Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 11, 2023

Original Research Article

AN EARLY MUSCULOSKELETAL SYMPTOMS IN I.T PROFESSIONALS:IS IT LEADING TO COMPUTER OVER USE SYNDROME(OOS)

Sheetal R Salvi[1], Sudip S Mukherjee[2]

[1]Associate Professor, Department of Physiology. Bharati Vidyapeeth (DTU) Medical College, Pune

[2] Resident, Dr. D.Y.Patil Medical College, Hospital & Research Centre, Pimpri, Pune.

Dr. D.Y.Patil Medical College Vidyapeeth, Pune(Deemed to be University)

Corresponding Author: Dr. Sheetal Salvi
shslvi@gmail.com

Abstract

Background: Study assess the hand grip strength, hand endurance and musculoskeletal symptoms in computer users. Healthy male, desk job profile ,25 to 40 yrs(28±4.24).Grip strengths and endurance was measured (Kgs); (Secs) respectively.40 respondants, compared with 40 age matched control, light manual workers who don't work on computers but working as college attendants. MSK symptoms; low back pain in 30(75%),fatigue 35(87.5%),neck pain 36(90%) and wrist pain 34(85%).Mean right hand grip strength(HGS) was 19 ± 2.44 in respondants and 26.15 ± 5.19 in controls. Mean endurance in right hand was 5.3 ± 0.973 in secs and 5.25 ± 2.37 in controls, $p<0.01$ was highly significant. Mean left HGS was 23.8 ± 2.72 in respondents and 24.3 ± 4.99 controls. Mean endurance in left hand was 3.9 ± 0.796 in respondents and 6.10 ± 2.15 in controls, $p<0.01$ was highly significant. We found that HGS of right hand had weakly positive association than left hand with HGE $p<0.05$ in respondants. Not significant at $p<0.05$ in control group. Constant computer usage may reduce hand grip strength, endurance and leads to musculoskeletal disorders in long run. Proper ergonomics is essential

Keywords: Ergonomics, Technological advances, Dominant Hand, Work Stations, Computers, Grip Strength, Endurance

Introduction

Hand-grip strength is an important skill for the human body to control objects. It assesses the skeletal muscle function and has received increasing attention from industrial engineers and ergonomic researchers in the last years.[1]

It requires high levels of activity of the flexor musculature of forearms and hands. Constant usage of computers by I.T professionals, leads to occupational overuse syndrome (OOS),low back pain, wrist pain, tension headaches, psychosocial stress, Musculo skeletal problems(MSK),eye strain etc.[2]Technological advances have otherwise reduced redundancy of tasks but unfortunately the distinct effects are observed between prolonged sedentary time, too little physical activity also leading to over weight concerns and MSK symptoms due to constant screen work which may reduce grip strength and more.[3]Relationship between hand grip strength, endurance and musculoskeletal system is captivating but unclear. Previous studies have been carried out on various occupations related to grip strength, endurance, stature and nutritional status etc. In context with this present study assesses the association of hand grip strength, grip endurance and musculoskeletal symptoms disorders in computer users. The

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 11, 2023

problems may seem to be coming slowly, they require urgent attention to prevent unwanted consequences.

Methodology :

Study was a cross-sectional type and conducted at Dr DY Patil medical college hospital & research centre, Pimpri, Pune, after obtaining approval of institutional ethics committee. Healthy male, age group ranging from 25 to 40 yrs(28±4.24).40 respondents, as study group compared with 40 control age matched from the same area ,not having desk job but doing light manual work, working as college attendants.

Total (n = 80).Respondents had 5 days as working days and are working in their current job for at least six months to maximum 3 years more and who are operating on computer desk table without wrist and elbow support and ergonomically not designed work stations. They worked at least 12 to 15 hrs per day depending upon work profile, role, responsibility and working shifts. Respondants indulged in recreational and or sports activity occasionally. Musculoskeletal symptoms were asked as per a pre-determined inventory of common symptoms amongst computer workers (yes/no).Physical examination not done but when any ailment they were usually referred to a physician in their company. No injuries encountered. Comorbidity excluded. Not subjected to expert musculoskeletal examination and investigations.

Informed consent was obtained. No restriction of movements in the upper limbs as inclusion criteria. Self report as no history of inflammatory joint disease, neurological disorder or injury or fracture to the same. Grip strength recorded, dominant hand was taken(Right hand) and non-dominant one(Left hand).Dominant hand was defined as the one preferred for daily activities like writing, eating and handling heavy objects. No participants reported ambidexterity.

Respondents were observed while working at their work station. They were not at an arm's distance (between 18-24 inches) away from their computers. Monitor screens were slightly below eye level. Half of the computers had a glare. Majority subjects had their elbow joint not angled at the recommended angle. No wrist rest. Mostly lower back unsupported in the chair and some sat at the edge of the chair without using the back support of the chair. Seats were cushioned and there was adequate room for leg clearance. Some chairs were not adjustable. Respondents were fully aware of the consequences of assuming poor posture while using the computer as they listed neck, back, shoulder, hand and wrist pain as problems that may arise as a result of poor computer ergonomics. Height (cms) and weight(kgs) was measured. BMI calculated by using Quetlet index. According WHO classification of BMI was used.

Instrumentation and Procedures:

All measurements were obtained (between 10:00 and 12:00 pm).Grip strengths was measured using a standard adjustable handle Jamar dynamometer in standing position with shoulder adducted and neutrally rotated and elbow. Participant was asked to compress the dynamometer with maximum strength. It was quantified by measuring the amount of static force that the hand can squeeze around a dynamometer**,** maximum value was recorded in kilograms(Kgs) and endurance in(secs).Confidentiality was maintained throughout the study. Data was expressed as mean±SD. Statistical analysis was done by using student's unpaired 't' test in microsoft office excel and $p<0.01$ was considered as highly significant. Statistical analysis for correlation was also done by using Karl Pearson's Correlation Coefficient denoted by(r).Results were matched with control group. After calculating the `r', the test of significance was checked by

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 11, 2023

using the Correlation Coefficient table of Probability. Significant correlation is said to be present if the calculated value of `r' is greater than the table value i.e. p

Results

Out of the 80 recruited subjects(91.25%)were right-hand dominant and (8.75%) were left-hand dominant. Table 1 shows the anthropometeric measurements in both the groups,p<0.01 is highly significant

Table 1: Mean values and standard deviation of various parameters

Parameters	**Study Mean ±SD**	**Control Mean ±SD**
Weight (Kg)	79 ± 1.414	64.5 ± 6.720
Height(m)	171 ± 6.399	163 ± 6.878
BMI(Kg/m^2)	26.85 ± 0.212	24.35 ± 3.101

Data expressed as Mean ± SD, ****** p<0.01 = Highly significant

Our study emphasizes on percentage frequency (%) of musculoskeletal symptom in (Table 2) Low back pain;30(75%),fatigue;35(87.5%),neck pain;36(90%) and wrist pain;34(85%)

Table 2:Percentage (%) frequency of musculoskeletal symptoms

Musculoskeletal symptoms	**Study (n =40)**	**Control (n=40)**
Low back pain	30(75%)	5(12.5%)
Fatigue	35(87.5%)	6(15%)
Neck pain	36(90%)	4(10%)
Wrist pain	34(85%)	2(5%)

The relationship of right hand grip strength(HGS) and HGE (secs) in both study and control group,is summarized in (Table 3) showing highly significant with each other(p<0.01).

Table 3:Relationship of right hand grip strength(HGS) and HGE(secs) in both study and control group

Parameters	**Study Mean ± SD**	**Control Mean ± SD**	**P value**
HGS (Kgs)	19 ± 2.44	26.15 ± 5.19	**0.0000
HGE(secs)	5.3 ± 0.973	5.25 ± 2.37	**0.0000

Data expressed as Mean ± SD, ****** p<0.01= Highly significant

A reviews in the relationship of left hand grip strength(HGS) and HGE in both study and control group(Table 4) no significant change

Table 4:Relationship of left hand grip strength(HGS) and HGE in both study and control group

Parameters	**Study Mean ± SD**	**Control Mean ± SD**	**P value**

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 11, 2023

HGS(Kgs)	23.8 ± 2.72	24.3 ± 4.99	0.026
HGE(secs)	3.9 ± 0.796	6.10 ± 2.15	0.038

Data expressed as Mean ± SD, p value - Not significant (NS)

A statistically correlation between handgrip strength and endurance by Pearson's correlation coefficient,denoted by `r'(Table 5).The test of significance was checked by using the correlation coefficient table of probability.Significant correlation is said to be present if the calculated value of `r' is greater than the table value.Results showed a positive association of HGS with HGE in respondants right hand,not significant at $p<0.05$.Negative association and negligible correlation with controls.

Table 5:Correlation of hand grip strength(HGS) of right hand and left hand with grip endurance(HGE)

Correlation between HGS and HGE(secs)	**Study Mean ± SD**		**Control Mean ± SD**	
HGE(secs) Right hand	**r value**	**P value**	**r value**	**P value**
	0.172	0.889	-0.0856	0.945
HGE(secs) Left hand	**r value**	**P value**	**r value**	**P value**
	0.122	0.922	0.01	0.993

Correlation not significant at $p<0.05$ but positive association of HGS with HGE. Negative association and negligible correlation with controls, not significant at $p<0.05$

Discussion:

Hands and forearm muscles are important in grip strength and endurance for daily activities such as carrying, turning a doorknob, household chores, even for that matter computer work and more. Laptops, tablets, computers are widely used by IT professionals and offices for their work.[4]Constant use may lead to various muscle disorder and less grip strength. Handgrip strength is basically a biomarker of multiple physiological and musculoskeletal systems, Its augmentation may be a feasible strategy to improve general health and decrease likelihood of having multiple premature morbidity.[5]Subgroups of 40 respondents of both study and control groups were assessed. Study group as computer users on daily basis and provided data with their operating time(hrs) hand grip strength and endurance of both hands were taken and dominant hand showed more grip strength. They complained of musculoskeletal symptoms such as low back pain, fatigue, neck pain, pain in forearm and wrist pain and swelling, tingling sensation at times. Although this pain wasn't continous and was dealt with analgesics or muscle relaxants. Hand grip strength and endurance of right hand it showed highly significant results as compared to left hand findings, likely role of dominant hand. The dominant grip strength is stronger than that of the nondominant side and this finding agree with results of Bansal.[6,7] Handedness is an important factor that should be taken into consideration while measuring hand grip strength. A general rule often used states that the dominant hand is approximately 10% stronger than the nondominant hand[8].Grip strength when compared was observed to be less. The power of grip is the result of forceful flexion of all finger joints with a maximal voluntary force that the subject is able to exert under normal biokinetic conditions[9],[10].Grip strength is influenced by factors like age, synergistic muscle action and state of nutrition, cooperation of patient, restricted range of motion, pain and sensory loss[11].There was a direct correlation in grip strength and overall body strength in elderly female populations[12].Apart from different types of work settings, college, university students and IT industry are using PC's extensively in their work or studies. Reports shows that with prolonged and extensive

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 11, 2023

computer use suffer from various forms of musculoskeletal disorders(MSDs).MSK disorders especially soft tissue syndrome even sometimes carpal tunnel syndrome, hand grip strength acts as an important tool[13].

Musculoskeletal symptoms was reported more in computer users than control group(Table 1).Prolonged use in one position could be the link to MSK pain. Menendez et al. (2009) found that among the computer graduate students, years of computer usage where weekly computer use was more than 10 hrs experienced musculoskeletal pain within 1 hr of computing[14].
This pain fluctuates in intensity, from being mild to intolerable. Another feature is that the pain tends to migrate from one part of the affected limb to another[15].
Factors such as workload, deadlines, work environment, are all external stressors which may drive people to work beyond their safe capacity which may lead to MSK. One study indicated that there is a difference in grip strength between arm positions with a significant reduction in handgrip in the right hand with the arm straight and not with flexed elbow[16].Our study too had differences in hand grip strength and endurance(Table 3 & 4) respectively.

Left hand showed no significant changes, but still right hand findings were less as compared to the control group. However, it is difficult to conclude whether pain leads to decrease in muscle strength and endurance or decrease in muscle strength leads to pain. In literature, relatively few studies have evaluated handedness and gender separately. These findings need to be analysed in large numbers[17].Respondants and controls, positive association seen in right hand grip strength with endurance, p was not significant ($p<0.05$) (Table 5).

Several mechanisms may explain the work related musculoskeletal disorders, it could be due to biochemical or physiological stress such as soft tissue inflammation and accumulation of agents-related pain such as cytokines, free radicals and blood supply interference [18]. Overestimation of computer use even if hypothesized in one study, however, was not associated with having musculoskeletal complaints[19].In one study results showed no statistical significant($p>0.05$)difference in grip strength in medical laboratory technicians, infact grip strength was found to be more in them when compared with control group[20].Here, we tried to find an indirect observations which can help to assess the role of constant usage of computers with hand grip strength, endurance and musculoskeletal symptoms. On the other hand, study has its own limitations. Being a cross-sectional study and data may not be have been sufficient enough to allow the final conclusions. Occupational safety and awareness needs to be enhanced to all IT professionals and computer users. Poor ergonomics can lead to early musculoskeletal symptoms. A further study in a representative population is required with multiple factors taken into consideration such as ergonomics, physical fitness, injuries, fibromyalgia tender points and musculoskeletal expert examination, for better conclusions.

Conclusion:

Grip strength is one of the main components tested while evaluating hand function and also provides an objective index of the functional integrity of the upper extremity. This study also can be useful to compare hand grip in sedentary workers and labourers. Further studies of this type are required to improve the computer users' health status by not only assessing them but providing regular exercise programs, and education about biomechanically healthy working habits.

Acknowledgment:

Authors are also very thankful to the participants who voluntarily participated in the present study. The authors are also thankful to the local ethics committee of the university for the approval of the study.

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 11, 2023

References :

1. Schlüssel M,Anjos A,Kac G (2008)Hand grip strength test and its use in nutritional assessment.Rev.Nutr 21(2),233-235
2. Sen A,Richardson S.(2007)A study of computer-related upper limb discomfort and computer vision syndrome.J Human Ergol 36:45-50
3. Hamilton T,Hamilton G, Zderic W(2007)Role of low energy expenditure and sitting in obesity,metabolic syndrome,type 2 diabetes and cardiovascular disease.Diab 56(11);2655-2667
4. Cortes C,Hollis C,Amick C & Katz N(2002)An invisible disability: Qualitative research on upper extremity disorders in a university community.Work 18:315-321
5. Cheung C,Uyen T,Eleanor A,Kathryn, and Annie K(2013)Association of handgrip strength with chronic diseases and multimorbidity-A cross-sectional study.Age Dordr(6);35:929-941
6. Bansal N(2008)Hand grip strength: Normative data for young adults. Ind J of Physio and Occup Therap 2(2):29-33
7. Fraser A,Vallow J,Preston A,Cooper G(1999)Predicting 'normal' grip strength for rheumatoid arthritis patients.Rheum 38:521-528
8. Schmidt R and Toews J.(1970)Grip strength as measured by the Jamar dynamometer.Arch Phys Med Rehab 51: 321-327
9. Richards L,Olson B,Palmiter P.How forearm position affects grip strength.Am J Occup Therap.1996;50:133-139
10. Bohannon RW(1997)Reference values for extremity muscle strength obtained by handheld dynamometer from adults aged 20 to 79 years.Arch Phys Med Rehab 78:26-32
11. Incel A,Ceceli E,Durukan B,Erdem R,Yorgancioglu R(2002)Grip Strength:Effect of hand dominance.Singapore Med J 43(5):234-237
12. Fry C,Ciroslan D,Fry D,Leroux D,Schilling K,et al(2006)Anthropometric and performance variables discriminating elite american junior men weight lifters.J Str and C Res 20: 861-866
13. Shyamal K,Jasmine C & Jaspal S,Ibnosina J(2010)Hand grip strength: an assessment criteria of upper extremity musculoskeletal disorders in indian collegiate computer users.Med BS 2(5):198-204
14. Menendez C,Benjamin A,Mark,J,Cyrus C and Michelle R et al (2009);Upper extremity pain and computer use among engineering graduate students: A replication study.Am.J.Ind.Med.52:113-123
15. A Guide to the Prevention of Occupational Overuse Syndrome" Computer Users Handbook.2001(6):1-8
16. Deborah A,Perovitch N,Eli C,Raymond C and Haim(2004)Handgrip strength as a diagnostic tool in work-related upper extremity musculoskeletal disorders in women.The Scien Worl J 4:111-117
17. Nicolay W,Walker L(2005)Grip strength and endurance:Influences of anthropometric variation,hand dominance, and gender.Int J Ind Erg 35(7): 605-618
18. Pritchard H,Pugh N,Wright I and Brownlee M(1999)A vascular basis for repetitive injury.Rheum 38(7):636-639
19. Venkatesan R,Rosmah R,Pederlia R,Nurani R,Rita B and Warni U(2012)The prevalence of computer-related musculoskeletal pain among college students-a cross-sectional study.Am Med J 3(1): 33-36
20. Shreya M,Iqbal R,De A,Chandra M(2015)Study of assessment of hand grip strength in medical laboratory technicians.Ergonomics of rural development.289-296