AN INVESTIGATION INTO THE RESISTANCE OFFERED BY DIFFERENT GRADES OF THERABAND™

Mitchell Wood MCSP HCPC, Simon Barry PhD, MCSP, HCPC
Faculty of Health and Life Sciences, Coventry University, Coventry ,UK, CV1 5FB
Department of Medical Education, University of Leicester, Leicester ,UK, LE1 9HN

Introduction:
TheraBand™ was created in 1978 in Akron, USA and is a global product that has been proven to facilitate an increase in strength, mobility and flexibility when used in patient rehabilitation. There are many studies that have found significant strength improving effects when using TheraBand™ as a form of resistance training. However, there is very little research that investigates the TheraBand’s™ true resistance as quantified by Electromyography (EMG) activity. Therefore, the true resistance gradient between the TheraBand™ colours has not been determined.

Purpose:
To accurately identify the resistance produced by different coloured TheraBand™ during elbow extension, as a percentage of maximum possible power, using EMG values. The results of this research will provide tangible evidence to inform clinician choice with regard to accurate prescription of the most appropriate TheraBand™ colour. This information will help to maximise the effectiveness and progression of strengthening rehabilitation.

Participants:
A purposive convenience sample of 16 healthy participants aged 18-35 years with no previous injuries to the dominant arm were consented to participate in the study.

Methods:
An experimental research design was employed to quantity and record the EMG output from the Triceps Brachii muscle during elbow extension when resisted by yellow (YT), red (RT) and green (GT) TheraBand™. Each participant had an EMG sensor placed on the Triceps Brachii of the dominant arm and were asked to extend their elbow joint from 90 degrees to 5 degrees. Each participant completed this standardised process 3 times per TheraBand™ colour in a random order, with a 2 minute rest interval to prevent fatigue. Participants also undertook this procedure with a non elastic strap to produce a Maximum Voluntary Contraction (MVC). The participants were not motivated verbally during the activity and were blinded to the colour TheraBand™ under test conditions.

Results:
The YT, RT and GT produced an average mean EMG value of 51.40% (SD 6.29%), 62.92% (SD 7.69%) and 73.56% (SD 7.22%) respectively when compared to their own maximum voluntary contraction. On average the RT produced 11.52% more EMG activity during extension of the Triceps than the YT. Similarly, the GT produced 10.64% more EMG activity during extension of the triceps than the RT.

Discussion and Conclusion:
There is an average incremental EMG increase of 11.8% between the YT when compared to the RT and the RT when compared to the GT. There is also a clear overlap evident between the YT when compared to the RT and the RT when compared to the GT. However, there is no overlap of EMG data when comparing the YT to the GT. There is sufficient evidence to show an obvious incremental EMG increase between the three TheraBand™ colours. The results of this research support a smooth progression of the intensity of resistance provided by different colour TheraBand™ for rehabilitating patients in clinical practice. However, there was no overlap found between the EMG data when comparing the YT to the GT. This suggests a progression from the YT to the GT may be too intense and could have adverse effects on patient progression during strengthening rehabilitation. In addition it is clear that limiting strengthening rehabilitation to only using a Green TheraBand™ will not achieve the Maximum Voluntary Contraction values seen in normal musculature.

Table 1. TheraBand™ EMG average peak % of MVC Means & STD deviation

<table>
<thead>
<tr>
<th>TheraBand™ Colour</th>
<th>Minimum %</th>
<th>Maximum %</th>
<th>Mean %</th>
<th>SD (±)%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>32.49</td>
<td>57.58</td>
<td>51.40</td>
<td>6.29</td>
</tr>
<tr>
<td>Red</td>
<td>41.72</td>
<td>71.58</td>
<td>62.92</td>
<td>7.69</td>
</tr>
<tr>
<td>Green</td>
<td>60.63</td>
<td>89.71</td>
<td>73.56</td>
<td>7.22</td>
</tr>
</tbody>
</table>

Table 2. TheraBand™ average mean peak % EMG differences

<table>
<thead>
<tr>
<th>TheraBand™ Colour</th>
<th>Percentage Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow to Red</td>
<td>11.52%</td>
</tr>
<tr>
<td>Red to Green</td>
<td>10.64%</td>
</tr>
<tr>
<td>Yellow to Green</td>
<td>22.16%</td>
</tr>
</tbody>
</table>

Figure 1: Plot presenting the average peak EMG activity as a % of MVC for each TheraBand™ colour

Figure 2: Box plot shows the average peak EMG produced during Triceps extension for YT, RT and GT TheraBand™ including Maximum Voluntary Contraction values

Acknowledgements:
Ethics approval by Coventry University Research Ethics Committee P18978
Presented at World Confederation for Physical Therapy Singapore May 2015
Poster presentation sponsored by the AOCP

Key Words: TheraBand™, Electromyography (EMG), Strengthening

Contact details: Dr Simon Barry email s.barry@coventry.ac.uk