Depression and music performance anxiety are associated with severity of performance related musculoskeletal pain in professional orchestral musicians

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We examined self-reported frequency and severity of performance related musculoskeletal pain (PRMD), trigger point pain (TPP) and depression, social phobia (SPIN), and music performance anxiety (MPA; Kenny Music Performance Anxiety Inventory, K-MPAI) in a cross-sectional survey of 377 professional orchestral musicians. Most (84%) musicians had experienced performance impairing pain; 50% reported current pain. Females reported more performance-impairing pain and more current pain than males. Cluster analysis indicated a complex relationship between depression and PRMD severity. Three clusters showed the hypothesized relationship (i.e. more depression, more pain). Musicians in the fourth cluster denied depression but reported the most severe pain, suggesting a group who somatize their psychological distress. Cluster analysis also revealed a strong relationship between PRMD severity and MPA. Clusters with higher scores on K-MPAI reported higher scores on PRMD severity. TPP was not associated with self-reported PRMD frequency or severity. There was a significant linear relationship between TPP and MPA for females, but males scoring the highest MPA reported lower TPP than those with milder MPA. Neither SPIN nor beta blocker use were associated with PRMD frequency or severity. The complex relationships identified between PRMD, TPP, depression, and MPA may have important implications for PRMD management in professional musicians.

*Keywords:* performance related musculoskeletal pain; depression; music performance anxiety; trigger point; professional musicians
Pain arising from performance related musculoskeletal disorders (PRMD) occurs frequently in professional musicians (Kaufman-Cohen and Ratzon 2011). The cause of musculoskeletal disorders and pain is multi-factorial, with occupational, environmental, biomechanical, psychosocial, and psychological factors contributing (Wu 2007). However, the impact of psychological factors, such as music performance anxiety, depression, and tendency to somatize (i.e. to express psychological distress through somatic symptoms), on the presence of musculoskeletal symptoms is unclear. Although relationships between pain and stress, anxiety, and depression have been explored in different pain populations, few studies have examined these relationships in professional musicians. Thus, this study assessed these relationships. Unlike the majority of studies assessing pain in musicians, we included both subjective (self-report) and objective measures of pain (i.e. trigger point pain, TPP), which have been used extensively in work settings to assess pain related to acute overload and overwork fatigue (Simons et al. 1999).

**METHOD**

**Participants**

Participants comprised professional orchestral musicians from each of the eight professional state orchestras in Australia.

**Materials**

Materials included:

- Psychosocial measures: Kenny Music Performance Anxiety Inventory (Revised) (K-MPAI; Kenny 2011); Trait questionnaire of the State-Trait Anxiety Inventory (STAI-T; Spielberger 1983); Social Phobia Inventory (SPIN; Connor et al. 2000); PRIME-MD Patient Health Questionnaire (PRIME-MD PHQ); and Core Self Evaluation Scale (CSE; Judge et al. 2003).
- Pain measures: pain frequency and pain severity scales were developed using 11-point numerical rating scales with endpoints 0=“never” and 10=“constantly” (frequency) and 0=“no pain” to 10=“worst imaginable pain” (severity).
- Physical examination of right and left upper trapezius triggers points.

**Procedure**

Information sheets, consent forms, and invitations were posted to all musician members of the participating orchestras. Those who agreed to participate
(N=377; 70% response rate) were sent a self-report survey, which they mailed in self-addressed, stamped return envelopes provided by the researchers. This method ensured confidentiality and anonymity of the musicians to all parties except the researchers, who had to match questionnaire data with results from the trigger point examination.

RESULTS

Three hundred and eighteen musicians (n=318, 84%; mean age=42 years, SD=10.2) reported having experienced pain that interfered with their performance. Ninety-one musicians (24%) reported experiencing PRMD pain constantly; 21% (n=75) reported that the severity of the pain was the “worst imaginable.” There was a highly significant relationship between the frequency of reported pain and its severity, with those reporting higher frequency much more likely to report higher pain severity (X²=304.84, p=0.001). Half the musicians (50%) reported current pain during performances; females had significantly higher reports of pain that interfered with their performance, and more occasions of such pain (X²=5.62, p=0.018).

Using the general linear model, the effects of sex and age group (<=30; 31-30; 41-40; 51+) on reported PRMD pain frequency and severity were assessed. There were significant main effects for both sex and age but the sex*age interaction was not significant. Table 1 summarizes the findings.

PRMD severity (but not frequency) was significantly associated with depression (F=3.90, p=0.02). Linear regression analyses tested the hypothesis that PRMD severity could be predicted by psychological distress as assessed by the K-MPAI, STAI-T, SPIN, CSE, and the depression screen. The K-MPAI was the only factor that contributed significantly to the prediction (Beta=0.17, t=3.23, p=0.001). However, the model’s ability to explain the variation in the PRMD pain severity was poor (R square=0.029). Cluster analysis was conducted to identify the cause of the nonlinearity in the regression findings and to test the possible presence of a somatizing group of musicians. A two-step cluster analyses was conducted using the K-MPAI with severity ratings of PRMD pain as inputs. The cluster quality was good (Average silhouette=0.7) and four distinct clusters were obtained with approximately equal proportions in each cluster. A significant association between pain severity and MPA severity was observed; as reported PRMD pain became more severe, mean scores on music performance anxiety increased. When the depression variable and severity of PRMD-related pain were used as the inputs to define the clusters, the cluster quality was good (Average silhouette=0.6) and again, four clusters were identified as shown in Table 2. Two clusters reported no de-
Table 1. Relationships between sex, age, and PRMD frequency and severity.

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<tbody>
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<td></td>
<td></td>
<td><strong>F</strong></td>
<td><strong>Sig.</strong></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
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<tr>
<td>PRMD frequency</td>
<td>7.27</td>
<td>0.007</td>
<td>0.77</td>
</tr>
<tr>
<td>PRMD pain severity</td>
<td>4.19</td>
<td>0.041</td>
<td>0.53</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
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<tr>
<td>PRMD frequency</td>
<td>5.38</td>
<td>0.001</td>
<td>0.93</td>
</tr>
<tr>
<td>PRMD pain severity</td>
<td>3.20</td>
<td>0.024</td>
<td>0.74</td>
</tr>
<tr>
<td>Sex*Age group</td>
<td></td>
<td></td>
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<tr>
<td>PRMD frequency</td>
<td>0.25</td>
<td>0.863</td>
<td>0.10</td>
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<tr>
<td>PRMD pain severity</td>
<td>0.55</td>
<td>0.651</td>
<td>0.16</td>
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</tbody>
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Table 2. Cluster analysis of PRIME-MD (Depression) using pain severity.

<table>
<thead>
<tr>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
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<tbody>
<tr>
<td>No Depression</td>
<td>No Depression</td>
<td>Yes to 1Q</td>
<td>Yes to 2Q</td>
</tr>
<tr>
<td>N=148 (42.9%)</td>
<td>N=86 (24.9%)</td>
<td>N=51 (14.8%)</td>
<td>N=60 (17.4%)</td>
</tr>
<tr>
<td>PRMD(S)=1.61</td>
<td>PRMD(S)=6.65</td>
<td>PRMD(S)=4.21</td>
<td>PRMD(S)=4.52</td>
</tr>
</tbody>
</table>

pression. The first group reported minimal PRMD severity (mean=1.61; 43% musicians); the second group (25% musicians) reported the highest PRMD severity (PRMD(S); mean=6.65) of all the clusters, including those in clusters 3 and 4 who replied in the affirmative to one or both of the depression questions, respectively.

The other psychosocial measures did not yield significant findings. With respect to trigger points, there were no significant correlations between the right trigger point with PRMD frequency (p=0.07) or PRMD severity (p=0.08) or the left trigger point with PRMD frequency (p=0.17) or PRMD severity (p=0.14). There was a significant sex difference for pain reports for both right (F_{1,3}=8.31, p=0.004) and left trigger points (F_{1,3}=10.31, p=0.001) for musicians reporting the highest scores on the K-MPAI. Scores for females increased as MPA scores increased, while males in the highest MPA group showed a decrease in report of pain from the trigger points. On pain ratings for the right (F_{1,6}=2.6, p=0.02) and left (F_{1,6}= 2.54, p=0.05) trigger points, those reporting high MPA and affirmative responses to both depression questions had higher trigger point pain ratings than subgroups with lower ratings of MPA.
DISCUSSION

Most (84%) elite professional musicians in this study reported having experienced PRMD pain severe enough to interfere with their performance; 50% reported current pain; 24% reported constant pain; 21% reported their pain as the “worst imaginable,” with a further 29% reporting moderately severe pain. Higher proportions of females reported both more severe performance impairing pain and more frequent occasions during which they experienced pain of this severity. Cluster analyses of PRMD severity and music performance anxiety severity showed that increasing PRMD severity ratings mapped linearly onto increasing mean K-MPAI scores across the four clusters identified in the analysis. Univariate analyses revealed a significant relationship between PRMD severity and depression, but not between pain frequency and depression. Cluster analysis further assessing this relationship between PRMD severity and depression is of considerable clinical and theoretical interest. Cluster 2, 25% sample, reported no depression while simultaneously returning the highest ratings for PRMD pain severity. Similar discordances have been observed in studies of anxiety and physiological arousal, but no comparable study has examined this phenomenon for depression or in musicians. Cluster 2 represent possible “somatizers,” that is, individuals who express their psychological distress in physical systems, while denying their emotional distress. Findings such as these highlight the short-comings of self-report measures over clinical assessment. One of the key reasons that standard self-report measures are limited in this way is that the relevant psychological processes may be implicit, that is, they are not available to awareness and thus, cannot be directly reported upon. Musician “somatizers” need closer study using measures devised to tap into implicit processes in order to further our understanding of this vulnerable group and to assist in the management of their pain. There were no significant relationships between right or left trigger points and PRMD frequency or severity. In contrast to the study by Rickert et al. (2012) where a specific instrumental group with high neck and shoulder loads during performance was studied, this study evaluated a wide range of instrumentalists, which may have required more trigger points to be assessed to reflect the specific mechanical loading of the different instruments. The use of trigger points in only one region of the body may have reduced the association between the reported PRMD frequency and severity and trigger point sensitivity as most reported associations of trigger point sensitivity and pain are located within the region of pain (Freeman et al. 2009). However, trigger points do seem to be sensitive to psychological phenomena. In our study, there were significant sex differences for both right
and left trigger points for musicians in the K-MPAI’s highest score category (125+). The results suggest that PRMD may not be able to be treated effectively without considering its relationships to depression and MPA.

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References