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EFFECTIVENESS OF ERGONOMIC TRAINING IN WORK RELATED MUSCULOSKELETAL PAIN AND POSTURE AMONG SCHOOL GOING STUDENTS -AN EXPERIMENTAL STUDY

[1]Sanchi Gaikwad,[2] Dr Sanket Nagrale,[3]Dr Sucheta Golhar

[1]Intern ,[2]Professor PES Modern College of Physiotherapy,[3]Principal,PES Modern College of Physiotherapy

[1]PES Modern College of Physiotherapy, Pune, India

Abstract:

Background: Musculoskeletal disorders (MSD) such as neck and low back pain have been widely reported as being of significant health and economic concern in industrialized countries. Recent literature has indicated that these disorders are also prevalent amongst school students. [2]In school going children non chronic is far more common than chronic pain with a prevalence of 37.6%. The prevalence of chronic pain is 3.9%.[3]

Objective: Aims to find the effect of ergonomics training in work related musculoskeletal pain and working posture among school going children.

Methods: Study had begun with the presentation of synopsis to the ethical committee in PES MCOP. An approval was granted from the ethical committee various schools were visited in and around the city. 41 subjects were selected on the basis of their inclusion and exclusion criteria. Pre score action method REBA score analysis was done Pre WBS score was analyzed. Intervention for 4 weeks every alternate day was given Post REBA and WBS were analyzed. Data entered and analyzed.

Results: there was significant effect of pain and posture on pain and posture p value <0.0001. Conclusion: This study concluded that there was positive effect of pain and posture on school going children.

Keywords: ergonomics, pain, posture, musculoskeletal disorder, school students

INTRODUCTION

School is an environment to realize the talents, creativity, and potentials of students. The physical condition at school has a direct effect on comfort, concentration, performance, learning, and efficiency of students, and also the prevalence of diseases in them.[1]

It is notable that poor environmental condition creates obstacles to educational development, increases the transmission of diseases in students and personnel, and decreases educational performance.[1]

Musculoskeletal disorders (MSD) such as neck and low back pain have been widely reported as being of significant health and economic concern in industrialized countries. Recent literature has indicated that these disorders are also prevalent amongst school students. [2] In school going children non chronic is far more common than chronic pain with a prevalence of 37.6%. The prevalence of chronic pain is 3.9%.[3]

A study found that the prevalence of neck pain was the highest among schoolchildren, followed by upper back pain and lower back pain. The factors associated with MSD were age, load of schoolbag and satisfaction with the features of classroom furniture. [4]

MSDs are defined as injuries to muscles, tendons, ligaments, joints, nerves and discs that are caused or aggravated by our actions and/or environment that does not follow safe and healthy work practices.[5]

In this review article it is evident that children are facing more and more with poor posture incidences. These challenges have become a daily problem because of their behavioural changes caused by the modernization process.[6]

Moreover, these studies demonstrate that there are many other factors which negatively influence the normal curvature of "Posture" in children such as, how to do homework, how to sit on the bench , the way they carry their heavy school bag. Wearing Knowing these factors and their influences on children's "posture" is very important in order to prevent not only the appearance of postural deviation in children but also to reduce the possibility to face the consequences that these deviations cause in children's daily life.[6]

Postural deviations are a common problem among children caused by long-term effects of poor posture induced by modern lifestyle.[6]

Ergonomics

The word ergonomics has its origin in two Greek words ERGON meaning work and NOMOS meaning laws. So it is the study of the man in relation to his work.[7]

Ergonomics is concerned with making the workplace as efficient, safe and comfortable as possible. [7]

Effective application of ergonomics in work system design can achieve a balance between students characteristics and task demands . This can enhance student productivity , provide students safety and physical and mental well beings and task satisfaction.

NEED OF STUDY

1)Students are constantly complaining of musculoskeletal pain like neck pain or low back pain during the studies due to improper posture or sometimes due to the load of their backpack .Thus the problem related to students must be determined and should be corrected .

2)Few studies have determined the prevalence of musculoskeletal disorders related to school going students and very few have tested the effect of ergonomic training in work related musculoskeletal pain and working posture among school going students .

3)The need of study is mainly focused on ergonomic training and risk factor modifications which is helpful for students to maintain the correct posture during their studies .

AIM

To study the effect of ergonomic training in work related musculoskeletal pain and posture in school going students.

OBJECTIVE

1)To find effect of ergonomic training in work related musculoskeletal pain among school going students using Wong–Baker Faces Pain Rating Scale in 4 weeks.

2)To find effect of ergonomic training in work related posture among school going students using REBA scale in 4 weeks.

HYPOTHESIS

Null Hypothesis

There will be no significant difference in work related musculoskeletal disorders (pain) and posture when treated with ergonomic training.

Alternate Hypothesis (H1)

There will be significant difference in work related musculoskeletal disorders pain when treated with ergonomic training.

Alternate hypothesis (H2)

There will be significant effect in posture when treated with ergonomic training.

METHODOLOGY

- Study Design : Pre and Post experimental study
- Sample Size: 41
- Sampling Method: purposive sampling
- Study Population: School going Students
- Study Setting : In and around the Pune city
- Study Duration: 6 months
- Intervention Duration: 3 days per week for 4 weeks

MATERIALS

Pen ,Paper, Camera, REBA Scale, Consent form ,Assent form ,Wong baker faces pain rating scale ,Data collection sheet

CRITERIA

INCLUSION CRITERIA

- Students willing to participate
- Students of age :- (12-15)yrs
- Students with complain of work related musculoskeletal pain
- Students sitting with incorrect posture for prolonged time .
- Students who regularly carry heavy back packs to school .

EXCLUSION CRITERIA

- Students with previous history of trauma or surgery.
- Students with congenital deformity like kyphosis, scoliosis.
- Students with any type of recent upper limb and lower limb fracture .

OUTCOME MEASURE

The Wong–Baker Faces Pain Rating Scale is a pain scale that was developed by Donna Wong and Connie Baker. The scale shows a series of faces ranging from a happy face at 0, or "no hurt", to a crying face at 10, which represents "hurts like the worst pain imaginable". Based on the faces and written descriptions, the patient chooses the face that best describes their level of pain.(7)

There are 6 faces in the Wong-Baker Pain Scale. The first face represents a pain score of 0, and indicates "no hurt". The second face represents a pain score of 2, and indicates "hurts a little bit." The third face represents a pain score of 4, and indicates "hurts a little more". The fourth face represents a pain score of 6, and indicates "hurts even more". The fifth face represents a pain score of 8, and indicates "hurts a whole lot"; the sixth face represents a pain score of 10, and indicates "hurts worst.(8)
Inter-rater reliability was 0.92. Correlation of the new scale with the Wong-Baker Faces Scale was r = . 62.

Fig1 Wong Baker Pain Rating Scale

REBA SCALE

The Rapid Entire Body Assessment (REBA) is a common tool used to facilitate the measurement and evaluation of the risks associated with working postures as a part of ergonomic workload.[11]
This study reports high intra-rater reliability (ICC = 0.925) for REBA raw scores and moderate inter-rater reliability (IRR) (Fleiss kappa = 0.54) for a categorical scoring of REBA.[11]

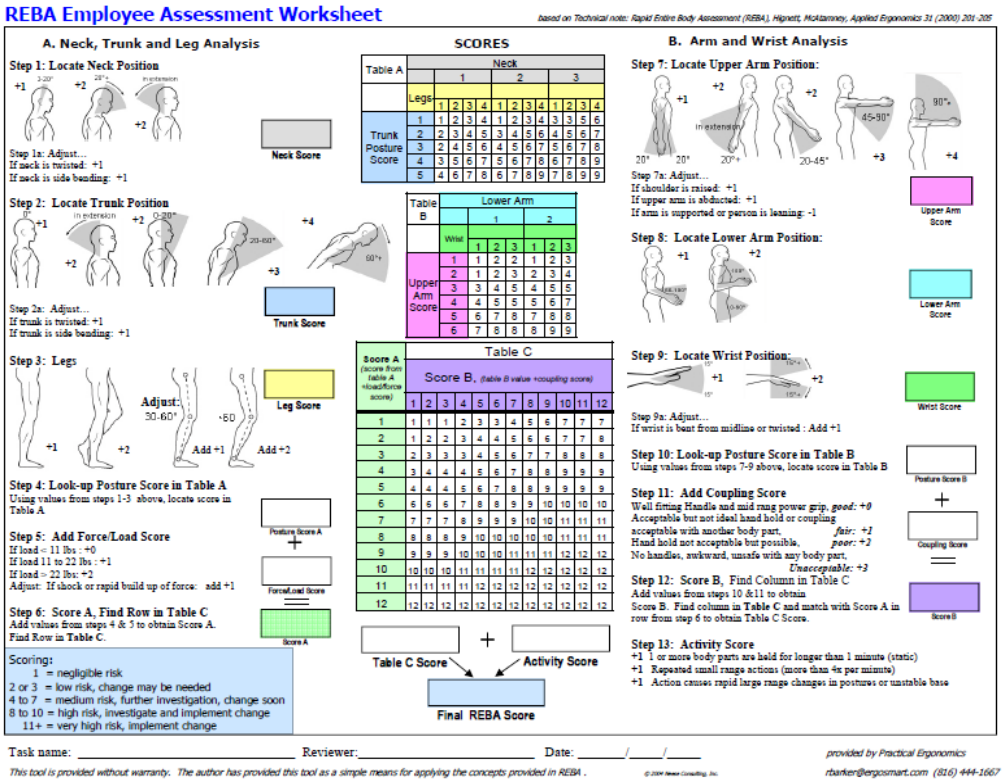


Fig:2 REBA SCALE

REBA score	Action level	Risk level	Action (including further assessment)
1	0	Negligible	None necessary
2–3	1	Low	May be necessary
4–7	2	Medium	Medium necessary
8–10	3	High	Necessary soon
11–15	4	Very high	Necessary now

Fig:3 REBA Interpretation

PROCEDURE

Study was begun with the presentation of synopsis to the ethical committee in PES Modern College Of Physiotherapy Pune .
Study was begun after an approval was granted from the ethical committee .
Various schools were visited in and around the city
The purpose of the study was explained to subjects and prior consent was be taken .
The subjects were selected on the basis of their inclusion and exclusion criteria.
Pre score action method REBA analysis was done
Pre Wong–Baker Faces Pain Rating Scale score was analysed .
Intervention for 4 weeks every alternate day was given.
Post REBA and Wong–Baker Faces Pain Rating Scale score was analyzed after 4 weeks.

TREATMENT PROTOCOL

The students , who according to inclusion criteria were asked about the pain by using the Wong–Baker Faces Pain Rating Scale and Pre posture (REBA) assessment was done to get base line information.
The Training intervention included the basic principles of ergonomics, postural advice ,backpack education with ergonomic training .
The basic principles of ergonomics were taught to the students during basic informative sessions to know how ergonomic training or ergonomics is important during work. In the informative session postural advice and backpack education was also given to the students.

Postural advice

In postural training (postural advice) students were be asked to sit erect and maintain the neck position.
They were taught about ideal standing and sitting position.
changes in their sitting postures,
proper foot rest
back support was advised. Rest interval was advised.

Backpack Education

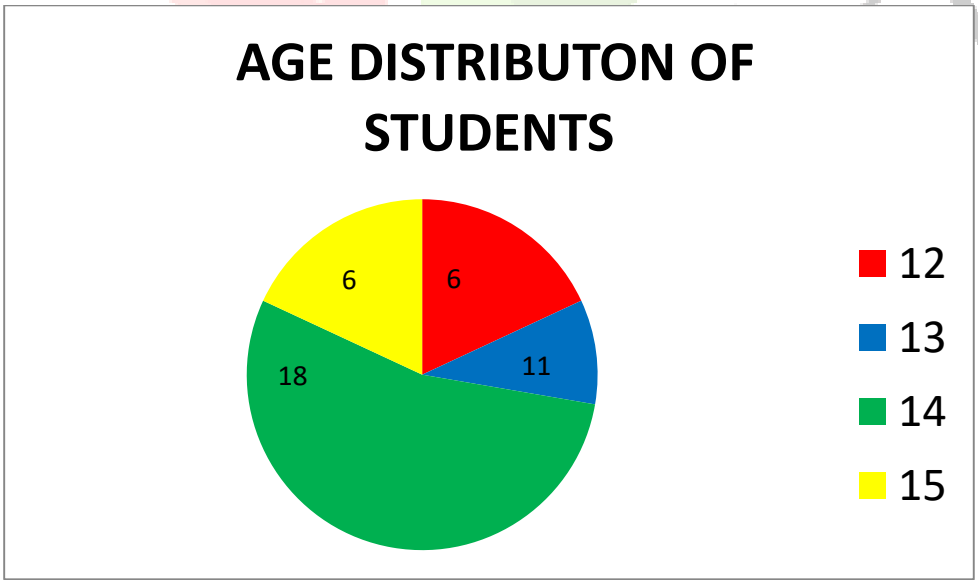
Suggestion/modifications in backpack. Backpack education program for participants -
Rest on the back, between neck and the curve of the low back of a student.
Include two wades curved, padded, adjustable shoulder straps.
Padded back to increase comfort.
Straps should be short enough to keep the bag close to the back, but not so short or tight as to discourage using both straps.
Provide multiple compartments for more even weight distribution.
Padding of the bags should be of soft material .
Simplify your task. Use all pockets in backpack (even weight distribution.) Place the heaviest items close to your back.
Ideal carrying technique for carrying backpack technique will be taught to participant. Backpack to be carried on both the shoulders and posteriorly on back. It should properly sit on the back around lower curve of the spine, not very low and loosely hanging.
Ideal lifting techniques for lifting backpack will be shown.
Stand as close as possible to the object. Bend with both knees keeping a straight spine when picking up a backpack from lower surface or floor (squat lift). If required backpack modifications were suggested in present backpack used by participants.

ERGONOMIC TRAINING

In ergonomic training basic exercise like shoulder rolls(shrugs) ,neck rotations , chin tucks, back exercises (back extension), bridging exercises , ,cat and camel , knee to chest stretch , knee (knee raises), hand exercises(using ball) and finger exercises (finger lifts)were included in the ergonomic training. Each session involves 1 set of 5-10 repetitions . Basic stretching was also taught to the students. The total duration of each session was among 30 mins.[12].

DATA ANALYSIS AND RESULT

Total 41 students of age between 12-15 yrs volunteered to participate in the study and have completed the 4 week of program.



DATA ANALYSIS AND RESULT

The pre and post values of nprs and owas were analysed
The data was entered in excel spread sheet, tabulated and subjected to statistical analysis.

WONG BAKER SCALE	PRE TREATMENT MEAN SCORE+SD	POST TREATMENT MEAN SCORE +SD	t value	p value	Results
12yrs	5.67+1.51	3.00+1.67	6.32	0.0015	Very statistically significant
13yrs	4.91+1.64	2.55+1.29	6.50	<0.0001	Extremely statistically significant
14 yrs	5.33+1.37	2.67+1.37	9.52	<0.0001	Extremely statistically significant
15yrs	4.33+1.51	1.67+0.82	6.32	0.0015	Very statistically significant

Fig4:.Comparison of pre and post WBS before and after intervention score

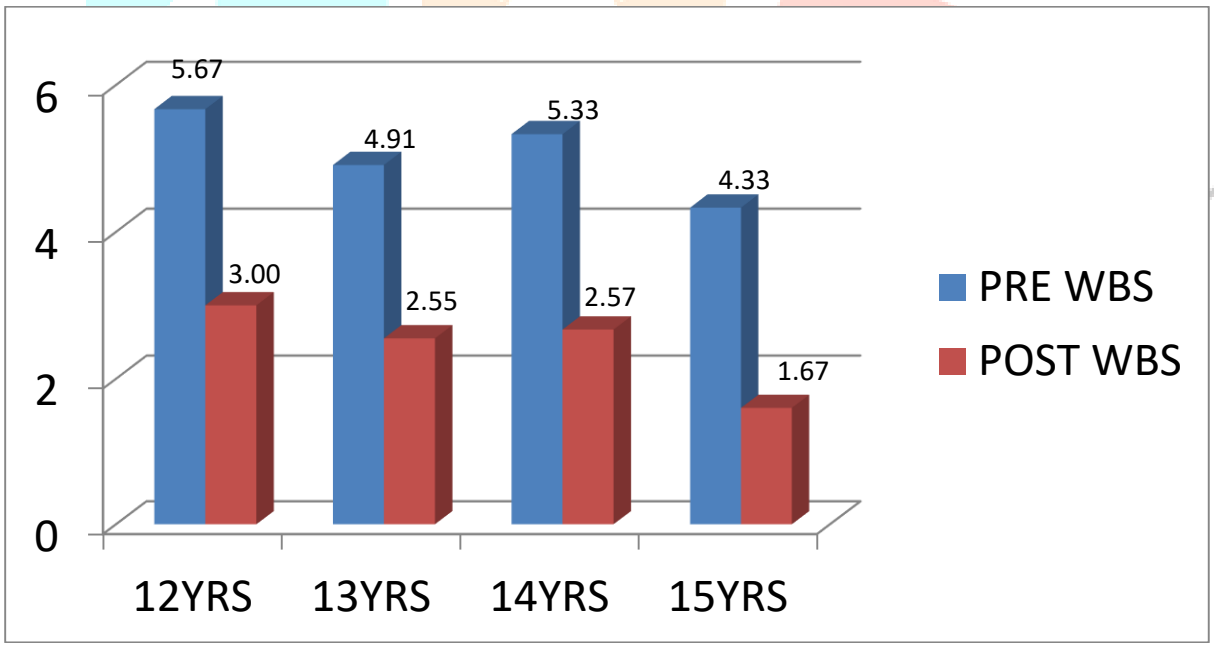
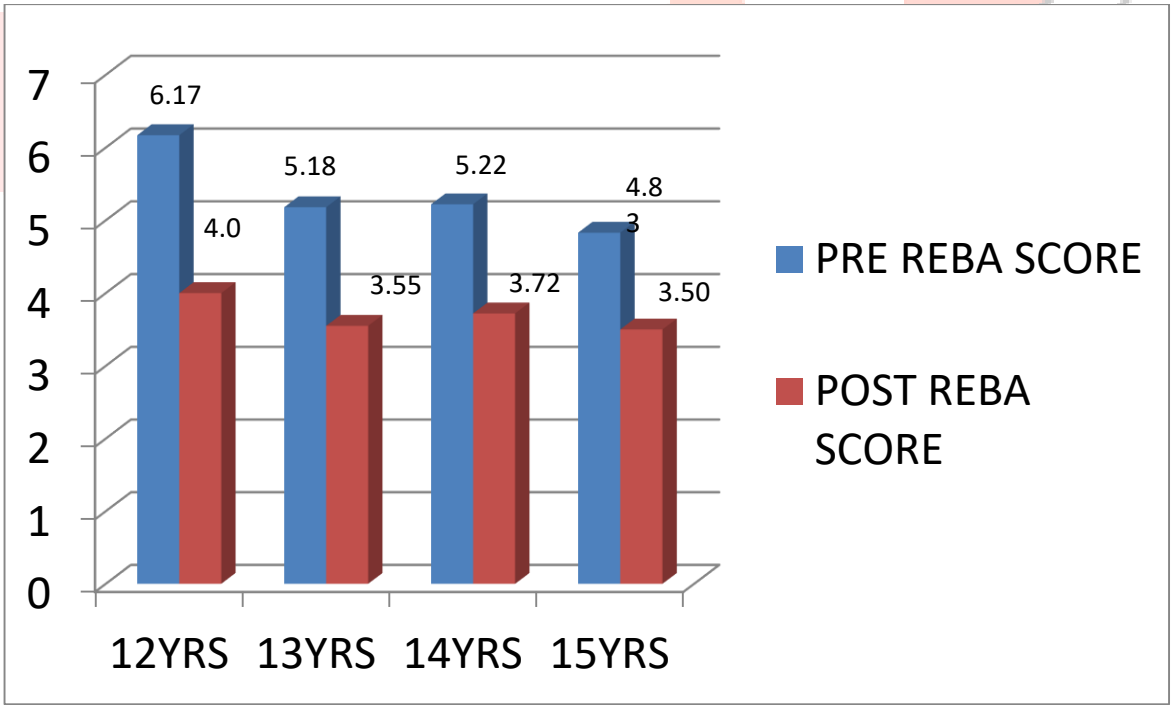


Fig:5 pre and post WBS graph

Fig:6:comparison of pre and post REBA Score

REBA SCORE	Pre treatment score +SD	Post treatment score +SD	t value	p value	Results
12yrs	6.17+0.98	4.00+0.63	7.06	0.0009	Extremely statistically significant
13yrs	5.18+0.98	3.55+0.82	10.75	<0.0001	Extremely statistically significant
14yrs	5.22+1.00	3.72+0.67	7.42	<0.0001	Extremely statistically significant
15yrs	4.83+0.41	3.50+0.55	4.00	0.0103	statistically significant

Fig :7: pre and post REBA Score graph



RESULT

On comparing the pre and post intervention values of WBS in participant with ergonomic intervention, Frequency of musculoskeletal pain was found to be reduced in school going children receiving the ergonomic intervention. The result was highly significant for ergonomic intervention ($p<0.001$) for age 13 and 14 yrs and for age 12 and 15 yrs the result was ($p<0.05$).
The results and statistical analyses indicated that younger students' aged 12 year old faced higher potential of musculoskeletal pain compared to older students aged 13,14 and15 years old.

There was significant improvement in REBA SCORE in age 13yrs 14,15 yrs of age students with mean value(5.18,5.22,4.83) respectively which indicate medium risk and that action is necessary to mean value (3.55,3.7,3.50) respectively which indicate low risk and and that action may be necessary to the ergonomic intervention.
There is considerable reduction in the value of REBA score of the students of 12 yrs age ,but the post treatment score still lies in the range of medium risk for which level of significance in reduction of risk is less as compared to 13, 14, 15 yrs

DISCUSSION

The present study aims at finding effect of ergonomic training in work related musculoskeletal pain and assessment of working posture among school going children.
Ergonomic intervention included ergonomic advice, exercise ,stretching and treatment for three days in a week for four weeks ergonomic intervention was given data analysis was done. The posture of student was assessed by REBA Scale and pain assessment was done using WBS and then analysis was done .
On comparing the pre and post intervention values of WBS in participant with ergonomic intervention, Frequency of musculoskeletal pain was found to be reduced in school going children receiving the ergonomic intervention. The result was highly significant for ergonomic intervention ($p<0.001$) for age 13 and 14 yrs and for age 12 and 15 yrs the result was ($p<0.05$).
One of the reasons for school going children to exhibit a prevalence could be that they tend to sit in awkward postures resulting in musculoskeletal disorders while sitting.
Children spend almost 75% of the time with flexion angles between torso and thighs below 90 º, thus causing a high pressure on the intervertebral discs. When analyzing the neck flexion, it is possible to notice that postures are essentially dependent on the activities that were being performed.[13]
When the child is looking at the board or hearing the teacher, the head is upright and the flexion degree of the neck is below 30º. However, in reading and writing activities, children tend to increase the flexion of their neck, to get an appropriate view of the work they are doing. [13]
Additionally study done by Shinn et al. signified that promotion of correct body mechanic in educational ergonomic can reduced the risks of musculoskeletal injuries .[14]
Musculoskeletal disorders are the most prevalent occupational disorders in different jobs. Some interventions such as ergonomic modifications and workplaces exercises are introduced as the methods for alleviating these disorders. In this study they compared the ergonomic modifications and workplace exercises on musculoskeletal pain and discomfort in children.
In the current study Ergonomic intervention in the form of ergonomic advice , exercise and stretching was useful in correcting working posture.

CONCLUSION

The result of this study shows ergonomic training is effective in reducing work related musculoskeletal pain and working posture in school going children.

FUTURE SCOPE

1)Future study should be conducted with a large sample size and ergonomic training sessions should be increased in future.
2)The same protocol could be implemented in different populations.
3)As this study was done only for 4weeks, further research can be carried out extending the duration of protocol.
4) Other components and duration of pain can be also considered in further studies.

LIMITATIONS

1)In present study, the duration of the intervention was short.
2)Activities of daily living and recreational activities of participants were not taken into account.
3) In this study, subjects were tested for working posture.
4)Duration of pain was not considered
5)Sample size was limit

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