

Comparison of Electromyographic Activity and Range of Neck Motion in Violin Students with and without Neck Pain During Playing

Kyue-nam Park, MS, PT, Oh-yun Kwon, PhD, PT, Sung-min Ha, MS, PT, Su-jung Kim, MS, PT,
Hyun-jung Choi, MS, and Jonghyuck Weon, PhD, PT

Neck pain is common in violin students during a musical performance. The purpose of this study was to compare electromyographic (EMG) activity in superficial neck muscles with neck motion when playing the violin as well as neck range of motion (ROM) at rest, between violin students with and without neck pain. Nine violin students with neck pain and nine age- and gender-matched subjects without neck pain were recruited. Muscle activity of the bilateral upper trapezius, sternocleidomastoid, and superficial cervical extensor muscles was measured using surface EMG. Kinematic data on neck motion while playing and active neck ROM were also measured using a three-dimensional motion analysis system. Independent t-tests were used to compare EMG activity with kinematic data between groups. These analyses revealed that while playing, both the angle of left lateral bending and leftward rotation of the cervical spine were significantly greater in the neck pain group than among those without neck pain. Similarly, EMG activity of the left upper trapezius, both cervical extensors, and both sternocleidomastoid muscles were significantly greater in the neck pain group. The active ROM of left axial rotation was significantly lower in the neck pain group. These results suggest that an asymmetric playing posture and the associated increased muscle activity as well as decreased neck axial rotation may contribute to neck pain in violin students. *Med Probl Perform Art* 2012; 27(4):188–192.

Among musicians, playing-related musculoskeletal disorders (PRMDs) are defined as chronic or severe pain, weakness, numbness, lack of control, tingling, or other symptoms that interfere with a player's ability to perform to his or her usual level of skill.¹ Violin players in particular have a significantly higher incidence of PRMDs related to the neck-shoulder region.^{2–4} Indeed, 39% of adult violin players complain that PRMDs interfere with their performance.⁵ PRMDs may also develop in adolescents. Among high school violin

students, the prevalence of PRMDs is 43%, with 16% of students complaining of moderate to severe pain and 27% complaining of mild pain.⁶

Repetitive movements and prolonged static and dynamic loading of the muscles of the neck-shoulder region are thought to cause neck-related PRMDs.⁷ Typical repetitive and sustained neck-shoulder movements while playing the violin include raising the left shoulder, leftward neck rotation, and lateral bending of the neck,⁸ indicating that the left upper trapezius (UT) and right sternocleidomastoid (SCM) may be overworked during this type of activity.³ Indeed, previous studies demonstrated that playing the violin was associated with overuse of the left UT among violinists with neck pain, compared to those without neck pain.^{8–10} Furthermore, violinists with neck pain show greater left UT activity when playing more difficult pieces of music, due to excessive stabilization of the left shoulder, than when playing relatively easy pieces.⁹

Although the role of UT and SCM activities in violinists with PRMD has been investigated, less is known regarding the activity of the superficial cervical extensors (CEs). In contrast to deep CEs, which have an important role in head stabilization,¹¹ increased or compensatory activity of the superficial CEs and SCMs may contribute to decreased participation of the deep neck flexor muscles, leading to disuse atrophy and widespread changes in the deep CE and deep cervical flexor muscles in patients with chronic neck pain.^{11,12} If deep cervical flexor and extensor muscle do not participate sufficiently in performing precise movements of the neck, neck pain and limited neck range of motion (ROM) may result.¹⁰ Limited ROM may also be the result of cumulative microtrauma by repetitive stress on cervical structures.^{10,13,14}

To our knowledge, however, no studies have compared surface electromyographic (EMG) activity, including superficial CE and neck movements during violin playing, and active neck ROM between violin students with and without neck pain. Examining differences between students with and without neck pain may provide insight into the importance of appropriate neck posture while playing the violin. Thus, the purpose of our study was to compare the EMG activity of the UT, SCM, and superficial CE with neck motion during violin playing, as well as active neck ROM while at rest, between violin students with and without neck pain. We hypothesized that:

Dr. Kwon is Professor at the Department of Physical Therapy, Kinetic Ergocise Based on Movement Analysis Laboratory, College of Health Science, Yonsei University, Wonju; K.-N. Park, S.-M. Ha, and S.-J. Kim are doctoral students from the Department of Rehabilitation Therapy, Graduate School, Yonsei University, Wonju; H.-J. Choi is Violin Lecturer at Yonsei Academy of Music, Seoul; and Dr. Weon is Assistant Professor at the Department of Physical Therapy, College of Tourism & Health, Joongbu University, Chubu-myeon, South Korea.

Address correspondence to: Dr. Oh-Yun, Kwon, Department of Physical Therapy, Kinetic Ergocise Based on Movement Analysis Laboratory, College of Health Science, Yonsei University, 234 Maeji-ri, Heungup-myon, Wonju-si, Kangwon-do 220-710, South Korea. Tel +82-33-760-2721, fax +82-33-760-2496. kwonoy@yonsei.ac.kr.

© 2012 Science & Medicine. www.sciandmed.com/mppa.