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Change in cervical range of motion of school students using inclined desk vs. flat desk

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ABSTRACT

INTRODUCTION: It is estimated that school kids spend an average of 10 hours a day sitting down. Unfortunately ergonomics, the design of the right work and studying environment, is largely ignored for kids. A chair is important for good posture, but when task like reading and writing are involved, the height and inclination of desk or table plays a dominant role. The study was conducted with the aim to find the change in cervical range of motion in school students using inclined desk vs. flat desk for at least 5yrs. **MATERIALS & METHODS:** The study had 75 sample of age group between 14 to 18 years amongst which 35 subjects were using flat desk since 5 yrs and. the rest of 40 subjects belonged to the group using 10 degree inclined desk. Their cervical range of motion (flexion, extension, right lateral flexion and left lateral flexion) using goniometer and inch tape method. **DATA ANALYSIS & RESULTS:** cervical ranges of motion (flexion, extension, right lateral flexion, left lateral flexion) were compared in two groups with Z-test as a statistical test in order to justify the null Hypothesis of the study. Students using flat desk were found to have more restricted cervical range of motion than inclined desk users. **DISCUSSION & CONCLUSION:** Students using flat desk top tend to slouch more on the table top while reading and writing. The implementation of ergonomically designed adjustable inclined desk for the school students in their pre-adolescent age is beneficial over the traditional usage of flat desk. The desk height and the degree of inclination should be adjustable according to the need of the individual.

Key Words: Cervical spine, Neck pain, Goniometry, Desk inclination.

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INTRODUCTION

“The most universal physical occupation of civilized human beings is sitting” Surprisingly, high proportion of school students report suffering from musculoskeletal discomfort. This is of great concern because the strongest predictor of having future spinal pain is often considered to be a previous history of such symptoms. Thus, it is important to determine contributory risk factors amongst school students.

It is estimated that school kids spend an average of 10 hours a day sitting down. Unfortunately ergonomics, the design of the right work and studying environment, is largely ignored for kids, although it is given due consideration for adults these days. So for healthy development of children, it is important that the desk and chair can keep pace with their growth.

A chair is important for good posture, but when task like reading and writing are involved, the height and inclination of desk or table plays a dominant role. Despite good chairs, posture with back bent, sagging or twisted can be observed. Problems arrive when such an extreme posture is maintained for long periods of time. However, reading with the trunk upright requires a sharp bent at CERVICAL SPINE, which can not be sustained for long time.

The spine of a newborn infant has none of the adult physiologic curves, i.e. it is in total flexion (kyphosis). The first lordotic curve of vertebral column is noted in the cervical region during first six or eight weeks of life. At this stage of development the newborn extends his or her head from the prone position. The posture of acquired habit has been considered a neuromuscular phenomenon that has its inception in early childhood. The acquired posture is also influenced by daily activities that demand a forward head posture.

There exists a substantial degree of mismatch between the size of the furniture and the anthropometric data of its user. For children between 7 to 12 yrs of age, the chair is too high and too deep and the table is too high. On the other hand, in the age group 12 to 18 yrs, it is found that the smallest student had the best fit. Taller students had more risk of developing spinal pain.

Muscles habitually kept in a stretched position beyond the physiologic resting position tend to weaken. This is known as *stretch weakness*.

Muscles habitually kept in a shortened position tend to lose their elasticity. These muscles test strong in the shortened position but become weak as they are lengthened. This is known as *tight weakness*. Kisner and Colby state that this

adaptive shortening of soft tissues and muscle weakness, caused by prolonged poor postural habits is considered to be a *postural dysfunction* (1). Stress to the shortened structures causes pain, and strength and flexibility imbalances may predispose the area to injury or overuse syndromes that a normal musculoskeletal system could sustain. Good postural habits are necessary to avoid postural dysfunctions.

It is hypothesized that if a student uses a flat desk for long reading and writing hours there is constant neck flexion which keeps the extensors in stretched position beyond the physiologic resting position. This may result in stretch weakness. The other study reveals that constant eccentric loading of cervical extensors could help improve their strength. Thus, the study is planned to find the variation in cervical range of motion in the school students using flat desk vs. those using inclined desk.

If musculoskeletal discomfort during computer use or long hours of desk work is a predictor of adults' musculoskeletal disorders then students need to learn how to protect themselves from injuries as they start their desk work. Also, if a common risk behavior in adults : poor seated postures for extended periods of time becomes a well-established habit at an early age, it is difficult to break in adulthood. A seated posture does not only depend on individual's sitting habit but also on work station and task design.

Work performance are seriously affected by musculoskeletal and visual concerns in adults, we don't know their effect on students' performance. Cardon have shown that a back prevention program in elementary school is effective in teaching back care principles. We need similar programs educating students in ergonomic principles also. Hopefully adjusting their workstation may ensure healthy posture and sound working habits.

With the aim to find the change in cervical range of motion in school students using inclined desk Vs. flat desk for at least 5yrs the study was conducted.

HYPOTHESIS

Null hypothesis: There is no significant difference in cervical range of motion between flat desk and inclined desk users.

Alternate hypothesis: There is significant difference in cervical range of motion between flat desk and inclined desk.

AIMS AND OBJECTIVES

- To determine if the inclination has an effect on individual's cervical range of motion.
- To draw a comparison between the effect of flat desk and 10° inclination desk on cervical range of the individual.
- To observe frequency of pain incidence in the students using different inclination of desk.

REVIEW OF LITERATURE

While sitting, our bodies have to fight gravity. A rigid sitting posture is manageable for a limited time. However, an exclusively static posture can lead to mental and physical impairment due to poor oxygen supply. This causes "The School Headache." The sitting discomfort is aggravated when a child has to work at a table or desk with a horizontal top. The child's back is noticeably rounded and their head is bent back in order to attain the necessary spacing between the eyes and the project at hand ⁽²⁾.

A common reason for adults to sit for long periods of time in poor postures is when using computers ⁽³⁾. Healthy computer use involves good workstation design features such as appropriate fit of body size to chair and desk height, screen angle and height, and keyboard arrangement, as well as the amount of time spent at the computer. Extended computer use has thus been proposed as a reason for adult back pain ^(4,5). Computer use is increasingly common among high school students around the world, although whether it constitutes a risk for adolescent back pain has not been established ^(6,7).

According to a study held in Department of

Physical and Rehabilitation Medicine, University Hospital of Turku, the occurrence of neck pain at least once a month was 21.3 and 43.4% and at least once a week was 6.3 and 19.4%. Sex difference was found only at the 4-year follow-up, when subjects were 13–16-year-old. Neck pain was then more common among girls than boys ($P < 0.001$). The intensity of pain increased with the frequency of pain ($P < 0.001$). This study strengthens the results of the previous cross-sectional studies that occurrence of neck pain increases with age, and that neck pain becomes more common among girls than boys in adolescence. Among preadolescents who were originally pain-free, there was only a small proportion who reported frequent neck pain at both 1 and 4 years ⁽⁸⁾. Twenty-seven percent of children reported having neck pain, 18% reported having upper back pain, and 22% reported having low back pain. Sam Murphy et al states that the upper back pain was associated with school bag weight (3.4–4.45 kg), school furniture features, emotional problems and previous treatment for musculoskeletal disorders ⁽⁹⁾. In 2004 he stated that static postures were also associated with neck and upper back pain ⁽¹⁰⁾. The study conducted by Niemi SM concluded that 21% of girls and 10% of boys suffered from disturbing neck and shoulder symptoms. ⁽¹¹⁾

The students flexed their head, neck and trunk more forwards compared to the other types of furniture whilst writing. This can be explained by the 15° inclined desktop. Other research with adults found that a horizontal desk resulted in a forward bent position of the neck with the highest muscular loads ⁽¹²⁾. The study conducted by M. De Wall stated that on average, the position of the head in the sagittal plane is 6 degrees more erect and the position of the trunk 7 degrees more erect when working at a desk with a 10 degree inclination than when working at a flat desk. The maximal decrease in load observed on the cervical spine was 35% and on the thoracic spine 95% ⁽¹³⁾. Reading with the trunk upright requires a sharp bend in cervical spine, which can't be sustained for long time. Furthermore, in this position the reading distance is more than 25 to 35 cm. Consequently, children and adult always bend

forward with curved spine over the table. In forward bend posture of trunk and head, considerable muscle force is needed ⁽¹⁴⁾.

M. Marschall et al stated that subjects demonstrate less neck flexion (mean 34.4) when seated on ergonomically designed work station as compared to traditional work station (neck flexion 38.7). It was concluded that use of the ergonomic work station could assist in maintaining a more efficient anatomical alignment of young children when sitting and writing ⁽¹⁵⁾. With a sloped table of 10° the head and trunk showed a more upright posture whilst reading and writing. The load on the back decreased with 29% and on the neck with 21% because of a lower gravitational moment. This inclination is easy to use whilst reading and is not an inconvenience when writing. Pens and paper do not slide down. In the study the decrease in head tilt was 10°, in neck flexion 8-9°. The trunk remained 4° more upright. This is similar to earlier findings ⁽¹⁶⁾. Larger inclination had no effect on the trunk angle and a relatively low effect on the neck. Schoolchildren strongly preferred an inclined table top independently of the height of the furniture. The slope should be adjustable between 0° and 20°. This makes it still possible for children to work together in groups with flat tables ⁽¹²⁾.

The question of work surfaces for special purpose arises in relation to school desk and tables where much reading and writing are carried on. Eastman and Kamon (1976) made a contribution to this problem. Inclination of the body (measure an angle between the horizontal plane and straight line from the twelfth thoracic vertebrae to eye) were as follows:

Horizontal table : 35-45

Table sloped 12 : 37-48

Table sloped 24 : 40-50

They found an impression of fewer aches and pain in students using flat top ⁽¹⁷⁾.

Freudenthal A while studying effect of posture with a ten degree inclination using adjustable chair and table found an average change in position of head from 38.5degree to 29.6 degrees, resulting in an average decrease of moment of

force on C7-T1 of 21% ⁽¹⁶⁾. Load moments and myoelectric activity studied by Karin Harms-Ringdahl concluded that extreme positions of the cervical spine do occur in sitting work posture, and level of muscular activity in such positions are low. The load moment for the Occ-C1 joint when the whole neck was flexed was only 1.2 times the value for the neutral position of the head, but for C7-T1 it increases to 3.6 times ⁽¹⁸⁾. Sitting posture in relation to three different desk slopes of 45, 22 and 0° (horizontal) was examined by statometry on 10 subjects who were reading. With increasing desk slope the cervical as well as the lumbar spine were extended, and the head and trunk changed towards a more upright posture. Electromyography (EMG) from the descending part of the trapezius muscle was also recorded during both reading and writing favored a steep slope of the desk for reading, while the opposite was favored for writing ⁽¹⁹⁾.

In a study it was found that students of same age group had furniture with desk and seat height bigger while seat height was less. Thus, the furniture didn't match the anthropometric variability among children ⁽²⁰⁾. Another study conducted by Georgia Panagiotopoulou indicates a mismatch between the students' bodily dimensions and the classroom furniture available to them. The chairs are too high and too deep and desks are also too high for the pupils. This situation has negative effects on the sitting posture of the children especially when reading and writing ⁽²¹⁾. The data of a study indicate a substantial degree of mismatch between the students' bodily dimensions and the classroom furniture available to them. Fewer than 20% of students can find acceptable chair/desk combinations ⁽²²⁾. F.H.A.Bex in his study concluded that desk should be lower and adjustable ⁽²³⁾.

Anna Lindblad Berkhout et al study confirms the importance of adjustable work tools that recognize anthropometric differences and biomechanics to meet the needs of individual customers during continuous visual display terminal work ⁽²⁴⁾. In schoolchildren, using individually adjustable saddle-type chairs and desks with comfort curve, a better match between workstations and anthropometric dimensions and

improved working postures are obtained than using conventional workstations ⁽²⁵⁾.

Back education in elementary schoolchildren is efficacious up to 1 year. The role of early back education in preventing back pain at the adult age merits further attention ⁽²⁶⁾. According to the study conducted in 1994, increased comfort and decreased symptoms may be used to motivate pupil to sit correctly ⁽²⁷⁾.

METHODOLOGY

Subjects

The study had 75 sample amongst which 35 subjects were using flat desk since 5 yrs in their 8th, 9th, 10th, 11th and current 12th std. the rest of 40 subjects belonged to the group using 10 degree inclined desk since last 5 yrs of their academic session.

Age

The study was conducted in school students of age group between 14 to 18 years to evaluate their cervical range of motion (flexion, extension, right lateral flexion and left lateral flexion) who are using the furniture provided by the school for at least 5 years with daily class teaching hours of 5 hours.

Research Design

The research design is of Diagnostic type determining the frequency with which the weakness of neck muscles and variation in range of motion occur in students due to various type of desks' inclination. The method of examination was used to carry the research.

Sample Design

Finite universe of social unit school is selected to conduct the research. Systematically a sample of 30 students of age group 14-18 yrs are randomly chosen as probability sampling from school using inclined desk and flat desk each. This age group is chosen because the growth spurt is

at end, there are clear sex difference and they sit for longer period of time.

Selection Design

Inclusion Criteria

- Student age group 14-18 yrs
- Sample with normal range of BMI
- Usage of particular angled inclination of desk for at least 5 yrs
- Average 4-5 hrs of reading/writing daily

Exclusion criteria

- Postural abnormality like scoliosis, LLD etc. leading to compensatory changes
- ADHD
- Marked deficit in visual acuity
- Established case of cardiac, psychological, systemic disorders

Material required

- Flat desk
- Inclined desk with the inclination of 10degrees
- Chair of fixed height
- Universal 180 degree Goniometer
- Skin marker
- Inch tape

Procedure

Range of motion of the cervical spine

Flexion/Extension:

Goniometer

To measure the range of motion of the cervical spine the subject was made to sit on a chair with his/her back against the back rest to stabilize the thoracic and lumbar spine. The stationary arm of a goniometer was aligned with the lateral side, pointing upward vertically with the axis over the external auditory meatus. The moveable arm was aligned with the base of the nares. The subject moved his/her chin toward the sternal notch to measure cervical flexion and then look up toward the ceiling to measure cervical extension. The

angle between the moveable arm and the line perpendicular to the floor was noted. Normal flexion and extension range of the cervical spine should measure 60°.

Tape method

The subject was made to sit on a chair with his/her back against the back rest to stabilize the thoracic and lumbar spine. He was asked to tuck in the chin and then touch the chin to sternal notch without opening the mouth and the distance between the two were measured. This helped to measure flexion in centimeters. To measure extension the subject was asked to look up to the ceiling, the distance of chin from sternal notch was again measured. The difference from the neutral space between notch and chin was considered extension range.

Right/Left Lateral Flexion

Goniometer

To measure the range of motion of the cervical spine the subject was made to sit on a chair with his/her back against the back rest to stabilize the thoracic and lumbar spine. The stationary arm of

a goniometer was aligned to 180 degree with the movable arm. The fulcrum of goniometer corresponded to the tip of the nose. The subject was asked to flex the neck laterally along which the movable arm moved. The angle made by the arm to the vertical axis was noted. The normal range of lateral flexion is 60- 65 degrees

Tape method

The subject was made to sit on a chair with his/her back against the back rest to stabilize the thoracic and lumbar spine. While the subject laterally flexes the neck, distance between the ear lobe and acromion process was measured. This gave the lateral flexion value.

DATA ANALYSIS AND RESULT

The large sample size of 75 was taken out of which 35 were using flat desk and 40 subjects were using inclined desk since 5 yrs. Various cervical ranges of motion (flexion, extension, right lateral flexion, left lateral flexion) were compared in two groups with Z-test as a statistical test in order to justify the null Hypothesis of the study. $P < 0.05$ was set as the standard level of significance.

	Flat Desk			Inclined Desk		
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error
Flexion(°)	48.26	13.35	2.25	62.48	17.50	2.76
Extension(°)	47.12	14.81	2.5	65.51	14.80	2.34
Right Lateral Flexion(°)	32.88	9.48	1.6	44.11	10.20	1.61
Left Lateral Flexion(°)	32.12	9.08	1.53	43.95	11.05	1.74
Flexion(cm)	2.9	2.2	0.37	2.51	2.51	0.39
Extension(cm)	6.04	1.33	0.22	7	1.78	0.28
Right Lateral Flexion(cm)	9.24	2.75	0.46	6.71	2.78	0.43
Left Lateral Flexion(cm)	9.2	2.5	0.42	7.04	2.64	0.41

Table 1: Comparison between Mean, Standard Deviation, standard error of flexion, extension, Right Lateral Flexion and Left Lateral Flexion of group using flat desk vs. the group using inclined desk (in ° through goniometer and cm through inch tape).

	FLAT DESK	INCLINED DESK
Flexion (°)	48.26 ± 2.25	62.48 ± 2.76
Extension (°)	47.12 ± 2.5	65.51 ± 2.34
Right lateral flexion (°)	32.88 ± 1.6	44.11 ± 1.61
Left lateral flexion (°)	32.12 ± 1.53	43.95 ± 1.74
Flexion (cm)	2.9 ± 0.37	2.51 ± 0.39
Extension (cm)	6.04 ± 0.22	7 ± 0.28
Right lateral flexion(cm)	9.24 ± 0.46	6.71 ± 0.43
Left lateral flexion (cm)	9.2 ± 0.42	7.04 ± 0.41

Table 2: Comparison between the means of cervical ranges of individuals using flat desk and inclined desk

	FLAT DESK	INCLINED DESK
Flexion (°)	48.26 ± 2.25	62.48 ± 2.76
Extension (°)	47.12 ± 2.5	65.51 ± 2.34
Right lateral flexion (°)	32.88 ± 1.6	44.11 ± 1.61
Left lateral flexion (°)	32.12 ± 1.53	43.95 ± 1.74
Flexion (cm)	2.9 ± 0.37	2.51 ± 0.39
Extension (cm)	6.04 ± 0.22	7 ± 0.28
Right lateral flexion(cm)	9.24 ± 0.46	6.71 ± 0.43
Left lateral flexion (cm)	9.2 ± 0.42	7.04 ± 0.41

Table 2: Comparison between the means of cervical ranges of individuals using flat desk and inclined desk.

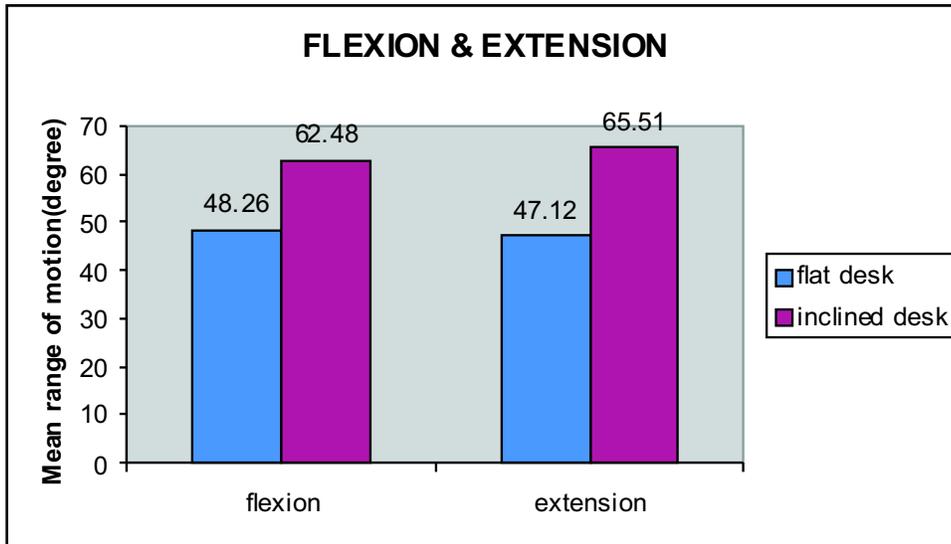
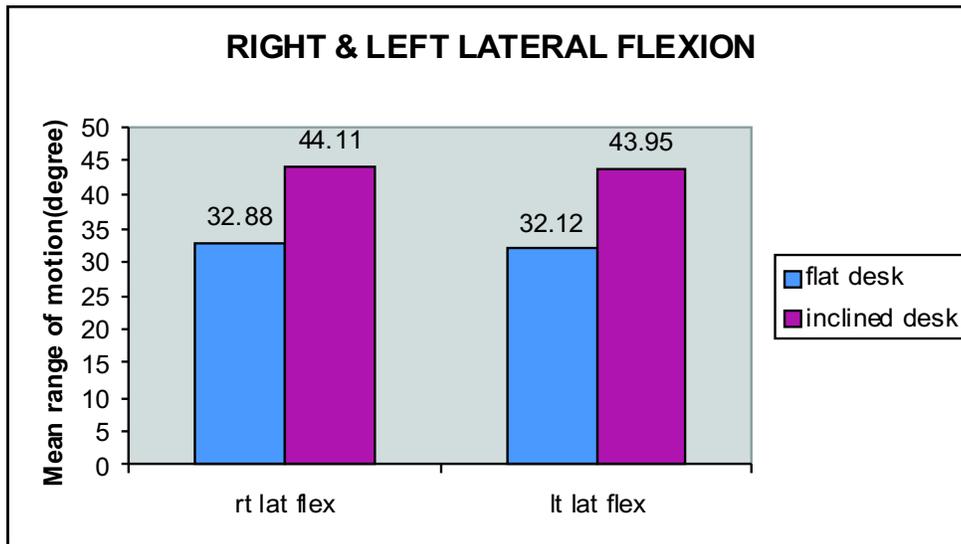


Figure 2: Mean of ranges of right and left lateral flexion through goniometer

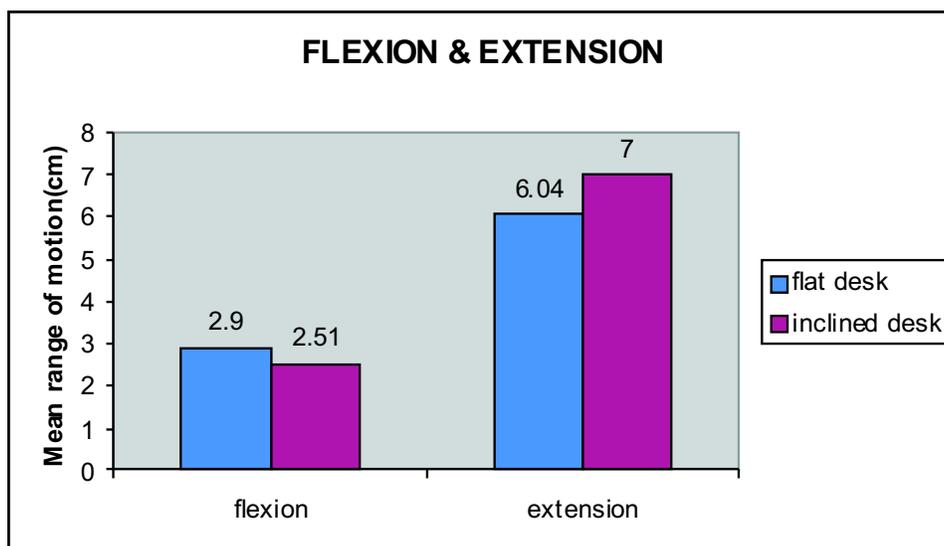
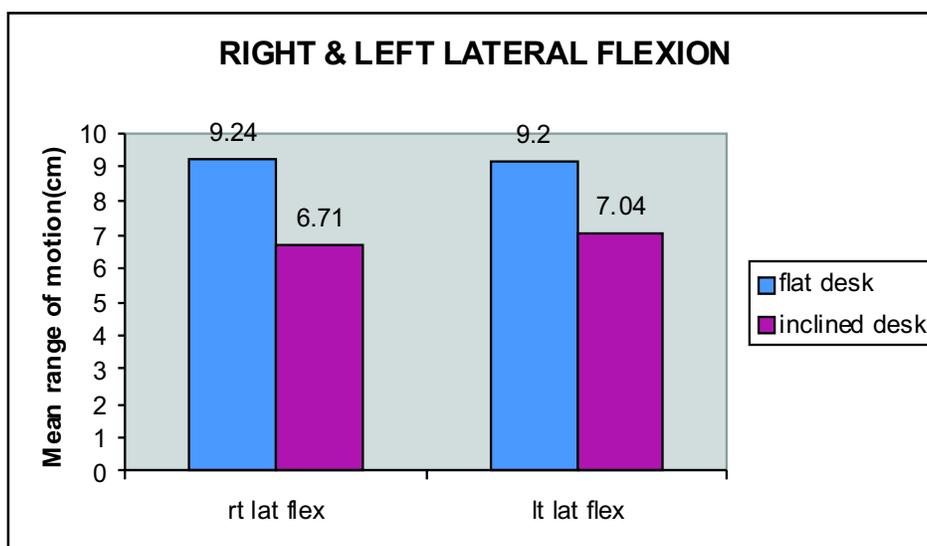


The study was conducted to compare the pain free ranges of cervical spine in students using flat desk to those using inclined desk since last 5 yrs.

Figure 1 shows the comparison between the mean of flexion range of motion measured through Goniometer of students using flat desk (48.26 ± 2.25) to those using inclined (62.48 ± 2.76) which proved insignificant when analyzed through Z test ($2.2486, p > 0.10$). Thus accepting

the null hypothesis. It also compared extension range of motion with the mean value of flat desk (47.12 ± 2.5) to the value of inclined desk (65.51 ± 2.34) which gives a significant change ($5.5225, p < 0.05$) rejecting the null hypothesis.

Figure 2 shows Right and Left lateral flexion ranges through universal goniometer comparison between flat and inclined desk with the mean values ($32.88 \pm 1.6, 44.11 \pm 1.61$ respectively).

Figure 3: Mean of ranges of flexion and extension through tape method**Figure 4: Mean of ranges of right and left lateral flexion through tape method**

The statistical analysis proved favorable to the alternate hypothesis (4.9140, $p < 0.05$ and 5.0297, $p < 0.05$ respectively).

Figure 3 is a comparison between the mean of pain free Flexion (inch tape method) available in flat desk user group (2.9 ± 0.37) with the inclined desk users (2.51 ± 0.39). The Z test values (0.7109, $p > 0.10$) rejected the expected result of the study. The analysis of extension between the two groups accepted the alternate hypothesis (2.5885 , $p < 0.05$) with the mean ranging $6.04 \pm$

0.22 of flat desk to that of inclined desk 7 ± 0.28 .

Figure 4 is the comparison of right lateral flexion of flat desk (9.24 ± 0.46) to that of inclined desk (6.71 ± 0.43). The null hypothesis is rejected through Z test (3.9518, $p < 0.05$). The comparison of left lateral flexion of the flat desk users (9.2 ± 0.42) to those using inclined desk (7.04 ± 0.41) proved significant at 3.6265, $p < 0.05$.

DISCUSSION

The relationship between poor working postures and the development of neck pain has been widely studied, but whether this can be related back to school sitting posture was the purpose of the study. School pupils' primary tasks require them to sit for the majority of their classroom lessons and education years. Their seated classroom tasks include reading, writing, listening and computer use. As different postures are usually adopted for some of these tasks (e.g. writing compared with listening), chair and desk features may be contrary to recognized safe sitting postures. Furthermore, an uncomfortable body posture can destroy a student's learning interest, even during the most stimulating and interesting lesson.

Of the total seated time, Storr-Paulsen and Aagaard-Hensen (1994) found that approximately 43% of classroom time was spent in a backward-leaning position, whereas 57% was spent leaning forwards e.g. reading or writing. Hence, up to 80% of the pupils' time was, therefore, spent slumped on the desktop. It is reasonable to conclude that the sit up straight and don't slouch' is not the typical pupil sitting posture (28).

The duration of sitting is consistently high throughout pupils' education. Children spend a large part of their school days in the classroom, and yet the effect of the design of school furniture on their behavior and health has received limited attention. As children progress through their education years, the percentage of time they are expected to be physically active i.e. not sitting, reduced from 73% in the preschool category to 19% in the mid-high school years. As schoolchildren spend most of their time at chairs and desks, the relationship between their anthropometric measurements and the physical design of their chairs and desks is therefore as essential as a correct workspace design feature (29). School children may spend approximately 30% of their waking hours at school, much of that sitting (30).

A sustained flexed posture causes soft tissue stresses on the spine. In a child's early life, postural deviations are likely to be functional and fully reversible (31). Children's bones are particularly soft

during their school years; hence they can be easily deformed by long-term stretching (32). Significant latissimus dorsi and trapezius activity, and the finding that erector spinae was most active in the erect, upright position is of anatomical importance in analyzing sitting postural behavior (33). These authors stated that further myography studies may be valuable in determining what features should be considered for the design and dimensions of school furniture (in conjunction with basic anthropometric requirements). Karvonen et al. (1962) supported a related view, recommending that school furniture design should permit changes in sitting posture. If, however, comfortable and correctly designed furniture was provided, there would be less incentive for children to make postural changes. As children's muscles tire more rapidly than adults' during static muscle work, introducing regular postural change is important (34).

Significant physical growth takes place during the school years; girls reach 65% of their stature at age 4, whereas boys reach 60% of their stature at age 4 (35). The growth spurt occurs at an earlier age in girls than in boys, with girls reaching 95% of their stature at age 13, but boys not reaching the same percentage until age 15 (35). According to Floyd and Ward (1969), the mean stature for secondary school boys is 174.5 cm, whereas for girls it is 163.1 cm. The implication of this is that a range of furniture sizes should be available to achieve a reasonable fit, with a recommendation that beyond age 14 one category of furniture size should not be recommended (33).

Students using flat desk top tend to slouch more on the table top while reading and writing. More of the trunk bending leads to more of the forward head posture of neck. Reading on flat desk require sharp bend in the cervical spine which can not be maintained for long. Furthermore, in this position the reading distance is larger than 25 to 35 cm (the height of the table must coincide with approximately the level of elbow). Consequently, children and adults always bend forward with curved spine over the table. In forward bent position of trunk and head considerable muscle force is needed. A prolonged continuous contraction causes lack of oxygen,

accumulation of sour metabolites and intracellular shortage of potassium. Pain is the result which can lead to muscle spasm, which closes a vicious circle. Prolonged isometric contraction can even cause an inflammation process with fibrosing; the result is passive shortening of the muscle.

The data analysis shows that the flexion ranges are not affected in either of the group as maximum time spent by the students is in flexed position while reading and writing. But due to prolonged flexed posture in students there is adaptive shortening of these muscles which results in limitation in extension range of motion. The excessive load on trapezius studied in August 1984 while reading and writing (18) proved true in both the groups. The spasm in upper fibers of trapezius was more prominent in students using flat desk than in those using inclined desk. Thus, the neck pain was more reported in flat desk group.

The group A were using sled desk (as per described by Chanda Nelofer Khanam) while other group B were using table and chair separately. The study conducted, advises chair and table to be better over sled desk. Students realized the importance of feature that contribute to good furniture design. They preferred furniture height to be adjustable ⁽²⁷⁾.

Tilted work surface reduces neck flexion and tension in the neck muscles. A 15° sloping tabletop was found to decrease neck angle by approximately 6°. Helps maintain more of erect spine, thus less of MSD.

CONCLUSION

We conclude from the study that the implementation of ergonomically designed adjustable inclined desk for the school students in their pre-adolescent age is beneficial over the traditional usage of flat desk. The desk height and the degree of inclination should be adjustable according to the need of the individual. This provides more erect and anatomical posture for the cervical spine. Hence, reducing the occurrence of musculoskeletal disorders related to neck in late adulthood. This also reduces the occurrence of neck pain due to sharp bent seen while reading

and writing on flat desk.

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Cognition in relation with hand dominance

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ABSTRACT

This was an experimental study done to determine the effect of hand dominance on cognition. 60 female subjects between the age group of 18-25 years from SBSPI were selected through convenient sampling by using inclusion and exclusion criteria. Subjects were divided in two groups- group A (Right handed individual) and group-B (Left handed individuals). Both the groups were assessed for their cognitive functions i.e. attention, memory and learning using trail making test, modified MMSE and VAK learning questionnaire. Data was analysed using independent t test and descriptive statistics. CONCLUSION: Left handers were found to be better in performing memory and attention tasks as compared to right handers. Majority of left handers were found to have auditory learning style and majority of right handers were found to have visual learning styles.

INTRODUCTION

Cognitive processes are generally defined as the abilities that enable us to "think" which includes the ability to concentrate (pay attention), remember and learn. It is the method used by the central nervous system to process information and includes knowing, understanding and awareness. Assessment of cognition is the important component under physical examination of patient which includes assessment of memory, orientation and ability to assimilate and manipulate information. Because persons with cognitive deficit often cannot recognize their own impairments

Cognitive intervention is being increasingly used for the treatment of many neurological conditions like parkinsonian disease, traumatic head injury, and stroke. The cognitive component of cognitive intervention focuses on modification of individual thoughts and feelings, through examination of cognition that arises in response to stressors. Complete understanding of cognition is important for planning effective treatment in patients with brain damaged due to various neurological insults.³¹ (Stroke, head injury) There are various factors which affect patient cognition like age, gender, pregnancy, handedness, systemic diseases like diabetes, hypertension etc. Naugels et al (1998) stated that left hand dominant individuals are more prevalent among the patients suffering from dementia of Alzheimer disease which begins prior to the age of 65 as compared to right hand dominant individuals. The premotor area of cerebral cortex is involved with the control of hand movements and it is larger in left side of right handed individuals than in the left handed individuals. Studies have found that the left hemisphere is important for language, logical

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decision making, in performing analytical task, mathematical calculation and performing fine motor skills. Each of the two cerebral hemisphere is responsible for specific functions that are not ordinarily performed by opposite hemisphere. The regional specialization is called as hemispheric lateralization.

Hand dominance has been a topic of investigation since so many years but the studies showing its influence over cognition are scarce. Thus, this study attempts to find out effect of hand dominance on cognition. The aim of the study is to found that is there any influence of hand dominance on cognitive components like learning, attention, memory.

METHODOLOGY

POPULATION: 400 female subjects between the age group of 18-25 years I were selected through convenient sampling by using inclusion and exclusion criteria.

SOURCE: Subjects were taken from SBSPGI, Balawala, Dehradun

SAMPLE: 60 Subjects were subjects were selected for the study on the basis of inclusion and exclusion criteria.

DESIGN: This study was an experimental study with descriptive in nature. It was based on comparison of cognitive functions (learning, attention, memory) in right and left handed individuals who were given trail making test for assessing their attention and VAK (visual, auditory, kinesthetic) learning style questionnaire for assessing their learning style and modified MMSE (Modified Minimental status examination) for assessing their memory.

PROCEDURE: Subjects were divided in two groups- group A (right handed individual) and group-B (left handed individuals). Firstly attention of both groups were assessed by using trail making test and than memory of both groups were assessed by using modified MMSE scale and lastly learning style were assessed through VAK learning questionarie. Time for completing the attention task for group-A and group-B were noted. The

score and duration of completing memory task were noted and lastly learning style were noted on the basis of number of maximum option as a, b, c. The values of both groups were compared through independent sample t test and descriptive statistics.

OUTCOME: Duration for attention task using trail making test, score and duration for the memory task using modified MMSE and scores for the learning styles using VAK learning questionnaire.

DATA ANALYSIS AND RESULT

An experimental design consisting of 60 subjects (females) of age group 18 to 25 years were allocated in two groups on the basis of their hand dominance for the study. Each group consists of 30 subjects. The values were collected through single task. The data was analyzed by using software SPSS version 11.00.

COMPARISION OF COGNITIVE FUNCTIONS IN BOTH GROUPS

- Group-A(right handed)
- Group- B(left handed)

COMPARISION OF ATTENTION TASK IN BOTH THE GROUPS VIA TRAIL MAKING TEST

- Results of trail making test part-a
- Results of trail making test part-b

DISCUSSION

This study was an experimental study which was designed to find out the effect of hand dominance on cognition i.e. learning, attention and memory. Subjects were divided into two groups on the basis of their hand dominance i.e. group A for right handed individuals and group

Table 1: Table showing mean and standard deviation of group-A and group-B for their trail making test part-a.

Attention (Trail making test part-a)			
Groups	Mean And SD	unpaired t test	
		t value	p value
		A(right handed)	46.2040±9.7201
B(left handed)	34.5630±8.7831		

Mean and SD for group-A (right handed) found to be (46.2040±9.7201) and for group-B is found to be (34.5630±8.7831) for trail making part-a

Table 2: Table showing mean and standard deviation of group-A and group-B for their trail making test part-B

Attention (Trail Making Part-B)			
Groups	Mean And SD	Unpaired t test	
		t value	p value
A(right handed)	91.86±27.89	3.173	0.002
B(Left Handed)	73.42±15.33		0.003

Mean and SD for group-A (right handed) found to be (91.86±27.89) and for group-B is found to be (73.42±15.33) for trail making part-b.

Table 3: Table showing mean and standard deviation of group-A and group-B for their memory (scores)

Memory-Score			
Groups	Mean And SD	Unpaired t Test	
		t Value	p value
A (Right Handed)	82.66±8.091	-	0.001
B(Left Handed)	89.50±5.042	3.926	

Mean and SD for group-A (right handed) found to be(82.66±8.091)and for group-B is found to be(89.50±5.042) for trail making part-b.

Table 4: Table showing mean and standard deviation of group-A and group-B for their memory (duration)

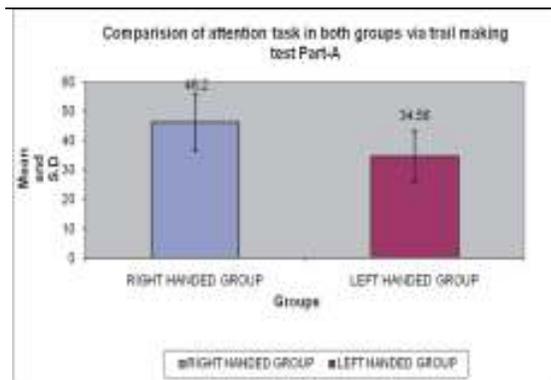
MEMORY-DURATION			
Groups	Mean and SD	Unpaired t test	
		t value	p value
A(RIGHT HANDED)	229.66±35.18	2.491	.016
B(LEFT HANDED)	208.66±30.78		

Mean and SD for group-A (right handed) found to be (229.66±35.18) and for group-B is found to be (208.66±30.78) for trail making part-b

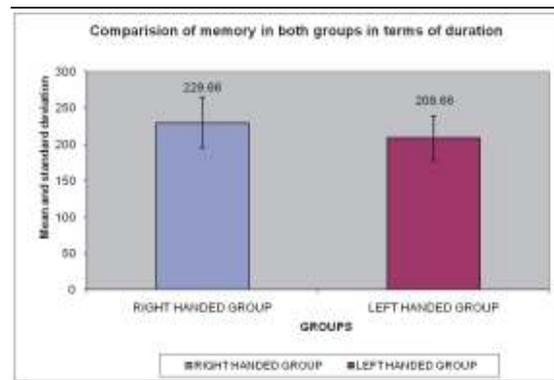
Table 5: Table showing comparison of learning styles in both the groups

Groups	Auditory	Visual	Kinesthetic
Group-A	73%	20%	6.7%
Group-B	36.7%	43.3%	20%

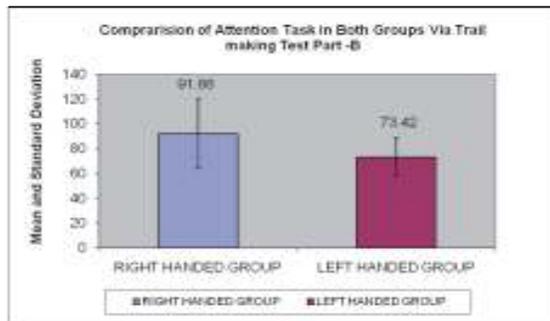
Graph-1 Showing Mean and Standard Deviation of both groups through Trail Making Test Part-A



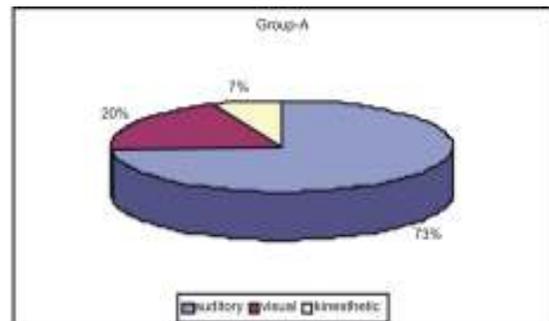
Graph 4: Showing Mean and SD of Both Groups Through Modified Mmse (Duration)



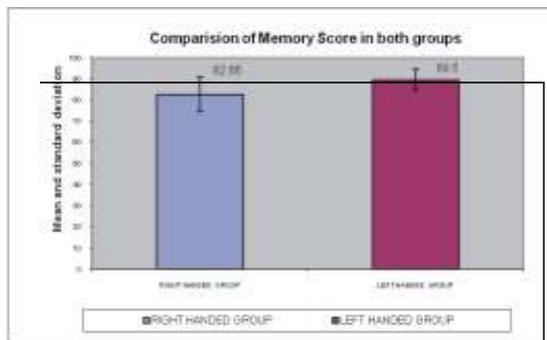
Graph 2: Showing Mean and Standard Deviation Of Both Groups Through Trail Making Part-B



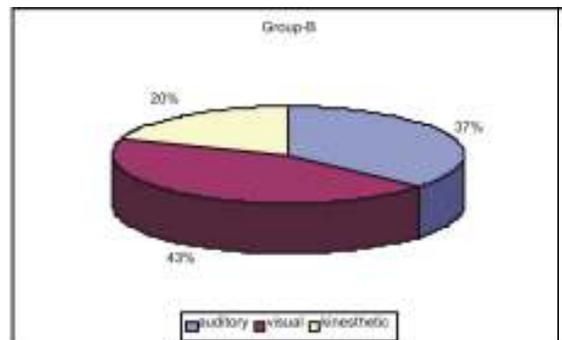
Graph 5: Pie Diagramme Showing Learning Style Of Right Handed



Graph 3: Showing Mean and SD of Both Groups Through Modified Mmse (Scores)



Graph 6: Pie Diagrammed Showing Learning Style Of Right Handed



B for left handed individuals. Both the groups were analyzed for their cognitive functions using trail making test for attention, modified MMSE for memory and VAK learning questionnaire for learning style. Data was analyzed using independent sample t test and descriptive statistics. For the ease of convenience, result of the study will be discussed as follows:

- Attention
- Memory
- Learning style

Attention: The results showed that left handed individuals took less time to complete the trail making test as compared to right handed individuals in our study. This finding can be explained by the study done by S F Witelson (1985) and Moffat SD Etal (1998). They stated in their study that corpus callosum, the main fiber tract connecting the two cerebral hemispheres, was larger by about 0.75 square centimeters, or 11 percent, in left-handed and ambidextrous people than in those with consistent right-handers which plays an important role in hemispheric integration. That may be one of the reasons that left handed individuals were found to be more attentive as compared to right handers.

Memory: Left handers scored more in memory scale and they took less time to complete the task as compared to right handers in our study. This is in agreement with the study done by JR. Minkel, Stephen D.Christmas and Ruth etal. In their review article, they stated that superior episodic memory is associated with interhemispheric processing which is stronger in left handed individuals. These findings were also supported by another study done by Arthur W Toga Who stated that the anatomical connectivity of the anterior temporal and inferior frontal lobe is thought to be more highly developed in left handed individuals.

Learning styles: Majority of right handed individuals were found to have auditory learning style and majority of left handed individuals were found to have visual learning style. The physiological reason for difference in their learning style may be because of differences in processing the information through right and left hemisphere

or in combination as told by Roshian M.Ali in the year 2006 They concluded in their study that learning styles were found to be associated with brain hemisphericity.

Thus in our study, we found that left handers were better in performing attention and memory tasks as compared to right handed individuals. This finding may be explained by the fact that broader and deeper connections exist between the two hemispheres of left handers as compared to right handers. We also found different learning styles in right and left handed individuals in our study.

On the basis of these results, it may be concluded that handedness has greater impact on cognition. So, it provides an important contributing tool for setting the treatment goal and plan out treatment of the patient.

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Effect of aging on timed balance test scores

Chaya Garg*
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ABSTRACT

Background and purpose: Although tests of standing balance are frequently included in neurological evaluations, few objective data are available to indicate how well individuals of different ages should be able to maintain standing balance. The purpose of this study was: (1) to establish the relationship between performance on timed balance tests and age, and (2) to provide data for use in clinical assessments of patients from 20 - 69 years of age.

Subjects: Normal males and females (n=75) in the age group of 20-79 yrs were included in the study after they gave their informed consent.

Methods: The subjects were allocated to the five groups according to their age Group A (20-29 years), Group B (30-39 years), Group C (40-49 years), Group D (50-59 years) and Group E (60-69 years). The subject stood without shoes with weight bearing lower extremities inside 18-by 20- inches frame on a smooth and level surface. Subjects in each age group performed eight balancing activities and time was recorded for each activity on a digital stop watch.

Results: All subjects balanced for 30 seconds with feet 8 inches apart and with feet together both with their eyes open and with their eyes closed. One legged balance activities were not, however, accomplished for 30 seconds by all subjects. A significant negative correlation existed between the age and the time balanced on one leg with eyes open and closed.

Conclusion: The duration that individuals are able to maintain standing balance on one leg is highly related to age.

Key Words: Timed balance tests

INTRODUCTION

Equilibrioception or sense of balance is one of the physiological senses. It helps to prevent falling over when walking or standing still. Balance is defined as the ability to maintain the projection of the body's center of mass within

manageable limits of the base of support, as in standing or sitting, or in transit to a new base of support, as in walking. According to Woollacott⁽¹⁾ balance can be defined as the ability to maintain the body's center of gravity over its base of support with minimal sway or maximal steadiness.

For many elderly subjects, the aging process is inevitably accompanied with restriction of the ability of independent movement and loss of balance⁽¹⁾. The postural system consists of several sensory systems (somatosensory, visual and vestibular), the motor system and a central integrating control system, which involves complex interactions among multiple neural

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systems⁽²⁾. These systems are known to be affected by aging and result in an impairment of the ability to maintain stance⁽³⁾. Aging is associated with decline in the function of the sensory systems^(3, 4, 5), with diminished muscle strength, decreased muscle volume and mass, loss of muscle fibers, alterations in the motor units, changes in posture and decreased balance control⁽⁶⁾.

Adequate postural control depends on the integration of vestibular, somatosensory and visual information of the body motion⁽¹⁾. Loss of sensitivity in peripheral sensory systems has been reported so frequently in the elderly without diagnosable disease that these losses are widely regarded as a normal consequence of aging⁽⁷⁾.

The changes in the somatosensory, vestibular and visual systems have shown significant deterioration in these systems in older adults. Advancing age accompanied with a generalized reduction of the visual system and impaired vision has been associated with postural instability and increased risk of falls⁽⁴⁾. Comparison of older and younger subjects showed age-related decreases in vestibular function⁽⁸⁾. Adults above 70 years of age have a 40% reduction in sensory cells within the vestibular system⁽¹⁾. Studies on age-related changes in the somatosensory system reflect a drop in the proprioceptive function of the elderly, a reduced vibration sense at the ankles⁽⁹⁾ and changes in joint sensation⁽⁷⁾.

Age is often accompanied by balance disorders or age-related pathologies, for example osteoarthritis, stroke, Parkinson's and Alzheimer's disease, which hinder independent mobility and lead to postural instability. It is estimated that one-third to one-half of the population over 65 years presents some problems with balance control, as shown in literature⁽¹⁰⁾. Since small balance impairment is a consequence of natural aging process, several authors showed that body sway increases with age^(9, 11, 12). For this reason, only a good knowledge of the effect of age on the stability of stance allows to differentiate between physiological aging and the pathologies leading to impaired balance control⁽³⁾.

Tests of standing balance are frequently included in neurological evaluations, still few objective data are available to indicate how well

individuals of different ages should be able to maintain standing balance. Even balance tests, for which maximum timed end points (5 – 75 seconds) are established, do not specifically support the clinical appropriateness of the end points or support with objective data their description of changes in the capacity of older individuals to perform timed balance tests^(13, 14). For example Potvin and Tourtellotte^(15, 16) claimed that all young adult, healthy subjects can balance on one leg for 30 seconds with eyes closed, but they offered no data to support their claim. Studies often included comparison of the ability to maintain stance for groups of young and older people only^(6, 9, 17) or compared middle-aged and elderly people⁽⁵⁾, or include only a single age group⁽⁴⁾.

Clearly, if clinicians are to use balance tests as a part of neurological evaluations, they need tests that are objective and for which age-related data are available. The purpose of this study was: (1) to establish the relationship between performance on timed balance tests and age, and (2) to provide data for use in clinical assessments of patients from 20 – 69 years of age. Like sway, performance on timed balance tests was expected to be significantly correlated with age.

Previous studies have not given conclusive evidence in favor or against "decreased timed balance test scores with aging". So the topic certainly begs further investigations.

METHODS

Normal males and females (n=75) in the age group of 20-69 yrs were included in the study after they gave their informed consent. Subjects were excluded from the study if they were unable to follow instructions or had vertigo, any neurological diagnosis that could account for possible loss in balance and falls such as CVA, Parkinson's disease, cardiac problem, TIA, multiple sclerosis, orthopaedic dysfunction of trunk and lower extremities such as fracture, surgery, lower limb joint replacements, were undergoing balance training or strength training for lower limb, were unable to walk without an assistive device, were dependent in activities of

daily living. Subjects were then assigned into 5 age groups.

Group A - Age 20-29 years

Group B - Age 30-39 years

Group C - Age 40-49 years

Group D - Age 50-59 years

Group E - Age 60-69 years

Every subject in each group performed the eight balancing activities and the goal of each activity was to maintain balance for 30 seconds. The subject stood without shoes with weight bearing lower extremities inside 18- by 20- inches frame on a smooth and level surface. Subjects in each age group performed eight balancing activities and time was recorded for each activity on a digital stop watch. Each subject was permitted five attempts per activity to reach the 30-second goal. If the subject reached this goal, we recorded a time of 30 seconds. If the subject did not reach his goal, we recorded the best of the five timed trials.

Subjects performed the following balancing activities:

1. balancing on two legs, with the feet 8 inches apart (first with eyes open and then with eyes close).
2. balancing on two legs, with the feet together (first with eyes open and then with eyes close).
3. balancing on right leg (first with eyes open and then with eyes close).
4. balancing on left leg (first with eyes open and then with eyes close).

All subjects performed two-legged activities before the one-legged activities. They were allowed to rest as necessary and to alternate between legs as they wished during one-legged balance. If any of the following events occurred before 30 seconds had lapsed, we stopped the timed trial and noted the time:

- a. during two legged balance, any displacement of the feet on the floor;
- b. during one legged balance, any use of the arms or the contra lateral leg for support such as bracing the non-weight bearing

lower extremity against the weight bearing lower extremity, hopping on the weight bearing lower extremity, or moving the weight bearing lower extremity outside the confines of the frame; and

- c. opening the eyes during the eyes closed activities.

RESULTS

Although a few old subjects required more than a single trial, all subjects balanced for 30 seconds with feet 8 inches apart and with feet together both with their eyes open and with their eyes closed. One legged balance activities were not, however, accomplished for 30 seconds by all subjects. The test results for the 5 groups are summarized in table: 1.

The mean duration that one legged balance could be maintained was longer with the eyes open than with the eyes closed. Similarly a larger percentage of subjects failed to balance for 30 seconds with the eyes closed than with the eyes open (Fig 1 and 2).

The mean amount of time subjects could maintain balance on one leg and the percentage of subjects balancing for 30 seconds diminished with age (Fig 1 and 2). A significant relationship existed between the age and time balanced on one leg with eyes open and closed when analyzed using a Pearson product moment correlation test (Fig 3, 4, 5, 6) and table 2.

DISCUSSION

Although tests of standing balance are frequently included in neurological examinations, few objective data are available to indicate how well individuals of different ages should be able to maintain standing balance. This study presents objective information regarding standing balance. Such objective documentation should allow the clinician to make better judgments. We choose to study healthy people who functioned independently without assistive devices in the

TABLE 1: Comparison of variables in different age groups.

	GROUP A Mean(SD)	GROUP B Mean(SD)	GROUP C Mean(SD)	GROUP D Mean(SD)	GROUP E Mean(SD)
Time (in seconds) for balancing on two legs with feet 8 inches apart Eyes open	30(0)	30(0)	30(0)	30(0)	30(0)
Time (in seconds) for balancing on two legs with feet 8 inches apart Eyes close	30(0)	30(0)	30(0)	30(0)	30(0)
Time (in seconds) for balancing on two legs with feet together Eyes open	30(0)	30(0)	30(0)	30(0)	30(0)
Time (in seconds) for balancing on two legs with feet together Eyes close	30(0)	30(0)	30(0)	30(0)	30(0)
Time (in seconds) for balancing on right leg Eyes open	29.68 (0.94)	26.69 (2.31)	21.31 (3.14)	17.29 (1.46)	11.81 (3.54)
Time (in seconds) for balancing on right leg Eyes close	24.79 (2.79)	21.11 (7.76)	17.40 (3.75)	8.95 (3.10)	4.45 (1.19)
Time (in seconds) for balancing on left leg Eyes open	28.26 (3.97)	20.66 (5.27)	17.27 (4.43)	15.37 (2.08)	9.53 (3.14)
Time (in seconds) for balancing on left leg Eyes close	16.91 (3.57)	12.09 (6.47)	8.74 (3.94)	3.43 (1.85)	2.38 (1.10)

Table 2 : Correlation between the age and time balanced on one leg

Variable	r	p
Time for balancing on right leg Eyes open	- 0.951	< 0.01
Time for balancing on right leg Eyes close	- 0.921	< 0.01
Time for balancing on left leg Eyes open	- 0.858	< 0.01
Time for balancing on left leg Eyes close	- 0.829	< 0.01

Fig. 1: Time for Balancing on Right Leg (Eyes Open and Close)

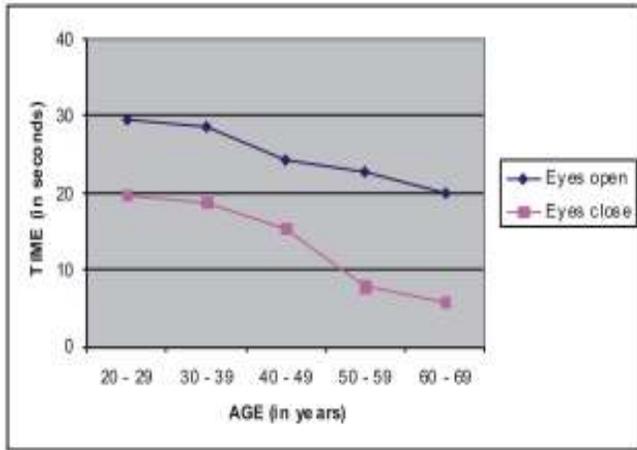


Fig. 4: Correlation between Age and Right Leg Balance Scores (Eyes Close)

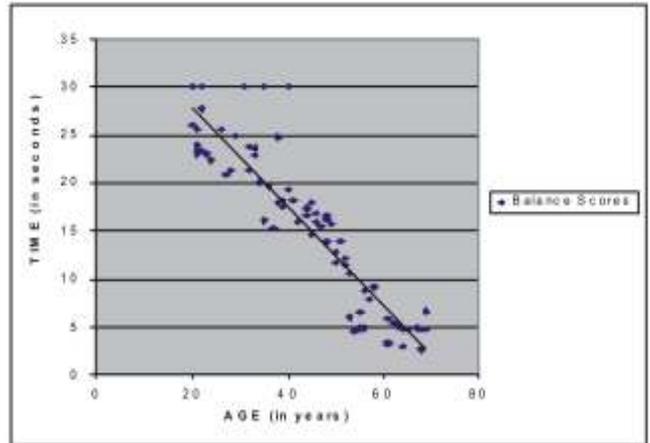


Fig. 2: Time for Balancing on Left Leg (Eyes Open and Close)

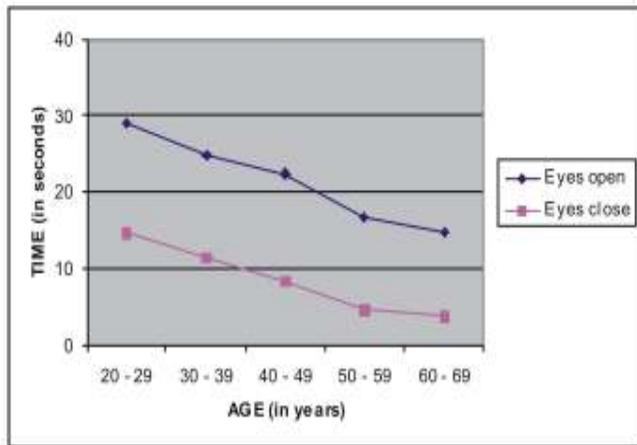


Fig. 5: Correlation between Age and Left Leg Balance Scores (Eyes Open)

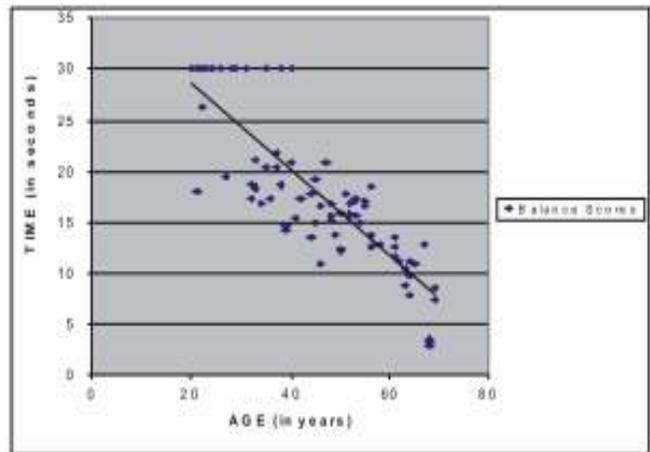


Fig. 3: Correlation between Age and Right Leg Balance Scores (Eyes Open)

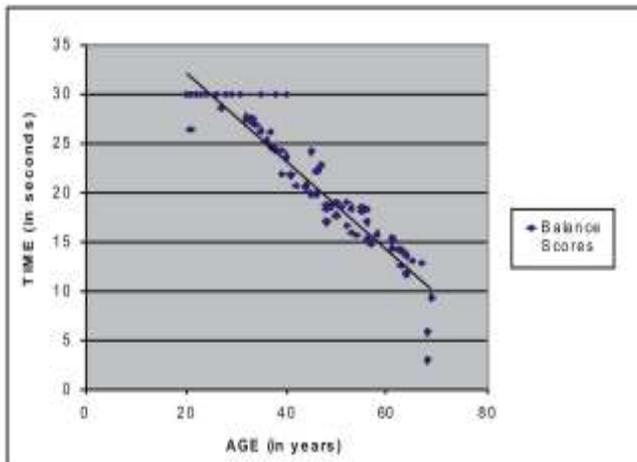
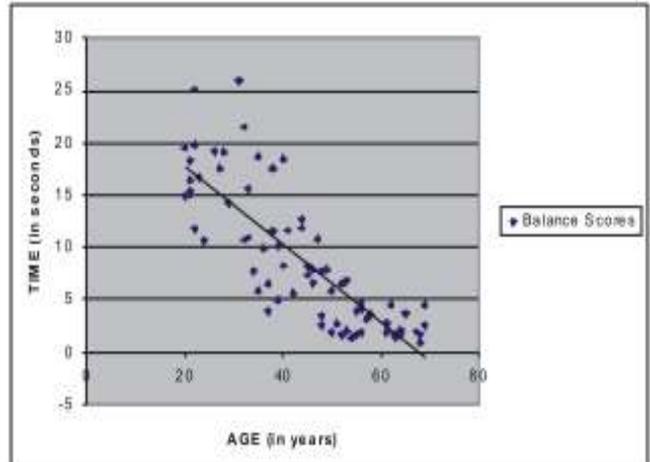


Fig. 6: Correlation between Age and Left Leg Balance Scores (Eyes Close)



community as they presented a more realistic standard of comparison for the elderly people seen by physical therapists. They represented a population who were fairly active and had fairly good health, in spite of presence of some pathology. All for tests in this study showed a trend toward age-related declines. These preliminary data suggest the need for using age related data in order to make judgments for older adults.

Our findings suggest that an inability to maintain balance for 30 sec while the feet are together is abnormal, whether the eyes are open or closed in individuals from 20-69 years of age. This finding is consistent with the report of Potvin and Tourtlotte^(15, 16). Romberg's sign, the tendency to sway and fall when the eyes are closed and the feet approximated, can legitimately be considered demonstrative of an abnormal state in patients younger than 69 years of age.

The mean time scores reported for one-legged balance in this study are somewhat lower, at least in the younger age group, than they would have been if an upper limit of 30 seconds had not been established. Analysis demonstrates an inverse relationship between age and balance. This suggests that grouping according to age is required if normative data is to be obtained.

The findings are in agreement with previous studies examining balance during quiet stance showing increased body sway in the elderlies^(3, 9, 11, 17). It is known that the body sway increases also with deficit of information from one of the sensory systems: visual, vestibular or somatosensory⁽⁴⁾. We found that the values increased significantly in the absence of visual information (with eyes closed) in each age group examined. Interesting to note is that the combination of sensory deficit (visual, somatosensory or both) with advancing age is likely responsible for the postural instability.

Jonsson⁽¹⁸⁾ identified two distinct postural phases that are necessary to perform single leg stance. During the dynamic phase, there was a rapid decrease of force variability amplitude as the subjects made postural adjustments to regain standing balance after transferring weight to one leg. The change in force amplitude occurred within

the first five seconds of testing. During the second phase, static postural equilibrium was required to maintain balance on one foot, and the force variability was minimal. They concluded that elderly subjects had difficulty maintaining balance in the static phase due to difficulty adjusting postural control during the initial dynamic phase of one-leg stance. Another possibility for the decrease in stance times for elderly subjects is a decrease in lower extremity muscular strength and endurance.

The limited number of subjects in the study prevents the use of these results as true normative values for balance, as does the nature of the sample (i.e., volunteers rather than randomly selected subjects). The information does, none the less, indicate the level of balance for subjects of different ages.

Whether the ability to balance as tested is related to functional capacity awaits further testing. This relationship and testing of the benefits of balance exercises, which have been advocated for increasing postural control, increasing confidence, and preventing falls⁽¹⁹⁾, are areas worthy of future research.

CONCLUSION

Our study results show that the balance scores decrease with increasing age. The duration that individuals are able to maintain standing balance on one leg is highly related to age. The practical implication of this information in patient assessment is that performance in timed tests is age specific and that the clinician's expectations for patients should be based on the patient's age.

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Physiotherapy student's attitude towards their education and profession

Jaya Shanker Tedla *
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ABSTRACT

Objective: Various factors tend to affect the attitude of students towards their course and future. This study investigated the attitude and perception of physiotherapy students towards their education and profession. The study also explored the limitations in the development of the discipline in India and the suggestions to overcome it.

Study design: Cross sectional

Methodology: 266 intern and final year students of 5 different physiotherapy colleges of Mangalore were selected by random sampling and their attitude towards their education and profession was assessed using Physiotherapy Student's Attitude Questionnaire (PSAQ). The self-report questionnaire consisted of 34 items, of which 27 were close ended questions and 7 were open ended questions.

Results: All the 4 domains of the questionnaire have poor association according to the chi square test. There was no significant difference in all the four domains between the interns and final years. Gender wise differences were also not significant according to unpaired t test. Many reasons were cited by the participants for stagnation of professional growth and suggestions to overcome were given for the same.

Conclusion: It can be concluded that the students and interns are indecisive with the course and their profession. However there are many untouched long standing problem areas which need to be modified.

Key Words: Students, Attitude, Career, Satisfaction, Physiotherapy profession.

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INTRODUCTION

Physiotherapists are concerned with using their knowledge and clinical skills to eliminate functional limitations and disability, thus enabling the individuals to achieve the most optimal quality of life possible. A proper education, hard work, optimal exposure to cases during the learning years and proper guidance are a few stepping stones to the success of the therapist as well as to the profession¹.

In India, there are numerous universities which impart the knowledge of Physiotherapy. The profession is governed by Indian Association of Physiotherapists. Physiotherapy is a four to four and a half years course, with six months of internship². On completion of the course the student is expected to be familiar with a thorough idea of the condition, proper evaluation techniques, reasoning for the management, goal setting and treatment of the patient.

Strohschein J et al stated that new generations of Physiotherapists emerging from professional programs require an educational foundation that is reinforced with attitudes and skills that will enable them to build their profession as well as their own professional practice. These attitudes and skills are believed to include the desire to engage in lifelong learning and professional growth and an ability to identify and critically evaluate their own practice and the underlying theories and perceptions that exist about the practice of physical therapy. He also concluded that clinical education, in which students engage in learning in the context of clinical practice, is the best area in which such skills and attitudes can be taught and refined³.

There is growing demand of Physiotherapists in the country as well as world wide⁴. The job options available to a fresher after completion of graduation are many⁵. Also, there is a growing trend towards post graduate and doctoral study. As the discipline is getting recognition, so is the number of students joining for Physiotherapy had been growing every year, However, recently observed trend was a decline in the admissions in and around Mangalore. This decline can be

attributed to various external reasons like introduction of new colleges in other states⁶, sharp hike in fees in many colleges, option to join newer courses etc. but there could be certain internal factors that could be operational in this decline.

With the number of students/professionals decreasing, there is a prerequisite to weigh the existing needs, look for scope of improvement as well as to find out what the future professionals expect when they pass out. An attempt is being made to study the attitude of students towards the course and towards their future.

Attitude is defined as "a mental state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related". Attitude can be the intensity of positive or negative effect for or against a psychological object and it can be used to predict behavior. Attitude can be represented by affective, behavioral and cognitive components^{7, 8}.

There has seldom been a report of students' attitudes and uncertainty of their future. Moreover there is scarcity of mention of Physiotherapy students specifically. So this study attempts to find out attitude and perception of a Physiotherapy student towards the Physiotherapy education and profession. The study will help to answer the questions like:-

1. Are the students happy with the choice of their profession?
2. Do the students anticipate a good future?
3. Do they confidently involve in patient care?
4. Are the students satisfied with their learning?
5. Do the students come up with suggestions to develop the profession?
6. What suggestions do the students provide?

Attitude of Physiotherapist can make dramatic changes in the rehabilitation of the patient. Where a positive attitude of a Physiotherapist can foster patient's confidence and thus making the rehabilitation faster and easier, a negative attitude can have adverse effects on desired outcomes and can inhibit reintegration into society⁹. In this study a positive attitude of

students would show that we can expect more growth in the profession in coming time and if students have negative attitude then we may have to find out the reasons for the same. Suggestions provided by the students may be utilized to improve as well as set better standards in the field of physiotherapy.

METHODOLOGY

Research articles pertaining to the attitude and perception of students towards profession and patients¹⁰⁻¹⁴ and opinions of the interns and final year students of Physiotherapy were sought before designing the questionnaire. Students and interns were asked to give opinion regarding the course curriculum, the profession, most commonly encountered problems in the field etc. A set of 108 questions were noted down based on the research articles and feed back given by the students and interns. 14 staffs of different Physiotherapy colleges who had more than 5 years of teaching experience in field of Physiotherapy were requested to provide feed back regarding the significance of the questions. The questions were further modified to a better format according to their significance. A pilot study was conducted in one of the 11 colleges in Mangalore. 5 final year students and 5 interns were given the questionnaire which they consented to complete and return back. These students were not included in the further survey. The questionnaire was refined and streamlined to a total of 34 questions following the pilot study and it was named as Physiotherapy Student's Attitude Questionnaire (PSAQ) (Appendix).

Random sampling was used in this Cross sectional study. Out of the 14 colleges in Mangalore 5 were randomly chosen using the lottery method. In the colleges a total of 280 students and interns were selected randomly by using random number table. 280 forms were distributed, out of which 266 duly filled forms were obtained (Table-1). Response rate is 95%. Out of 266 participants, 71 were interns (26.7 %) and 195 were final year students (73.3%). Fourteen forms were excluded from the study, as 3 of them

were incompletely filled and 11 responses were not obtained.

Table 1: Distribution of the participants

Gender Distribution	Interns	Final years	Total (266)
Females	50	110	160
Males	21	85	106

Participants were supposed to meet the following inclusion and exclusion criteria.

Inclusion criteria

1. Undergraduate students who are attending their final year classes.
2. Interns who have successfully completed their study tenure.

Exclusion criteria:

1. Students who are re-appearing the final year exams.
2. Students who have cleared their final year after more than one attempt
3. Physiotherapist assistant or trainees working for salary.

Out of the 34 questions, 27 questions were close ended questions and 7 were open ended questions. The 27 close ended questions were graded according to the five point Likert scale- Absolutely agree, Agree, Neutral, Disagree and Absolutely disagree. These 27 questions were subdivided into four broad domains (Table 2). 7 open-ended opinion seeking questions were graded according to the frequency of the options entered. The purpose of the study was not revealed to the participants. It took around 20 minutes to complete the questionnaire. The responses were graded with the help of scoring key (Appendix). Participants were advised to go through the questionnaire thoroughly and answer the questions appropriately without being influenced by others.

Table 2: 4 Domains and their question numbers in the questionnaire

DOMAINS	QUESTION NUMBERS
A. Are the students happy with their profession	1,3,4,5,9,10,26.
B. Do they anticipate a good future in this profession	2,6,7,8,25,27.
C. Do they actively participate in patient care	11,12,13,14,15,16,17.
D. Are they happy with the quality of teaching they receive	18,19,20,21,22,23,24,25.

DATA ANALYSIS

The statistical package SPSS (windows 12.01) was used in the analysis of the data. Chi square test was used to investigate the strength of association for categorical variables of different domains. Differences between the groups were analyzed by using unpaired t tests (male interns, female interns, male final years and female final years). The open ended data from the questionnaire were analyzed using descriptive analysis. A Significance level of 0.05 was used in

all tests.

RESULT

All the 4 domains of the questionnaire have poor association according to the chi square test (Table-3). There was no significant difference in all the four domains between the interns and final years. Gender wise differences were also not significant (Table- 4).

Table 3: Mean, standard deviation and p value of different domains of the questionnaire

Domains	Groups	Number	Mean \pm Standard deviation	p value
A	Intems	71	17.04 \pm 3.84	0.23
	Final years	195	17.71 \pm 4.13	
B	Intems	71	14.07 \pm 2.65	0.48
	Final years	195	14.31 \pm 2.45	
C	Intems	71	18.22 \pm 2.43	0.85
	Final years	195	18.15 \pm 2.69	
D	Intems	71	18.18 \pm 4.01	0.25
	Final years	195	18.82 \pm 4.07	

Table 4: Mean scores for the interns and final years

DOMAINS	QUESTION NUMBERS
A. Are the students happy with their profession	1,3,4,5,9,10,26.
B. Do they anticipate a good future in this profession	2,6,7,8,25,27.
C. Do they actively participate in patient care	11,12,13,14,15,16,17.
D. Are they happy with the quality of teaching they receive	18,19,20,21,22,23,24,25.

Figure 1: Mean scores for the interns and final years

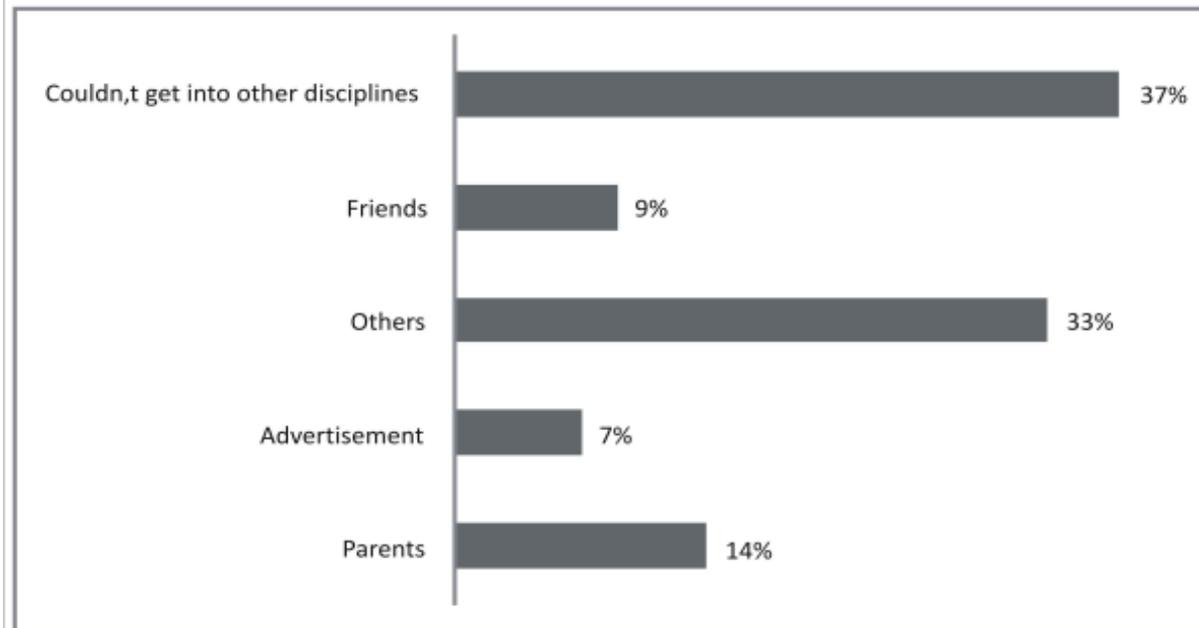


Fig. 2: Reasons for Increasing Dropouts from the Profession

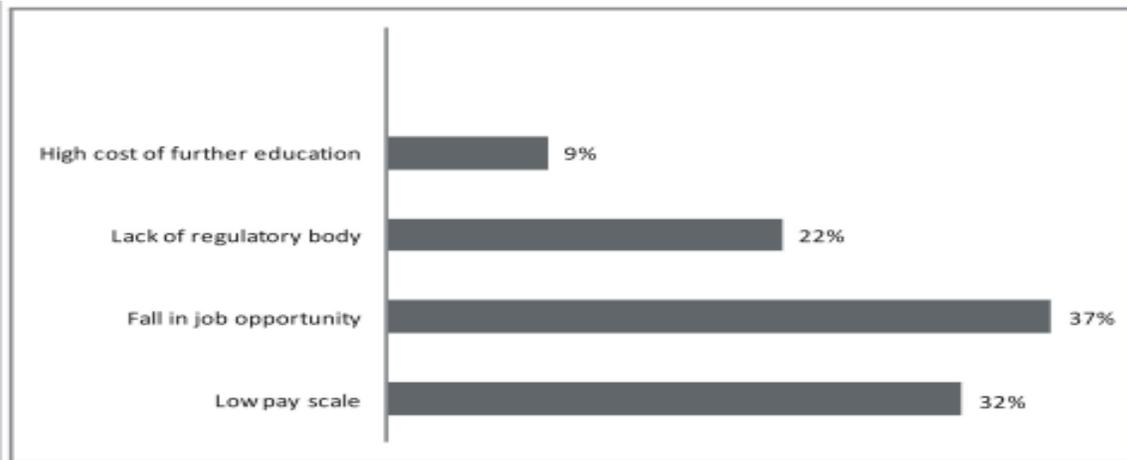


Figure 3: Most Preferred Reference

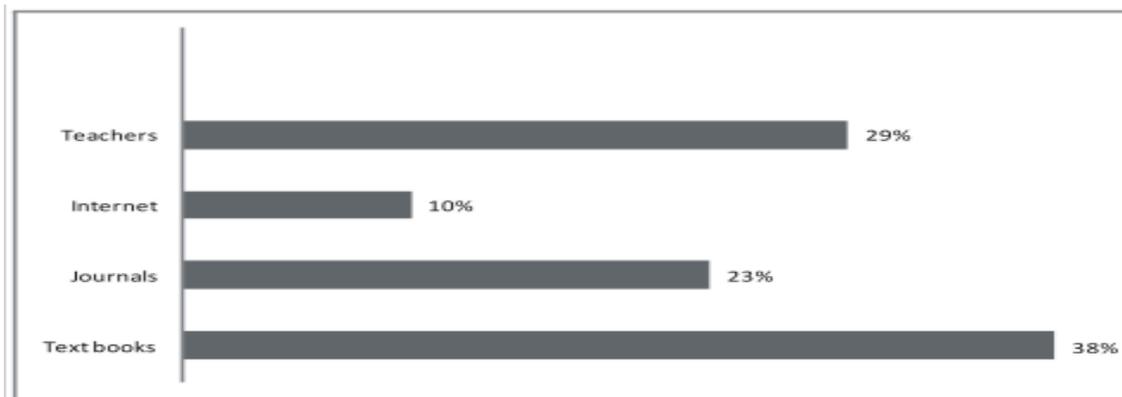


Figure 4: Subjects Which Can Be Obliterated from the Syllabi

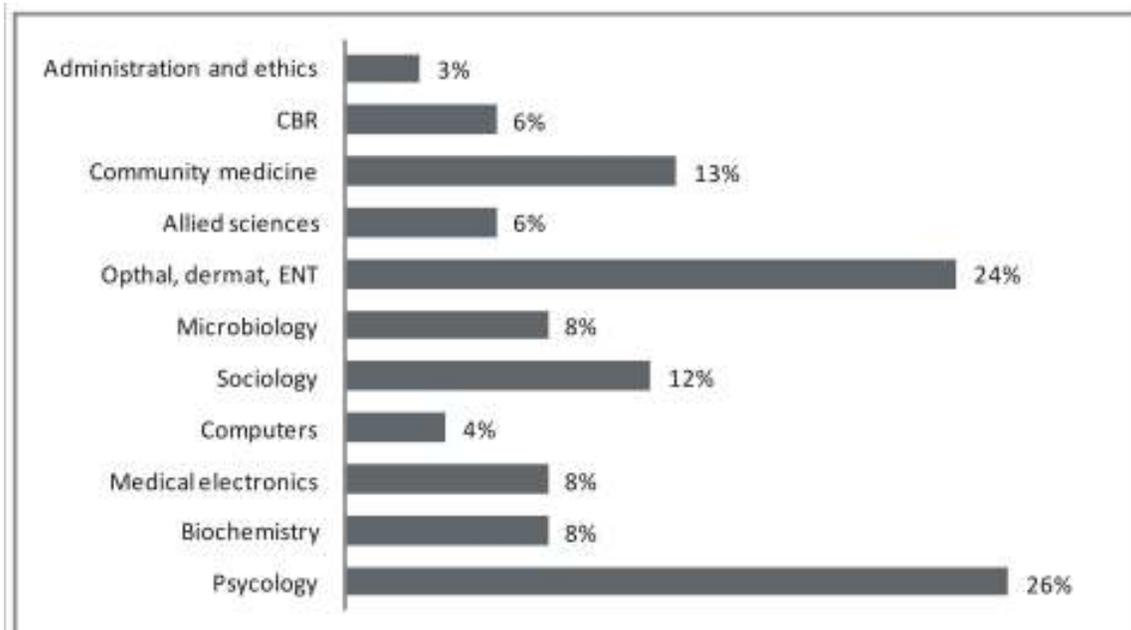


Fig. 5: Easiest or More Preferred Job Placement

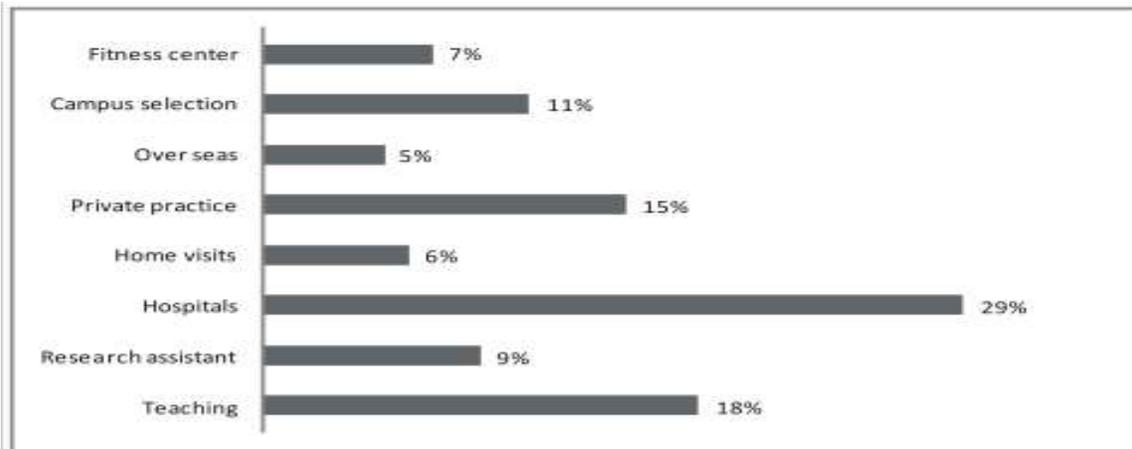


Fig. 6: Most Important Problem Areas in the Field of Physiotherapy

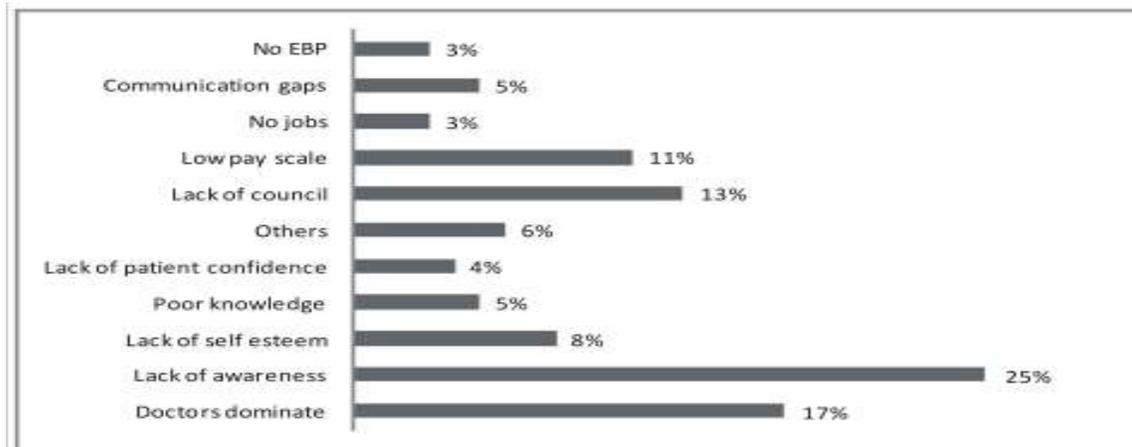
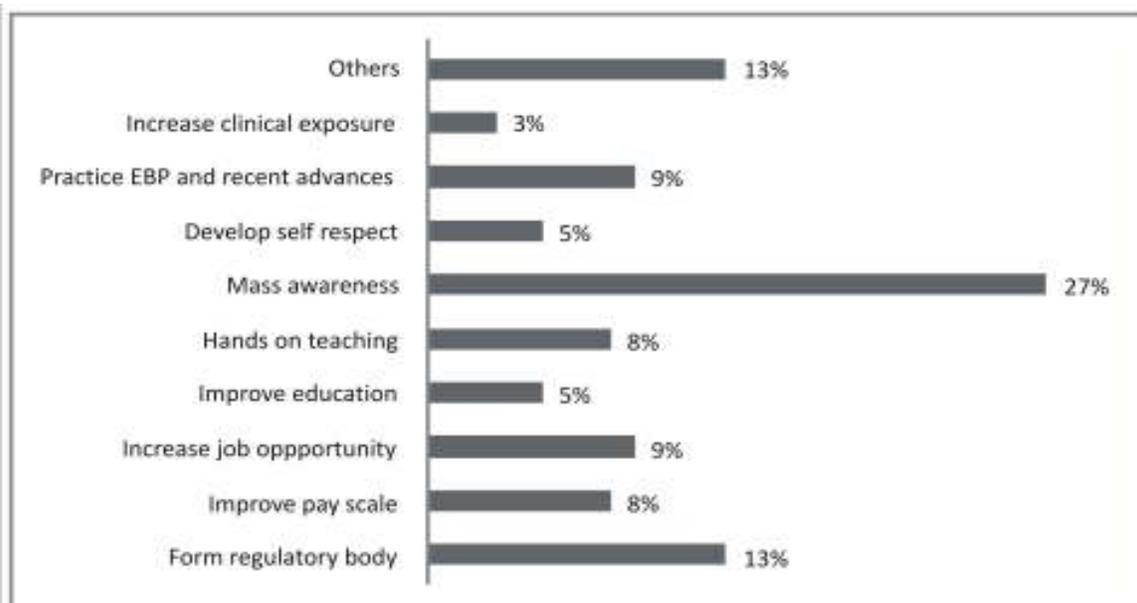


Fig. 7: Suggestions to improve the profession



Group Domains Gender N Mean \pm SD p value

DISCUSSION

The questionnaire was aimed at getting an insight into the students' attitude towards their education and profession. It was found that the students were pleased with their education and profession though the values could not reach a significant level. Table 4 compares the mean values of attitude scores in all four domains among interns and final years and also between the genders. It was evident that there was no significant difference between the groups.

The first domain A assessed the student's happiness with their choice of profession. There was an above average score available for the happiness. The male and female students as well as interns showed no significant difference in the scores. The plausible reasons for an above average response could be figured out with help of figure 1 and 6. Figure 1 explains that many students joined Physiotherapy as they couldn't get into other disciplines (37%), due to parents' wish (14%), friends influence (9%), or due to some other unspecified reasons (33%), only (7%) claimed to have joined after reading the advertisement. This clearly shows that for most of the students, Physiotherapy was not the first choice of profession. On referring to figure 6 it can be concluded that, lack of public awareness about the field leads to hurdles in approaching patients as well as medicos (25%), doctors were more dominant on the work scene leaving very less decision making power to Physiotherapists (17%), and absence of a governing body (13%) adds on to dissatisfaction towards the profession. Thus students felt that in the present scenario where most of the Physiotherapy references come from the medical practitioner the prospects of independent Physiotherapy practice is reduced. The lack of awareness among the public is a leading factor causing dissatisfaction towards the profession.

Domain B assessed students' anticipation towards good future. The students' attitudes were average. There was no significant difference

between interns and final years. Gender wise comparison was also not significantly different. The likely reasons for average results could be that the job arena is getting saturated as days pass by. The saturation of physiotherapy field in turn leads to decreased job prospects (37%), thus compelling the students to pursue their post-graduation. The higher cost for pursuing post graduation and the low remuneration (32%) adds on to the grievance. A regulatory body, if persisted, would have framed the basic standards for education as well as the pay scale. Since the regulatory body is not formed yet, the scenario remains obscure. Newer job opportunities or improving the patient-therapist ratio will solve the job saturation to a greater extent (figure 2). The students also felt that hospitals provide with maximum jobs (29%), followed by overseas placement (18%), private practice or clinics (15%), teaching colleges (9%). The students also pointed out to the possibility of introducing campus selection (11%) (Figure 5).

Domain C assessed whether students confidently involve in patient care? Response for this domain was average. There was no significant difference between interns and final years and gender wise analysis showed no significant difference. Figure 6 and 7 explains the reasons for the same. The students claim that doctors are dominant in the field (17%). They also complained of poor case exposure (13%) and less hands on teaching (8%). This leaves them with poor knowledge (5%). Internal factors like poor self esteem (8%) and Communication gap (5%) acts as major factors affecting Physiotherapists' confidence in patient care. The above said results emphasize the fact that as clinical exposure increases; the student confidently participates in patient care. Hands on techniques have to be given more importance in Indian curriculum. Local language has to be taught to bridge the communication gap between patient and therapist.

Domain D assessed student's satisfaction with their learning? The students' satisfaction regarding their learning was just above average. There were no significant differences between interns and final years and gender wise analysis also showed no significant difference. Figure 6 and

7 helped to explain these results. 9% respondents felt that the present curriculum is not well modified or up to date with the recent advances. They also felt that Evidence based practice is neither practiced nor taught. Clinical teaching time is less compared with theoretical teaching (3%). Hands on techniques have to be emphasized. Newer treatment techniques need to be developed. Skilled and qualified lecturers facilitate efficient learning. Lack of adequate equipments for practice and library facilities interfere with efficient learning. 13% respondents pointed out that no strict quality policy was ensured while giving authorization/permission for new colleges.

On being asked their preferred way of learning new things and reference, 38% of the students preferred text book as reference. 23% students opted for searching journals, 29% liked to clear their doubts with teachers. 10% opted for internet as the preferred source of reference (Figure 3). They also pointed out to vast curriculum and felt that certain subjects can be dropped out of curriculum. The subjects listed were psychology (26%), community medicine (13%), sociology (12%), microbiology, biochemistry, electronics, ophthalmology, dermatology and ENT (8% each) (figure 4).

The students were finally asked for their suggestions to improve the profession/discipline. Five most important points provided by them were as follows:

1. Creating awareness among people (27%),
2. Form a regulatory body (13%),
3. Increase job opportunity and practice evidence based practice (9% each),
4. Improve pay scale and increase hands on teaching (8% each),
5. Improve education and develop self respect amongst the physiotherapists (5% each).

And 13% quoted miscellaneous opinions (Figure 7).

CONCLUSION

It can be concluded that the students and

interns are indecisive with the course and their profession. However there are many untouched long standing problem areas which need to be modified. The students also provided suggestions to improve the field. This proves that the students and the interns are concerned with development of the profession.

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Appendix

Physiotherapy Student's Attitude Questionnaire (PSAQ)

Questions	Absolutely agree	Agree	Don't know	Don't agree	Absolutely disagree
1. Physiotherapy is my choice of profession?	5	4	3	2	1
2. I was aware of the course before joining?	5	4	3	2	1
3. I joined physiotherapy because I wanted to be a physiotherapist.	5	4	3	2	1
4. I feel that my potentials have been rightly utilized in this course.	5	4	3	2	1
5. I receive good respect and regards from people who know that I have chosen this field.	5	4	3	2	1
6. You were aware of the job prospects before joining the course?	5	4	3	2	1
7. Some times I feel like changing my profession.	1	2	3	4	5
8. I feel that other professionals are well aware of the scope and work nature of the physiotherapists.	5	4	3	2	1
9. I am satisfied with the education and to work as a physiotherapist.	5	4	3	2	1
10. I would recommend many others to join this course.	5	4	3	2	1
11. I find patients cooperate with me during exercises.	5	4	3	2	1
12. I like to treat already assessed case with treatment indication.	1	2	3	4	5
13. I like to assess my case and plan accordingly.	5	4	3	2	1
14. I like only to treat cases and not to assess them.	1	2	3	4	5
15. I don't think assessing case is as important as treating.	1	2	3	4	5
16. I feel documentation of assessment and treatment is very necessary.	5	4	3	2	1
17. I would find newer treatment strategies if the present treatment fails.	5	4	3	2	1
18. I feel the profession is developing fast and whatever we are learning are very old concepts.	1	2	3	4	5
19. Continued medical education and workshops helps in learning.	5	4	3	2	1

20. I feel more of class room teaching helps to gain knowledge.	5	4	3	2	1
21. Self learning enhances learning	1	2	3	4	5
22. I think this four year course is apt for me to apply whatever I have learnt.	5	4	3	2	1
23. I feel clinical teaching available to the students is appropriate.	5	4	3	2	1
24. I think six months of internship is apt for me to apply whatever I have learnt.	5	4	3	2	1
25. I feel by internship I must be allowed to plan for treatment independently.	5	4	3	2	1
26. My extra curricular activities and hobbies have reduced after joining this course	1	2	3	4	5
27. I feel Physiotherapists need to be addressed as doctor	1	2	3	4	5

28. you joined Physiotherapy under influence of
 a)Parents b)Friends studying physiotherapy
 c)Peer d)News paper advertisement e)Because I could not get into medicine or dental f)Others
29. Answer this question only if you have answered agree or absolutely agree to question number 7, what according to you is the reason for the above: Low pay scale b) Fall in job opportunity in India c) Lack of regulatory body d) High cost of further education d) State if reasons are not in above. You can also choose more than one of the above.
30. Answer this if you have answered question number 17 as agree or absolutely agree, I prefer referring a)Textbook b)Journals c)Internet d)My teachers for the same. If you any other options please specify them.
31. Please mention the subjects from your syllabus/curriculum which you feel is unnecessary.
32. What according to you will be an easier job placement after completion of course?
 a. Teaching b. Home visits c. Campus selection d. Research assistant e. Private practice f. Fitness centre g. Hospitals h. Overseas i. Others (please specify)
33. Mention five most commonly encountered problems in Physiotherapy field. (List down according to priority)
34. Mention five ways by which you feel the field of Physiotherapy can be improved. (List down as per your priority)

STUDENTS ANSWERING PSAQ



STUDENTS FILLING PSAQ



STUDENTS SIGNING CONSENT FORM FOR PSAQ



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With best wishes,

Ms. Eva Snehlata kujur(Sr.O.T)

Co-ordinator

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