BACKGROUND AND PURPOSE

- Environmental stimuli must be processed by the central nervous system (CNS) to initiate appropriate responses
- Reaction time (RT) may be important for both avoidance of sport-related injury and optimum sport performance
- Prolonged RT has been associated with non-contact anterior cruciate ligament injury
  
- A baseball bat has approximately 200 ms to react to a ball as it leaves a pitcher's hand
- Simple RT (i.e., visual-motor response) occurs faster than Choice RT (i.e., requires neuromuscular processing)
- Neurocognitive RT is associated with the amount of blood flow reaching the brain
- Muscle tension in the sub-occipital region decreases blood flow within the vertebral arteries
- Manual therapy (MT) has been advocated for treatment of conditions involving CNS dysfunction
- Application of pressure and/or tissue mobilization, with or without MT tool
- The purpose of this research was to determine whether or not MT focused on trigger points in sub-occipital muscles accelerates Simple "visual-motor" RT or Choice "neurocognitive" RT

PARTICIPANTS AND PROCEDURES

- Participants were 54 college students (22.6 ± 1.8 years of age; 39 females; 15 males
- Exclusion criteria: Conclusions within 6 months; cardiovascular strain symptoms; history of migraine headaches
- Random assignment: Control group n=27 (15 females; 12 males); Experimental group n=27 (24 females; 3 males)
- Repeated measures experimental design (analysis of Group X Trial interaction effect; alpha = .05)
- No Simple RT difference: MT procedure performed for calculation of Simple RT - 2 trials (Fig. 1-A-C)
- 10 measurements recorded (thumb/index finger position on drop-stick scale to nearest 0.5 cm)
- First 2 drops considered practice: drops 3-10 used to calculate 8-drop average
  
- Simple RT calculation: $RT = \frac{1000}{12[(\text{Average Drop Distance})]}$
  
- Experimental group: MT procedure (AquaFlora® 7.0, Magister Corp., Chattanooga, TN); 10 min (Fig. 2 A-D)
- Mechanical stimuli applied to thoracic and lumbar erector spinae: rolling (Fig. 2A & 2B) and stripping (Fig. 2C)
- Concentrated mechanical stimuli applied to trigger points from occiput to superior margin of scapulae (Fig. 2D)
  
- Direct pressure over trigger points: 12-excm hold; distal progression in 1/4-inch increments
  
- Procedure repeated along linear path that was 1/4-inch lateral to initial progression
- Control group participants rested for 10-min period (approximate duration of MT administration)
- Global Rating of Change (GRC) survey instrument administered to participants who received MT treatment

RESULTS

- Choice RT Group X Trial interaction (F_{(2,54)}=5.208; p=.027), Experimental group significantly improved (Fig.3)
  
- Experimental group demonstrated slower response than Control group for Trial 1
  
- Control group demonstrated relatively little change from Trial 1 to Trial 2
  
- Experimental group improvement produced comparable performance between groups for Trial 2
  
- No Simple RT Group X Trial interaction evident (F_{(2,50)}=1.90; p=.660) comparable change for both groups (Fig. 4)

- Significant main effect for Trials (F_{(2,50)}=9.052; p<.004); faster response for Trial 2 evident for both groups

- No significant main effect for Group membership (F_{(1,49)}=2.27; p=.131)

- Group and gender means standard deviations for Simple RT and Choice RT presented in Tables 1 and 2

- No gender difference apparent for either Simple RT (F_{(1,50)}=0.739; p=.394) or Choice RT (F_{(1,50)}=5.13; p=.027)

CLINICAL RELEVANCE

- MT appears to provide a beneficial effect that increases Choice RT, but no effect on Simple RT was apparent
  
- Cognitive processing may be enhanced by improved blood flow attributable to the MT technique
  
- Lack of Experimental Group improvement in Simple RT probably due to differing nature of test demands
  
- Simple RT only involves visual recognition of drop-stick movement and motor response
  
- Significant RT improvement from Trial 1 to Trial 2 suggest a substantial learning effect on task performance
  
- Participants in Experimental Group demonstrated slower Trial 1 performance for both Simple RT and Choice RT
  
- MT therapeutic effect on Choice RT seems likely, despite lack of Trial 1 equivalence between groups
  
- Conceivably, administration of MT focused on sub-occipital muscles may have a short-term beneficial effect on Choice RT that could improve sport-related performance capabilities and facilitate injury avoidance

REFERENCES