D.L., Kubitz, K.A., Grannon, T.L., & Han, M. (1991). The influence of electrocortical biofeedback on performance in pre-elite archers. Medicine and Science in Sports and Exercise, 23, 123-129.
Latash,M. & Jaric,S. (1998). Instruction-dependent muscle activation patterns within a two-joint synergy: Separating mechanics from neurophysiology. Journal of Motor Behaviour. 30, 194-198.
Lubar, J. F. (1995). Neurofeedback for the management of attention-deficit/hyperactivity disorders. In M. S. Schwartz (Ed.), *Biofeedback: A practitioner's guide* (2nd ed., pp. 493-522).
Nideffer, R. M. (1981). *The ethics and practice of applied sport psychology*. Ithaca, NY: Movement Publications.
Nideffer, R. M. (1987). Psychological preparation of the highly competitive athlete. The Physician and Sports Medicine, 15 (10), 85-92
Orlick, T., & Partington, J. (1988). Mental links to excellence. The Sport Psychologist, 2, 105-130.
Peper, E. (1990). Breathing For Health. Montreal: Thought Technology Ltd.
Peper, E. and Gibney, K.H. (2003). A Teaching Strategy for Successful Hand Warming. Somatics. XIV (1), 26-30.
Peper, E., Gibney, K.H. & Holt. C. (2002). *Make Health Happen: Training Yourself to Create Wellness.* Dubuque, IA: Kendall-Hunt.
Peper, E. & Schmid, A.B. (1993-1994). The use of electrodermal biofeedback for peak performance training. Somatics, 4 (3), 16-18.
Perkins-Ceccato, N., Passmore, S., & Lee, T. (2003). Effects of focus of attention depdnd on golfers' skill. Journal of Sports Sciences, 21, 593-600.
Rossi, B., & Zani, A. (1986). Differences in hemispheric functional asymmetry between athletes and non-athletes: Evidence from a unilateral tactile matching task. Perceptual and Motor Skills, 62, 295-300.
Salmela, J.H. (1976). *Competitive behaviors of Olympic gymnasts*. Springfield, IL: Thomas.
Salazar, W., Landers, D.M., Petruzzellow, S.J., Han, M., Crews, D.L., & Kubitz, K.A. (1990). Hemispheric asymmetry, cardiac response and performance in elite archers. Research Quarterly for Exercise and Sport, 61, 351-359.
Schmid, A.B. (1982). Coach's reaction to Dr. A.B. Frederick's coaching strategies based upon tension research. In L.D. Zaichkowsky & W.E. Sime (Eds.), Stress management for sport (pp.95-100). Reston, VA: AAHPERD.
Schmid, A.B., & Peper, E. (1982). Mental preparation for optimal performance in rhythmic gymnastics. Paper presented at the Western Society for Physical Education of College Women Conference, Asilomar, CA.

Singer, R., Lidor, R. & Cauraugh,J. (1993)To be aware or not aware? What to think about while learning and performing a motor skill. Sport Psychologist, 7, 19-30.
Song, H & Lehrer, P. (2003). The effects of specific respiratory rates on heart rate and heart rate variability. Applied Psychophysiology and Biofeedback, 28, 13-23:
Sterman, M.B. (1995). Concepts and applications of EEG analysis in aviation performance evaluation. Biological Psychology, 40 (1-2), 115-130.
Sterman, M.B., Mann, C.A., Kaiser, D.A., & Suyenobu, B.Y., (1994). Multiband topographic EEG analysis of a simulated visuomotor aviation task. International Journal of Psychophysiology. 16: 49-56.
Suinn, R.M. (1980). Body thinking: Psychology of Olympic champs. In R.M. Suinn (Ed.), *Psychology in sports: Methods and applications*. Minneapolis, MN: Burgess.
Theodorakis, Y., Laparidis, K., & Kioumourtzoglou, E. (1998). Combined effects of goal setting and pefromance feedback on performance and physiological response on a maximum effort task. Perceptual and Motor Skills. 86, 1035-1041.
Unestahl, L.E. (1983). *Inner mental training*. Orebro, Sweden: Veje.
Walsh, M., & Spelman, F. (1983, June 13). Unvarnished symphonies. *Time*. P. 75.
Wilson, V.E., Ainsworth, M. & Bird, E.I. (1985). Assessment of attentional abilities in male athletes. International Journal of Sport Psychology. 16, 296-306.
Wilson, V.E. & Cummings, M.S. (2002). *Owners Manual of How to Control Your Mind and Body*. Toronto: YSAM.
Wilson, V.E. & Gunkleman, J. (2000) Practical applications of psychophysiology and neurotherapy in sport. Journal of Neurotherapy. 12,14-21.
Wilson, V.E & Thompson, M. (2003). The integration of biofeedback and neurofeedback in the assessment and training of high performing executives and athletes: Update. Proceedings of the Association for Applied Psychophysiology and Biofeedback, Annual meeting in Jacksonville, Fl. March
Ziegler, S.G. (1994). The effects of attentional shift training on the execution of soccer skills: A preliminary investigation. Journal of Applied Behavioral Analysis, 27, 545-552.