



# 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?

✓ Motor learning is measured indirectly through behavior

- Improvement in dynamic balance will be quantified by the **Y balance test**. Rationale: (a) previously validated; (b) commonly used in clinic; (c) can be implemented with different cues.

✓ Injury Rates

- Lower extremity injury rates will be tracked with the **Athletic Healthcare System Daily Injury Report (DIR)** during a basketball season

## Background

### Explicit knowledge:

is rule-based, available to conscious attention, and verbalizable (Reber 1993)

### Implicit Knowledge:

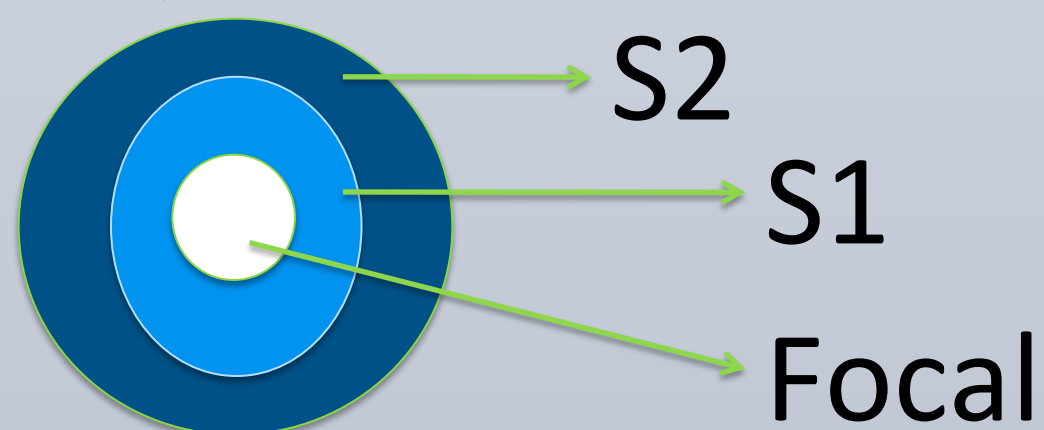
is abstract, not part of conscious attention, and not verbalizable (Reber 1993)

### 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
- focal vs. subsidiary levels of awareness: "focal awareness depends upon the tacit integration of subsidiaries to produce a focal whole" (Gulick, 2007); focal 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/tacit? (i.e. lumbar stabilization exercises)
- 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 an intra-rater test-retest reliability of .85-.93 (Shaffer et. al. 2013); MDC<sub>95</sub> = 2.91 cm, SD of composite measure = 3.5 cm, and the SEM = 1.05 cm



## Methods



**Experimental Groups:** inclusion/exclusion criteria;  
2 groups based upon 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 exercise (see below); dosage = 4x/week for 3 weeks  
**Assumption:** improvements in the Y balance test will be due to motor learning; a three week training period is sufficient for neural enhancement without gains due to muscle hypertrophy

## IMP

**Exercise One:**  
Standing in single leg runner's Position on a pommel training pod (24") 3x20 seconds

**Exercise Two:**  
Standing on dynadisc or BOSU ball and playing catch (focus on catching the ball); 3x15 catches

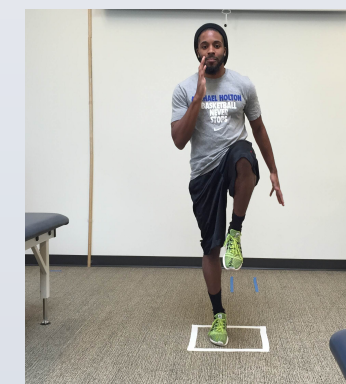
**Exercise Three:**  
Runner touch with band creating valgus force at the knee; 3x10 each leg

## EXP

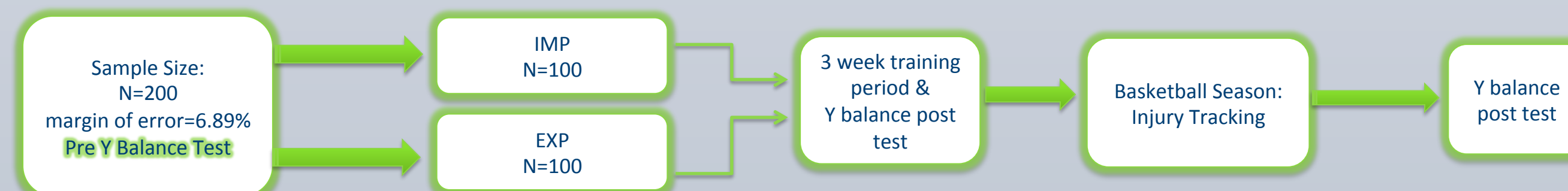
**Exercise One:**  
Single leg runner position in a 24x24" square 3x20 seconds

**Exercise Two:**  
Standing on a dyna disc or BOSU ball and playing catch (focus on maintaining balance) 3x15 sec

**Exercise Three:**  
Runner touch 3x10 each leg



## Study Design



## 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 as 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 relevant, evidence-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 (Beilock et. Al. 2002)
- Lack of research into MDC and meaningful change in Y balance test composite score

## References

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