

Speed Wins Volleyball Matches

By James E. Robertson

While advanced volleyball players are superior to average players in a variety of areas, speed is truly a separating factor. However, I am not referring to foot speed alone. Rather, I am talking about how fast and in-sync a player's mental and sensory processing functions regulate his/her physical (motor) performance. In essence, this article is about the speed and synchronicity of the sensory balance/motor coordination process. [Sensory balancing is explained more precisely further along in the article].

The speed and accuracy of any volleyball move (as in attacking) is equivalent to sensory processing speed and accuracy. The more efficiently and precisely a player takes information in, integrates it and passes along instructions to the motor system, the slower the pace of the game appears to them. This distortion of time is a primary element in defining what is commonly referred to as playing in the "zone of peak performance."

Sensory balancing/motor coordination is required for effective concentration and cognition (thinking), as well as motor output. Players who are even slightly out-of-sync can experience imbalances leading to on-court problems such as:

- Less efficient fine motor movement (eye-hand coordination in attacking)
- Less efficient gross motor skills (lower body movement)
- Delays in adjusting movements (reaction time)
- Lapses in maintaining balance through motion
- Distortion to awareness
- Shorter attention spans (concentration)
- Less able to "read" court situations accurately and quickly, or to pick up appropriate cues from the surroundings

Success and Failure as Measured in Milliseconds

Unfortunately, it does not take much of a variation in a player's sensory balance system for on-court play to be out-of-sync. If you think of volleyball as a game of seconds, think again; it's a game of milliseconds. The difference between making and missing a block can be measured in milliseconds, not seconds, as is true with most other volleyball moves.

Until recently, we did not have effective technology for assessing and re-balancing a player's sensory processing to match the precise requirements of volleyball. With the advent of technology such as that found in the Interactive Metronome™, we can locate and re-train many sport-related sensory balance/motor coordination problems. As a case in point, you can tell from Table 1 (provided by Interactive Metronome™) that an athlete's response timing does not have to be very far off to drop him/her from one performance level down to the next.

Table 1: Millisecond deviations in performance:

Disassociative	200 ms. +
Severe Deficiency	147-199 ms.
Below Average	70-146 ms.
Average	41-69 ms.
Above Average	30-40 ms.
Exceptional	23-29 ms.
Superior	Below 22 ms.

The Interactive Metronome™ measures variations in motor response time from a reference tone. Players receive visual, vestibular, proprioceptive input and tactile input throughout a 12-part assessment and development sequence. (Source: Interactive Metronome™.)

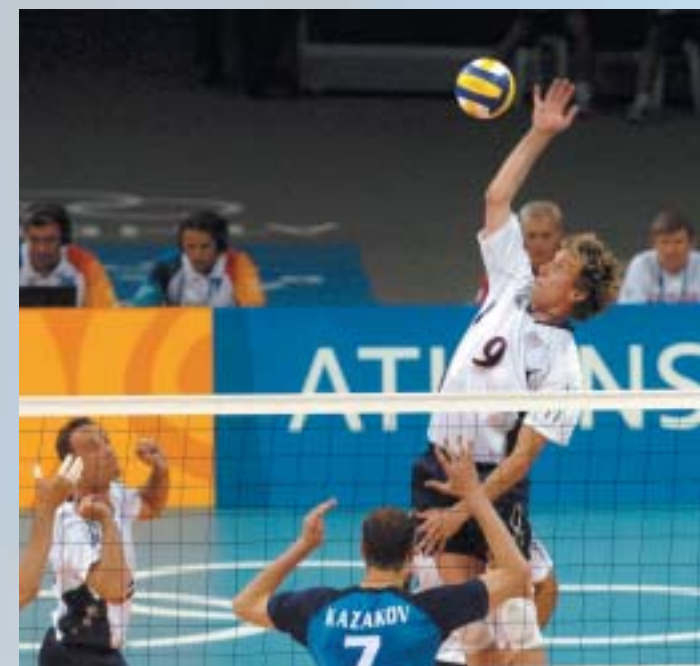
It may surprise you, but every athlete assessed to date with the Interactive Metronome™ at The Performance Lab (including college and professional athletes) has been average or worse in one or more of the motor tasks used to test sensory balance/motor coordination and concentration. (The Performance Lab in Springfield, Mo., has standardized a 12-session performance enhancement program centered on sensory balancing, cognition, volleyball-specific performance techniques and routines.)

While an athlete may only be out of sync with his/her right hip, that imbalance creates compensating moves in other parts of the body. All compensations break down eventually, especially under fatigue and competitive stress.

Sensory Processing as a Critical Performance Factor

In 83 percent of the players assessed by The Lab, one of the most frequent weaknesses has been their inability to inhibit (hold a movement until the ideal release time) to the millisecond level required for top performance. The typical athlete is too early in his/her movements, while the typical non-athlete is too late. In critical situations, an athlete's performance routine is frequently one of *Fire-Ready-Aim* versus a preferred *Ready-Aim-Fire* sequence. Again, I am referring to holding or gathering motor performance at the millisecond level. Pre-and post-assessment results following a 12-session timing development sequence incorporating the Interactive Metronome™ helped all athletes re-balance and correct this sequence. (Upon completing the 12-part development sequence, one of the junior college All-Americans had been reduced to 9.8 ms. for eye-hand coordination. She was at 49 when she started the training.)

During this same pre-assessment, 98 percent of the players could only concentrate on a specific motor movement for 1 to



2 seconds during a 54-second task before being distracted. The complete sensory processing cycle for an activity such as serving can take up to 8 seconds, thus creating a mental gap of 6 to 7 seconds during the execution of each serve. The root cause of many performance problems occurs within that 6- to 7-second void. Athletes successfully completing a 12-session training sequence were able to extend their attention spans by approximately 1/2 to 1 second during each 1-hour training block. An attention span goal of 12 seconds was reached by a majority of the athletes.

Players with even slight sensory imbalances are:

- less proficient in the use of cognitive skills (mental on-court skills), including attention;
- more easily distracted;
- often attend to incorrect and irrelevant performance cues; and
- display slower decision-making.

These players also showed signs of struggling with creativity and anticipation, which are among the hallmarks of advanced players.

Where—And How—Are These Imbalances Occurring in Players?

In defining and correcting performance problems, it helps to understand the interconnection between a player's mental (brain), physical (body) and nervous (central nervous system) systems. It also helps to understand that success and failure are determined in large measure by input from three of the

most important sensory subsystems for sport performance: visual, vestibular and proprioceptive. For the purpose of this article, the entire area will be discussed under the heading of sensory balancing/motor coordination or sensory balancing for short.

Terms Related to Volleyball

Terms a coach may not be comfortable with as they relate to volleyball include:

Attention: One might be familiar with the term attention, but perhaps not in the context of defining it as the voluntary control of focusing on specific forms of sensory input and output. For the purposes of this article, the words attention and concentration are interchangeable.

Cognition: The process of thinking. Cognitive skills include critical performance capacities such as awareness, attention, perception, memory, imagination and creativity, and problem solving.

Neuroplasticity: The ability of the human brain to change and grow throughout life, particularly as required for sensory re-balancing and motor coordination.

Proprioception: Includes sensations resulting from the movement of body parts through time and space. This sensory input system is critical to motor (athletic) performance because it is the awareness of movement that formulates the motor memories (blueprints) required of learned yet pre-conscious movement.

Sensory Balance/Motor Coordination: The process of receiving and organizing sensory input from internal and external environments and producing appropriate motor responses, i.e., reading the court and making the best move possible under current conditions. For illustrative purposes, sensory balancing is described as a multi-staged process of: awareness, attention, interpretation, response organization, response execution and feedback processing. (Because sensory integration and sensory integration dysfunction are specific medical terms with prescribed interventions, and because of the adaptations made for sport training, the term sensory balance/motor coordination is used to describe the Lab's particular training sequence.)

Vestibular: That part of the inner ear system responsible for registering the movement of the head in relation to gravity. This system is responsible for helping players maintain a sense of balance and equilibrium through motion.

It is important to understand the central nervous system and motor response process involved in any volleyball move. This process is referred to as sensory balancing/motor coordination.