THE INTERACTION OF EXERCISE VIBRATION TRANSMISSIBILITY AND BODY COMPOSITION AND ITS EFFECTS ON PERFORMANCE

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Introduction: In recent research, authors have highlighted the variability in the vibration exercise protocols used by investigators [1, 2, 5, 6]. This variability, which could affect damping, resonant frequency and transmissibility, might be related to the vibration waveform characteristics, intra-subject (orientation, position, and posture) and inter-subject factors (size, age, gender and body dynamics) [3,4]. Theoretically, different materials have different resonant frequencies that affect vibration transmissibility. Because the human body is composed of various tissues of different resonant frequencies (bone, muscles and fat), it is likely that body composition affects vibration transmissibility. It is then necessary to investigate the effects of body composition on exercise vibration transmissibility.

Aim: The aim is to improve the efficacy of vibration training by matching frequency and amplitude of vibration to the physical characteristics of individuals. Therefore, the purpose of this study is to investigate whether leg composition interacts with vibration transmissibility by examining its effect on performance.

Methods: Twenty male subjects will perform 1 control testing session and 4 vibration sessions. In the control session, subjects will complete a muscle stiffness test, leg skinfolds, 1-Repetition Maximum measurement on the leg press machine, and leg press repetitions to exhaustion at 70% of their 1-RM. Each vibration session will expose subjects to a frequency-amplitude vibration combination for 20 minutes (30 sec of vib. exposure alternating with 30 sec of rest) on the PowerPlate (Table 1). Subjects will complete leg press repetitions to exhaustion at 70% of their 1-RM after each vibration session. EMG will record during performance measurements while accelerometers record vibration transmissibility during vibration exposure.

Expected Results: We hypothesize that 1) individuals with higher leg fat content will require higher vibration frequency and amplitude to achieve better performance than those with less leg fat; 2) those with greater muscle stiffness will require higher vibration frequency and amplitude to achieve better performance than those with lower muscle stiffness; and 3) different leg fat contents and different levels of muscle stiffness will both demonstrate variations in vibration transmissibility.

References:

**Table 1 Vibration Parameter (Frequency-Amplitude) Combinations**

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>Exposure A</th>
<th>Exposure B</th>
<th>Exposure C</th>
<th>Exposure D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Amplitude (high/low)</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>