How does disability develop from spinal pain?
A systematic review of mediating variables

Hopin Lee1,2, Markus Hübscher1, G. Lorimer Moseley1,3, Steven J. Kamper4, Adrian C. Traeger1,2, Gemma Mansell5, James H. McAuley1,2

1 Neurosciences Research Australia (NeuRA), Sydney, NSW, Australia; 2 School of Medical Sciences, University of New South Wales, Sydney, NSW, Australia; 3 Sansom Institute for Health Research, University of South Australia, Adelaide, SA, Australia; 4 The George Institute for Global Health, University of Sydney, Sydney, NSW, Australia; 5 Arthritis Research UK Primary Care Centre, Primary Care Sciences, Keele University, Keele, Staffordshire, United Kingdom

OBJECTIVE: To determine how pain leads to disability in patients with spinal pain. More specifically, to identify factors that mediate the relationship between pain and disability.

METHODS

Search: Using a sensitive search strategy, 5 electronic databases were searched on 01.08.14.

Inclusion criteria:
• Studies that included participants 18 years of age or older with complaints of acute and/or chronic pain (including whiplash)
• Studies that formally conducted a mediation analysis (product of coefficient test; Baron and Kenny’s steps of mediation, SEM) and/or significance tests of mediation (Sobel’s first-order test or bootstrapped analysis).

Exclusion criteria:
• Studies that included patients with specific spinal pathology
• Studies that did not test the pain-disability relationship.

Quality assessment: The quality of each study was assessed using a modified criteria outlined by Mansell et al. (2013).1 Two reviewers independently assessed the risk of bias. Disagreements were resolved by reaching consensus or by consulting a third reviewer.

Meta-analysis: Data from the included studies were categorized into cross-sectional and longitudinal data. First, an overall model that combined all psychological factors as mediators was pooled, and then data for each distinctive psychological construct was pooled separately. Pooled estimates were derived for the indirect effect (ab) and the total effect (c) of pain on disability, with 95% CIs. Heterogeneity was examined using the I² statistic. Statistical analyses were conducted using Comprehensive Meta-Analysis (Version 2.2.064).

Q U A L I T Y A S S E S S M E N T

The mean quality assessment score for all studies was 2/7. While most studies cited a theoretical framework and specified psychometric properties of the mediator(s) and outcome(s), no study reported power calculations or fully addressed the issue of temporal precedence.

SUMMARY OF RESULTS
• Psychological variables significantly mediate the relationship between pain and disability.
• Specifically, self-efficacy, fear, and distress significantly mediate the relationship between pain and disability.
• Catastrophizing does not significantly mediate the relationship between pain and disability.

DISCUSSION

While the fear avoidance model has gained considerable attention for explaining how pain leads to disability, intermediate variables in the fear-avoidance model (catastrophizing and fear) showed little or no mediating effects.
• Alternative models, such as the social learning theory that incorporates self-efficacy as an intermediate variable, may provide further understanding into the development of disability from spinal pain.

References:

RESULTS

Pooled standardized correlations with numbers in parentheses representing upper and lower limits of 95% confidence intervals; arrows indicate longitudinal data; straight lines represent cross-sectional data; dotted lines indicate non-significant correlations; * p < 0.05

<table>
<thead>
<tr>
<th>Design</th>
<th>No. of studies</th>
<th>No. of models</th>
<th>N</th>
<th>pooled β</th>
<th>Lower limit</th>
<th>Upper limit</th>
<th>pooled β</th>
<th>Lower limit</th>
<th>Upper limit</th>
<th>Indirect effect (ab)</th>
<th>Lower limit</th>
<th>Upper limit</th>
<th>Total effect (c)</th>
<th>Lower limit</th>
<th>Upper limit</th>
<th>% mediated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychology</td>
<td>CS</td>
<td>7</td>
<td>22</td>
<td>1974</td>
<td>0.40*</td>
<td>0.30</td>
<td>0.50</td>
<td>0.38*</td>
<td>0.26</td>
<td>0.49</td>
<td>0.16*</td>
<td>0.12</td>
<td>0.20</td>
<td>0.58*</td>
<td>0.47</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>UO</td>
<td>6</td>
<td>13</td>
<td>1357</td>
<td>0.21*</td>
<td>0.15</td>
<td>0.26</td>
<td>0.35*</td>
<td>0.26</td>
<td>0.44</td>
<td>0.08*</td>
<td>0.02</td>
<td>0.13</td>
<td>0.36*</td>
<td>0.28</td>
<td>0.44</td>
</tr>
<tr>
<td>Catastrophizing</td>
<td>CS</td>
<td>3</td>
<td>5</td>
<td>234</td>
<td>0.33*</td>
<td>0.12</td>
<td>0.50</td>
<td>0.22*</td>
<td>0.09</td>
<td>0.34</td>
<td>0.07</td>
<td>0.06</td>
<td>0.19</td>
<td>0.65*</td>
<td>0.57</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>UO</td>
<td>1</td>
<td>1</td>
<td>193</td>
<td>0.03</td>
<td>-</td>
<td>-</td>
<td>0.30*</td>
<td>-</td>
<td>-</td>
<td>-0.01</td>
<td>-</td>
<td>-</td>
<td>-0.01</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fear</td>
<td>CS</td>
<td>7</td>
<td>15</td>
<td>1974</td>
<td>0.42*</td>
<td>0.31</td>
<td>0.52</td>
<td>0.38*</td>
<td>0.26</td>
<td>0.48</td>
<td>0.18*</td>
<td>0.12</td>
<td>0.20</td>
<td>0.58*</td>
<td>0.47</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>UO</td>
<td>4</td>
<td>5</td>
<td>906</td>
<td>0.25*</td>
<td>0.09</td>
<td>0.39</td>
<td>0.32*</td>
<td>0.22</td>
<td>0.42</td>
<td>0.08*</td>
<td>0.01</td>
<td>0.14</td>
<td>0.40*</td>
<td>0.28</td>
<td>0.50</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>CS</td>
<td>2</td>
<td>2</td>
<td>236</td>
<td>0.41*</td>
<td>0.51</td>
<td>0.29</td>
<td>0.54*</td>
<td>0.69</td>
<td>0.33</td>
<td>0.23*</td>
<td>0.10</td>
<td>0.34</td>
<td>0.60*</td>
<td>0.30</td>
<td>0.79</td>
</tr>
<tr>
<td></td>
<td>UO</td>
<td>1</td>
<td>1</td>
<td>172</td>
<td>0.32*</td>
<td>-</td>
<td>-</td>
<td>0.43</td>
<td>-</td>
<td>-</td>
<td>0.14</td>
<td>-</td>
<td>-</td>
<td>0.43*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Distress</td>
<td>CS</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>UO</td>
<td>2</td>
<td>6</td>
<td>502</td>
<td>0.25*</td>
<td>0.10</td>
<td>0.39</td>
<td>0.39*</td>
<td>0.25</td>
<td>0.52</td>
<td>0.10*</td>
<td>0.01</td>
<td>0.18</td>
<td>0.32*</td>
<td>0.19</td>
<td>0.43</td>
</tr>
</tbody>
</table>

CS = cross-sectional; LO = longitudinal; * p < 0.05; % mediated is a proportion of the Total effect that is explained by the Indirect effect. * = data from one study.