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RESEARCH ARTICLE

EFFECTIVENESS OF MIRROR THERAPY AND ERGONOMICS IN SHOULDER MOUSE

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ABSTRACT

Background: These diseases are considered as professional diseases. Severity of technological disease usually responds to the level and duration of exposure, and usually occurs after many years of exposure to harmful factor. Diseases occur due to excessive work at the computer, or excessive use of keyboards and computer mouse, especially the non-ergonomic ones.
Objective: This randomized controlled study was conducted to compare the effectiveness on pain and upper limb function of mirror therapy and ergonomics in mouse shoulder.
Methods: Of 30 patients which include 15 for control group who was received stretching and strengthening for 40 min. and 15 for experimental group who was received stretching, strengthening with mirror therapy program and ergonomics for 40 min. and advised them vertical mouse. The primary end points were a reduction in the shoulder pain disability index scale score of pain. The secondary end points were improvement in motor function and Posture.
Results: The mean scores of both the primary and secondary end points significantly improved in the mirror group. No statistically significant improvement was observed in any of the control group values posture and shoulder pain and disability index (p= 0.188 and p= 0.1038) but experimental group has shown essential significant result in posture and shoulder pain and disability index (p= 0.0001 and p= <0.0001) Moreover, statistically significant differences after treatment (P < .0001) and at the 4 weeks follow-up were found between the 2 groups.
Conclusions: The results indicate that mirror therapy and ergonomics are effectively reduces pain.

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INTRODUCTION

Under term of "Technological diseases" we mean the diseases caused by the harmful influence of the job in the first place, the working position in which it is involved excessive work on a computer, such as the banking sector, the health sector and many others who are directly or indirectly connected with the work on the computer and overuse of keyboard and computer mouse, which are in large number of cases of non-ergonomic, and inappropriate for a hand. It is therefore recommended to use ergonomic computer mouse. (Merita Tiric-Campara *et al*., 2014) Computer users often report musculoskeletal complaints and pain in the upper extremities and the neck- shoulder region. (Pollard, 2013) The number of hours of daily or weekly computer work is positive associated with arm-hand and neck-shoulder pain. (Pollard, 2013) The ergonomic risk factors that can cause or aggravate musculoskeletal disorders include: repetitive motion, awkward posture, forceful exertions, pressure points, and static postures (National Institute for Occupational Safety and Health, 2007). In previous study was found strongly support the hypothesis that mirror therapy significantly reduces the perception of pain and increases upper limb motor function.The repetitive use of mirror therapy providing increasingly longer periods of analgesia should help improve patients' compliance with conventional neurorehabilitation exercises. The results indicate that mirror therapy effectively reduces pain and enhances upper limb motor function. (Angelo Cacchio *et al*., 2009) In 1998 study shown the operators using video display units in this study prefilled to use the mouse on a table in a close to relaxed, neutral posture of the arm in combination with arm support. Short and narrow-shouldered operators worked in more strenuous postures of the arm when the mouse was located lateral to the keyboard. By using video display units in this study prefilled to use the mouse on a table in a close to relaxed, neutral posture of the arm in combination with arm support. Short and narrow-shouldered operators worked in more strenuous postures of the arm when the mouse was located lateral to the keyboard. (Karlqvist *et al*., 1998)

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Mouse Shoulder

The long-term work at the computer leads to inflammation of tendons and shoulder joint, and in severe cases can lead to tearing of tendons and muscles "rotator cuff". If inflammation persists, the capsule and ligaments of the shoulder joint becomes stiffer and limited mobility. Limited and painful mobility is especially pronounced when raising your arms above your head or behind your back. (Pollard, 2013) The aim of the present study was therefore to study posture, muscular load, and perceived exertion for different positions of the mouse during text editing (Moseley, 2005a).

Need of study

- Prolong sitting profession are exposed to more number of patients. Simultaneously they are also exposed to increased workloads which in turn increased the prevalence of a wide variety of musculoskeletal disorders among them.
- The major risk factors associated with musculoskeletal disorders in computer professional are working in static postures for prolonged period and less flexibility.
- Currently were very few study so we are providing with appropriate therapeutic intention for computer professional, who are maintaining static posture for long time.

Aim and objective

Aim

To evaluate the effect of mirror therapy and ergonomics in work-related mouse shoulder pain.

Objective

- To assess the posture of the subject.
- To benefit of mirror therapy and ergonomics used to reduce mouse shoulder pain

Hypothesis

Alternative Hypothesis: - There will be significant effect of mirror therapy and ergonomics in shoulder mouse.

Null-Hypothesis: - There will be not significant effect of mirror therapy and ergonomics in shoulder mouse.

METHODOLOGY

It is comparative study, with a sample of 30 population which include 15 for control group and 15 for experimental group. Duration of research was 4 weeks. The subject who are suffering from severe shoulder pain were selected according to the inclusion and exclusion criteria. The inclusion criteria was all computer professional (who are working more than 1 year between the age of 25-35) complaining of shoulder pain radiating on surrounding areas (Trapezius) which was included by doing special test such as for shoulder to rule out neurological, vascular deficit.spurling test, distraction test, hawkins-kennedy impingement test, empty can test. And the patients were included on the basis previous shoulder surgery, both side shoulder pain and with radiating pain. Each subject have been explained purpose and procedure of study individually. The subject's written consent was taken. The demographic data was obtained from the participants in term of age, duration; present complaints of shoulder pain were determined by interviewer-assisted questionnaires. The diagnosis of mouse shoulder, the most important is detailed history with regard to occupation and physical review, special test and shoulder pain and disability index. First to check the posture by using plumb line. Participant underwent randomized allocation in to 2 groups. There 2 groups were follows-

Control Group – Patient of these group received stretching and strengthening for 40 min. 3 days in 4 weeks (total =12 section) first to give the general exercise an mobility or warm up exercise like shoulder ROM for 10 mins and 10mins for cool down. Stretching, strengthening and statics (for 20 mins)

Experimental Group - Patient of this group received stretching, strengthening with mirror therapy program and ergonomics for 40 min. 3 days in 4 weeks (total =12 section) first to give the general exercise an mobility or warm up exercise like shoulder ROM for 10 mins and 10mins for cool down. Stretching, strengthening and statics in front of mirror for 20 mins

Mirror Therapy –The mirror group received a 4-week conventional rehabilitation program, consisting of three sessions a week. The mirror group received and 40 mins per session of a mirror therapy program consisting of unaffected upper limb movements. Patients were seated on a chair, with the mirror board (70 × 120 cm) positioned between the upper limbs perpendicular to the subject's midline and with the unaffected upper limb facing the reflective surface.

Ergonomics –Ergonomically advice was givento help posture correction to be follow throughout 4 weeks

Correct posture and set up for computer use

- Eyes should be slightly above the top of the screen and no less than 50cm from the screen.
- Sit upright and close to the desk.
- Forearms should be approximately horizontal and supported by the desk. A space in front of the keyboard to allow hands and wrists to rest when not typing.
- Keep wrists straight when keying.
- Position a mouse within easy reach so it can be used with a straight wrist.
- Legs should have rooms to move under the desk.
- Choosing a chair with round edge or curved cushion seat can avoid excess pressure from the edge of seat on the backs of legs and knees.
- A footrest may be helpful.
- Hip and knee angle should be maintain 90 degree during work.
- We have advised them vertical mouse.

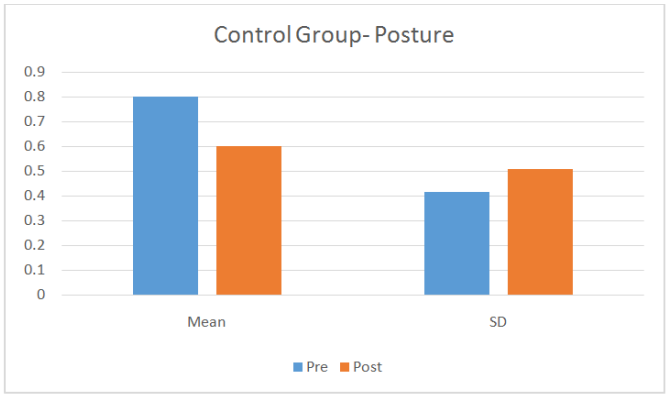
Statistics analysis

As the data were approximately normally distributed, all the descriptive data have been presented as means with the standard deviations. Statistical analysis was done with student T-test.

Control Group

Evaluation of Posture

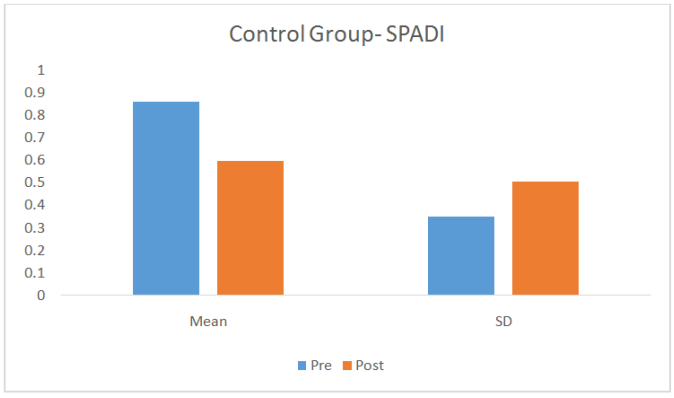
Posture	Mean	SD	P value	T-test	Remark
Pre	0.8	±0.414			
Post	0.6	±0.507	0.188	1.382	NS



Interpretation – In control group, there were no significant result shown with p value 0.188

Evaluation of Pain and disability index

SPADI	Mean	SD	P value	T-Test	Remark
Pre	0.866	±0.351			
Post	0.6	±0.507	0.1038	1.74	NS



Interpretation -In these study, there were not significant changes in the control group with p value 0.103

Experimental Group

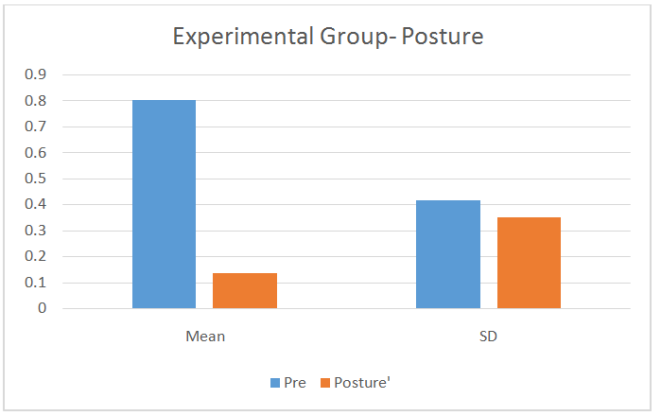
Evaluation of Posture

Posture'	Mean	SD	p value	T-test	Remark
Pre	0.8	±0.414			
Posture'	0.133	±0.351	0.0001	5.292	ES

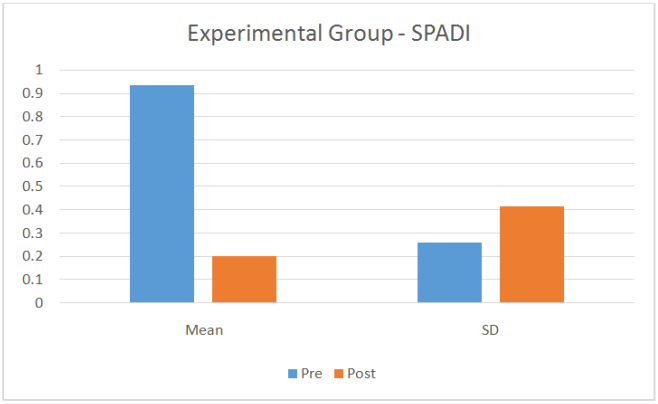
Interpretation -In experimental group, there were essential significant result shown with p value 0.0001

Evaluation of Pain and disability index

SPADI'	Mean	SD	P value	T-test	Remark
Pre	0.933	±0.258			
Post	0.2	±0.414	<0.0001	6.205	ES

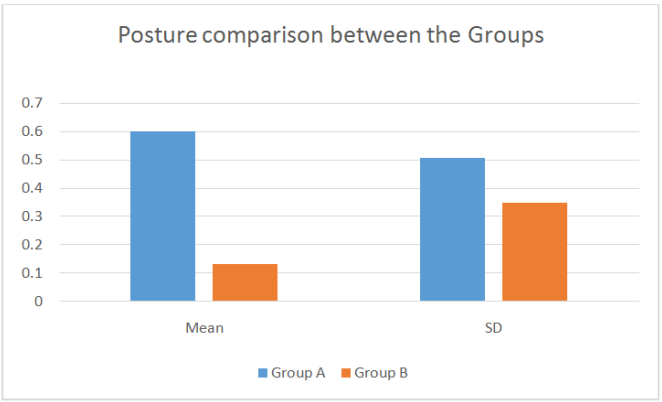


Interpretation - In experimental group, SPADI were found significant result with p value <0.0001 and



Posture comparison between both groups

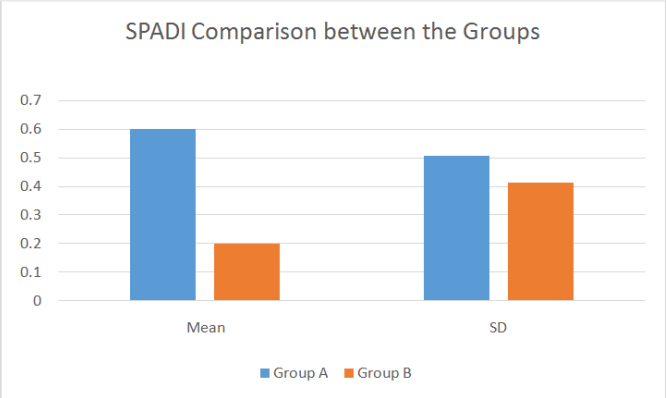
Posture	Mean	SD	P value	T- test	Remark
Control Group	0.6	±0.507	0.0067	2.928	VS
Experimental Group	0.133	±0.351			



Interpretation -In these study, we found significant changes in between the control group and the intervention group with p value 0.0067

Pain and disability - comparison between both groups

SPADI	Mean	SD	P value	T-test	Remark
Control Group	0.6	±0.507	0.251	2.366	CS
Experimental Group	0.2	±0.414			



Interpretation -In our study, we found a significant effect in between the control group and the intervention group with p value 0.251.

DISCUSSION

In this present study the experimental group shown that the mirror therapy and ergonomic advices was significant improvement for posture and pain and disability index. Control Group has shown not significant result in posture and shoulder pain and disability index (p= 0.188 and p= 0.1038) but experimental group has shown essential significant result in posture and shoulder pain and disability index (p= 0.0001 and p= <0.0001) But in comparison they shown in posture very significant result and p value 0.0067 and in shoulder pain and disability shown consider significant result and p value 0.251. The posture has significantly improved as: -Pre-intervention there was protected and depressed scapula with rounding of back with slight cervical spine was flattened.Post-intervention after 4 weeks there is more correction of protracted and depressed scapula and improvement in cervical spine flatten. The aim of this study was to evaluate the response to mirror therapy in mouse shoulder patients affected by upper limb.

Mirror therapy: - Physiotherapy treatments have been directed at peripheral symptoms, often with limited efficacy. Mirror therapy aims to create an illusion of normality in the affected limb. Mirror therapy involves concealing the affected limb behind the mirror, while the non-affected limb is positioned so that its reflection is superimposed to where the affected limb should be. The brain has been shown to prioritize visual input over proprioceptive input, so when the unaffected limb moves it appears as though the affected limb is functioning normally. Mirror therapy has been shown to have positive and negative effects on the symptoms mirror therapy reduced stiffness. Acerra and Moseley (2004) demonstrated that pain could be evoked in the affected limb of CRPS participants when the unaffected limb was stimulated in front of a mirror (via light touch, sharp touch and the application of cold). Interestingly, only participants with CRPS experienced pain. (Pollard, 2013)

Ergonomics: -Increased dependence on computers in many work situations is frequently the cause of neck and shoulder discomfort if basic ergonomics rules are ignored. The office set-up below was chosen as an example of how to correct alignment and relieve strain. The key to improving posture is well-fitting chair that adjust for proper height, arm support and back support and we have advised. Fugl-Meyer Assessment scores, active range of motion, movement speed, and hand dexterity. Similarly, Sütbeyaz *et al*. 18 reported an improvement of motor recover and motor functioning as measured by Brunnstrom stages and FIM, respectively. The results of our study strongly support the hypothesis that mirror therapy significantly reduces the perception of pain and increases upper limb motor function.As per Fugl-Meyer in stroke patients with upper limb CRPSt1. These results were maintained at the 6-month follow-up. The repetitive use of mirror therapy providing increasingly longer periods of analgesia should help improve patients' compliance with conventional neuro rehabilitation exercises. Mirror reflection, generating a false though congruent visual feedback of the unaffected limb movement, allows stroke patients with upper limb CPRSt1 to rehearse and practice movements of the affected upper limb without pain.Mirror therapy appears to create a movement illusion of the affected arm within the brain in stroke patients. These mirror illusions, which have displayed marked effects on brain activity, are believed to compensate for a reduced or absent proprioceptive input, and reestablish the normal pain-free relationship between sensory feedback and motor intention, thus resulting in the rapid resolution of the pain state. Indeed, an increased inflow of inputs from sensory modalities via various pathways has been shown to enhance brain plasticity. (Angelo Cacchio *et al*., 2009) Mick and louic found in study the benefits of movement on this condition involve and require normal proprioceptive feedback to the nervous system (Pollard, 2013) The computer mouse and other non-keyboard input devices supplement the keyboard in many visual display unit (VDU) workstations. The mouse technique changes posture and movements compared with keyboard use without the mouse (Karlqvist *et al*., 1994). Franzblauet a1 found the incidence of carpal Tunnel syndrome to be related to the pattern of mouse usage in a medical illustration department. Associations between self-reported neck and upper-limb symptoms and physical exposure factors at VDU workstations have recently been investigated (Karlqvist *et al*., 1996). The study showed that long hours of work with the mouse, as well as work with the mouse non-optimally located on the table, seem to be risk factors for upper-limb symptoms. (Karlqvist *et al*.,) The fixed mouse positions in our study were selected from experience in field studies (Arnetz *et al*., 1995; Karlqvist *et al*., 1995). Design work is often performed on a fixed table immediately in front of the operator, where a mouse is used to click on several objects. Most computer operators have a keyboard located on the table in front of them and have to place the mouse further away and lateral to the keyboard.The mouse technique changes posture and movements compared with keyboard use without the mouse (Karlqvist *et al*., 1994). A comparison of muscle activity and working position during work was examined. Muscle sites were collapsed and compared across positions. Results revealed participants experienced an almost immediate reduction in muscle activity in position. The wrists are in neutral position, and fingers arched, thus reducing extended reaching. The elbows are in an open angle of approximately 115°, which allows the upper trapezius muscle to rest, and opens the elbow angle to decrease stress on the upper and lower arm. Likewise keyboard height was not as important as keyboard angle when considering muscle activity. (ElizabethDowler and Situs, 2001)

However, many operators put the mouse even further away on the table. It is easier to support the arm against the work surface place the mouse further away and lateral to the keyboard the table is higher than elbow height (Bergqvist *et al*.,

1995; Hunting *et al*., 1981). On theother hand, too high a work surface could increase the shoulder height and lead to a high muscular load in the trapezius muscles and cause discomfort (Bergqvist *et al*., 1995). This evidence again may support the fact that muscle activity decreases by immediate position of the arms and that time is not a significant factor. (ElizabethDowler and Situs, 2001)

Limitation

The data collection in this study was made during a period of only 2 minutes in each position. This study focused on the location of the mouse only.

- Short sampling periods are necessary due to time-consuming data analysis. However, all the subjects were experienced computer operators and should not have had any initial difficulties in performing the work.
- Bilateral pain was not considered.
- Negative effect of mirror therapy not be mention.

Future scope

- Further long term study can be conducted for effectiveness mirror therapy and ergonomics in shoulder mouse.
- Similar study could be used to establish the effectiveness mirror therapy and ergonomics in shoulder mouse.

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I would like to thank Mrs. KalpanaGhatpande for statistics

Conclusion

In the present study, there is significant effect of mirror therapy and ergonomics in shoulder mouse syndrome.

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