Ramp Up Reaction Skills
By Peter Twist

Observe your favorite team sport and notice that the best athletes are always in the right place at the perfect time to shut down the game breaking play, contain the opposition or be wide open for a goal scoring pass. Ever wondered how hard it is to hit a home run off a 100 mph fast ball or return a blistering serve in tennis? The best athletes make these accomplishments look easy, but they are far from simple tasks. Reaction is a critical factor in big league performance and interestingly enough, every athlete – young or old, elite or recreational, needs improved reaction time to reduce the incidence of injury and to succeed in sports and real life.

Neuromuscular Communication Pathways
As athletes we take complex, dynamic movement for granted and when we see elite athletes perform explosive, dynamic and innovative skills with ease, we fail to acknowledge the depth and the sum of the intricate communication pathways that are happening within the human machine.

The brain is the command center for reaction skill using constant filtering and information processing functions to differentiate vital neuromuscular information from the pool of neural communication messages. Consider the amount of information that would flow through your mind if you were at the plate facing a major league pitcher, puck handling through traffic on a pro team or racing down a mountainside on your bike. Athletes train focus, concentration, visual memory, selective attention and information processing speed to prioritize and manage the neural messages that constantly bombard the brain. Within the brain, the cognitive systems (attention, memory, intelligence) sort the incoming information for vital messages and then activates the musculoskeletal system to engage.

The motor system action is the result of muscle response synergies when the brain commands specific muscle groups to work together to create a common coordinated movement (jumping, running, throwing, catching). The more frequently a motor pattern is recalled and executed the faster and more refined the command - motor response time becomes due to neuromuscular activation where neurons are stimulated to fire faster and connectivity is improved.

The sensory systems (vision, somatosensory and vestibular) provide the athlete with information about the external environment and the internal changes that occur within the athlete when movement occurs. The sensory system

communicates information about movement, position in space, vibration, touch, pain, relationship of body segments, movement of joints along with spatial awareness. The sensory system anticipates changes in the environment and responds with information regarding adjustments. Certain corrective mechanisms are reflexive or automatic and occur without any communication to the cognitive brain, where other information must be received and filtered by the brain to create a refined motor pattern command. This continuous communication system between the sensory and motor systems is commonly referred to as the perception – action cycle.

When a new skill is attempted or a new situation evolves, the brain (cognitive system) must filter the information before a motor command is activated. This new skill or situation creates a great deal of information for the brain to filter causing a backlog of messaging to be processed. The more an athlete has to "think" through the movement or the response, the slower the reaction time between perception to action. When skills are well rehearsed, the brain recognizes the common messages / motor patterns, experiences less information to process and has a well rehearsed motor response prepared resulting in a fast and accurate response. The result is Smart Muscle™ with effortless skill execution because the muscles easily comply with the mind's commands.

Exposure to complex training tools, exercises, situations and skills in a controlled training environment overloads the perception – action cycle, floods the neuromuscular pathways with information and forces the athlete to solve the exercise puzzle and execute or fail. Failure in training teaches the mind – muscle network to refine all aspects of the communication systems to gain success on the next attempt. Perfect practice, where a skill or drill is done with precision and sport required speed and power leads to perfect performance in a game situation. The result is exceptional reaction skills.

External vs Internal Reaction Skills

To develop all aspects of the perception – action cycle, the athlete is exposed to skills and drills that improve both internal and external reactivity. Internal reactivity is the ability of the neuromuscular system to recognize and react to an unpredictable stimulus or an unstable environment yet continue to produce the desired quickness or powerful response. Exercises or drills that are complex and exposure to unstable surfaces flood the neuromuscular system with internal messaging and challenge the athlete to filter the vital information to successfully execute the required motor patterns with precision, speed and power. External reactivity is the ability to react to the unpredictability of opponents, a variety of

game situations and tactical requirements in a sport situation. Exercises, skills and drills must be performed with the integration of decision making layered on top of neuromuscular information processing. The best athletes read the opponent or the play and react quickly with the exact defensive or evasive tactic to stand apart. Both aspects of reactivity are neuro-physical skills that can be enhanced within the training environment.

Training Considerations

To develop Smart Muscle™ and improve Reaction Skill, athletes are challenged using these concepts:

1. **Unstable Surfaces** – challenging balance using an unstable surface creates sensory overload to the visual system (eyes sense location in space), somatosensory system (joint receptors sense spatial location, movement and position of body segments) and the vestibular system (body awareness) forcing the athlete to execute a well rehearsed motor pattern in an unpredictable situation.
2. **Drill Complexity** – increasing the complexity of a drill can be accomplished by foot patterns, linking motor patterns, sequential firing patterns, multi directional movements, multi joint movement, tempo changes, and power production as some common examples. More complex drills increase information to be processed and increase the volume, speed and type of messages that must be communicated to execute the skill with proficiency.
3. **Unpredictable Tools** – when an athlete is required to execute a skill, drill or exercise in unpredictable circumstances, reaction is initially delayed until a well refined response is created. Tools like a SlingShot or Smart Toner provide variable resistance or a Fit Ball / Smart Med Ball catch / throw with a complex exercise also increases the neuromuscular demands.
4. **Coaches Cues** – exercise execution is made more complex when an athlete must respond to a coaches cue (visual or auditory) for a fast direction or pattern change. Decision making is layered on top of neuromuscular demand.
5. **Partner Shadow Drills** – to create a game like situation, partner drills are included where 1 partner leads the drill and the other must shadow or follow their movement pattern, range, intensity or speed. These drills are fun and competitive and teach decision making where competition takes over the outcome.

Challenge Reaction Skills

Smart Muscle Board Squat to Overhead Smart Toner Press
Training Concepts Applied: unstable surface + exercise complexity

Set up: Begin in low athletic position, balance with Smart Muscle Board off the floor, Smart Toner handles at shoulder height.

Execution: Lower into a balanced squat position (triple flexion of hip, knee, ankle) maintaining tension on the Smart Toner, pause then use triple extension of the lower body (hips, knees, ankles) sequentially with triple extension of the upper body (shoulders, elbows, hands) to press the Smart Toner overhead. Cue the athlete to maintain body control and balance of the Smart Muscle Board at all times. Repeat x12

SlingShot Lateral Bound
Training Concepts Applied: unpredictable tool + exercise complexity

Set Up: Begin in low athletic position, balanced on 1 leg with tension on the SlingShot buckled around the waist. (note the positive angle – lean in toward the direction of the bound)

Execution: With the arms leading the legs across the body, triple extend with ankles, knees, hips to bound onto the other leg. Absorb the landing using triple flexion (ankle, knee, hip) and stick the single leg land. Cue the athlete to maintain body control and balance as they react to the unpredictable tension of the SlingShot.

Flat Rung Agility Ladder Forward Shuffle with Smart Med Ball Catch / Throw

Training Concepts Applied: unpredictable tool + exercise complexity + coaches cue

Set Up: Begin at the end of the ladder in ready position on the Left foot, outside to the left of the first rung.

Execution: Step inside the 1st rung on the Right foot, step inside the 1st rung on the Left foot, step outside the 1st rung on the Right foot. Step up into the 2nd rung on the Left foot, quickly followed by the Right foot into the 2nd rung, then step outside the 2nd rung on the Left foot (into the 3rd rung – same pattern – in, in, out, step up next rung). During the execution of the foot pattern the coach throws the Smart Med Ball to the athlete at unpredictable times. The athlete catches and throws the Smart Med Ball back without breaking the foot pattern. Repeat 6x

Micro Hurdle Partner Shadow 2 in 1 out

Training Concepts Applied: exercise complexity + partner shadow

Set Up: Set up 2 micro hurdles approximately 1.5 to 2 feet apart. Partners face each other. Begin outside the hurdles. Athlete A is offence, Athlete B is defense.

Execution: Athlete A leads the drill, Athlete B shadows the movement of Athlete A. Athlete A quickly steps over the 1st hurdle on the Left foot, followed by the Right foot before quickly stepping over the 2nd hurdle onto the Left foot using a 2 steps in, 1 step out sequence. Using a fast transition, Athlete A quickly repeats the In In Out pattern in the other direction while Athlete B attempts to mimic the pattern. Athlete A can modify their tempo (fast, medium or slow) to challenge Athlete B to read and react quickly. This is a fun and competitive drill.

Competition + Play = Hard Work + Fun

Athletes of all ages love to work hard, compete and have fun. Once the foundational movements have been taught (movement, strength, balance sequences), these reaction skills concepts can be layered on to exercise / drill execution to increase the level of athlete challenge, but also inspire play – with a purpose.