

The Relationship between Chin Pressure and the Severity of TMD in Violin Players

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ABSTRACT

This research aimed to determine the relationship between playing the violin and the severity of TMD and the maximum pressure on the chin rest within safe limits while playing the violin, to prevent TMD occurrence. The 20 violin players of OSUI Mahawaditra and MYSO orchestra were undergoing the examination and interview. Measurement of the pressure on the chin rest was done using a Flexi force device attached to the chin, which will measure the chin pressure on the instrument (N). The highest maximum pressure is 15.157 N, while the lowest maximum pressure is 0.126 N. The most elevated average pressure is 6.203 N, and the most moderate average pressure is 0.025 N. There is a strong relationship between chin pressure on the chin rest and TMD conditions in the violinist. There is no relationship between the frequency and duration of violin training with TMD conditions in violin players.

Keywords: Chin Pressure, Temporomandibular Disorders, Violin Players.

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INTRODUCTION

Temporomandibular Joint (TMJ) is a joint formed by a mandibular condyle that enters the fossa in the temporal bone.^{1,2} Disorders of the TMJ, called Temporomandibular Disorder (TMD), cause a variety of clinical problems characterized by craniofacial pain involving the joints and the muscles of mastication and innervation of the head and neck, other related orofacial structures, and limitations of mandibular movements and clicking.^{3,4} TMD is one of the leading causes of non-odontogenic pain in the orofacial area, affecting 10% -15% in adults.^{5,6} Signs and symptoms of TMD include pain in the TMJ, preauricular area, cervical spine, face and head, muscle pain mastication, limitations of jaw movement, jaw deviation or deflection, and articular sounds⁷.

Violin and its effects on TMD have been studied. It was found that exercise while learning the violin or playing professionally has an impact on facial bone structure and relates specifically to the way the player holds the violin. There is a pressure of 30-70 N (5-14 N / cm²) or 220-2000 gr on TMJ due to pressure on the chin rest that is channeled through the mandible during playing the violin, which also resulted in force on the right TMJ and subluxation on the left TMJ.^{8,9} String instruments, especially violins, are prone to TMD due to repetitive movements such as asymmetrical posture and the position of pinching instruments between the chin and shoulders performed for instrument stability and to enhance perfect sound during rapid finger movements.^{7,10} Violinists often complain of pain in some parts of their body, including the jaw, back, neck, shoulders, and hands, which are related to nerves and muscles. This complaint is caused by improper, repetitive, and pressure postures for a long time in a sitting position or while holding the instrument¹¹. The neck area is the most frequently complained of as a source of pain in string instrument players¹². In violin players, disorders generally occur because of the monotonous and long-standing style and position. The monotonous position includes asymmetrical postures, such as the position of the arms during bowing and a higher position of the shoulder than

the other parts. A tense left shoulder with a tilted head to hold the instrument with the chin. This gives excessive force to the motor system, especially in the dorsal region¹³. The relationship between the occurrence of TMD in violin players and the chin pressure is still unknown, as well as the amount of minimal pressure on chin rest, which can cause TMD in violin players in some organizations in Indonesia. This study will analyze the TMD conditions and the amount of minimal pressure on the chin rest, leading to TMD in violin players in Indonesia. This analysis was carried out by examining the TMJ, starting from history taking, clinical examination, filling in the questionnaire regarding the physical condition to the duration and frequency of exercise, and the pressure on the chin rest measured on each player. Through this research, it is expected to be able to know the relationship between playing the violin and the severity of TMD, as well as the maximum pressure on the chin rest which is within safe limits while playing the violin, to prevent the occurrence of TMD.

MATERIAL AND METHODS

The subjects were 20 violin players of OSUI Mahawaditra, and the MYSO orchestra ranges from 18 to 35 years old. The study used primary data, which was gathered through an examination and interview. Measuring the pressure on the chin rest is done by using a Flexi force device that is attached to the chin (Figure 1), which will measure the chin pressure on the instrument and will be connected to USB which will later be read in the monitor (LabView 2019, National Instrument).

This study uses pressure gauges made by researchers in the form of pressure sensors integrated with applications in computer programs. The pressure sensor uses a device in the way of a Flexi force unit attached to the mandibular corpus subject (Figures 2). The pressure applied to the chin rest is then captured by a pressure sensor forwarded to the central unit. The main unit will connect to the laptop via a USB cable, and the pressure value will be read on the program in the laptop in the form of graphics and graphics in Newton. All violin players were

instructed to play a classical musical composition entitled "La Vie en Rose" with a tempo guide using a metronome device within 60 bpm. Bowing and fingering are written on scores and arranged so that each player will perform the uniform bowing and fingering, without using the vibrato effect. Players are asked to play the composition four times. The first turn is intended for relaxation and adaptation of muscles and emotions, while the next three corners will be included in data retrieval.

RESULTS

This research uses pressure gauges made by researchers in the form of pressure sensors that are integrated with a computer program. The chin pressure on the chin rest was measured in 20 subjects who met the inclusion criteria. The chin pressure on the chin rest while playing the violin ranges from 0.025 N to 15.157 N. The highest maximum pressure is 15.157 N, while the lowest maximum pressure is 0.126 N. The most elevated average pressure is 6.203 N. The most moderate average pressure is 0.025 N.

The prevalence of TMD in violin players based on DC-TMD examination is 80%. A total of 16 subjects experienced TMD, while four other subjects were not detected having TMD. This is because the conclusions from the clinical examination and the symptoms felt by the subject do not lead to the diagnosis of any TMD. In analyzing the data using the Spearman test, it can be seen that the significance value of the average pressure relationship with DC-TMD is 0.032 ($p < 0.05$). The average pressure is related to DC-TMD. Table 1 shows the results of statistical data analysis with the Spearman test for the two variables. Based on these tests, there is a relationship between the average pressure with DC-TMD, with a significance of 0.032 ($p < 0.05$). Based on the results of the Spearman correlation in the table above, it is known that the magnitude of the Spearman correlation (ρ) is 0.521. Thus, H_0 is rejected, and H_a is accepted. So, it can be concluded that there is a relationship between the average pressure with TMD based on DC-TMD. According to Guliford, 0.521 is included in the category of significant relationships based on high and low correlation.

DISCUSSION

At first, it is estimated that the length of play or training will be related to the TMD conditions that occur in the violinist. However, in this study, it was found that the duration of play was not associated with the incidence of TMD, both analyzed through duration and frequency of play. This is in line with the research conducted by Rodriguez et al., which states that the two variables are not significantly related to statistical analysis. This is viewed from the length of play and the frequency of subjects practicing violins in one week. This statement is also in line with research conducted by Jae-Young et al., Which states that TMD symptoms do not significantly relate to the duration of playing the violin or the length of playing experience of someone's violin³. This condition may be related to subjects who have a habit of resting between exercises or doing some muscle stretching exercises while practicing the violin⁷. However, this is contrary to research conducted by Kovero et al., where the duration of playing violin in one week is positively related to some symptoms of TMD. The researcher concluded that playing violin could be a predisposing factor for musicians to experience TMD.¹⁴

The force applied to the rest can cause pressure on the right TMJ.¹⁵ In this study, as many as 20% of subjects

experienced pain during palpation of TMJ. Eighty percent of them felt pain in the left TMJ area during palpation. Pain in the right TMJ area when palpation was felt by as many as 20% of subjects at the time of clinical examination. This is following the study results described by Rodriguez et al., whereas many as 24.4% of subjects experienced pain in TMJ. He also stated that the pressure on the left side when playing the violin would affect the complaints of pain on the opposite side of the TMJ. This theory is also supported by research conducted by Steinmetz et al., who has collected data on 31 subjects and provided results in the form of pain in TMJ with a percentage of 45% in violin players.¹⁶

During playing the violin, there was a pressure of 30-70 N on the rest of chin. In this study, the maximum average pressure value applied to the chin rest while playing the violin was 6.203 N. Obata Satoshi et al. on the chin rest while playing the violin. The pressure is measured in 15 subjects and produces the maximum average value of 16.2 N. This value is the pressure value applied to the rest without the vibrato effect. This is in line with this study, where all subjects were instructed not to use the vibrato effect when playing the violin when measuring pressure. The maximum pressure in Obata Satoshi et al. research showed a value of 29.6 N. In contrast, in this study the maximum pressure value of 15.157 N.¹⁷ The difference in pressure from some of these studies could be due to differences in violin type and type of shoulder rest used by each player.¹⁴ Based on statistical calculations, it was concluded that the group of TMD conditions in the mild and moderate categories were in the same group. This happened because there was no significant difference between TMD conditions in the two groups. Therefore, the safe limit of pressure that can be applied to the rest while playing the violin is set at the maximum pressure limit in the moderate TMD group, equal to 2.687 N.

CONCLUSION

The safe limit of pressure that can be applied to the chin rest while playing the violin is 2.687 N. There is a strong relationship between chin pressure on the chin rest and TMD conditions in the violinist. There is no relationship between the frequency and duration of violin training with TMD conditions in violin players.

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Table 1. The relationship between chin pressure and TMD

			DC TMD category	Chin pressure average value
Spearman's rho	DC TMD category	Correlation Coefficient	1.000	.521*
		Sig. (2-tailed)	.	.032
		N	17	17
	Chin pressure average value	Correlation Coefficient	.521*	1.000
		Sig. (2-tailed)	.032	.
		N	17	17

*Correlation is significant at the 0.05 level (2-tailed).

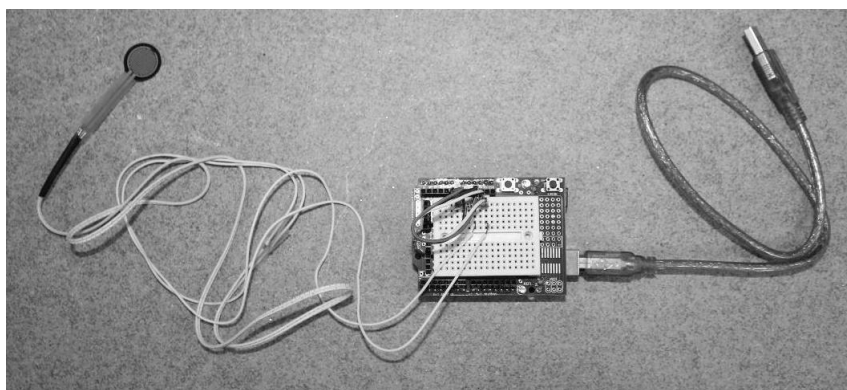


Figure 1. Force recording unit.

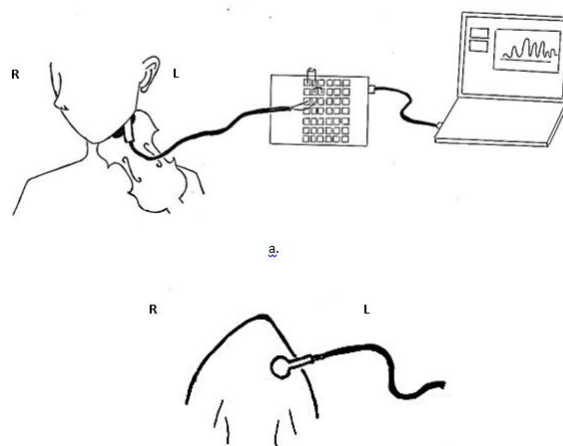


Figure 2. Chin pressure recording simulation