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Effects of Implicit vs. Explicit Cueing on Dynamic Balance and Injury: A Grant Proposal

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Questions
1. Does training with implicit or explicit cueing promote greater improvement in motor learning, as demonstrated by improvement on a validated dynamic balance test?
2. Does type of cueing impact injury rates over the course of a basketball season?

Methods

Experimental Groups: Inclusion/exclusion criteria:
- Groups based on type of training cues: Implicit (IMP) vs. explicit (EXP)
- Design: repeated measures; Y balance test dependent variables
- Dependent variables: composite score (MDC=3.0 cm) and composite score R/L difference (±4.0 cm)

Balance Training Protocol: all subjects train using implicit or explicit cues
- As a variation on three exercises (see below), dosage = 4 x weeks for 3 weeks

In-Season Post Test:
- IMP: based on the Y balance test; exercise will be due to motor learning; a three week training period is sufficient for neural enhancement without gain due to muscular hypertrophy

Significance
- We want to demonstrate an optimal method of cueing to be implemented during training in order to improve performance of dynamic balance with the intention of preventing lower extremity injuries of high school basketball athletes.
- According to the National Federation of State High School Associations, a combined total of 974,398 students participated in the 2013-2014 basketball season.
- A growing body of evidence supports the use of valid tests such the Y Balance in order to identify athletes who are at high risk for lower extremity injuries.
- It is imperative for coaches, trainers and clinicians to implement the most evidence-based, relevant-based protocols for improving the at-risk athlete’s overall fitness in order to prevent injury once identified.
- It is important to have an efficient, methodical approach that is governed by scientific evidence not only to prevent injury but also to decrease money spent on healthcare costs associated with those injuries.

Limitations
- In some situations an internal focus may have a positive impact on performance: novice performers of a complex task (Duke et al., 2011)
- Skill level of performer may have an impact on ceiling and floor effect (Bellisio et al. 2002)
- Lack of research into MDC and meaningful change in Y balance test composite score

References

Study Design

Sample Size: N=200
- 3 week training period & Y balance post test
- Basketball Season: Injury Tracking
- EXP N=100
- IMP N=100

Experimental: Standing on a dynamic or BOSU ball and playing catch (focus on catching the ball); 3x15 catches
- Exercise Two: Single leg runner position in a 24"x24" square 3x20 seconds
- Exercise One: Standing on a dynamic or BOSU ball and playing catch (focus on catching the ball); 3x15 catches

Control: Standing in single leg runner’s Position on a poolmell training pool (24") 3x20 seconds

Verbal Cues for EXP:
- 1) “Pinch your shoulder blades back”
- 2) Don’t arch or round your low back
- 3) Don’t let you hip drop, keep your photos tight

Instructions that are implicitly embedded in task constraints, task goals, and self-assessment of environment

Reduction of the amount of explicit task-relevant knowledge may help performance (Masters, 2000; Masters & Maxwell, 2004)

Are explicit/conscious components of movement transferable to activities where the component is implicit? (e.g. lumbarn stabilization exercises)

Therefore should we choose implicit strategies with patients?

Y Balance Test: a modification of the star excursion balance test; inter-rater test-retest reliability of .8 .85 and a intra-rater test-retest reliability of .85-.9 (Shaffer et al. 2013; MDC=2.91 cm, 5D of composite measure= 3.5 cm, and the 90% confidence interval= 1.05 cm)

Balancing Post Test:
- IMP vs. EXP
- 3 week training period & Y balance post test
- Y balance post test
- Basketball Season: Injury Tracking
- EXP N=100
- IMP N=100

Background

Explicit knowledge: is rule-based, available to conscious attention, and verbalizable (Reber 1999)

Implicit Knowledge:
- Is not, part of conscious attention, and not verbalizable (Reber 1999)

Implicit Motor Learning:
- The relatively passive accumulation of task-relevant knowledge that is normally processed at an unconscious level and cannot be easily verbalized (Maxwell 2008)
- Movement as emergent and self-organizing (Bernstein, 1967)
- Task specificity and training
- Focus vs. subsidiary levels of awareness: “focus awareness depends upon the tacit integration of subsidiaries to produce a focal whole” (Gulick, 2007; focus is always explicitly identifiable; the two are mutually exclusive (see image below)
- “...the more distal the focus of attention, the more accurate the motor control” (musicians; Duke et al., 2011)
- KP vs. KR
- Instructions that are implicitly embedded in task constraints, task goals, and self-assessment of environment
- Reducing the amount of explicit task-relevant knowledge may help performance (Masters, 2000; Masters & Maxwell, 2004)
- Are explicit/conscious components of movement transferable to activities where the component is implicit? (e.g. lumbarn stabilization exercises)