Musician’s dystonia and comorbid anxiety: Two sides of one coin?

June T. Spector¹, Leonie Enders², Eckart Altenmüller², Alexander Schmidt³, Christine Klein³, and Hans-Christian Jabusch⁴

¹ Occupational and Environmental Medicine Program, University of Washington, USA
² Institute of Music Physiology and Musicians’ Medicine, Hanover University of Music, Drama, and Media, Germany
³ Department of Neurology, University of Lübeck, Germany
⁴ Institute of Musicians’ Medicine, Dresden University of Music Carl Maria von Weber, Germany

We sought to characterize anxiety and other psychological conditions in musicians with focal dystonia (MD) and to determine whether a significantly higher degree of these conditions is present in musicians with MD compared with healthy musicians and non-musicians. Psychological conditions were studied in 44 professional musicians with MD, 45 healthy musicians, and 44 healthy non-musicians using the State-Trait Anxiety Inventory (STAI) and NEO-Five-Factors Inventory (NEO-FFI). Musicians with MD displayed significantly increased levels of anxiety and neuroticism compared with healthy musicians and non-musicians. The observed lack of correlation between anxiety and the duration of dystonia suggests that anxiety may not be a psycho-reactive phenomenon and is consistent with the hypothesis that anxiety and MD share a common pathophysiological mechanism.

Keywords: dystonia; musician; psychology; anxiety; State-Trait Anxiety Inventory

Focal dystonia (FD) in musicians, also called musician’s dystonia (MD), is a task-specific movement disorder characterized by a painless muscular incoordination of extensively trained movements (Altenmüller and Jabusch 2009). Involuntary flexion or extension of individual fingers or loss of control of the muscles involved in the embouchure in affected musicians can lead to impaired technical performance on the instrument. Musicians with FD are
therefore often unable to continue their careers as performing artists (Schuele and Lederman 2004).

Although several published studies have examined psychological conditions in patients with FD, only two studies have focused specifically on psychological conditions in musicians with FD (Jabusch et al. 2004, Jabusch and Altenmüller 2004). These studies reported that musicians with FD more commonly exhibited specific phobias, anxiety, and perfectionism than healthy musicians. However, sample sizes in these studies were relatively small, and questionnaires used to evaluate the mentioned psychological characteristics had not been validated.

The present study was designed to investigate psychological abnormalities in a larger group of musicians with FD, as compared with healthy musicians and healthy non-musicians, using validated questionnaires (Enders et al. 2011). We hypothesized that a significantly higher degree of anxiety and other psychological conditions is present in musicians with FD.

**METHOD**

**Participants**

Three groups of participants were enrolled in the study: (1) 44 musicians with MD, recruited from the outpatient clinic of the Hanover Institute of Music Physiology and Musicians’ Medicine; (2) 45 healthy professional musician controls, recruited from German orchestras and music schools; and (3) 44 healthy non-musician controls, who were university graduates. All patients underwent complete neurological evaluations and were diagnosed with MD by at least one of the authors (E. A.). Patients with other neurological disorders or secondary dystonias or psychiatric diseases were excluded from the study. Potential controls were excluded if they reported a history of neurological or psychiatric diseases. All groups were matched for age and sex, and healthy musicians were additionally matched by instrument family to the MD group. Details of the three groups are shown in Table 1.

**Materials**

Assessment of personality and anxiety were performed using the revised German version of the validated self-administered NEO-Five-Factors Inventory (NEO-FFI) (Costa and McCrae 1992), and the validated State-Trait-Anxiety Inventory (STAI) (Spielberger and Gorsuch 1983), respectively. The NEO-FFI is a multidimensional personality inventory that consists of 12 items (descriptions of behaviors), scored on five point Likert-type scales, in each of five
Table 1. Patient and control characteristics.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MD</th>
<th>HM</th>
<th>NM</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>44</td>
<td>45</td>
<td>44</td>
</tr>
<tr>
<td>Sex (male/female)</td>
<td>26/18</td>
<td>27/18</td>
<td>27/17</td>
</tr>
<tr>
<td>Age in years (M±SD)</td>
<td>40.2±9.2</td>
<td>41.5±12.6</td>
<td>41.7±16.2</td>
</tr>
<tr>
<td>Age in years (min/max)</td>
<td>23/64</td>
<td>20/68</td>
<td>21/76</td>
</tr>
<tr>
<td>Woodwind instruments (n)</td>
<td>16</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>String instruments (n)</td>
<td>14</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>Brass instruments (n)</td>
<td>4</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Plucking instruments (n)</td>
<td>5</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Keyboard instruments (n)</td>
<td>4</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Drums (n)</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Age at onset of dystonia in years (M±SD)</td>
<td>30.9±8.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Duration of dystonia in years (M±SD)</td>
<td>9.3±8.1</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. MD=musicians with dystonia, HM=healthy musicians, NM=healthy non-musicians. MD presented as hand dystonias in 40 and as embouchure dystonia in 4.

personality domains: (1) extraversion, (2) agreeableness, (3) conscientiousness, (4) neuroticism, and (5) openness to experience. The STAI distinguishes chronic, or trait anxiety from temporary, or state anxiety. The STAI has 20 trait and 20 state anxiety statements, each scored on 4-point scales, that assess how respondents feel “generally” and “right now, at this moment.”

Procedure

Questionnaires were distributed and collected by mail and were accompanied by written instructions in the German language. All subjects were able to speak, read, and write German fluently. Informed consent was obtained from all subjects before study participation. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Comparison of NEO-FFI and STAI scores between the dystonia and control groups was performed using the Kruskal-Wallis test and the post-hoc Tamhane’s T2 test. Correlation was determined using Spearman’s rho. P values less than 0.05 were considered statistically significant.

RESULTS

All components of the questionnaires were completed by all subjects. Musicians with dystonia had significantly higher NEO-FFI neuroticism subscale
scores than healthy musicians (p=0.018) or non-musicians (p=0.001) (see Figure 1). There was no significant difference in neuroticism scores between healthy musicians and non-musicians (p=0.790) or between subject groups in any of the other NEO-FFI subscales.

Musicians with dystonia had significantly higher STAI state and trait anxiety subscale scores than healthy musicians (p=0.009 and p=0.012, respectively) or non-musicians (p=0.013 and p=0.001, respectively) (see Figure 1). There was no significant difference in state and trait anxiety scores between healthy musicians and non-musicians (p=0.997 and 0.614, respectively).

There was no significant correlation between the duration of dystonia and NEO-FFI neuroticism subscale scores (Spearman’s rho=0.005, p=0.976). Negative correlation was found between the duration of dystonia and the openness subscale (Spearman’s rho=-0.268), and this correlation approached statistical significance (p=0.079). There was a negative correlation between age and openness in musicians with dystonia (Spearman’s rho=-0.363, p=0.016) but no correlation between age and openness in the control groups. There was no correlation between duration of dystonia and state or trait anxiety.
DISCUSSION

In this study of psychological conditions in MD, affected musicians showed a higher degree of state and trait anxiety and neuroticism than healthy musicians and non-musician controls. Our results are supported by conclusions of prior publications that reported significantly greater anxiety in musicians with MD compared with healthy musicians (Jabusch et al. 2004, Jabusch and Altenmüller 2004).

The cross-sectional nature of this study precludes a definitive determination of whether or not anxiety or neuroticism was present before the onset of MD. However, trait anxiety and neuroticism scores were significantly elevated in MD patients, and there was no correlation between neuroticism or anxiety scores and MD duration. These results are consistent with studies of non-musician patients with anxiety and other forms of FD which reported that anxiety did not develop after the onset of FD, suggesting that anxiety is not a psycho-reactive phenomenon (Lencer et al. 2009).

A shared underlying mechanism for the development of MD and anxiety may exist as reported for some forms of monogenic dystonia, such as myoclonus-dystonia (Doheny et al. 2002). Transcranial magnetic stimulation and electroencephalogram studies have provided evidence for decreased cortical inhibition in FD (Ridding et al. 1995, Toro et al. 2000). Decreased cortical inhibition has also been observed in subjects with trait-related anxiety (Wassermann et al. 2001). It has been suggested that reduced cortical inhibition may play a role in the pathophysiology of both FD and anxiety (Lencer et al. 2009; Ron 2009). Specifically, abnormal neural activity in motor loops linking the basal ganglia to the frontal cortex via the thalamus may additionally influence limbic loops, resulting in both altered motor and also affective processing (Lencer et al. 2009).

In conclusion, musicians with FD showed significantly higher values of neuroticism, state anxiety, and trait anxiety than healthy musician and non-musician controls. The observed lack of correlation between anxiety and the duration of dystonia suggests that anxiety may not be a psycho-reactive phenomenon. The hypothesis of a potential common pathophysiological mechanism of anxiety and MD should be further investigated.

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Address for correspondence

Hans-Christian Jabusch, Institute of Musicians' Medicine, Dresden University of Music
Carl Maria von Weber, Wettiner Platz 13, 01067 Dresden, Germany; Email: jabusch@hfmdd.de

References