INTRODUCTION

Vibration is an oscillatory motion that has been applied to muscle contractions at various frequencies and amplitudes to facilitate muscular strength characteristics. Research has shown 30% improvements in dynamic explosive muscle strength (Issurin & Tenenbaum, 1999; Warman & Humphries, 2002), 10% improvements in isotonic muscle power (Bosco et al., 1999), 10% increases in isometric torque and 50% changes in electromyographic amplitude (Gabriel et al., 2002). In addition, early research on muscle strength has reported vibration generates high motor unit firing rates seen in the initial phase of maximal isometric contractions (Bongiovanni & Hagbarth, 1990). In contrast, researchers have shown a reduction in isometric leg extension strength and EMG median frequency (Rittweger et al., 2000) and a suppression in motor output of the muscle (Bongiovanni & Hagbarth, 1990).

The aim of this study is to examine the effects of a superimposed vibration at 50 Hz on muscular activation and torque for an isometric contraction.

METHODS

Sixteen participants (22 ± 4.4 years, 73.2 ± 11.7 kg and 173.1 ± 9.7 cms) were recruited for this study. Prior to participation each individual read and signed an informed consent document.

A modified four kilowatt, three phase electrical induction motor transferred vibration to the leg at 50.42 ± 1.16 Hz at 13.24 ± 0.18 ms⁻².

Mechanical Force Data: Peak isometric force (N) was recorded via a load cell and analysed for RFD at times 0.05 s, 0.01 s, 0.1 s and 0.5 s, and RFD time at 50, 75 and 90% of peak force.

Electromyographic (EMG) Data: The EMG signals were collected from Rectus Femoris (RF) muscle via surface electrodes (10mm x 30mm).

Synchronisation of all Force, and EMG data collection was achieved via a software trigger set at 30 N force for the isometric contractions. Data was sampled at 1000 Hz.

Statistical Analysis: Mean ± standard deviations were calculated for subject characteristics. Statistical analysis involved a one-way analysis of variance (ANOVA) comparing vibration and no-vibration conditions. Statistical significance was accepted at or below 0.05.

RESULTS AND DISCUSSION

A one-way ANOVA revealed no significant (p < .05) differences between the vibrated and no-vibration conditions for Peak isometric force, time peak force, time to
improvements previously reported in strength performances may rely on an individual optimal contraction velocity. Support for this explanation may be found in the recent studies reporting significant improvements in strength measures (Bosco et al., 1999; Issurin & Tenenbaum, 1999; Warman & Humphries, 2002). Each of these studies has examined isotonic contractions, with the participant contracting as hard and fast as possible, thereby having complete control over the contraction velocity. It is therefore possible that an unexamined reason behind these improvements may be in the selection of contraction velocity and its possible affect on the effectiveness of the vibration stimulation.

**SUMMARY**

The application of vibration stimulation at 50 Hz does not improve isometric force, or rate of force development in the initial phase of maximal isometric contractions.

**REFERENCES**


**Table 1.** The mean(sd) characteristics of isometric force and rate of force development data.

<table>
<thead>
<tr>
<th></th>
<th>Peak RFD (N)</th>
<th>Time Peak (s)</th>
<th>Time Peak 50% (s)</th>
<th>Time Peak 75% (s)</th>
<th>Time Peak 90% (s)</th>
<th>RFD 0.01 s (N)</th>
<th>RFD 0.05 s (N)</th>
<th>RFD 0.1 s (N)</th>
<th>RFD 0.5 s (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration</td>
<td>581.8 (163.5)</td>
<td>2.5 (1.2)</td>
<td>.22 (.08)</td>
<td>.46 (.21)</td>
<td>.95 (.43)</td>
<td>983.3 (947.6)</td>
<td>1348.9 (300.9)</td>
<td>1525.4 (1006.5)</td>
<td>912.9 (268.6)</td>
</tr>
<tr>
<td>No-vibration</td>
<td>493.1 (163.9)</td>
<td>2.3 (1.2)</td>
<td>.18 (.13)</td>
<td>.49 (.48)</td>
<td>1.1 (.90)</td>
<td>657.9 (383.4)</td>
<td>1240.3 (300.9)</td>
<td>1620.4 (970.3)</td>
<td>785.9 (258.2)</td>
</tr>
</tbody>
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