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Impact of an Occupational Gym Program on Flexibility in Office Workers

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ABSTRACT
The problem of work-related musculoskeletal disorders is a rising concern in the companies. Thus, occupational gym has emerged as a possible solution to this problem because it leads to changes in the lifestyle by promoting health and physical activity. In this regard, this study purposes to evaluate the impact of an occupational gym program in the neck and shoulder flexibility in office workers. In order to evaluate the levels of flexibility, a universal goniometer was used for pre and post occupational gym program implementation. The program had an extension of three months, with 15 minutes sessions twice a week. The sample consisted in an intervention group comprised of 30 elements and a control group composed of 8 elements. The results suggest that there were improvements in flexibility at the cervical spine and shoulder segments levels. The increase on flexibility between the two time points in the intervention group was significant, unlike the control group that presented only slight improvements.

Keywords: work-related musculoskeletal disorders; occupational gym; shoulder; neck; flexibility

1. INTRODUCTION

The problem of work-related musculoskeletal disorders (WRMSD) has been increase over the past few decades with the implementation of new models of work organization. Upper limb and vertebral column injuries are the most recorded WRMSDS (Buckle & Devereux, 1999). In a study carried out in Portugal on the prevalence of WRMSD, it was found that the most common injuries are neck, shoulder, wrist and elbow pain (Cunha-Miranda, Carnide, & Lopes, 2010).
The mechanization of the workplaces was largely responsible for the frequent adoption of the sitting position at workstations (Graf, Guggenbühl, & Krueger, 1995). Currently, 75% of jobs include the use of computers, which means spending more time sitting and less time in motion, a fact that is related to the appearance of many WRMSD, mainly on neck, shoulder and hand (Tittiranonda, Burastero, & Rempel, 1999). The introduction of WRMSD prevention strategies in enterprises aims to reduce its impact has been important. The importance of social responsibility leads to an increase of companies considering occupational gym (OG) as an essential condition for their employees' well-being. OG is typically the exercise that occurs in the workday, which aims to reduce the negative effects that the activity may cause, resulting in benefits for employees and for the company (Mendes & Leite, 2008). OG programs were created with the goal of decrease the negative impacts resulted from physical inactivity and promote healthier habits. A possible impact of these programs is on flexibility, so considering this aspect in the OG evaluation seems to be important.
Association between sitting posture and cervical spine and shoulder changes have been extensively studied. However, it seems that there are no studies able to attest a clear relationship between posture, muscles motor activity and WRMSD (Tittiranonda et al., 1999). Some authors have shown that a sustaining static sitting posture for longs periods of time is related to persistent muscular activity on the spine and shoulder stabilizers. Others report that this muscle activity is higher in symptomatic workers compared to asymptomatic controls (Szeto, Straker, & O'Sullivan, 2005a, 2005b). This posture produces a continuous static load in the neck and shoulder muscles that cause muscle tension that, in a long term, causes shoulder pain and restricted range of motion (RoM) (Ariëns et al., 2001). The most common neck pain in the computer users is located in the upper trapezius muscle (Jensen, Finsen, Hansen, & Christensen, 1999), which is caused by muscle tension, and it usually radiates to the shoulder and involves muscle stiffness.
The shoulder joint is a complex joint that allows a synchronized movement of the scapula and the humerus (Ebaugh, McClure, & Karduna, 2006). Simple movements, such as shoulder flexion, associate coordinated action of many muscles in the neck, shoulder and trunk. Some studies have assessed shoulder biomechanics with or without shoulder joint dysfunction (Klopcar & Lenarcic, 2006; Lin et al., 2005). These showed that people with shoulder dysfunctions have less tipping and upward rotation, and more anterior tipping and elevation of the scapula during functional arm tasks, as well as the greater activity of the upper trapezius muscle is related to shoulder dysfunctions (Ebaugh et al., 2006; Lin et al., 2005). Others suggested that the spine misalignment allows the arising of neck-shoulder dysfunction (Szeto et al., 2005a, 2005b) and some authors have proposed that the thoracic posture can affect the scapula kinematics (Finley & Lee, 2003). These studies proposed that an increased thoracic kyphosis and a forward head posture can induce an anterior tilt and a scapula protracted position, restricting the sub acromial space and shoulder RoM. Others suggested that the abnormal shoulder posture leads to muscle imbalance and weakness, emphasizing the importance of strategies aimed to muscular training (Kebaetse, McClure, & Pratt, 1999; Wang, Mcclure, Pratt, & Nobilini, 1999). In this way, it was suggested that the change in the shoulder biomechanics can be the cause for pain and RoM restriction.
Therefore, due to the fact that flexibility is the ability of one or more joints to move through a RoM without restrictions and without pain, this research aim to evaluate the effect of occupational gym program in the flexibility of a sample of office workers.

2. MATERIALS AND METHOD

This study was conducted in an insurance broker, between September and December of 2013. The sample was composed intentionally by officers who participated or not in the OG sessions. The participation was done in a voluntary basis. An informed consent, which explained briefly the study, its goals and the used methods, was distributed to all the participants. The final sample was composed of 38 workers, divided into two groups: the intervention group (IG), with 30 participating workers in the OG sessions; and a control group (CG), with 8 non-participating workers in the OG sessions. In the CG was included the workers who made all the evaluations but didn't join in the OG classes. The flexibility measuring instrument used was the universal goniometer, model MSD EA-8161. The evaluation was carried always by the same evaluator, with the objective of improving the reliability of the measurements by eliminating the inter-measurer variability. The evaluated movements were neck lateral flexion and shoulder flexion, abduction and external rotation, for both sides of the body. Workers were asked to bring light clothing. The tests were performed in a sitting posture, as described by Clarkson (2013). The program was held for 3 months, with 2 sessions per week and with duration of 15 minutes each. All the OG classes took place in the afternoon. The exercises performed were previously selected, according to the musculoskeletal problems verified in the initial assessment. Data were analyzed through a descriptive statistics (mean, standard deviation (SD) and percentages). To compare different evaluations, a Wilcoxon test was used. The considered significance level was 0.05. All the statistical data analysis was carried out using SPSS program (version 22).

3. RESULTS AND DISCUSSION

The current study was conducted with 38 participants divided into two groups – the intervention group (IG) and the control group (CG). The analysis of the values of flexibility was held in two different moments – before (M1) and after (M2) the implementation of OG. Values obtained in these two evaluation moments for each group are shown in table 1.

Table 1 – Levels of flexibility for group (in grades)

Joint	Movement		IG		CG	
			M1	M2	M1	M2
			mean ± sd	mean ± sd	mean ± sd	mean ± sd
Neck	Lateral Flexion	Right	35.50 ± 7.28	38.97 ± 6.34	37.75 ± 6.82	38.50 ± 6.39
		Left	33.60 ± 7.27	36.50 ± 7.53	38.63 ± 5.76	37.50 ± 6.57
Shoulders	Flexion	Right	172.73 ± 9.22	175.03 ± 9.15	177.50 ± 2.39	177.88 ± 2.30
		Left	170.97 ± 10.78	174.2 ± 9.37	175.75 ± 2.60	176.63 ± 3.02
	Abduction	Right	172.57 ± 12.86	175.97 ± 9.06	171.25 ± 14.26	174.00 ± 8.05
		Left	170.67 ± 5.49	174.63 ± 10.52	173.63 ± 8.07	174.75 ± 6.45
	External Rotation	Right	81.30 ± 11.77	85.13 ± 6.26	80.13 ± 14.36	80.13 ± 14.36
		Left	79.40 ± 11.42	85.20 ± 6.51	81.63 ± 10.01	81.63 ± 10.01

Table 2 presents the Wilcoxon test results for the verification that the differences found between the two moments of motion evaluation and per group are, or not, statistical significant.

Table 2: Wilcoxon test results for difference analysis between evaluation moments.

Joint	Movement		IG (*P* value)	GC (*P* value)
Neck	Lateral Flexion	Right	<0.001**	0.098 (NS)
		Left	0.001**	0.655 (NS)
Shoulders	Flexion	Right	0.002**	0.257 (NS)
		Left	0.001**	0.038*
	Abduction	Right	0.003**	0.102 (NS)
		Left	0.002**	0.066 (NS)
	External Rotation	Right	0.007**	1.000 (NS)
		Left	<0.001**	1.000 (NS)

* $P < 0.05$, ** $P < 0.01$ and NS – Not significant

Regarding the analyzed movements, it can be seen that the averages of the RoM increased for the IG between M1 and M2. These differences between moments are significant, according to table 2. For the CG, these remained quite constant between M1 and M2, although there was a slight increase in the right lateral flexion of the neck and flexion and abduction of the shoulder on both sides and decreased for movement of left lateral flexion of the neck. Only the shoulder left flexion movement presents a significant difference between the two moments, as indicated in table 2.

The flexibility is influenced by the lack of physical activity. It is known that the sedentary people tend to be less flexible than active people and that exercise increases flexibility. Restricted RoM can also be caused by factors such as the postural misalignment and muscle imbalance. At the physiological level, the properties of synovial fluid inside of joints change according to activity level and the movement of each joint. When an individual is inactive, the synovial fluid looks like a thick paste or gel. When the body begins to move, as during the sessions of OG, body temperature rises transforms the synovial fluid in a viscous consistency to act as an improved lubricant of the joints, thereby improving

the movement and contributing to the increase of the RoM (Kisner & Colby, 2007). The exercises applied during the OG program were accompanied by physiotherapist verbal stimulus in order to increase workers' awareness about the proper posture of the neck and upper limbs. The main goal was to ensure that when workers go to their workplace they can adopt a better posture on their daily activity and not only during the sessions. According to the literature, there is some evidence that exercise may produce a better posture in thoracic high (Wang et al., 1999) helping in a better mobilization of the shoulder muscles, leading to an increase on their RoM. The incentive for workers to adopt an appropriate standing and sitting postures allowed to reduce stress and muscle tension due to the fact that the muscles are working on balance, enable them to develop their work more efficiently. The decrease on the trapezius muscle tension may have had influenced the increase of the RoM on the assessed movements, especially in neck lateral flexion, as well as a decrease of fatigue of the shoulder muscles result in increased external rotation RoM of the shoulder (Ebaugh et al., 2006). The improvements observed in the CG may have been due to the recommendations made during assessments to perform some specific exercises for each body part. These improvements can still be associated to the impossibility of have a separate evaluation of the IG and the CG. OG sessions were held in the open-space center in the sight of all workers, which may have influenced the CG workers to perform some of the proposed exercises.

4. CONCLUSIONS

The adoption of an OG program suggests some beneficial changes on neck and shoulders flexibility. With the conducted analysis, it was noted that changes in the daily habits at work, through the OG and at home, with a view to improve the posture in the workplace and increase physical activity, allow a significant increase in flexibility levels at the neck and shoulders level in the IG. In the CG, the increase in the practice of physical exercises outside the program and the impossibility of separating the groups may have influenced the results. Some suggestions for future work are related to a need to increase the sample, both for the IG and for CG. By the other side, it is necessary to have more control over some variables like the subjects' lifestyle routines, clinical history and others, for obtaining more accurate results. In turn, an increase of the sample would also allow for sample stratification for example, for gender, allowing grouped analysis and comparison between the groups. Finally, it should be noted that an extension of the OG program seems to be relevant, since it will allow, at least potentially, to have more consistent, reliable and, eventually, more relevant results.

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