Journal of Sports Physiology and Athletic Conditioning (J.S.P.A.C) 2023; 3 (9): 69-80

Research Article

Comparison of functional screening test score in dentists with and without upper cross syndrome

Behnaz Hajirezaei[1], Abdolrasoul Daneshjoo*[2]

1. MSc in Corrective Exercises and Sport Injuries, East Tehran Branch, Islamic Azad University, Tehran, Iran.
2. Department of sport sciences, East Tehran Branch, Islamic Azad University, Tehran, Iran.

Received: 27 July 2023
Revised: 29 August 2023
Accepted: 14 September 2023

Keywords:
upper cross syndrome, dentists, motor function screening tests, musculoskeletal disorders

Abstract

Background: The purpose of this research was to compare the score of functional screening test in dentists with and without the complication of upper cross syndrome.

Materials and Methods: A number of 30 dentists (age 39.97±5.47 years and body mass index 23.71±1.82 kg/m2) voluntarily participated in this research, who were selected by available selective sampling method and they were divided into two groups of 15 people (group 1, simultaneously suffering from upper cruciate syndrome anomaly and group 2, without anomaly). Motor performance screening tests including deep squat, hurdle step, launch, rotational stability, push up stability, shoulder range of motion and active leg raising were measured in all participants.

Also, the head and shoulder forward a(1)ngel and the kyphosis angel were measured to detect the mentioned abnormalities. Kolmogorov-Smirnov test was used to normalize the data. To compare the demographic variables between two groups, one-way analysis of variance (ANOVA) test, to compare each of the FMS tests between two groups with and without upper cruciate syndrome, the non-parametric U-Man-Whitney test, and if the distribution of the results is normal, from Parametric independent t test was used. Also, independent parametric t-test was used to compare the overall scores of FMS tests. The collected data were analyzed with SPSS version 16 software at a significance level of 0.05.

Results: Test scores of deep squat (P=0.003), launch (P=0.001), shoulder range of motion (P=0.000) and rotational stability (P=0.001) between two groups with and without deformities There was a significant difference in forward head and shoulder and kyphosis.

However, there was no significant difference between the two groups in the test of stepping over the obstacle (P=0.397), active leg raising (P=0.133) and push up endurance (P=0.143).

Discusion: From the results and discussions of this research, it can be concluded that the spine acts as a chain. So that the change in the curvature in any part of it can also change its muscle structure; This means that the muscles in that area can be weak or shortened. These changes in one of part of the spine can cause changes in the muscle structure of other areas.In the present research, according to the score of the seven FMS tests, it was found that the change in the muscle structure of the head, neck and chest causes a change in the muscle structure of other trunk areas and the scores of the tests are reduced.

***Corresponding author:** Abdolrasoul Daneshjoo
Address: Department of sport sciences, East Tehran Branch, Islamic Azad University, Tehran, Iran.
Email: phdanesh@yahoo.com **Tell**: 00982133584911-14
A D: 0000-0003-4410-084X

1. Introduction

According to researches, more than 90% of dentists' working postures are physical postures with medium and high risk levels (1). Most dentists experience muscle pain at some point in their work, and due to this, many studies have been conducted around the world on this profession (2). In this profession, as in other professions, there are a number of harmful factors in the work environment that endanger the health of workers in this profession if they do not comply with occupational health standards. It has been reported that the prevalence and incidence of musculoskeletal disorders in different areas of the body is higher among dentists than other professions (3, 4).In this profession, due to the small and limited area on which they work (the patient's mouth), dentists are often forced to adopt inappropriate, asymmetric and at the same time static positions. The head is bent forward, the arms are away from the trunk and they also rotate. If this state continues every day for a long time, it will cause excessive pressure on the involved muscles and joints, and it will lead to discomfort and pain, especially in the neck, shoulders, back, and waist areas, and skeletal pain- Muscular is created (5). The prevalence of these discomforts in various studies has been reported between 63-93% in the back, neck, shoulder and hand areas. In a research, Finsen and her colleagues studied the risk factors leading to musculoskeletal disorders in the dentist community, and their results showed that 65% of the participants suffered from neck and shoulder pain(6). Functional assessment of upper cruciate syndrome is a way to prevent injuries to the shoulder girdle and other areas of the body

Functional Movement Screening (FM S) is an assessment tool that measures fundamental movement patterns in an individual and requires simultaneous movement, stability and balance, which is provided by flexibility, strength, range of motion, coordination and proprioception of muscles. This test is also used to screen people at risk of injury. Kiwanlu et al. (2009) stated in a research that forward head position generally reduces the natural lordosis of the neck and causes cervical kyphosis. If the position of the head forward is severe, an s-shaped curvature may be created as a result of decreasing the lower curvature of the cervical vertebrae (C2-C7) and increasing the upper curvature of the cervical vertebrae (C1-C2).Therefore, it can be said that in this case, the muscles in the lower part of the front of the neck are shortened and the muscles in the upper part are stretched in severe situations.

On the other hand, the muscles of the posterior-inferior part of the neck are stretched, and in severe cases, the muscles of the upper part of the neck are shortened. Therefore, stretching the anterior-inferior and posterior-superior muscles of the neck and strengthening the anterior-superior and inferior-posterior muscles are suggested as corrective exercises(7). Therefore, the aim of this research will be to compare the score of the functional screening test in dentists with and without upper crossed syndrome.

2. Materials and Methods

Subjects

30 dentists (age 39.97±5.47 years and body mass index 23.71±1.82 kg/m2) voluntarily participated in this research. People who had completed the consent form to participate and cooperate in the research work; were chosen. The statistical sample of this research was selected by available selective sampling method and they were divided into two groups: 15 people were suffering from forward head and shoulder deformities and kyphosis at the same time and 15 people were healthy. The history of shoulder and neck disorders and the presence of pain in each of the participants were investigated. The initial screening of the samples was done by the researcher using checker board (r=0.89) and flexible ruler (r=0.93).The statistical population of the present study was made up of male dentists in Mashhad with an age range of 30 to 50 years, of which 30 dentists (15 of whom were simultaneously suffering from forward head and shoulder deformities and kyphosis and 15 healthy) participated. In this research, they were selected by available selective sampling method. How to perform and score the motor function screening tests. Subjects scored 3 points if they performed correctly and without compensatory movements in the deep squat, step over hurdle, lunge test, and rotational stability tests, and 2 points if they performed the movement with compensatory movements. The inability to perform a movement without compensatory movements was given 1 point for the individual, and if she felt pain while performing the movement or performing the exposure test, the subject received a point

How to perform and score motor performance screening tests (FM S) of the subjects, including deep squat tests, step over the obstacle, launch test, rotational stability test, stability swimming test, shoulder range of motion test and active leg raising test for the subjects Explained and measured. Also, the amount of forward head and shoulder angle and the amount of kyphosis angle of all subjects were also measured. Below is a description of the seven special tests used in FM S and their scoring system. (figure 1)

1. Deep squat test: In this test, the person stands with his feet shoulder-width apart and his toes facing forward, while his shoulders and elbows are at a 90-degree angle. The balance stick should be held horizontally above the head with both hands. While keeping the heels on the ground and holding the balance stick above the head, he moves down as far as possible without losing his balance. Then it is kept in the same state until the number one is counted by the examiner and then it returns to the initial state(8). If the criteria for score 3 are not met, the individual is asked to perform the test with a 2 x 6 block under the heel (Figure 1).

2. Obstacle step test: To perform this test (Figure 1), the subject is placed behind the barrier while the toes are in contact with the legs of the barrier. Then, holding the balance stick with both hands, he passes it between the shoulders and places it behind him neck. While maintaining his posture, he lifts his right leg and steps over the hurdle, making sure to raise his leg toward the calf while keeping the foot, ankle, knee, and hip straight. Disruption maintains balance. Then touch the floor with the heel and immediately return to the initial position without pausing (9).

3. Lunge test: In this test, hip and ankle mobility and stability, quadriceps flexibility and knee stability are evaluated. To perform the lunge test, the examiner should hold the balance stick in a way that it is in contact with the back of the head, the upper part of the back and the hips. In this position, the right hand should be placed behind the neck and the left hand should be placed behind the waist. In this case, he takes a step forward. Then lower the leg that is behind until the knee touches the board. This movement is done three times for both legs. (figure 1).In this test, hip and ankle mobility and stability, quadriceps flexibility and knee stability are evaluated(9).

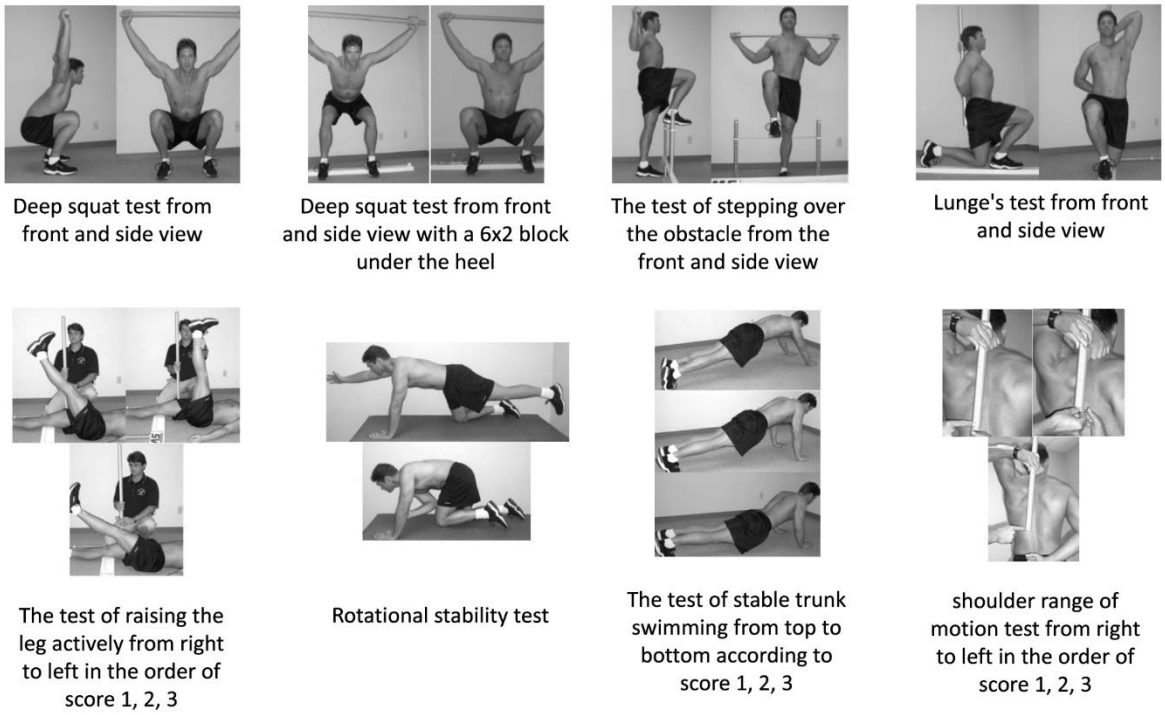
4. Shoulder range of motion test: To perform the range of motion test (Figure 1), the person stands shoulder to shoulder while the legs are together and the arms are hanging by the side of the body. He wraps his fingers around his thumbs and makes a fist. Then he raises his right fisted hand above his head and lowers it as far as possible while simultaneously moving his left fisted hand behind his back as far as possible(10).

5.Active direct leg raising test: In this test, the subject lies on his back (Figure 1), in this position, the direction of the toes is up. Both hands are placed by the side of the body and the palms are facing, the toes of the right foot are bent towards the calf (dorsiflexion) and the leg is raised as high as possible without bending the knee, while the left foot is on the ground. is in contact (9).

6. Trunk stability swimming test: To perform the swimming trunk stability test, the subject is placed in the swimming position on the hands (Figure 1) while the hands are facing the head and the toes are in contact with the ground. Without bending the trunk or the knees, it rises from the ground in such a way that the spine and lower limbs are in the same line and returns to the ground after a few seconds (10).

7. Rotational stability test: To perform the rotational stability test, the subject is placed on a balance board with a height of 2 cm and a width of 6 cm while the elbow is under the shoulder and the knee is under the pelvis (Figure 1). In this position, the hands, knees and toes of one side of the body are placed on the balance board.In this position, he stretches his right hand forward and simultaneously moves his right leg backward. Then, without touching the ground, touch the elbow of your right hand to your right foot and return to the initial position. This movement is also done for the opposite side(11).

Figure 1: Seven special tests used in FMS



Evaluation of head and shoulder forward angle: Body profile photography was used to evaluate the head and shoulder forward angle(12).

- Evaluation of the kyphosis angle: The kyphosis angle of the participants was measured using a flexible ruler(13).

Statistical analysis: The mean and standard deviation of the demographic information of the participants in the two groups are shown in Table 1.

Table 1: Demographic characteristics of the participants by group

Indicator / group	Age (year)	Height (Cm)	Weight (kg)	Body mass index
With forward head and shoulder deformities and kyphosis	39.67±5.96	178.53±4.16	77.07±5.76	24.18±1.65
No abnormality	40.27±4.98	179.47±3.60	74.87±6.75	23.24±1.98
No abnormality The significance level*	0.767	0.516	0.345	0.170

The results of the U-Man-Whitney test (in Table 2) showed that there was a significant difference between the scores of the deep squat, launch, and rotational stability tests in the two groups with and without forward head and shoulder deformities and kyphosis.The average scores of the group without deformity were higher than the group with forward head and shoulder deformities and kyphosis. Also, the results of the U-Man Whitney test showed that there was no significant difference between the scores of the obstacle stepping test, the active leg raising test, and the stability swimming test in two groups with and without forward head and shoulder deformities and kyphosis, despite the fact that The average scores of the group without deformity were higher than the group with forward head and shoulder deformities and kyphosis.

Table 2: U-Man Whitney test results of FMS tests

Table 2: U-Man Whitney test results of FMS tests

Test	Group	Number	average rank	Total ranks	z	p
Deep squat	With forward head and shoulder deformities and kyphosis	15	11.23	168.50	48.50	0.003
	No abnormality	15	19.77	296.50		
Step over the obstacle	With forward head and shoulder deformities and kyphosis	15	14.33	21.500	-0.846	0.397
	No abnormality	15	16.67	250.000		
Lunge	With forward head and shoulder deformities and kyphosis	15	11.00	165.00		
	No abnormality	15	20.00	300.00	-3.352	0.001
Active leg raising	With forward head and shoulder deformities and kyphosis	15	13.63	204.50	-1.502	0.133
	No abnormality	15	17.37	260.50		
Stable swimming	With forward head and shoulder deformities and kyphosis	15	13.50	202.50	-1.466	0.143
	No abnormality	15	17.50	262.50		
Rotational stability	With forward head and shoulder deformities and kyphosis	15	10.90	163.50	-3.253	0.001
	No abnormality	15	20.10	301.50		

3. Results

According to the results of studies in the field of occupational hazards, dentists are exposed to physical ailments caused by work, and the diseases that people involved in this profession are exposed to are increasing day by day in the world (14). In this profession, which is a precise and tiring job, dynamic and static activities create the basis of musculoskeletal disorders and this group suffers a lot of biomechanical pressures in their work environment (15). According to research, musculoskeletal disorders are the most reported occupational injuries in dentists(16). According to the statistics of the occupational health center of the Ministry of Health of Iran, about 36% of the country's workers have poor physical posture while working. According to the results of the statistical tests, there was no significant difference in the scores of the tests of stepping over the obstacle, active raising of the leg and stable swimming in dentists with and without forward head and shoulder deformities and kyphosis. Also, the averages obtained in these three tests were close to each other and had slight differences. In this context, similar to these results, Behbodian et al. (2016) reported that there was no significant difference in the scores of the active leg raising test in active and inactive people (17). Since the active leg raising test actively evaluates the flexibility of the hamstring and gastrocnemius muscles, and the ability to perform this test requires the functional flexibility of the hamstring, gluteal and iliotibial band muscles (10). It can be concluded that the presence or absence of forward head and shoulder complications and kyphosis has no significant effect on the results of this test between the two groups. A significant difference was observed in the scores of the squat, lunge, shoulder range of motion, and rotational stability tests in people with and without forward head and shoulder deformities and kyphosis, and the averages of these four FMS tests were significantly different. This means that the average of people without forward head and shoulder abnormalities and kyphosis was higher than the average of people with the mentioned abnormalities. The deep squat test requires a lot of lower limb strength movements.

According to the results of studies in the field of occupational hazards, dentists are exposed to physical ailments caused by work, and the diseases that people involved in this profession are exposed to are increasing day by day in the world (14). In this profession, which is a precise and tiring job, dynamic and static activities create the basis of musculoskeletal disorders and this group suffers a lot of biomechanical pressures in their work environment (15). According to research, musculoskeletal disorders are the most reported occupational injuries in dentists(16). According to the statistics of the occupational health center of the Ministry of Health of Iran, about 36% of the country's workers have poor physical posture while working. According to the results of the statistical tests, there was no significant difference in the scores of the tests of stepping over the obstacle, active raising of the leg and stable swimming in dentists with and without forward head and shoulder deformities and kyphosis. Also, the averages obtained in these three tests were close to each other and had slight differences. In this context, similar to these results, Behbodian et al. (2016) This test is used for bilateral assessment and functional mobility of hip, knee and ankle joints. The launch test puts the lower limb in the usual scissor position. This test evaluates the movement and stability of the hip, knee and ankle joints and the flexibility of the quadriceps muscles, it can be said that poor performance in these tests is related to the limitation of stability, limitation of movement control and insufficient balance(10).According to the mentioned cases, these two tests (deep squat and lunge) evaluate the strength of the lower limbs and the stability of the hip, knee and ankle joints and considering that lack of physical activity and having skeletal-muscular abnormalities of the upper limbs lead to muscle weakness and decrease in muscle strength and result in limited stability and movement control and insufficient balance, it can be said that people without head abnormalities and shoulder forward and kyphosis perform these two tests better than people with head and shoulder abnormalities and kyphosis. In a study conducted by Gomina et al. (2017), they acknowledged that patients with thoracic kyphosis, during shoulder flexion, the large shoulder bump hits the last appendage prematurely and causes shoulder impingement(18). Gray et al. (2004) also reported that patients with forward head disorder, rounded shoulder, and increased thoracic kyphosis caused scapular repositioning (downward scapular rotation) and reduced subacromial space and displacement of the glenoid cavity(19). Therefore, the causes of the difference between the group with and without forward head and shoulder abnormalities and kyphosis can be mentioned as the effect of existing abnormalities on the overall stability of the body, disturbance of balance and lack of proper control of the subjects during the FMS test. In a research conducted on athletes, in the screening test, the group with a greater forward head and shoulder angle showed poorer performance in the shoulder(20). The subjects tested in this study did not have any history of pain and discomfort in their shoulder, so these researchers acknowledged that as long as this irregular function does not lead to pain and functional impairment, it is possible to restore function in rehabilitation in order to prevent common shoulder problems. Correct shoulder is important.

Based on these results, since the subjects of the present study had no history of shoulder pain, it is recommended to participate in rehabilitation programs for these people in order to prevent future problems in the shoulder girdle. One of the limitations of the current research is not taking into account the physical activity level of the subjects, as these variables can affect the results, although their role was unknown. The sample size of the study was small (30 people) and it may affect the results. In addition, considering that the study was conducted cross-sectionally and also the method of data collection was visual and self-reported; Therefore, the research findings should be interpreted with caution.

Conclusion

From the results and discussions of this research, it can be concluded that the spine acts in the form of a chain.so that the change in the curvature in any part of it can also change its muscle structure; This means that the muscles of that area can be weak or shortened. These changes in one part of the spine can cause changes in the muscle structure of other areas. In the present research, according to the scores of the seven FM S tests, it was found that the change in the muscle structure of the head, neck and chest causes a change in the muscle structure of other parts of the trunk and the scores of the tests are reduced.

Acknowledgements

Hereby, from all the patients and people participating in the present research and their loved ones We are grateful to those who have helped us in this research.

Funding

This study did not have any funds.

Compliance with ethical standards

Conflict of interest None declared.

Ethical approval.

Informed consent Informed consent was obtained from all participants.

Author contributions

Conceptualization: B.H., A.D.; Methodology: B.H., A.D.; Software: B.H., A.D.; Validation: B.H., A.D.; Formal analysis: B.H., A.D.; Investigation: M.H., M.P., S.A.H.; Resources: B.H., A.D.; Data curation: B.H., A.D.; Writing - original draft: B.H., A.D.; Writing - review & editing: B.H., A.D.; Visualization: B.H., A.D.; Supervision: M.H., B.H., A.D.; Project administration: B.H., A.D.; S.A.H.; Funding acquisition: B.H., A.D.;

References

1. Yaghobee S, Esmaeili V. Evaluation of the effect of the ergonomic principles' instructions on the dental students' postures an ergonomic assessment. jdm 2010; 23 (2) :121-127

URL: http://jdm.tums.ac.ir/article-1-104-en.html

2. Askaripoor T, Kermani A, Jandaghi J, Farivar F. Survey of Musculoskeletal Disorders and Ergonomic Risk Factors among Dentists and Providing Control Measures in Semnan. j.health 2013; 4 (3) :241-248

URL: http://healthjournal.arums.ac.ir/article-1-41-en.html

3. Riyahi Malayeri S, Kaka Abdullah Shirazi S, Behdari R, mousavi Sadati K. Effect of 8-week Swimming training and garlic intake on serum ICAM and VCAM adhesion molecules in male obese rats. . JSSU 2019; 26 (10) :867-878.URL: http://jssu.ssu.ac.ir/article-1-4695-en.html.

4. Ratzon NZ, Yaros T, Mizlik A, Kanner T. Musculoskeletal symptoms among dentists in relation to work posture. Work. 2000;15(3):153-158. PMID: 12441484.

5. Choobineh A R, Soleimani E, Daneshmandi H, Mohamadbeigi A, Izadi K. Prevalence of Musculoskeletal Disorders and Posture Analysis Using RULA Method in Shiraz General Dentists in 2010. J Iran Dent Assoc 2013; 25 (1) :35-40

URL: http://jida.ir/article-1-1321-en.html

6. Finsen L, Christensen H, Bakke M. Musculoskeletal disorders among dentists and variation in dental work. Appl Ergon. 1998 Apr;29(2):119-25. doi: 10.1016/s0003-6870(97)00017-3. PMID: 9763237.

7. Ahmadnezhad L, Ebrahimi- Atri A, Khoshraftar-Yazdi N, Sokhangoei Y. Research Paper: Effect of Eight Weeks Corrective Games on Kyphosis Curve and Strengths of Trunk Muscle in Kyphotic Mentally Retarded Children. jrehab 2016; 17 (2) :178-187.URL: http://rehabilitationj.uswr.ac.ir/article-1-1671-en.html.

8. Hootman JM, Dick R, Agel J. Epidemiology of collegiate injuries for 15 sports: summary and recommendations for injury prevention initiatives. J Athl Train. 2007 Apr-Jun;42(2):311-9. PMID: 17710181; PMCID: PMC1941297.

9. Robertson JA. F. P. Kendall and E. K. McCreary "Muscles, Testing and Function" (Third Edition). Br J Sports Med. 1984 Mar;18(1):25. PMCID: PMC1858872.

10. Cook G, Burton L, Hoogenboom BJ, Voight M. Functional movement screening: the use of fundamental movements as an assessment of function - part 1. Int J Sports Phys Ther. 2014 May;9(3):396-409. PMID: 24944860; PMCID: PMC4060319.

11. Riyahi Malayeri, S., Nikbakht, H, Gaeini (2014). Serum Chemerin Levels and Insulin Resistance Response to High- Intensity Interval Training in Overweight Men. Bulletin of Environment, Pharmacology and Life Sciences, 3(2), pp. 385-389.

12. Thigpen CA, Padua DA, Michener LA, Guskiewicz K, Giuliani C, Keener JD, Stergiou N. Head and shoulder posture affect scapular mechanics and muscle activity in overhead tasks. J Electromyogr Kinesiol. 2010 Aug;20(4):701-9. doi: 10.1016/j.jelekin.2009.12.003. Epub 2010 Jan 22. PMID: 20097090.

13. Rajabi R, Seidi F, Mohamadi F. Which method is accurate when using the flexible ruler to measure the lumbar curvature angle"? deep point or mid-point of arch. World Appli Sci. 2008;4(6):849-52. https://www.researchgate.net/publication/242320422_Which_Method_Is_Accurate_When_Using_the_Flexible_Ruler_to_Measure_the_Lumbar_Curvature_Angle_Deep_Pint_or_mid_Point_of_Arch .

14. Ahmadi Motemayel F, Abdolsamadi H, Roshanaei G, Jalilian S. Prevalence of Musculoskeletal Disorders among Hamadan General Dental Practitioners. Avicenna J Clin Med 2012; 19 (3) :61-66.URL: http://sjh.umsha.ac.ir/article-1-178-en.html.

15. Thornton LJ, Stuart-Buttle C, Wyszynski TC, Wilson ER. Physical and psychosocial stress exposures in US dental schools: the need for expanded ergonomics training. Appl Ergon. 2004 Mar;35(2):153-7. doi: 10.1016/j.apergo.2003.11.007. PMID: 15105077.

16. Comes C, Valceanu A, Rusu D, Didilescu A, Bucur A, Anghel M, et al. A Study on the Ergonomical Working Modalities using the Dental Operating Microscope (DOM). Part II: Ergonomic Design Elements of the Operating Microscopes. Timisoara Medical J. 2010;60:97-102. https://www.researchgate.net/publication/291906832_A_study_on_the_ergonomical_working_modalities_using_the_dental_operating_microscope_DOM_Part_II_Ergonomic_design_elements_of_the_operating_microscopes

17. Behboodian N A, khajeh ali J, letafat kar A. Comparing the scores of functional movement screening tests in active and inactive subjects. RSMT 2017; 15 (14) :37-46

URL: http://jsmt.khu.ac.ir/article-1-234-en.html

18. Gumina S, Di Giorgio G, Bertino A, Della Rocca C, Sardella B, Postacchini F. Inflammatory infiltrate of the edges of a torn rotator cuff. Int Orthop. 2006 Oct;30(5):371-4. doi: 10.1007/s00264-006-0104-0. Epub 2006 Apr 7. PMID: 16601984; PMCID: PMC3172757.

19. Mohammadi, S., Rostamkhani, F., Riyahi Malayeri, S. et al. High-intensity interval training with probiotic supplementation decreases gene expression of NF-κβ and CXCL2 in small intestine of rats with steatosis. Sport Sci Health 18, 491–497 (2022). https://doi.org/10.1007/s11332-021-00829-5.

20. Lynch SS, Thigpen CA, Mihalik JP, Prentice WE, Padua D. The effects of an exercise intervention on forward head and rounded shoulder postures in elite swimmers. Br J Sports Med. 2010 Apr;44(5):376-81. doi: 10.1136/bjsm.2009.066837. PMID: 20371564.