EFFECT OF KNEE FLEXION ANGLE ON NEUROMUSCULAR RESPONSES TO WHOLE-BODY VIBRATION

Short duration exposure to Whole-Body Vibration (WBV) during standing elicits acute increases in power and force of leg extensor muscles, possibly due to spindle modulated reflex contractions. A related research study in our laboratory demonstrated increased leg muscle EMGrms during two different modes of WBV. Changes in muscle length and damping characteristics of the body during varying degrees of knee flexion may affect neuromuscular responses to WBV. **PURPOSE:** To determine whether changes in knee flexion angle (KA) and vibration modality (M) affect neuromuscular responses of leg muscles during short periods of WBV. **METHODS:** Surface EMG was recorded from the tibialis anterior (TA), gastrocnemius (GS), biceps femoris (BF), and vastus lateralis (VL) of the right leg of ten male and six female subjects. Two different modalities of vibration were used: vertical vibration (VV) and rotational vibration (RV) using two separate platforms. Both platforms vibrated at 30Hz with 4mm amplitude at subjects' feet. During WBV, subjects performed dynamic squats from 10^o to 40^o (0^o=upright), each lasting 10 seconds. KA was recorded at 400Hz using a motion capture system. Baseline trials were performed prior to every WBV trial, all conditions were performed twice, and the order in which platforms were used was balanced over the 16 subjects. A bandstop filter removed motion artifact and line interference from EMG data between 25-35Hz and 55-65Hz, respectively. Root mean square EMG (EMGrms) was calculated over each 5^o of knee flexion for each trial. For each muscle, interactions between WBV, M, and KA were compared using Repeated Measures ANOVA. Significant WBV x M x KA interactions were followed-up by separate WBV x KA ANOVAs for each modality. **RESULTS:** During VV but not RV, significant (p<.05) VB x KA interactions were observed in VL (d=.374), GS (d=.186), and TA (d=.353). **CONCLUSION:** RV and VV elicit similar significant levels of EMGrms enhancement at small KA. However, while RV is more effective in enhancing EMGrms as KA increases, responses to VV diminish as KA is increased. **PRACTICAL APPLICATION:** RV is more effective than VV at enhancing muscle activation over the full range of a squat and provides maximum enhancement during deep squats. Responses to lower-body strength training may be enhanced by WBV, possibly through the mechanism of increased motoneuron activation.

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