Sensorimotor alterations in violinists/violists with neck pain

Anke Steinmetz¹, Andrew Claus², Wolfram Seidel³, Paul Hodges², and Gwendolen Jull²

¹ Institute of Musicians’ Medicine Berlin-Brandenburg, Department of Manual Medicine and Pain Medicine, Sana Kliniken Sommerfeld, Germany
² Centre for Clinical Research Excellence in Spinal Pain, Injury, and Health, University of Queensland, Brisbane, Australia
³ Department of Manual Medicine and Pain Medicine, Sana Kliniken Sommerfeld, Germany

The aim of this research project was to determine the extent to which neck pain is present in violin/viola players and to investigate if fine motor control and dexterity are influenced by dysfunctions as such. This is important to know as impairments in dexterity are expected to have an impact on motor control in violin/viola playing and contribute to a decrease in performance excellence.

Keywords: violin/viola players; neck pain; sensorimotor impairments; CCFT; EMG

Playing-related musculoskeletal disorders (PRMD) are a common problem in musicians. Growing evidence demonstrates that up to 80% of musicians experience pain within their musculoskeletal system during musical performance (Blum 1995, Fishbein et al. 1988, Fry 1986a, 1986b, Ledermann and Calabrese 1986, Molsberger et al. 1990). Neck pain is a frequent complaint of violin and viola players. Between 20-28% of violin/viola players reported suffering from neck pain in studies investigating PRMD (Fishbein et al. 1988, Ackerman and Adams 2003).

Neck pain is known to be associated with various changes in motor control. Impairment of deep cervical flexors is a common feature in neck pain and contributes to altered muscle activation patterns during various functional tasks of the head and shoulder region (Falla 2004a, 2004b). Additionally, there is evidence of sensory changes and sensorimotor alterations with
pain (Sheather-Reid 1998, Scott et al. 2005, Bisset et al. 2009). Nevertheless, there is no research data at present to determine if these phenomena are present in musicians as well.

**METHOD**

Within this study, 22 violin/viola players with neck pain, 21 without, and 21 healthy non-musician as a normal control group were required to complete the Neck Disability Index (NDI), the General Health Questionnaire (GHQ), the Patient Specific Functioning Scale (PSFS), and questions about their violin/viola playing.

Sensory testing included pressure algometry over the neck and over the M. tibialis anterior and thermal pain thresholds (cold and heat) over the neck. Sensorimotor hand function was tested with the Human Performance Resources hand module BEP I recording reaction times, tapping velocity, and performance accuracy.

Muscle activity was investigated with surface-electromyography of the upper, middle, and lower trapezius muscle and the sternocleidomastoid muscle (SCM) during the craniocervical neck flexion test (CCFT), a functional tapping test, and a violin/viola playing task.

**RESULTS**

Based on their NDI scores, the symptomatic violin/viola player group was divided into a low-NDI and a high-NDI group. There were no statistically discernible differences between the musician groups in terms of years playing the instrument and average playing time.

The mean NDI and GHQ values differed significantly among groups (p<0.001). No statistically relevant difference was shown for pain intensity values (visual analogue scale) between low and high NDI player groups. A significant difference was shown for participation in sports (p=0.004). Concerning the PSFS, nearly all musicians in the symptomatic group reported at least one impaired instrument-playing related activity.

Analysis of sensory data showed significant differences for both cold and heat thresholds between asymptomatic and symptomatic musicians (p<0.05). Pressure pain values and motor performance tests with BEP I were not significantly different between player groups and controls. In the CCFT, significantly higher EMG activity was found at several levels of the test (p<0.05). Additionally, symptomatic violinists had more often asymmetric SCM patterns. The EMG results of the functional tasks demonstrated trends for higher
EMG values in musicians with high NDI values, but the differences were not significant.

**DISCUSSION**

Violin/viola playing-related neck pain changes thermal thresholds for heat and cold. This is in accordance with existing studies investigating sensory features in neck pain patients. Function of neck muscles in the CCFT as well as EMG activity in functional tasks were partly altered. Results were not as distinctive as in corresponding studies with non-musician neck pain participants, which may be explained by the higher NDI levels of those subjects. It also has to be taken into account that the musicians investigated complained about task-specific neck pain, which was not present during normal daily life activities. Sensorimotor deficits in an experimental setting assessing reaction speeds, tapping velocity, and performance accuracy of a dexterity task were not present in musicians with playing-related neck pain.

Possibly, sensorimotor deficits of musicians are too subtle and task specific to be picked up with the tests used for sensorimotor assessment in the present study. Therefore, future studies and tests have to be tailored assessing musician’s fine motor skills during musical performance.

**Address for correspondence**

Anke Steinmetz, Department of Manual Medicine and Pain Medicine, Sana Clinics of Sommerfeld, Waldhausstr. 44, Kremmen 16766, Germany; Email: a.steinmetz@sana-hu.de

**References**


