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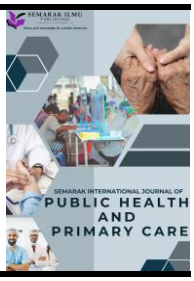

Prevalence of De Quervain's Tenosynovitis among Classical Piano Students in Tertiary Education, Universities Tunku Abdul Rahman

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ABSTRACT

The prevalence of De Quervain's tenosynovitis has shown that growing trend among the world. There are some of the studies found out that the prevalence of De Quervain's tenosynovitis is higher in their country. This study aims to find out the prevalence of De Quervain's tenosynovitis among classical piano students in tertiary education, Universities Tunku Abdul Rahman. A questionnaire was distributed to the students around the school compound around Universities Tunku Abdul Rahman. The questionnaire involves 3 main sections. The first section records the first section is to fill up the demographic data, the second part is to find out the inclusion criteria for the participants in this study and the third part is the symptoms of De Quervain's tenosynovitis. The participants who met the inclusion criteria are required to perform a test to confirm the diagnosis of De Quervain's tenosynovitis. There is a total of 156 of pianists around in Universities Tunku Abdul Rahman. Out of 156 of pianists, there is 137 of the pianists are eligible for this study. Among 137 pianists, there is 80% of the pianists are positive to the WHAT test. As conclusion, the prevalence of De Quervain's tenosynovitis is higher among the pianists in Universities Tunku Abdul Rahman. Thus, intervention and preventions should be implemented to prevent the prevalence of De Quervain's tenosynovitis among the pianists.

1. Introduction

De Quervain's tenosynovitis is one of the common musculoskeletal problems in the distal upper limb. De Quervain's tenosynovitis is a prevalent chronic inflammatory musculoskeletal disorder predominantly affecting the radial aspect of the wrist [1]. The symptoms of the De Quervain's tenosynovitis are pain sensation at the radial border of the wrist and swelling around the base of the thumb. De Quervain's tenosynovitis is caused by inflammation over the tendon which controls the movement of the thumb especially in abductor pollicis longus (APL) and extensor pollicis brevis (EPB). These tendons pass via the wrist's first extensor compartment, a tiny tunnel [2]. The reduced gliding

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is thought to be caused by thickening of the extensor retinaculum in the first dorsal (extensor) compartment of the wrist, followed by constriction of the fibro-osseous canal. Thus, will lead to De Quervain's tenosynovitis.

Based on the systemic review study, the most used device in physiotherapy management for treatment of De Quervain's tenosynovitis are laser therapy and therapeutic ultrasound. This is because by using the low-level of laser therapy and therapeutic ultrasound will produce a positive clinical, functional and radiological improve which will cause reduction of the tendon sheaths' diameter and tenderness will then increase the grip strength and pain reduction [3,4].

Nowadays, humans are continuously developing themselves to learn in music this era. There will be a chance of musculoskeletal problem to develop among those people due to poor technique or body posture or prolong training with the music instruments [5,6]. Other than that, there are two studies shown that there is low awareness and knowledge among pianists, and through the study, the author mentioned this will lead to a high risk of getting playing-related musculoskeletal disorders (PRMDs) [7,8]. Besides that, another study mentioned nowadays, there is an increasing number of musicians being diagnosed with playing-related music disorders. Therefore, this will lead to increased risk of injury among the musicians [9]. Thus, the reason for this research is to find out the prevalence of De Quervain's tenosynovitis among classical piano students in tertiary institution, Universities Tunku Abdul Rahman (UTAR).

One study conducted research to find out the measurement of a number of indices of hand and movement angles in pianists with overuse disorder [10]. In their research, there are 4 common types of musculoskeletal problems among pianist which are overuse disorder known as De Quervain's tenosynovitis, arthritic conditions, trauma, and other problems. De Quervain's disease showed a significant difference in the length of the hand span. De Quervain's disorder mainly affects on the abductor muscle tendon so the hand span will be directly related to the load in the abductor muscle when the is hyper-abducted when playing an octave or chord. During playing the octave or chord, the thumb will play the most important role, thus the thenar muscles are commonly undergoing overuse, stiffness, or pain. Other than the thumb, the little finger is another important finger in playing chords and octaves because of little finger is the shortest as compared to others thus the thenar muscle is prone to overuse and more hyper abducted and hyperextend especially when playing the piano to achieve greater hand span. Meanwhile, the little fingers will have more stiffness than the large hand pianist and the hypothenar, thenar muscle, and wrist flexor require more contraction strength to resist the reaction force in each piano key due to short fingers insufficient leverage for striking the piano key.

Based on the literature review, several studies have examined the knowledge of playing-related musculoskeletal disorders among classical piano students at tertiary institutions in Malaysia. Ling et *al.,* [7] conducted a study to determine the level of knowledge among these students regarding such disorders. The study found that 58.3% of respondents had low awareness that continuing to play the piano could worsen wrist or hand pain. Additionally, Lonsdale and Boon [8] explored the awareness of playing-related health problems among instrumental music students at the University in Malaysia. Their findings revealed that half of the respondents had not received adequate knowledge or information about these issues. Furthermore, many students were unaware of body awareness classes, such as Feldenkrais and Alexander techniques, which are recommended before starting music education [8]. This study aims to determine the prevalence of De Quervain's tenosynovitis among classical piano students at the tertiary institution, UTAR.

2. Methodology

This study used a prevalence and case-control design to investigate the prevalence of De Quervain's tenosynovitis among classical piano students at Universiti Tunku Abdul Rahman (UTAR). This study targeted students aged 18 to 30 years. A total of 307 participants were needed, calculated using OpenEpi version 3 with a 95% confidence level. Convenience sampling was used for its cost-effectiveness and simplicity.

After obtaining ethical approval from UTAR's Scientific and Ethical Review Committee (SERC), questionnaires were distributed to students across the campus. Out of 237 responses, 156 were pianists, and 139 met the inclusion criteria. The remaining 137 pianists underwent the WHAT test to check for De Quervain's tenosynovitis. Data was collected until mid-November and analyzed using odds ratios and chi-square tests. All participants provided informed consent, understanding the study's aims, procedures, and confidentiality of their data.

Participants were eligible for inclusion in the study if they were between 18 and 30 years old, played the piano for at least 45 minutes per day or more than 5 hours per week, had been playing the piano for at least six months, and volunteered to participate. Conversely, participants were excluded if they had experienced a recent fracture or injury to the upper limb, were not studying at the UTAR Sungai Long campus, or could not read or write in English.

The main outcome measures in this study were a self-modified questionnaire and the WHAT test. The questionnaire had three sections: demographics, eligibility criteria, and symptoms of De Quervain's tenosynovitis. The WHAT test assesses tendon stress and pain in the wrist, which helps diagnose De Quervain's tenosynovitis. Figure 1 show the mechanism of the WHAT test, while Figure 2 show how the test is performed.

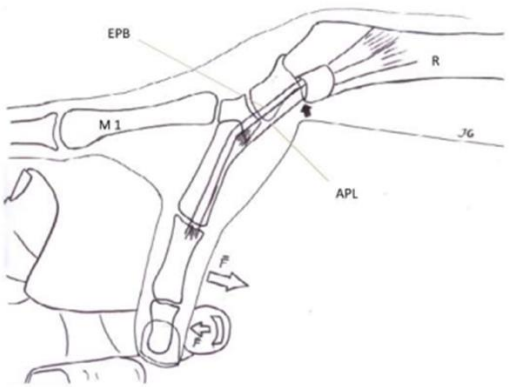

Fig. 1. Mechanism of WHAT test

Fig. 2. WHAT test

The WHAT test assesses the mechanics of the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons. The test mechanism reduces shear and tendon excursion in the sheath between the APL/EPB and the bone floor of the first extensor compartment. It involves actively contracting the APL and EPB tendons, which generates shear stress on the inferior palmar border of the pulley of the first extensor compartment, potentially leading to pain indicative of De Quervain's tenosynovitis [11].

3. Results

Table 1 shows the demographic data of the participants which includes the gender and age of participants.

Table 1
Demographic data

Demographic data	Frequency, N (%)
Gender	
Male	23 (19.20)
Female	114 (80.80)
Age	
20	31 (22.63)
21	28 (20.44)
22	28 (20.44)
23	18 (13.14)
24	6 (4.34)
25	3 (2.12)

Figure 1 shows the percentage of pianists either they are practicing every week or not. Respondents were required to fill in this question to clarify on the practice either it is based on recreational or elite pianist. Out of 156 pianists, only 90.4% (141) of the respondents practice piano every week. While 9.6 (15) of the respondents occasionally practice playing piano and will be excluded from the study. This information is used to screen the participants based on the eligibility criteria of this research study.

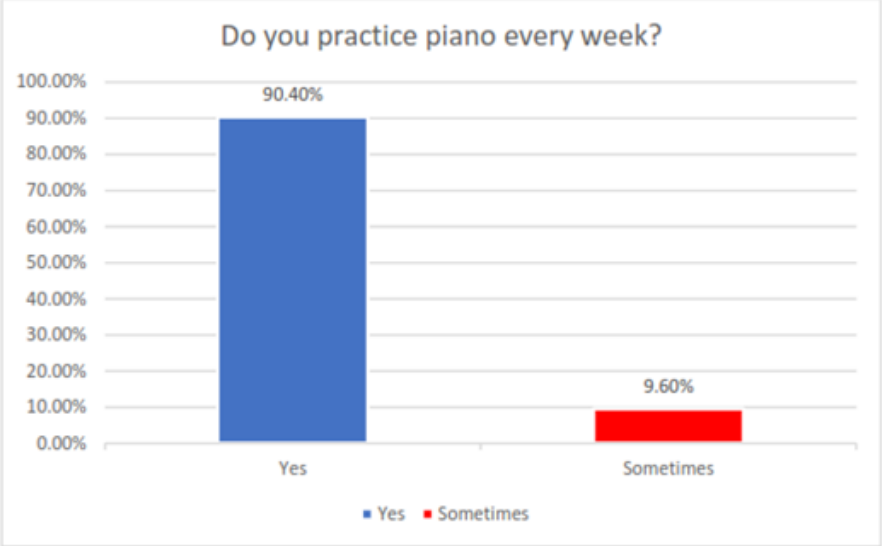

Fig. 1. Percentage of Practicing Piano Every Week

After distributing 237 of the Google form to the UTAR students, there were 156 of pianists among 237 of the respondents. In this 156 of the pianists, there is 137 of the pianists who met the inclusion criteria of this study. After performed Wrist Hyperflexion Abduction Test to the 137 of the pianists, the result shown that there is 110 of the pianists were tested positively while there is 27 among the 137 of the pianists shown that they were negative to the test.

The prevalence of pianists in UTAR Sungai Long is 1.95% among 8000 of the students in UTAR Sungai Long (Universiti Tunku Abdul Rahman (UTAR) Sungai Long Campus, n.d.). This calculation is performed by the prevalence calculation [12]. Prevalence of pianist positive with De Quervain tenosynovitis practice for 45 minutes is 80.4878%. Other than that, the prevalence of pianists with De Quervain tenosynovitis who practice more than 45 minutes is 80%. The prevalence data of De Quervain tenosynovitis were calculated by using the prevalence odds ratio [12].

Table 2 presents the association between gender and the occurrence of De Quervain's tenosynovitis among pianists. A total of 137 participants were analyzed, consisting of 114 females and 23 males. The table shows that 89 females (91.53% of females) and 21 males (18.48% of males) tested positive for De Quervain's tenosynovitis, resulting in a total of 110 positive cases. Meanwhile, 25 females (22.47% of females) and 2 males (4.53% of males) tested negative, resulting in a total of 27 negative cases. A Chi-Square Test of Independence was performed to determine if there is a significant association between gender and the presence of De Quervain's tenosynovitis. The test resulted in a Chi-Square value (X^2) of 2.118 with 1 degree of freedom and a p-value of 0.05. The Chi-Square statistic suggests that the association between gender and De Quervain's tenosynovitis is not statistically significant at the 0.05 significance level, as the p-value equals 0.05.

Table 2
Association between gender and the occurrence of De Quervain's tenosynovitis among pianists

	Female	Male	Total	Chi-Square (X2)	
Positive	89 (91.53)	21 (18.48)	110	0.070088	0.34739
Negative	25 (22.47)	2 (4.53)	27	0.285542	1.415294
Total	114	23	137	2.118314	

Figure 4 presents the association between the number of days of practice and the presence of De Quervain's tenosynovitis among 137 participants, analyzed with 3 degrees of freedom. The data are categorized based on gender and the number of days participants practiced per week, with corresponding Chi-Square values provided to indicate any potential associations.

		De Quervain's Tenosynovitis				
m		Positive	Negative	Total	Chi Square value (X2)	
1	2	n (%)				
Gender	Female	89 (80.91)	25(92.59)	114(83.21)		
	Male	21(19.09)	2(7.41)	23(16.79)		
No. of training days	1 to 2	10(9.09)	2(7.41)	12(8.76)	0.013824	0.056322
	3 to 4	22(20.00)	8(29.63)	30(21.90)	0.180925	0.7371
	5 to 6	62(56.36)	13(48.15)	78(56.93)	0.052675	0.214602
	everyday	16(14.55)	4(14.81)	20(14.60)	0.000212	0.000865
1	2	110(100)	27(100)	137(100)	1.256525	

Fig. 2. The association between the number of days practice and De Quervain's tenosynovitis. n = 137, dof = 3

The table examines the number of training days per week and their association with De Quervain's tenosynovitis. For participants practicing 1 to 2 days per week, 10 (9.09%) tested positive, and 2 (7.41%) tested negative, resulting in a Chi-Square value of 0.056322, which does not suggest a significant association. For those practicing 3 to 4 days per week, 22 (20.00%) tested positive, and 8 (29.63%) tested negative, with a Chi-Square value of 0.214620, also indicating no significant association. Among participants practicing 5 to 6 days per week, 58 (52.73%) tested positive, while 4 (14.81%) tested negative, yielding a Chi-Square value of 0.000879. Although this value is lower, it still does not indicate a statistically significant association. Finally, for participants practicing every day, 16 (14.55%) tested positive, and 4 (14.81%) tested negative, resulting in a Chi-Square value of 0.006885, which similarly suggests no significant association between daily practice and the occurrence of De Quervain's tenosynovitis. This indicates that the frequency of practice and the occurrence of De Quervain's tenosynovitis are likely independent of each other.

4. Discussion

In this study, our first objective is to find the prevalence of pianists around the UTAR Sungai Long area. There is a total distributed 237 Google forms for the students around the UTAR area, out of 237, there is 156 of them are pianists. After using the calculation of the prevalence, the results shown that there is 1.95% of pianists among the total population of students of UTAR Sungai Long.

Based on WHAT test, the prevalence of pianists getting De Quervain's tenosynovitis who played piano for 45 minutes is 80.49% and pianists who played more than 45 minutes is 80%. Based on the study, most of the hand trauma disorders are positive for De Quervain's tenosynovitis. Another study mentioned that there is a high prevalence of PRMDs for musical students especially among university students [13].

Other than that, based on the study in Malaysia, the author concluded that the longer the time playing piano without breaking have higher risk of PRMDs to the pianist [14]. In this study, the result shown that there is a higher prevalence of the pianists who played 45 minutes of practice time as compared to the pianists who played more than 45 minutes. This is because in our study the prevalence of the pianists who played 45 minutes is more than the pianists who played more than 45 minutes, thus it shown a higher prevalence of De Quervain's tenosynovitis in pianists who played 45 minutes.

In this study, we found out that the result of De Quervain's tenosynovitis and the gender of the pianists were very likely, not independent. This finding aligns with the study by Ramchandani *et al.,* [15], which reported an increased risk of De Quervain's tenosynovitis among females. The study attributes this heightened risk to the anatomical differences in females, specifically a greater angulation of the styloid process, which may lead to a narrowing of the osteoligamentous canal, thereby increasing susceptibility to the condition.

However, the relationship between hand size and injury risk adds a layer of complexity to this association. Lai *et al.,* [16] found that a smaller hand span size is associated with a higher risk of injury among pianists, suggesting that hand size, rather than gender alone, might influence injury risk. Another study further investigated hand dimensions, comparing hand length, hand breadth, and the lengths of the index and ring fingers between males and females. The results showed that males typically have greater hand length and breadth, while females have longer index and ring fingers [17]. This indicates that while there are gender differences in specific hand dimensions, neither gender consistently has a "bigger" hand overall.

In summary, while there is evidence suggesting a higher risk of De Quervain's tenosynovitis among females due to anatomical differences, the role of hand size and specific dimensions also

appears to be significant in determining injury risk. Therefore, it may not be solely gender, but a combination of hand anatomy and size that contributes to the likelihood of developing De Quervain's tenosynovitis among pianists.

After analyzing the association between the number of days of practice and the occurrence of De Quervain's tenosynovitis, our study suggests that these variables are very likely not independent of each other. Study by Kaufman-Cohen *et al.,* [17] which reported that the longer the duration of piano practice, the higher the risk of musculoskeletal (MSK) disorders among pianists. This study also highlighted that factors such as extreme and repetitive movements during piano playing further increase the risk of MSK disorders.

Similarly, a study by Hamedon *et al..* [14] found that incorporating adequate breaks during practice sessions, particularly for those practicing up to three hours per day, can help prevent muscle fatigue and reduce the risk of playing-related musculoskeletal disorders (PRMDs). This suggests that not just the duration, but also the quality and structure of practice sessions, are crucial in managing the risk of these conditions. Additionally, a study by Kay *et al.,* [18] focused specifically on De Quervain's tenosynovitis, indicating that repetitive hand movements are a significant factor contributing to pathological changes in the hand, ultimately leading to the development of this disorder.

Despite these findings, our study appears to contradict some aspects of the established research on the relationship between practice duration and De Quervain's tenosynovitis. One possible explanation for this discrepancy could be the small sample size of our study, which may limit the ability to detect a significant association between the number of practice days and the development of De Quervain's tenosynovitis. This highlights the need for further research with larger sample sizes to better understand the factors influencing the onset of De Quervain's tenosynovitis among pianists.

This study has an impact on healthcare practices and the pianist population. The prevalence data will give awareness to pianists on the risks of getting De Quervain's tenosynovitis if they practice for a longer period of time. Not only that, they should be aware that it will affect their quality of life in the future. As a physiotherapist, it is very important to raise awareness among the pianist population on taking care of their thumbs as well as their wrists. Thus, protecting the pianist's population from this disease is very important for future practice.

For future studies, researchers should consider selecting a larger sample size to achieve more accurate and generalizable results. Additionally, expanding the study to include different types of populations could provide insights into the prevalence of De Quervain's tenosynovitis across various demographic groups. Researchers might also conduct initial screenings or assessments immediately following the recruitment of participants, as certain tests are easy to administer in various settings and can save time for both researchers and participants.

Furthermore, the present study was conducted within a highly limited timeframe, which imposed several restrictions and limited the study's potential. It is recommended that future research be carried out over a longer duration to ensure a higher quality of research and more robust findings.

5. Conclusion

In conclusion, this study found that a majority of pianists practice their instruments for 45 minutes or more per session. Among the participants, 44.5% reported experiencing pain at the base of the thumb, a common symptom of De Quervain's syndrome. Furthermore, the study revealed that 80% of the pianists tested positive for De Quervain's tenosynovitis using the WHAT test, indicating a high prevalence of this condition among pianists at UTAR. These findings highlight the significant

occurrence of De Quervain's tenosynovitis in this population and underscore the need for targeted interventions to manage and prevent this condition among musicians.

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