

# Extra-Academical Engagements Promoting Dexterity as a Part of Modified Dental Ergonomics

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**Abstract— Background-** Dexterity provides the versatility and range of hand activities that provide the capability to follow a wider range of ergonomics. Poor dexterity has also been associated with frequent myofascial pain, especially for practising dentists. **Aim -** To assess dental students' awareness, practice, and attitude towards implementing ergonomics through extra academical activities promoting or complimenting dexterity exercises. **Methods-** A cross-sectional study was conducted among 210 dental students of various dental colleges in India. A self-administered, closed-ended questionnaire was used to assess dental students' awareness, practice, and attitude towards dexterity incorporated ergonomics. **Results-** Data was collected from a total of 210 people. 150 female and 61 male students. Overall knowledge, practice and attitude are 46%, 46% and 64%, respectively. A positive correlation was found between knowledge and attitude and practice and between attitude and practice with 'r' values of 0.2479, 0.1794 and 0.3683, respectively. **Conclusion-** The awareness of ergonomics among the dental students was not as high as expected; the implementation of exercises concerning dexterity was mostly done subconsciously or not at all. However, there was a positive response regarding activities that can include ergonomic-based exercises, showing a considerable increase in students' interest in performing activities incorporating dexterity rather than the exercises themselves.

**Keywords—** Ergonomics, dexterity, myofascial pain, dental students, India.

## I. INTRODUCTION

Ergonomics is the scientific study of people and their working conditions, primarily increasing effectiveness.<sup>1</sup> Ergonomics is derived from a couple of greek words. 'Ergo' means "work", and 'Nomos' means "the study of". Thus ergonomics exercises itself on designing procedures and products for maximum clinical efficiency with minimal strain and maximum safety to the one performing the activity.<sup>2</sup> Ergotech defines it as the ability to fit the job around the comfort and stability of the person rather than performing a job compromising the person rendering him vulnerable to pain, fatigue and limited productivity.<sup>3</sup> Dexterity, on the other hand, is the readiness and skill in physical activity, especially dealing with refined, polished activities, the ability of smooth performance due to the proficiency and efficient usage of the digits in our hands as described by Merriam Webster.<sup>4</sup>

The importance of dexterity in ergonomics is crucial, considering ergonomics provides efficiency in work with

minimal strain and pain to the body. Dexterity provides the versatility and range of hand activities that provide the capability to follow a wider range of

ergonomics. In addition, dexterity can be built using the same exercises for developing ergonomics.

Dr Roger Kneebone, professor, Department of Surgery and Cancer, Imperial College London, mentions the difficulty in relying on the pass out students from medicine, claiming that most of them lack the required hand skills even in the basics of procedures assigned to them.<sup>5</sup> Many experts attribute the advancing technology and the increasing level of codependency to the decline in manual dexterity in medical students.<sup>6</sup> Many studies have highlighted the lack of hand

on hobbies as the cause for this declining dexterity marking that hobbies play a vital role in shaping the skillset of surgeons.<sup>7</sup> Robert Spetzler MD, former president and chief executive officer of the Barrow Neurological Institute, believes the sooner the exposure someone has to the hands-on activities, and the increased frequency and the repetitive practice of the same can heavily attenuate the skillset of the one undertaking it.<sup>8</sup>

Poor dexterity has also been associated with frequent myofascial pain. Therefore, the role of ergonomics in preventing myofascial pain is pivotal.<sup>9</sup> A cross-sectional survey conducted to check the prevalence of musculoskeletal problems in dentists showed a 100% prevalence rate. It highlighted the importance of implementing ergonomics, especially for working dentists.<sup>10</sup> The process of attaining manual dexterity has a very flexible note with traditional and unconventional means. In this research, we aim to understand the level of awareness among dental students has on the traditional aspect of dexterity, awareness of the different exercises and the practical implementation level.

## II. METHODS AND METHODOLOGY

The study was conducted among dental students of various colleges in India. Ethical clearance was obtained from the Ethical Review Committee of the Institutional Review Board of SRM College of Dental Sciences and Hospital. In addition, the head of the institution and other faculty members were informed about the purpose of the study and obtained permission. The study constituted 210 students aged 19-25

pursuing BDS from various dental colleges through a convenience sampling method.

The questionnaire was investigator approved, self-administered and closed-ended. The study participants were supplied with instructions and the questionnaire, for which they were allotted approximately 15 minutes for completion.

The questionnaire consisted of 14 questions. Five were aimed at assessing awareness and self-assessed skillset, six questions were aimed at assessing the implementation and frequency of incorporating dexterity building exercises, and the remaining three questions were aimed at assessing the attitude towards future endeavours. Questions aimed at knowledge focused on the awareness of dexterity, Carpal Tunnel syndrome, awareness of the need for ergonomics and the need for practising dexterity was assessed by frequency of episodic musculoskeletal pain. Questions aimed at practice were based on the most common and basic exercises for building dexterity. Questions to assess attitude were done on a 4 point Likert scale.

Knowledge scores were calculated as 4/3 for roundabout knowledge and 0 for no knowledge, with a maximum of 10. Questions based on practice were awarded 3 for implementation and 0 for no implementation, with 18. Finally, questions based on awareness were given 10, with 4/3 for very likely and 0 for definitely no.

The statistical analysis was done using SPSS software version 26.0, descriptive statistics were done using frequency and percentage, and inferential statistics were calculated using the chi-square test. P-value <0.05 was considered to be statistically significant.

III. RESULTS

The questionnaire was completed by 58 males (27.7%) and 152 females (72.3%) dental students from the various dental colleges, as seen in Figure 1.

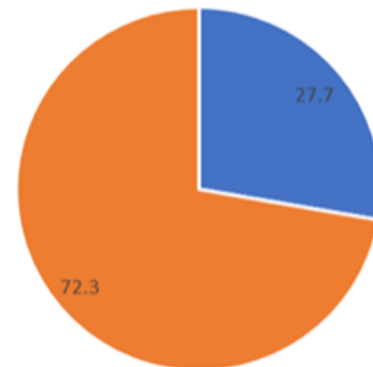


Fig. 1. Gender Distribution

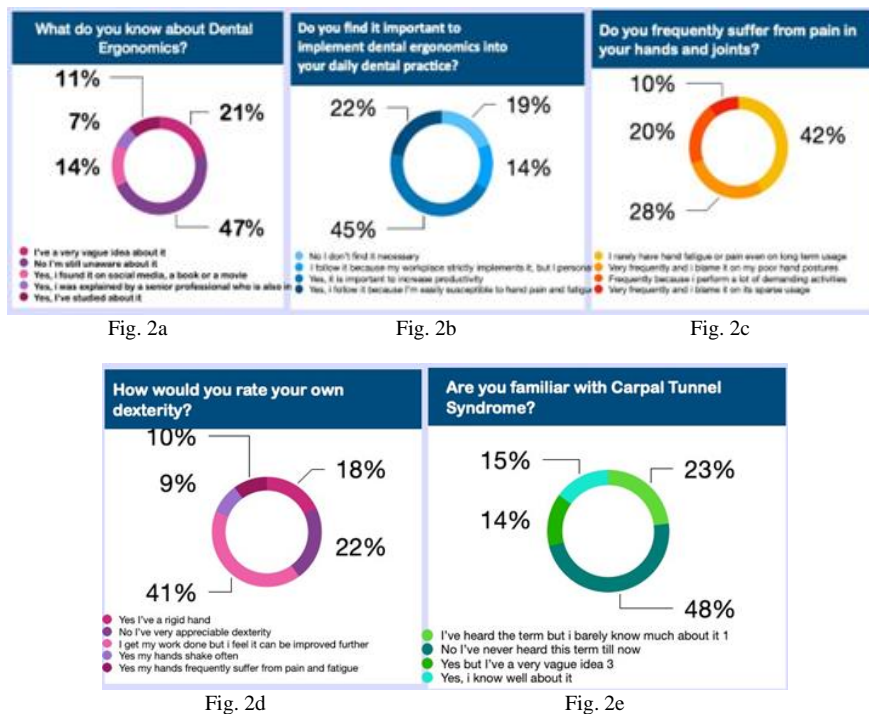


Fig. 2. Knowledge based Questions

Figure 2 is based on assessing knowledge of ergonomics (Figure 2a) while asking 47% of the dental students had a very vague idea. Among the people who knew, most of them of about 14% knew about it from self-based activities like social media. A minimum of 7% were taught about it by senior professionals. 45% of the people found it important to implement ergonomics into their daily practice (Figure 2b)

because they felt it needed to increase productivity. In comparison, 14% followed it due to strict implementation by the college without really finding any cause or use for it themselves. While almost half, 42% of the people don't suffer much pain from their daily activities, the other half complained of fatigue and pain mainly due to poor posture (28%) and demanding activities (20%) (Figure 2c). On being

asked if they feel limited due to lack of dexterity, 41% of the people felt that their hand skills could be improved even though they seemed to be doing a decent job with their work, and 78% felt limited to lack of hand expertise. On the other hand, 22% were satisfied with their present dexterity (Figure 2d). Finally, upon their knowledge of Carpal Tunnel Syndrome, only 15% had some knowledge about it, whereas almost half (48%) weren't even familiar with the term (Figure 2e).

Figure 3 compiles the questions based on the practice of ergonomics, regarding hand stretching, 29% of the population performed back and forth stretching activities, with 19% rarely doing them. The remaining 9% have never performed any dedicated hand stretching for additional activity or exercise (Figure 3a). When asked about using play dough or elastic models for hand exercises, 51% of the people were unaware of

performing such activities. In comparison, 17% of the people used it for stress relief (Figure 3b). On being asked about hand independence, 33% of the people wouldn't perform any dedicated activity for it. In comparison, 26% of the people were either planning on or would've initiated an activity to implement it (Figure 3c). On being asked how often they flex their hands, 32% of the people would rarely do it, while 31% showed interest in initiating something while only 16% implemented it (Figure 3d). Around 51% of the people frequently performed hand exercises that emphasized individual fingers, while 29% rarely performed them and 20% seldom (Figure 3f). Finally, we asked them to rate their hand flexibility, to which 35% agreed on having decent flexibility even without performing any activities. In comparison, 19% had bad dexterity due to a lack of dedicated activities (Figure 3e).

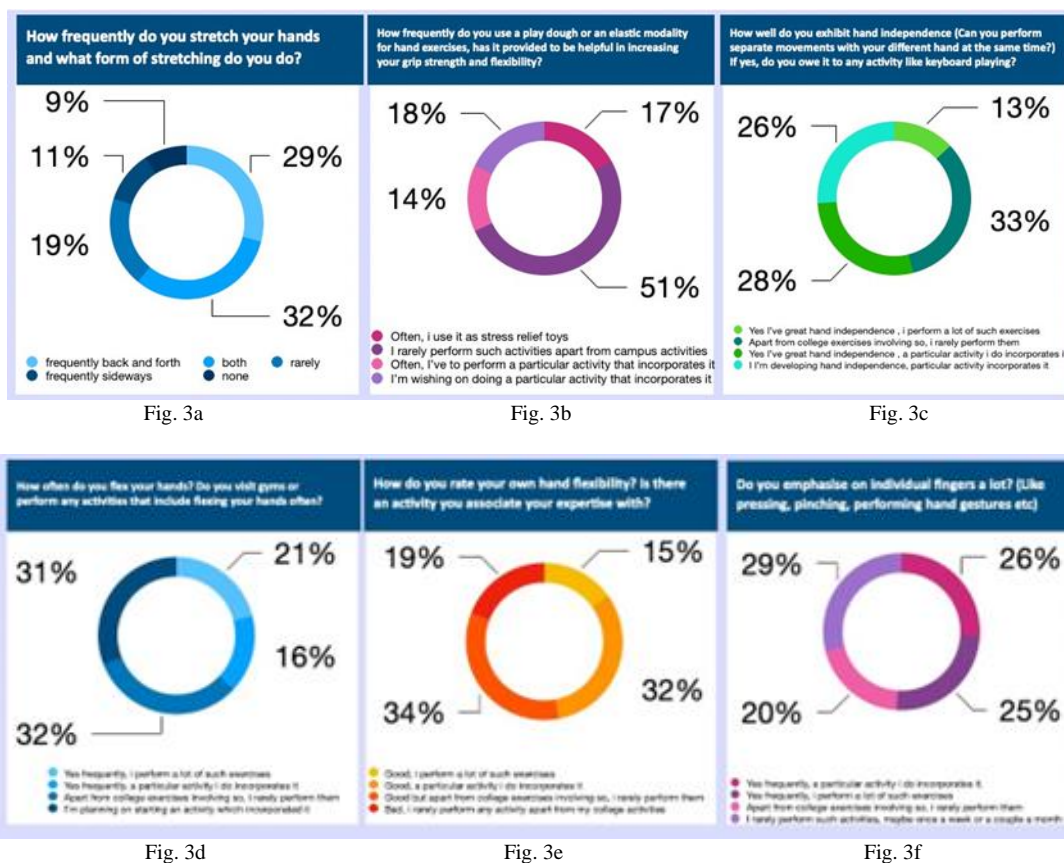


Fig. 3. Practice based Questions

Figure 4 compiles the data obtained on the attitude towards participation in the newer forms of implementing dexterity. On being asked if they find themselves having good dexterity, 33% felt they had good dexterity without any fatigue or pain. In comparison, 10% of the people felt bad dexterity with fatigue or pain (Figure 4a). On being asked if their hobbies can help improve their dexterity, 30% of the people agreed to incorporate some of the given activities, which showed sufficient results. In comparison, 17% weren't interested in having extra hobbies (Figure 4b). Finally, on being asked if they would perform certain activities if properly guided, 95%

of the people agreed on the pact while 5% found it a waste of time (Figure 4c).

Figure 5 depicts Pearson's coefficient correlation analysis; there is a weak positive relationship between knowledge and attitude ( $r=0.2479$ ), knowledge and practice ( $r=0.1794$ ) and attitude and practice ( $r=0.3683$ ), with the coefficient of determination as 0.0615, 0.0322 and 0.1356 respectively.

Figure 6 depicts the scores based on the scoring system for knowledge, attitude and practice. In the knowledge category, 134 people had scores below five or poor which is 63.8%, while only 20 had scores above eight or high, which is merely



9.5% of the population. The mean score was 4.6, with a standard deviation of 2.619. In the practice category, around 134 people, which is 63.8% of the people, scored less than 9(50%), while a very less number 15(7%) of the people scored more than 14.4 with a mean score of 8.3 with a standard

deviation of 3.797. Finally, in the attitude category, 40 people had scores equal to or lesser than 50, around 20% of the participant. In contrast, 105 participants, which is 50% of the participants, scored more than or equal to 7, with a mean of 6.4 with a standard deviation of 2.188.

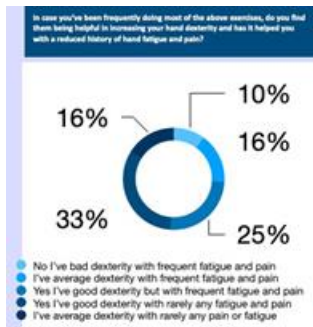


Fig. 4a

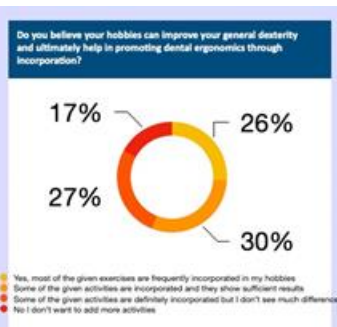


Fig. 4b

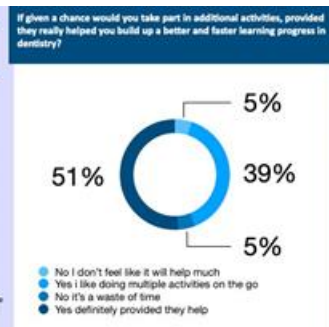


Fig. 4c

Coefficient relationship analysis	r value	r^2
Knowledge with attitude	0.2479	0.0615
Knowledge with Practice	0.1794	0.0322
Attitude with Practice	0.3683	0.1356

Fig. 5. Pearson's coefficient correlation analysis

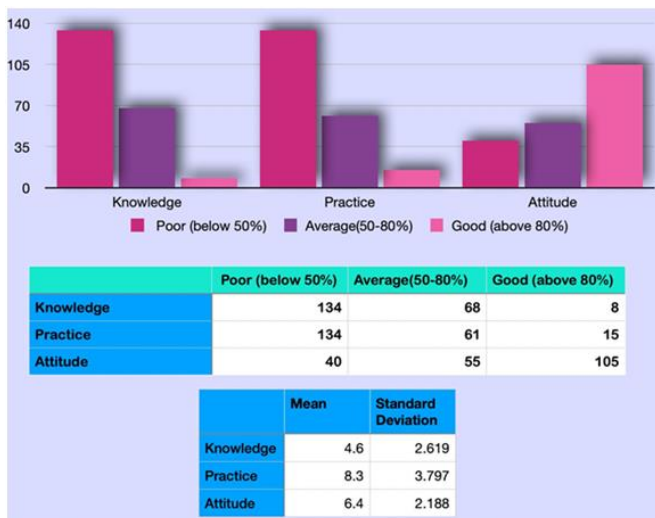


Fig. 6. Scores with respect to knowledge, attitude and practice

#### IV. DISCUSSION

Hobbies and extra academical activities are essential in moulding better dexterity. This part of ergonomics, which includes the need for dexterity, can significantly affect dental students' attitude, confidence, and outlook toward dentistry, making it an easier and more exciting process and enriching

the quality that they will carry into their future practice. Apart from increasing work versatility, augmenting dexterity exercises also significantly helps deal with the rehabilitation from Carpal tunnel syndrome. In the study, it was noticed that there would be a developed interest in the performance of the activities considering it was incorporated into a hobby. Hobbies thus can be strategically used as a core build-up. Considering the lack of importance given to ergonomics.

Conventionally a complete lack of it in the curriculum of DCI for both undergraduates and postgraduates<sup>11</sup>, which makes it usually expressible only in an informal form. Thus necessitating assessment of awareness, attitude, and practices toward ergonomic principles during routine dental procedures, especially as students, so that the base is firm for further development.

Results showed that the knowledge of ergonomics was 46%, which is significantly higher than an Indian study conducted by Madaan and Chaudhari<sup>12</sup> in a similar sample population of dental students, including house surgeons, which showed alarmingly lower scores (19%) compared to our current study. However, it was significantly lesser than the 52% of another Indian survey conducted by Shrivardhan Kalghatgi<sup>13</sup>. Moreover, among foreign studies, it was significantly lower to 55.1% as seen by Garbin et al.,<sup>14</sup> to be 52.6% as observed by Bârlean et al.,<sup>15</sup> on the self-perceived knowledge about correct working posture.

In a gender comparison, the self-assessed manual dexterity of men (65.5%) was higher than the females (53.3%), contradictory to some studies conducted that evaluate dexterity in nursing students and others<sup>17</sup>. Attitude scores being considered, having 64%, which is higher than an Indian study with an attitude score of 55% and significantly higher than a study by Mailoa and Rovani<sup>18</sup>, which had a low score of 38.6%.<sup>12</sup>

The correlation analysis reveals a positive response for knowledge and attitude of  $r=0.2479$  but a significantly low positive response for knowledge and practice,  $r=0.1794$ . In contrast, attitude and practice have the highest positive response of  $r=0.3683$ , implying that if a proper practice is

incorporated, the attitude significantly increases; as with knowledge, there is a low response towards practice implying that despite having the requisite information, the practice of the same is limited.

The limitation of this study includes the inclusion of dental students from only a few dental institutes limited to selected cities may not be enough to generalize the study results. The possibility of answering affirmatively or acquiescence bias, deviation or faking bad bias, and social desirability or faking good bias should be considered. Likert scales might be subjected to the halo effect, positive skew, and end-aversion bias. Because the current study was questionnaire-based, the ability to assess awareness, attitudes and practices of ergonomics for developing dexterity extra academically may not be an accurate reflection of the current situation.

**Conclusion**

The awareness of ergonomics among the dental students was not as high as expected; the implementation of exercises concerning dexterity was mostly done subconsciously or not at all. However, there was a positive response regarding activities that can include ergonomic-based exercises, showing a considerable increase in students' interest in performing activities incorporating dexterity rather than the exercises themselves. Incorporating ergonomics is vital for increasing dexterity and reducing the chances of musculoskeletal disorders like Carpal Tunnel syndrome; dexterity building is quintessential for a better and more trustworthy dental practice. DCI can add the topic of ergonomics under the group of Must Know and include dexterity building as an essential part of it. Both are proportionally correlated; the faculty should guide the students on ergonomic principles and ensure implementation during clinical hours. Students should be encouraged to make and form hobbies of their choices which incorporate hand skills. Such habits should be pushed into the curriculum for building up an all-rounded dental professional.

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