

Do pianists play with their Teeth?

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The aim of this study was to find out whether the masticatory and postural muscles are used by pianists during their music performances. The study also aimed to ascertain whether the complex neuromuscular activity involved in the act of playing the piano also encourages hyperactivity in terms of the masticatory muscles. The bio-electric potentials of the masticatory and postural muscles of 20 pianists were recorded. The electromyographical figures obtained from regarding the temporal and masseter muscles are much higher than those recorded when in the resting position. These registrations, which are not the same as those obtained, for example, when the individuals are chewing hard food such as a carrot, are nonetheless indicative of daily parafunctional activity in musicians who often study for as much as 7 hours per day.

Keywords: Pianists, electromyography, muscular hyperactivity, masticatory muscles and postural muscles

Music performance is based on the knowledge musicians acquire through a great deal of deliberate practice to obtain high levels of skills (Ericsson, Krampe & Tesch Roemer, 1993; Hallam, 1997). Consequently, the incidence of focal dystonia, for example, may be as high as one in 200 professional musicians (Altenmueller, 2000). Research has shown the musculoskeletal system to be the most frequently involved area of impairment (Morse et al., 2000). Orofacial problems may also be included as result of the musicians' professional activity. Malocclusion, focal dystonia, herpes labialis, dry mouth, and temporomandibular joint disorders (TMD) have been identified especially among wind and stringed instrumentalists, as

well as vocalists. These problems may result from the impact of the selected instrument on the orofacial structures of the musician (Raney, 2006) or from an inadequate dental treatment and increase with stress. In all cases it may be detrimental to the musician's careers.

Pianists are among the highest in number of students in music colleges in Portugal, both in classical and jazz degree courses. Research on piano related injuries is mainly focused on the upper limbs, namely the hand adaptation to the keyboard; hand pain; focal hand dystonia; finger joints or tendon and arm overuse related problems (Shields and Dockrell, 2000; Sakai, 2008). Yet, little has been written about their orofacial activity. Given the duration and intensity of the daily practice these pianists might undertake (as much as 7 hours a day) they may well develop a parafunctional activity, especially in the masticatory muscles and postural muscles. It is extremely important to monitor such a parafunctional activity so that muscular hyperactivity does not interfere in maintaining a functional equilibrium of the cranial-cervical-mandibular complex. Hence, the aim of the present study was to determine whether the masticatory muscles (elevator muscles – temporal and masseter, jaw depressor muscles – digastrics), whose main functions are chewing, swallowing and speaking, are used by pianists during their music performances and so ascertain whether the complex neuromuscular activity involved in the act of playing the piano also encourages hyperactivity in terms of the masticatory and postural muscles. Since we had both classical and jazz pianists on our sample an additional aim was to ascertain whether different styles have a different effect on the masticatory and postural muscles (trapezius).

METHOD

Participants

The experiment was conducted with 20 subjects ranging from 18 to 27 years old with classical and jazz piano training. In this paper we present the most significant cases.

Materials

The Electromyographic (EMG) activity was recorded using the Bio EMG 2 electromyograph with eight channels (Bioresearch Assoc. Inc., Milwaukee, WI, USA.).

Procedure

An alcohol pad was wiped in the area where the sensors were to be placed, and a conductive gel was placed on 9 mm diameter disposable silver/silver-chloride bipolar surface electrodes (Duo-Trode, Myotronics Inc., Seattle, WA, USA), before their attachment to the skin. These bipolar surface electrodes were located on the muscular bellies of the anterior temporalis, masseter, digastric and trapezius muscles of both sides (right and left), and parallel to the muscle fibers.

The electromyographic activity was recorded during the following procedures: (i) at rest; (ii) maximum voluntary clenching in the intercuspal position; (iii) maximum voluntary opening (iv) playing piano and (v) eating a cake.

Subjects played a piece of their choice in classical style (Figure 1 on the right) and jazz style (Figure 1 on the left). A resting period of one minute between recordings was allowed, to avoid muscular fatigue.



Figure 1. Pianists performing a jazz and a classical piece

RESULTS AND DISCUSSION

The head posture adopted by piano players during their performance gave different patterns of EMG activity in the masticatory and postural muscles. The visual system used in this study played an important role in the perception that there are variations in seated positions between classical

piano and jazz players, with direct implications on the cranio-cervical-mandibular complex.

Likewise, it is possible to verify an adoption of an anterior head position on Jazz players, with a tendency on most of these subjects to maintain a jaw position by using the anterior temporal more than the masseter muscles. In classical players, there were higher values on the EMG activity of the masseter muscles compared to the Jazz players. A contributing factor can be that Jazz players are used to improvise during their performance while classical players have a prolonged and strained stress placed on the masticatory muscles, specifically the masseter muscle. For the particular case of classical piano players, we were able to compare the activity of a mandible elevator muscle (masseter) during one of its main functions, eating. When eating a cake, the bioelectrical potential of the masseter muscles reached 15-18 μV while playing for example the c minor Rachmaninoff Concerto, the masseter muscle can reach values of 49.6 μV .

The findings of this study illustrate that pianists may feel persistent neck and orofacial pain due to the high hours of piano exposure, the physical demands as well as the psychosocial factors involved in such a demanding profession.

Understanding what kind of muscles are being used in the cranio-cervical-mandibular complex during the performance of a pianist is of vital importance for it can help in a correct diagnosis of a concrete problem originated by repetitive movements.

Understanding how the orofacial muscles behave during voluntary exercise like playing piano, is essential, in this particular case it was not a question of being able to evaluate if the fatigue of these muscles could restrict the pianist to the point of no longer being able of performing his task, playing piano. An overuse of these muscles may have a direct impact on the pianists' quality of life when performing their maximal voluntary performance of these orofacial muscles during normal tasks like eating.

In time these kind of restrictions can induce pain that can be related to certain movements or occur at any time of the day. This special attention towards the performer's health issues and specific needs will provide a working diagnosis, allowing health care professionals to focus their examination rather than conducting a series of tests that usually are time consuming.

Having piano players, teachers and performing arts medicine professionals conscious of what is actually happening to the orofacial region while playing piano will encourage the daily supervision of any parafunctional habit like clenching their teeth during the performance.

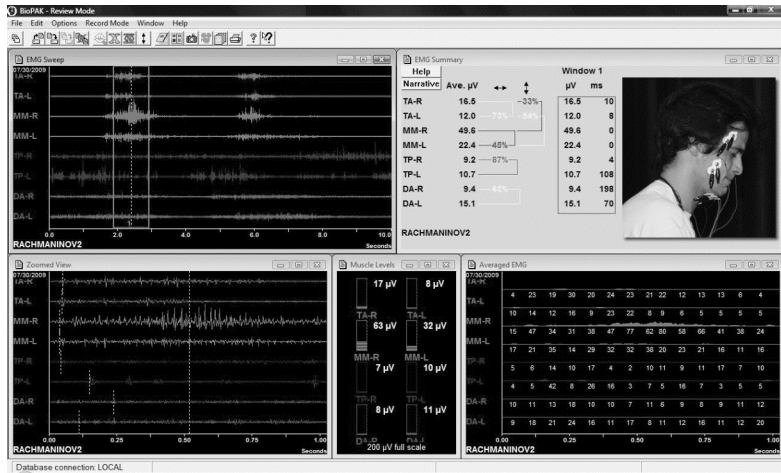


Figure 2. Pianist with high electromyographic activity of the Masseter muscle

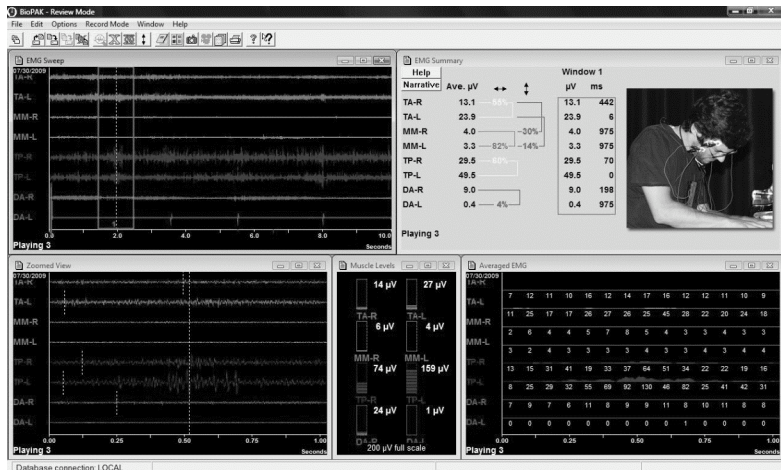


Figure 3. Pianist with high electromyographic activity of the Trapezius muscle

CONCLUSIONS AND FUTURE WORK

So, do piano players really play with their teeth? The essential point is yes, some piano players in fact play with their “teeth” since that they have an activity of their masseter and anterior temporal muscles which act as an

elevator of the mandible forcing the mandible teeth to contact the maxillary teeth- So here piano players during their daily performance have parafunctional habits inducing hyperactivity of some of the orofacial muscles that very often is associated when an individual is concentrated in a particular task or when anxiety levels arise.

Further studies would benefit from a multimodal approach in which this methodology would parallel with High resolution sound recording.

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