To What Extent Does Cane Handling Technique Training Impact Wrist Flexion and Extension?

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Background
• 16.4% of Americans aged 65 and older use canes for mobility purposes (Gell et al., 2015)
• Canes are one of the 50 most essential pieces of assistive technology needed worldwide (WHO, 2016)
• Significant strength and metabolic demands from long term cane use (Bateni & Maki, 2005)
• Cane use can compromise the integrity of the individual’s upper extremity and hand (Son et al., 2012)
• Clients purchase canes independently without professional consultation
• Lack of instruction for proper cane fitting and use
  • 82% of cane-users reported that they received “Neither instruction nor demonstration from medical professionals” (Liu et al., 2011)
  • 54% had their cane at an incorrect height (Liu et al., 2011)

Hypotheses
• Based on clinical experience, individuals do not know how to use their canes
• Individuals do not have properly fitted canes
• Poor cane use leads to greater forearm muscle activation and wrist range of motion which leads to adverse consequences

Research Questions
• To what extent does cane handling technique training impact wrist flexion and extension?
• To what extent are older adults who use a cane trained in proper technique?
• To what extent does improper cane handling technique, such as hyperextended wrist angle, result in greater forearm musculature activation?

Methodology
• 7 community dwelling elders were recruited using convenience and snowball sampling

Procedure (Adapted from Haddas, Liberman, & Kakar (2018)
1. Short survey form
2. Mini-Mental State Exam (MMSE)
3. Surface EMG sensors applied
4. Opal Movement Monitor System placed
5. Sensors calibrated
6. Three walking trials for 10m each
7. Sensors removed
8. 5-10 minute fitting and training session
9. Optional 5-10 minute rest break
10. Sensors replaced
11. Three walking trials for 10m each
12. Follow-up interview

Results

<table>
<thead>
<tr>
<th>Survey Questions</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>81</td>
<td>80</td>
<td>82</td>
<td>80</td>
<td>83</td>
<td>88</td>
<td>85</td>
</tr>
<tr>
<td>Hours of cane use</td>
<td>8 years</td>
<td>6-7 years</td>
<td>7-8 years</td>
<td>2 years</td>
<td>1-2 years</td>
<td>6-10 years</td>
<td>5 years</td>
</tr>
<tr>
<td>Was the cane adjusted?</td>
<td>No</td>
<td>Yes (PT)</td>
<td>No</td>
<td>No</td>
<td>No (PT)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Where was the cane adjusted?</td>
<td>Pharmacy</td>
<td>N/A</td>
<td>Pharmacy</td>
<td>Retail</td>
<td>Purchased for free</td>
<td>Pharmacy</td>
<td>Pharmacy</td>
</tr>
<tr>
<td>Did you receive cane instruction or fitting?</td>
<td>No</td>
<td>No</td>
<td>Yes (PT)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes (PT)</td>
</tr>
<tr>
<td>Reason for cane use</td>
<td>Balance</td>
<td>Balance</td>
<td>Injury, muscle damage, surgery</td>
<td>Balance</td>
<td>Balance</td>
<td>Balance &amp; Falls prevention</td>
<td>Balance</td>
</tr>
<tr>
<td>Medical Condition Diagnosis</td>
<td>Arthritis, Osteoarthritis, Hip replacement</td>
<td>N/A</td>
<td>Arthritis, (RA) Hip replacement</td>
<td>Parkinson’s Disease</td>
<td>N/A</td>
<td>Osteoarthritis (OA) Hip replacement</td>
<td>Knee pain, Hip replacement</td>
</tr>
<tr>
<td>Pain or discomfort in upper extremity?</td>
<td>No</td>
<td>No</td>
<td>Hand numbness</td>
<td>Numbness in wrist and hand</td>
<td>Hand pain</td>
<td>Fatigue</td>
<td>Numbness</td>
</tr>
</tbody>
</table>

Conclusion
• No significant changes in muscle activation
• Some change noted in wrist angle toward a more neutral position

• Cannot generalize findings due to small sample size
• More research is needed