

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Motion analysis in the field of dentistry - A kinematic comparison between dentists and orthodontists
AUTHORS	Nowak, Jennifer; Erbe, christina; Hauck, Imke; Groneberg, David; Hermanns, Ingo; Ellegast, Rolf; Ditchen, Dirk; Ohlendorf, Daniela

VERSION 1 - REVIEW

REVIEWER	Dr. Abhishek Mehta Faculty of Dentistry, Jamia Millia Islamia, New Delhi-25,India
REVIEW RETURNED	10-Mar-2016

GENERAL COMMENTS	<ol style="list-style-type: none">1. good, informative study2. please mention limitations of the study3. what are your recommendations for future studies and also for the practicing dentists e.g. any exercise/device/education to improve the posture4. is this only system available to record ergonomics ? if no please compare results with such system5. if possible, compress and make tables more informative or put diagrams
-------------------------	--

REVIEWER	Timm Schott University of Tübingen Germany
REVIEW RETURNED	16-Mar-2016

GENERAL COMMENTS	<p>Major comments:</p> <ul style="list-style-type: none">- Abstract, line 35: "however, dentists were observed to take slightly more unfavorable postures during treatment" vs. p.8, line 19 "During the aforementioned activities dentists and orthodontists take almost identical posture". Please clarify- Methods (page 5, line 18-21): Both groups differ concerning age and work place: dentists, 40 +/- 10 y old, "working in an established practices" vs. orthodontist residents, 30 +/- 3 y old, working at an university medical centre. It is known, that daily routine at a university department differs from an orthodontic private practice or general private practice. This should be discussed.- Is there any difference known in this study or from the literature concerning different postures in the field of dentistry in relation to age?- Discussion - this is largely a rewrite of the results with little discussion with respect to any other work on this field. <p>Minor comments:</p> <ul style="list-style-type: none">- Methods, p.5, line 19: please use "residents" instead of "assistants"
-------------------------	--

	<ul style="list-style-type: none"> - Please correct and standardize punctuation and spelling - Please correct the number of patients: there is a discrepancy between abstract and methods. What is the reason for the drop-out? - Please translate Table 1 --> "bis" in column "Angle range" - Table 4 is unclear: Please add more information, e.g. for column "sensor"
--	---

REVIEWER	Dr. Arpit Gupta Centre for Dental Education & Research, All India Institute of Medical Sciences, New Delhi - India
REVIEW RETURNED	16-Mar-2016

GENERAL COMMENTS	<p>Good concept but needs a lots of improvement.</p> <p>Title: Needs to be improved - Term 'Physician' seems to be irrelevant.</p> <p>Abstract: Relook at the study design. Clarify the abbreviation CUELA upfront. Discussion may not be required in abstract, rather conclusion might be.</p> <p>Strengths and Limitations are not clear. These should be explicitly mentioned.</p> <p>Page3 line 28 - Such a corelation is confirmed nowhere in the study. Since participants were aware that they were being observed, a bias would have been crept in.</p> <p>Page 4 line 19: '29.5% or 55%' - unclear??</p> <p>Page 4 line 36: The study doesnt really measure the possible impact on development of pain.</p> <p>page 5 : Specify the selection criteria explicitly and also the basis for sample size calculation. Line 16: 23w+18m=42(Recheck the total). It Would be better to use 'm' and 'f' to maintain international uniformity.</p> <p>Since orthodontic assistants were the participants and not orthodontists, therefore just mentioning orthodontists anywhere would be injustice.</p> <p>Page 8 line 9: und??</p> <p>Page 12 line 10: Incomplete sentence. How does the results confirm the correlation with MSD??</p> <p>Page 12 line 15: writing hypothesis as 'partially verified' is unscientific.</p> <p>Page 12 line 20: 'mode operation' : incomplete sentence.</p> <p>Since the study was done at a single centre and only one day observation was made that too on orthodontic assistants, therefore the external validity stands questionable. Therefore the limitations needs to be mentioned explicitly.</p> <p>Page 25 : 'signifikance' - misspelt</p>
-------------------------	--

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

2. please mention limitations of the study

We did refer to given limitations twice in the article. Please refer to the sections “Strengths and limitations of this study” and to page 17, line 5 f..

3. what are your recommendations for future studies and also for the practicing dentists e.g. any exercise/device/education to improve the posture

We appreciate your advice on this matter. One recommendation for future studies was described on page 17, line 6-10, 24f. as well as page 18, line 5-8. Moreover, we also added another paragraph at the end of the discussion section.

4. is this only system available to record ergonomics ? if no please compare results with such system

There are indeed other systems for long-term measurements in the field of ergonomics. However, these systems were not used for the posture analysis of orthodontists or dentists, which is why we did not include them. Also, such a comparison with other professional groups and evaluation parameters is less significant for our study.

5. if possible, compress and make tables more informative or put diagrams

The authors tried to revise table 4 in order to make this table more informative.

Reviewer: 2

Major comments:

- Abstract, line 35: "however, dentists were observed to take slightly more unfavorable postures during treatment" vs. p.8, line 19 "During the aforementioned activities dentists and orthodontists take almost identical posture". Please clarify

Thank you for your comments. This is a misunderstanding. The statement in line 35 refers to category I (treatment) and the statement found line 7 on page 9 refers to category III (other activities). As a result, the aforementioned statements are not comparable, a point that we stress again on page 8 to avoid such potential misinterpretation.

- Methods (page 5, line 18-21): Both groups differ concerning age and work place: dentists, 40 +/- 10 y old, "working in an established practices" vs. orthodontist residents, 30 +/- 3 y old, working at an university medical centre. It is known, that daily routine at a university department differs from an orthodontic private practice or general private practice. This should be discussed.

We are well aware of the difference between the various work routines of orthodontists. As most orthodontists do divide their time between working as residents at university medical centers and private practices, we find that, also with regard to great number of patients treated at the three university medical centers mentioned in the article, both groups can and ought to be compared.

- Is there any difference known in this study or from the literature concerning different postures in the

field of dentistry in relation to age?

A very good question. Such a study exists indeed. For instance, in the introduction we mentioned the following study:

13. Gopinadh A, Devi KN, Chiramana S, Manne P, Sampath A, Babu MS. Ergonomics and musculoskeletal disorder: as an occupational hazard in dentistry. The journal of contemporary dental practice. 2013 Mar-Apr;14(2):299-303. PubMed PMID: 23811663. Epub 2013/07/03. eng.

- Discussion - this is largely a rewrite of the results with little discussion with respect to any other work on this field.

The authors disagree with this observation. The discussion was certainly not a rewrite of results but instead discussed current scientific literature in the field of orthodontics, an aspect that the other two reviewers agree on. Therefore, we find this comment quite surprising and concur with the opinions verbalized by the other two reviewers.

Minor comments:

- Methods, p.5, line 19: please use "residents" instead of "assistants"

The authors changed "assistants" to "residents" in the article.

- Please correct and standardize punctuation and spelling

The manuscript was proofread by a professional language-editing service.

- Please correct the number of patients: there is a discrepancy between abstract and methods. What is the reason for the drop-out?

The authors corrected the discrepancy regarding the number of patients and included reasons for drop-outs.

- Please translate Table 1 --> "bis" in column "Angle range"

Thank you so much for pointing this error out to us. We corrected table 1 in the meantime.

- Table 4 is unclear: Please add more information, e.g. for column "sensor"

We very much appreciate your advice on this matter. Table 4 now includes more information.

Reviewer: 3

-Title: Needs to be improved - Term 'Physician' seems to be irrelevant.

The term "of physicians" was deleted in the title.

-Abstract: Relook at the study design.

We revised the abstract with regard to study design.

-Clarify the abbreviation CUELA upfront.

We explained the acronym and included the long version of CUELA in the abstract.

-Discussion may not be required in abstract, rather conclusion might be.

Indeed! We reread the author guidelines and changed the discussion section into a conclusion in the abstract.

-Strengths and Limitations are not clear. These should be explicitly mentioned.

Please see our response to comment 2 by reviewer 1.

-Page3 line 28 - Such a correlation is confirmed nowhere in the study.

The authors follow the results provided by the articles reviewed. We made sure to color-code relevant sentences in case the reviewer would like to reread the sections.

OBJECTIVE: Musculoskeletal disorders (MSDs) are commonly experienced in dentistry. The objective of this study is to determine the prevalence of ergonomics and MSDs among dental professionals.

MATERIALS AND METHODS: A cross-sectional survey was conducted among 170 dentists of different specialties. The questionnaire gathered information regarding demographic details, MSDs, work duration, working status, awareness of ergonomics, etc. Data was analyzed using SPSS version 15.0. Student's t-test and analysis of variance (ANOVA) test was used for comparison in mean scores. Stepwise multiple linear regression analysis was used to assess the independent variables that significantly influenced the variance in the dependent variable (pain).

RESULTS: It was found that 73.9% of the participants reported musculoskeletal pain and most common painful sites were neck and back. More than half of the participants, i.e. 232 (59.3%) were aware of correct ergonomic posture regarding dental. Almost percentage of pain increased significantly with increase in age and working time. Among all specialties, prosthodontics were found to have more prevalence of MSDs.

CLINICAL SIGNIFICANCE: The appearance of musculoskeletal symptoms among dental professionals was quite common. It suggested that ergonomics should be covered in the educational system to reduce risks to dental practitioners.

Since participants were aware that they were being observed, a bias would have been crept in. We referred to the Hawthorne effect as a possible bias in the article. However, the fact that hardly anyone performs particularly well for a total period of 5 hours actually mitigates concerns for bias.

-Page 4 line 19: '29.5% or 55%' - unclear??

The authors changed "or" into "to".

-Page 4 line 36: The study doesnt really measure the possible impact on development of pain.

This is the case because it is not the focus of this article. As we emphasized on page 4, line 27f.: "[...] this study aims to investigate patterns of postures that are involved in the daily routines of orthodontists and dentists [...]."

The authors intend to investigate movements that occur in a workday of dental and rthodontic residents to identify movements that can result in pain.

-page 5 : Specify the selection criteria explicitly and also the basis for sample size calculation.

As requested by the reviewer, we added a paragraph describing the sample size.

- Line 16: $23w+18m=42$ (Recheck the total). It Would be better to use 'm' and 'f' to maintain international uniformity.

The authors used 'm' and 'f' to maintain international uniformity and checked the total number of participants.

-Since orthodontic assistants were the participants and not orthodontists, therefore just mentioning orthodontists anywhere would be injustice.

The authors apologize for this misunderstanding. However, all participants in group 2 were orthodontic residents, not assistants.

-Page 8 line 9:

The authors changed the word “und” into “and”.

- Page 12 line 10: Incomplete sentence. How does the results confirm the correlation with MSD??

The authors completed the sentence.

-Page 12 line 15: writing hypothesis as 'partially verified' is unscientific.

Thank you for pointing this out to us. We changed the sentence and verified the hypothesis as whole.

- Page 12 line 20: 'mode operation' : incomplete sentence.

The authors completed the sentence.

-Since the study was done at a single centre and only one day observation was made that too on orthodontic assistants, therefore the external validity stands questionable. Therefore the limitations needs to be mentioned explicitly.

The authors would like to stress that participants worked at three different hospitals and each day a different participant was measured. This means the data generated represents 42 days of measuring. Moreover, the authors have included the Hawthorne effect as a possible limitation of the study (see discussion above). Nevertheless, the bias is considered minimal as participants were not inhibited by the presence of the evaluator in their daily work routine because the evaluator kept a distance that allowed the participant to perform naturally. Furthermore, the authors assume that the measured participants do not break with their professional habits over a work period of 5 hours (habitation effect). (Page 17 line 11-19)

-Page 25 : 'signifikance' – misspelt

Thank you for drawing our attention to this. The manuscript was proofread and checked by a professional editing service to eliminate such errors.

VERSION 2 – REVIEW

REVIEWER	Timm Schott University of Tuebingen Germany
REVIEW RETURNED	01-May-2016

GENERAL COMMENTS	The reviewer completed the checklist but made no further comments.
-------------------------	--

REVIEWER	Dr. Arpit Gupta Centre for Dental Education & Research All India Institute of Medical Sciences, New Delhi, India.
REVIEW RETURNED	29-Apr-2016

GENERAL COMMENTS	<ol style="list-style-type: none">1. Recheck the study design. It doesn't seem to be a prospective study.2. Criteria for selection of participants are yet to be mentioned.3. P27 L5: 'yet' may be omitted.4. P27 L1: mention "correlation of MSD's with??"5. P29 L13: use m/f instead of w/f. recheck total "21 ortho residents(13+7)6. P39 L29: word"only" can be deleted.
-------------------------	---