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Comparative Evaluation On Effectiveness Of Different Teaching Methods On Implementation Of Ergonomic Operator And Patient Positioning Among Dental Students.

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Abstract
Context*: for dental practitioners, ergonomics is essential for minimizing operator fatigue and averting musculoskeletal diseases (msds). The purpose of this study is to assess how well various instructional strategies can help dentistry students adopt ergonomic practices.*
Methods*: ninety third-year undergraduate, final-year, and internship dentistry students participated in the study, which was carried out at sri siddhartha dentistry college and hospital. After didactic lectures on ergonomics, participants were randomly assigned to one of three groups: one-on-one demonstration, photographic self-assessment, or lectures only. A rubric of eight variables was utilized to evaluate ergonomic scores.*
Results*: there were strong correlations between ergonomic outcomes and instructional strategies. While the group that self-assessed through photography demonstrated superior elbow level and patient chin position, the one-on-one demonstration group demonstrated better postures of the neck and shoulders. The locations of the feet, hips, and spine did not differ significantly.*
In conclusion, dental students' ergonomic practices are improved by interactive teaching techniques such as one-on-one demonstrations and photographic self-assessment. These techniques are essential for maintaining adherence to correct postures and can help prevent msds in aspiring dental professionals when combined with didactic lectures.
Keywords*: dentistry students, didactic lectures, posture evaluation, photography self-assessment, dental education, musculoskeletal diseases, ergonomics, and instructional approaches.*

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I. Overview

The field of ergonomics, which focuses on designing workspaces and equipment to maximize productivity while minimizing operator pain and tiredness, is especially important in the workplace (1, 2). This becomes important when you take into account how musculoskeletal disorders (msds), which are marked by pain and mobility limitations, might impede a person's capacity to work and engage in social activities.

Dental professionals' msds: dental workers often struggle with pain, with common complaints including wrists, shoulders, upper and lower back, and neck (3, 4, 5, 6). Low back pain is most common in dentists, who are mostly attributable to their static postures during clinical practice (7). Preventive efforts are prioritized in order to address this, and clinician-tailored education in appropriate ergonomic placement has emerged as a key tactic.

Prevention through ergonomics: adopting appropriate ergonomic practices greatly lowers the risk of injuries and the emergence of msds, as it is recognized that prevention is more effective than cure (7). Therefore, it becomes essential for dental students to have a strong foundation in safe and efficient postures for patient care and operator positioning.

Difficulties in forming good posture habits: garcia et al. Draw attention to a possible drawback in only teaching students the necessary ergonomic stance. According to their findings, information alone might not be enough to help people form long-lasting ergonomic posture habits (9). In order to guarantee that good posture is not only ingrained but also sustained throughout time, strategies are required.

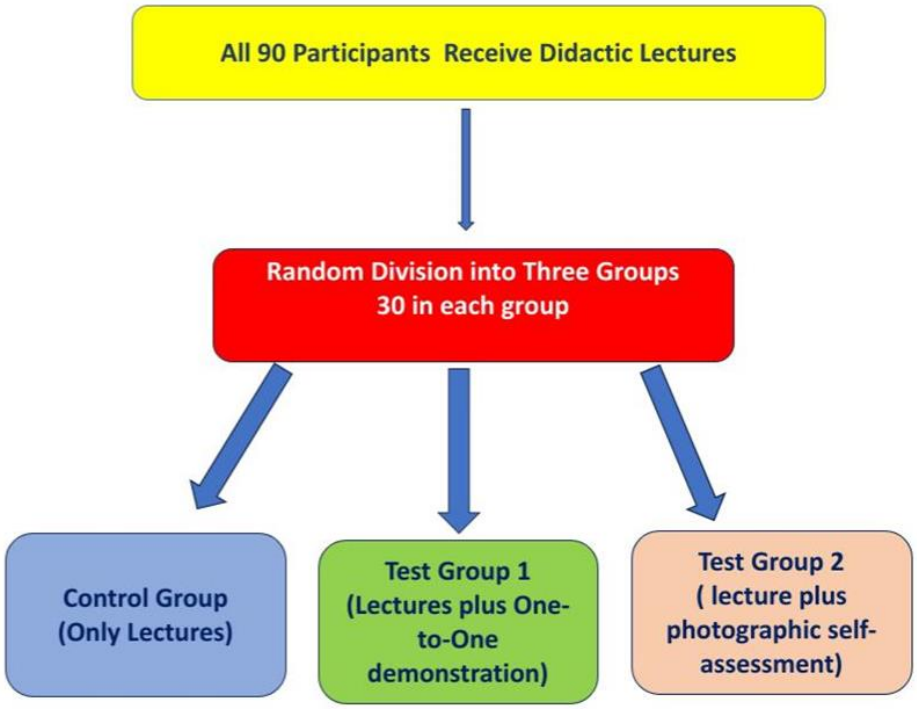
Comparative study of teaching methodologies: in light of this, we compare two different approaches to teaching ergonomics in dental practice in order to fill this knowledge gap. Determining how well these approaches inculcate and maintain appropriate ergonomic practices in dentistry students is the goal.

To sum up, the various issues that msds present in dentistry practice highlight the significance of taking preventative action by way of ergonomic education. It goes beyond only teaching content, but also about using

efficient teaching strategies to guarantee dentistry students' long-term commitment to appropriate ergonomic procedures.

Supplies and techniques

Over the course of three months, the study was carried out at sri siddhartha dental college and hospital. Third-year, senior-year, and internship dentistry students from the same university made up the participants. A dslr canon camera, lectures, a dentist chair, and a clinician chair were among the supplies used.



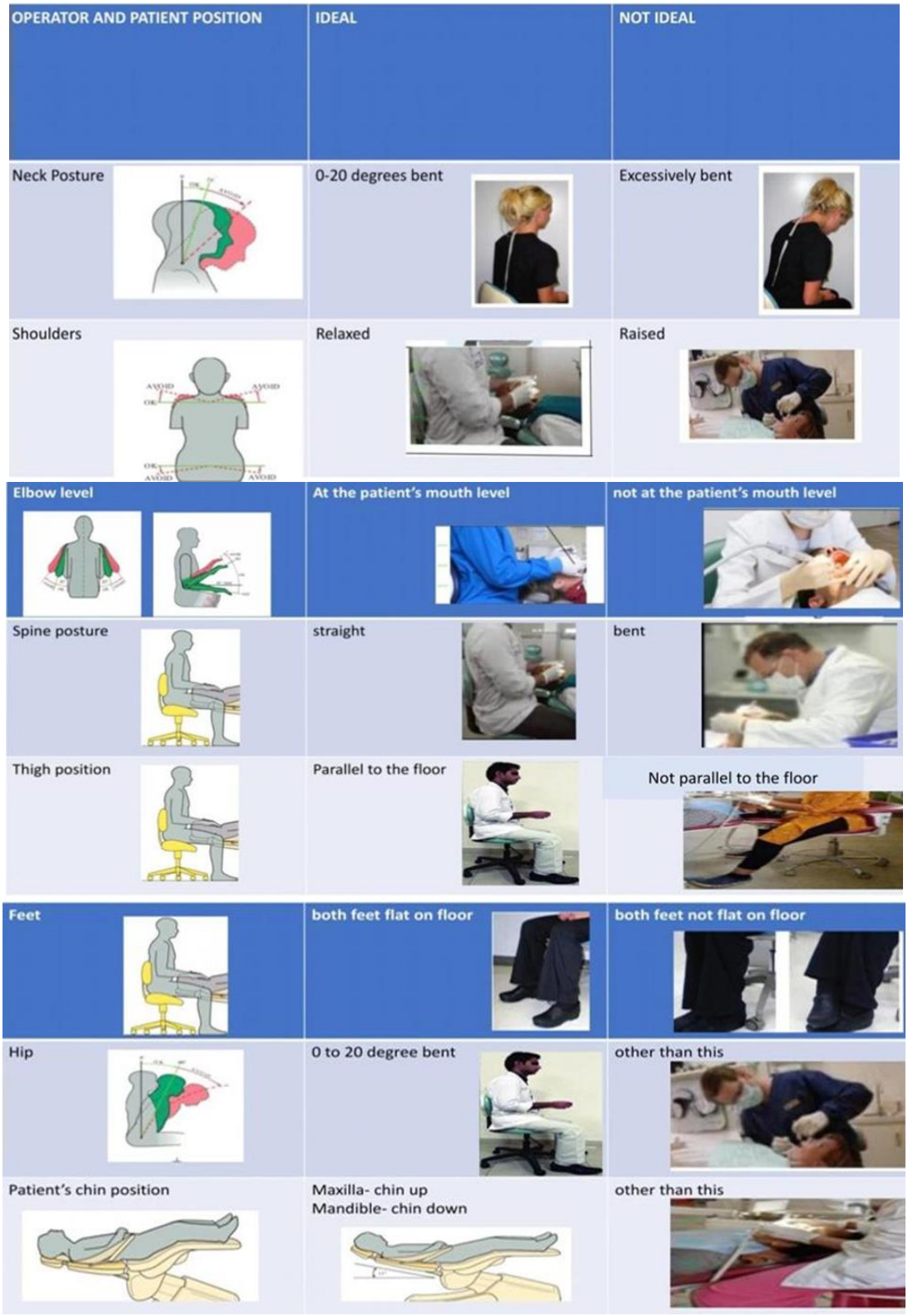
Method for sampling and estimating size: convenient sampling was used, and χ^2 tests—more precisely, goodness-of-fit tests utilizing contingency tables—were used to establish the sample size. G*power version 3.0.1 enabled a power analysis that determined the necessary sample size, which came out to be 87, rounded to 90 (30 each group). An effect size of 0.45, a significance threshold of 0.05, and a power of 0.90 were assumed in the power analysis.

Methods: evaluation procedure and points:

A rubric that was created after consulting with the body of current research on proper operator and patient placement was used to evaluate ergonomic scores. Positions that adhered to recommended ergonomic postures as per literature were classified as "ideal" on the rubric, while those that did not were classified as "not ideal." eight outcome factors were measured: elbow level, patient's chin position, hip position, thigh position, spine position, neck position, and shoulders position. The participants positioned themselves to work on various mouth regions, including After the operation began and analysis was completed, pictures were taken ten minutes later.

By using a methodological approach that focuses on positions that are in line with recognized ergonomic literature, it ensures a thorough evaluation of dental students' ergonomic practices, taking into account both theoretical knowledge and practical implementation.

rubric



II. Results:

The purpose of the study was to assess and contrast the efficacy of various training approaches on the adoption of ergonomic practices for patient and operator placement in dentistry students. Eight outcome variables were included in the assessment, and each was classified as "ideal" or "not ideal" depending on the positions that were in line with the literature on proper ergonomic postures.

Analytical statistics

Version 21 of the spss (statistical package for social sciences). For the statistical study, (ibm spass statistics [ibm corporation: ny, usa]) was utilized. Information was input into the excel spreadsheet.

Frequency and proportions were used to compute descriptive statistics for the explanatory and outcome variables.to determine the connection, inferential statistics such as the chi-square test were used for the qualitative variables. 5% is the threshold for significance.

Neck posture: group 2 had the largest proportion (76.7%) of ideal neck posture, while group 1 had the highest percentage (70.0%) of not-ideal posture. These findings were statistically significant (p = 0.001).

Shoulders: group 2 had the largest percentage (80.0%) of shoulder posture that was excellent, while group 1 had the highest percentage (40.0%) of shoulder posture that was not ideal, according to a significant connection (p = 0.044).

Elbow level: groups and elbow level were significantly correlated (p = 0.001). In contrast to group 1, which had the highest percentage of elbow levels that were not perfect (53.3%), group 2 had the highest percentage of elbow levels that were ideal (90.0%).

Spine posture: the groups' distribution of ideal and non-ideal posture was equal, according to non-significant data (p = 0.319).

Thigh position: the most percentage of not-optimal thigh position (76.7%) was found in group 1, whereas the most percentage of optimum thigh position (70.0%) was found in group 2. These findings were statistically significant (p = 0.001).

Foot:the distribution of perfect and non-ideal foot position was consistent throughout the groups, as indicated by non-significant results (p = 0.602).

Hip: results showed that the groups' distribution of ideal and non-ideal hip posture was equal (p = 0.74).

Patient's chin position: group 2 showed the highest proportion (96.7%) of the optimum chin position, while group 1 had the highest percentage (30.0%) of the not-ideal chin position. These findings were statistically significant (p = 0.004).

These findings offer a more nuanced knowledge of how well various instructional strategies might encourage dental students to adopt the best possible ergonomic postures. Some approaches yielded more consistent results across groups, whereas others indicated notable benefits in particular postures. The study provides insightful information that can be used to improve teaching tactics aimed at improving ergonomics in dentistry settings.

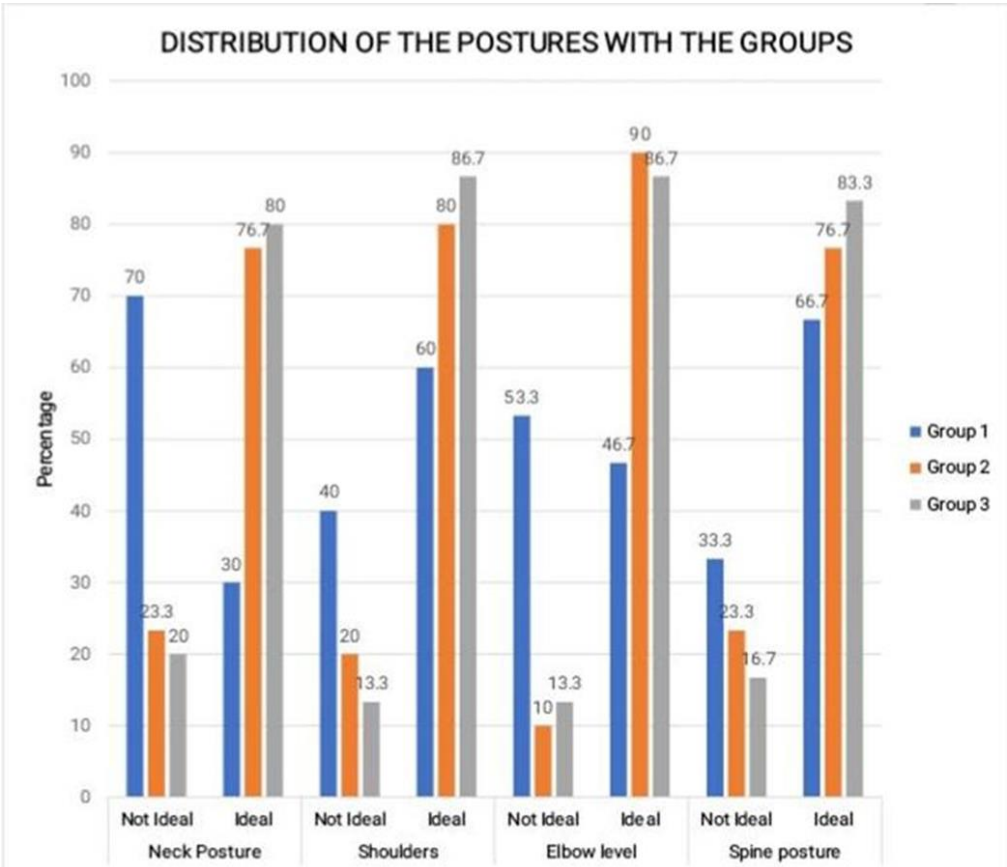


TABLE 1: ASSCOIATION OF THE POSTURES WITH THE GROUPS

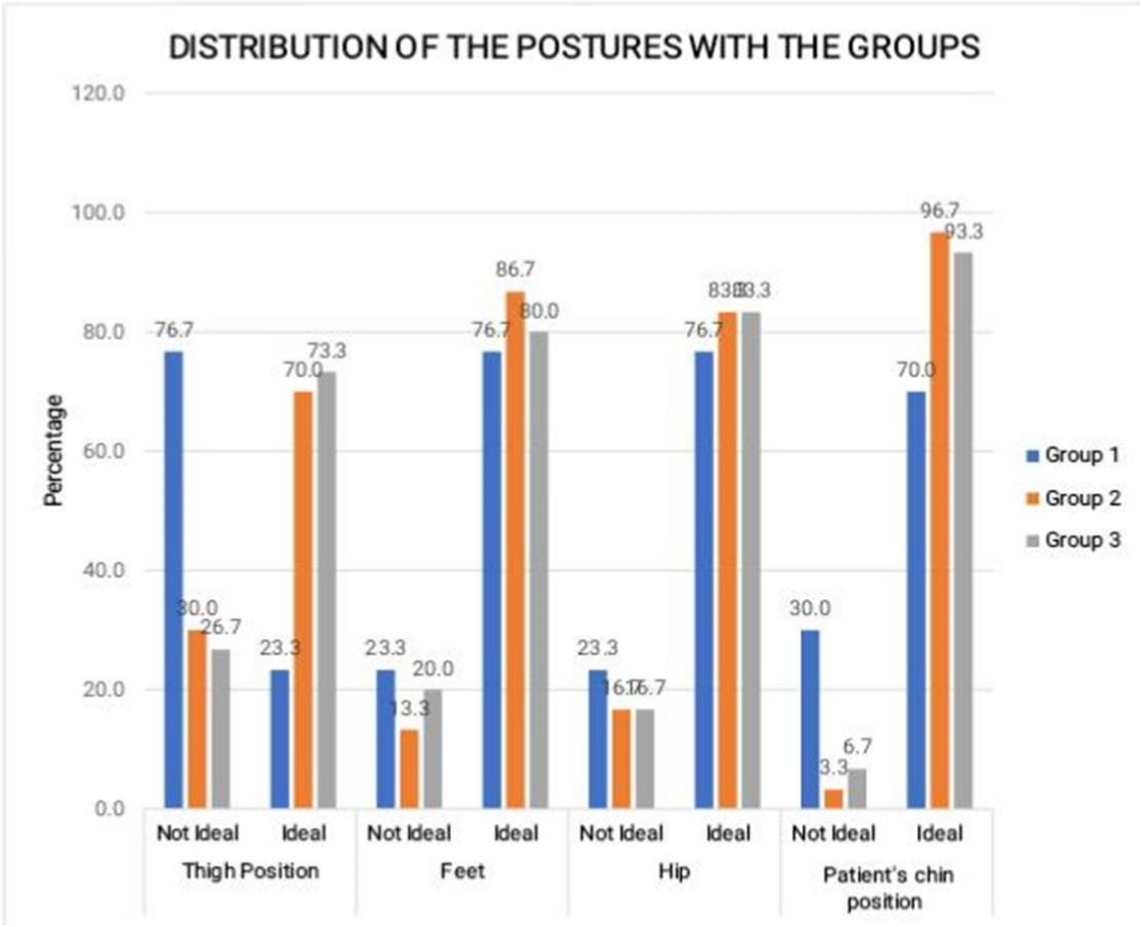
			Groups			Total	Chi-square value	p value
			Group 1	Group 2	Group 3			
Neck posture	Not-ideal	Count	21	7	6	34	19.94	0.001*
		%	70.0%	23.3%	20.0%	37.8%		
	Ideal	Count	9	23	24	56		
		%	30.0%	76.7%	80.0%	62.2%		
Shoulders	Not-ideal	Count	12	6	4	22	6.25	0.044*
		%	40.0%	20.0%	13.3%	24.4%		
	Ideal	Count	18	24	26	68		
		%	60.0%	80.0%	86.7%	75.6%		
Elbow level	Not-ideal	Count	16	3	4	23	18.33	0.001*
		%	53.3%	10.0%	13.3%	25.6%		
	Ideal	Count	14	27	26	67		
		%	46.7%	90.0%	86.7%	74.4%		
Spine posture	Not-ideal	Count	10	7	5	25	2.28	0.319
		%	33.3%	23.3%	16.7%	27.8%		
	Ideal	Count	20	23	25	65		
		%	66.7%	76.7%	83.3%	72.2%		

*significant

TABLE 2: ASSCOIATION OF THE POSTURES WITH THE GROUPS

			Groups			Total	Chi-square value	p value
			Group 1	Group 2	Group 3			
Thigh position	Not-ideal	Count	23	9	8	40	18.99	0.001*
		%	76.7%	30.0%	26.7%	44.4%		
	Ideal	Count	7	21	22	50		
		%	23.3%	70.0%	73.3%	55.6%		
Feet	Not-ideal	Count	7	4	6	17	1.01	0.602
		%	23.3%	13.3%	20.0%	18.9%		
	Ideal	Count	23	26	24	73		
		%	76.7%	86.7%	80.0%	81.1%		
Hip	Not-ideal	Count	7	5	5	17	0.58	0.74
		%	23.3%	16.7%	16.7%	18.9%		
	Ideal	Count	23	25	25	73		
		%	76.7%	83.3%	83.3%	81.1%		
Patient's chin position	Not-ideal	Count	9	1	2	12	10.96	0.004*
		%	30.0%	3.3%	6.7%	13.3%		
	Ideal	Count	21	29	28	78		
		%	70.0%	96.7%	93.3%	86.7%		

*significant



III. Discussion

Several postures in this investigation demonstrated clinical importance, as indicated by the results of the chi-square tests. Notably, there were strong correlations ($p < 0.05$) between the instructional approaches used and the patient's chin position, thigh position, elbow level, neck posture, and shoulders posture. These results imply that dentistry students' adoption of better postures was influenced by interventions, such as one-on-one demonstrations and photographic self-assessment (10).

Garbin et al. (2011) highlighted the significance of proper postural hygiene by comparing these results with similar studies and finding that only 35% of clinical photos showed adherence to ergonomic principles. This is consistent with the findings of this study on the posture of the shoulders and neck, which show that different teaching approaches might affect these important postures.

In their 2017 study, brian b. Et al. Examined the effects of using photos on dental hygiene students' ergonomic ratings and self-assessment accuracy. Although dental hygiene students were not the focus of our study, the significance of shoulder posture is consistent with the findings of brian b et al. Regarding the value of visual feedback and self-assessment in enhancing ergonomic procedures. This study deviates from theirs, though, in that it did not discover any meaningful correlations between hip and foot posture.

Hyun-suk park et al. (2015) emphasized the dangers that dentists face from their neck and lower back positions. While these locations were not the exclusive focus of this investigation, the necessity of managing risks in these places is supported by the noteworthy findings in shoulder and neck posture. Furthermore, the study's major findings regarding the patient's chin position are consistent with ergonomic practices' emphasis on treating neck-related problems. This study, however, did not identify any significant connections between hip and spine posture, which is different from the focus placed on these areas by hyun-suk park et al.

Students' inappropriate sitting in the dental chair and their unfamiliarity with ergonomics principles were highlighted by cervera-espert et al. The emphasis of this study on various postures, such as the neck and shoulders, is in line with the larger requirement that dentistry students have a solid basis in ergonomic techniques. Cervera-espert et al. Did not discover any significant connections in particular postures such as hip, foot, or spine position, which is similar to the results of this investigation.

As a result, targeted interventions are crucial to addressing specific postural challenges in dental education. The significant postures identified in this study, including neck posture, shoulders posture, elbow level,

thigh position, and patient's chin position, are in line with the concerns expressed in related studies. The necessity for customized interventions based on the unique ergonomic issues found in each study is highlighted by the variability in findings across different postures (10, 11, 12, 13).

IV. Conclusion

In summary, although there are still obstacles in incorporating ergonomic knowledge into dentistry students' clinical practice, this study's examination of diverse teaching approaches offers insights into potential solutions. These research' similarities and differences highlight how difficult it is to address ergonomic procedures in dental education and how multimodal approaches are necessary to close the knowledge gap between theory and clinical practice.

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