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Knowledge of European orthodontic postgraduate students on biostatistics

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SUMMARY The purpose of this study was to explore the level of knowledge in biostatistics of orthodontic postgraduate students. A four-section questionnaire, which included a knowledge test/quiz on biostatistics and epidemiology, was developed. This questionnaire was distributed to postgraduate programme directors of European universities to be delivered to students for completion under mock examination conditions (in-class session). The frequency distributions of demographic characteristics were examined, the percentages of participants who agreed or strongly agreed with each attitudinal statement were calculated, and the percentages of participants who felt fairly to highly confident for each statement were determined. Knowledge scores were calculated by the percentage of correct answers; missing values were counted as incorrect answers. The Student's *t*-test or one-way analysis of variance, where appropriate, was utilized to determine the participants' characteristics associated with mean knowledge scores. Data were further analysed with multiple linear regression modelling to determine the adjusted/unconfounded effect of possible knowledge score predictors. A two-tailed *P*-value of 0.05 was considered statistically significant with a 95 per cent confidence interval (CI).

One hundred and twenty seven from a total of 129 orthodontic students who replied completed the questionnaire. The mean correct answers of the participants were 43.8 per cent with a 95 per cent CI of 40.2–47.3 per cent. This score was not influenced by gender, years elapsed from graduation, other advanced degree, or year of study; the sole parameter, which seemed to influence this score was attendance at a biostatistics/epidemiology course (51.9 versus 39.5 per cent score of participants who had previously taken a course versus those who had not, $P < 0.001$). A surprising finding was the inability of the responders to identify the appropriate use of the chi-square test (11.8 per cent, 95 per cent CI: 6.1–17.5 per cent). The knowledge on biostatistics of orthodontic postgraduate students in Europe is only influenced by previous relevant education.

Introduction

With the current emphasis placed on evidence-based care, the clinician is faced with a plethora of articles, which address several clinical issues, assessing treatment modalities and exploring the predictive value of various factors on orthodontic therapeutic outcome. This process necessitates a substantial level of expertise of the reader to appraise the design, methodology, data analysis, and interpretation of findings of relevant studies to arrive at conclusions. The foregoing requirements, together with the progressively increasing complexity of statistical methods reported in the literature, make information processing a complex task.

In health care sciences, understanding biostatistics may have important implications in modulating clinical practice as it possesses a large effect on evidence-based diagnostic and treatment applications. Similarly, in academics, sufficient knowledge of epidemiological principles is required to successfully conduct a study and correctly analyse data derived from clinical investigations. Although check lists have been developed to assess study quality (Moher *et al.*, 1995, 1999), there is still a considerable amount of research, which lists inappropriate analyses, lacks descriptive data (Golditz and Emerson, 1985; Kay and Locker, 1996; Varnell *et al.*, 2004), or includes erroneous data interpretation (Weiss and Samet, 1980; Wulff *et al.*, 1987). Because of the introduction of complex statistical data elaboration and the importance given to clinical trials, basic biostatistical knowledge must be enhanced with knowledge of advanced methods frequently encountered in clinical research (Windish *et al.*, 2007).

To overcome these deficiencies, surveys have been conducted to record the knowledge of health care professionals on biostatistics and epidemiology, as well as to identify influencing factors. These surveys have mainly targeted specializing physicians and have shown that even those who are more familiar with the literature and research principles have limited biostatistical knowledge and an impaired capacity to understand a number of epidemiological basics (Berwick *et al.*, 1981; Altman and Bland, 1991; O'Donell, 2004; Estellat *et al.*, 2006; Windish *et al.*, 2007). A recent survey (West and Ficalora, 2007) demonstrated that only a small percentage (17.6 per cent) of medical students, internal medicine residents, and internal medicine teaching faculties believe that they have adequate training in biostatistics, while even fewer (14.6 per cent) feel adequately prepared to conduct a statistical analysis. Furthermore, in that survey, just one-quarter of participants reported that they could identify if correct statistical methods had been applied, whereas almost 9 out of 10 believed that they would benefit from further biostatistical training.

A review of the available literature revealed a sole source of evidence on this subject as it relates to dentistry (El Tantawi, 2009). Because of its unique characteristics, orthodontic research deals with outcome assessment and comparative analysis of population variables, materials, and basic sciences. As such, it includes a wide range of analyses and, therefore, requires a thorough understanding of biostatistics, which would better equip the practicing clinician to critically review the literature and formulate an informed decision on the validity of novel diagnostic methods and the effectiveness of treatment modalities. This is the reason that courses on biostatistics and epidemiology have been included in all guidelines of contemporary postgraduate orthodontic education aiming to provide relevant familiarity and competence (van der Linden, 1992; Commission on Dental Accreditation, 2006; Athanasiou *et al.*, 2009).

The purpose of this survey was to explore the level of postgraduate students' knowledge on biostatistics. The overall objective was to identify areas where emphasis should be placed in postgraduate orthodontic curricula.

Subjects and methods

A questionnaire (Appendix) was structured to include four basic sections: the demographics of participants, attitude towards statistics, self-reported confidence on biostatistics, and a knowledge section comprising 13 questions. The first section included personal data (age and gender), current education level, and past statistical education of the participants. The second and third parts rated, on a five-point scale, from strongly disagree—no confidence to strongly agree—confidently, the self-perceived knowledge of responders. The last section included questions on various statistical subjects in the form of cases or research in the orthodontic field.

The questionnaire, accompanied by a covering letter with directions on the correct set and mode of responding, was given in person to all orthodontic programme directors who participated in the founding meeting of the Network of Erasmus Based European Orthodontic Programmes in Geneva, Switzerland, in 2008. Directors who were invited to the meeting but were not present received the same material by post. The intention was that these persons would distribute the questionnaire to the students in their orthodontic postgraduate programmes.

All students participating in this study had to complete the document individually, under the conditions of a formal examination (i.e. no collaboration, discussion with colleagues, searching the Internet or books). After completion of the questionnaire, the programme directors were asked to return the questionnaires, using the self-addressed envelope provided.

The frequency distributions of demographic characteristics of participants were examined and the percentage of participants who agreed or strongly agreed with each attitudinal statement were calculated; percentages of participants who felt fairly to highly confident for each confidence statement were also determined. Knowledge scores were calculated by the percentage of correct answers; missing values were counted as incorrect answers.

As values of mean knowledge scores obtained were found to be approximately normally distributed, the Student's *t*-test or one-way analysis of variance, where appropriate, were utilized to determine the participants' characteristics associated with mean knowledge scores. Data were further analysed with multiple linear regression modelling to determine the adjusted/unconfounded effect of possible knowledge score predictors. A two-tailed *P*-value of 0.05 was considered statistically significant with a 95 per cent confidence interval (95% CI). All analyses were performed with the Stata version 10.0 software (Stata Corporation, College Station, Texas, USA).

Results

The demographics of responders are shown in Table 1. Completed questionnaires were returned from 127 participants from 21 postgraduate programmes in 10 European countries; two questionnaires from those distributed were not completed. The distribution of universities per country was as follows: Bulgaria 1, Finland 3, Germany 8, Greece 2, Italy 2, Netherlands 1, Norway 1, Switzerland 1, Sweden 1, and UK 1. The profile of the students who responded to the questionnaire was as follows: between 27 and 32 years of age, 3–6 years from graduation from dental school, and no previous training in biostatistics.

Table 2 depicts the attitude and confidence of participants towards statistics. Of the 106 participants who felt confident about *P*-value interpretation, only 37.7 per cent gave the correct answer to the corresponding question listed in the knowledge section. The overall correct percentage score is shown in Table 3; the mean correct answers was 43.8 per cent with a 95% CI of 40.2–47.3 per cent. The participants achieved the highest score in recognizing the purpose of clinical trial double blinding (77.9 per cent, 95% CI: 70.6–85.2 per cent) and the lowest score in recognizing a case–control investigation (3.1 per cent, 95% CI: 0.0–6.2 per cent). It is surprising that responders achieved a very low score in identifying the use of chi-square test (11.8 per cent, 95% CI: 6.1–17.5 per cent).

Table 4 lists the results of univariate analysis used to explore participants' demographic characteristics possibly related to knowledge scores. There was no effect of gender, the number

Table 1 Demographic characteristic of the 127 postgraduate students who participated in the survey.

Characteristic	Category	*N*	%
Country	Bulgaria	2	1.6
	Finland	14	11.0
	Germany	35	27.6
	Greece	11	8.7
	Italy	19	14.9
	Netherlands	12	9.5
	Norway	9	7.0
	Switzerland	5	5.5
	Sweden	8	6.3
	UK	10	7.9
Gender (%)	Male	48	37.8
	Female	79	62.2
Age range (years)	≤26	13	10.3
	27–29	43	33.8
	30–32	42	33.0
	≥33	29	22.9
Other advanced degrees	Doctorate	21	16.5
	Master of Science	36	28.3
	Other	12	9.5
	None	58	45.7
Time since Dental School graduation (years)	≤2	23	18.2
	3–4	34	26.7
	5–6	34	26.7
	≥7	36	28.4
Current level of training, academic year	First	47	37.0
	Second	23	18.2
	Third	43	33.8
	Fourth	11	8.7
	Other/fellow	3	2.3
Previous training/coursework in epidemiology/biostatistics (%)	No	83	65.3
	Yes	44	34.7

Table 2 Attitudes towards biostatistics and confidence of 127 participants.

Attitude statement	Agree or strongly agree	
	N	%
I would like to gain more knowledge on biostatistics	80	63.0
I understand all the statistical terms seen in journal articles	19	19.9
I often use statistical information to formulate decisions in orthodontic treatment	28	22.0
Confidence statement	**Fairly to highly confident**	
	N	%
I can interpret the *P*-value for a given test	106	83.5
I can assess the soundness of a statistical method used in research	83	65.3
I can interpret the results of a statistical analysis reported in journal articles	100	78.7

of years elapsed since graduation, other advanced degree, or the year of study on the mean correct score of participants. The sole factor that seemed to influence this score was attendance at a biostatistics/epidemiology course where participants who had previously taken this course scored higher than their peers (51.9 versus 39.5 per cent, $P < 0.001$). Even after adjustment for participants' demographic characteristics, a previous statistical course attendance was found to be associated with a significant net increase in correct answers, which reached 11.8 per cent (95% CI: 4.3–19.4 per cent, $P = 0.002$; Table 5).

Table 3 Percentages of correct answers for the knowledge questions.

Question number (Appendix)	Knowledge objective	Correct answer %	Correct answer 95% confidence interval (95% CI)
7a	Identify a continuous variable	44.8	36.1–53.6
7b	Identify a nominal variable	44.0	35.3–52.8
7c	Identify a dichotomous variable	54.3	45.5–63.1
8	Recognize a case–control study	3.2	0.0–6.2
9	Recognize a meta-analysis	70.0	62.0–78.1
10	Recognize the purpose of randomization	25.2	17.5–32.8
11	Recognize bias definition	70.8	62.8–78.8
12	Interpret standard deviation	37.8	29.2–46.3
13	Recognize purpose of double blinding	77.9	70.6–85.2
14	Interpret null hypothesis	70.0	62.0–78.1
15	Recognize parametric methods	62.2	53.6–70.7
16	Interpret *P*-value	33.0	24.7–41.3
17	Identify Cox proportional hazard regression	14.1	8.0–20.3
18a	Identify analysis of variance	42.5	33.8–51.2
18b	Identify chi-square test	11.8	6.1–17.5
18c	Identify *t*-test	40.1	31.5–48.8
19	Interpret odds ratio and 95% CI	46.4	37.6–55.2
20	Recognize reliability measures	40.1	31.5–48.8
	Overall	43.8	40.2–47.3

Discussion

The results of this survey showed that orthodontic postgraduate students' knowledge on biostatistics in Europe is only influenced by previous relevant education.

As expected from other surveys, advanced statistical tests, such as Cox proportional hazard regression, were difficult to correctly identify by most of the participants (Horton and Switzer, 2005; Windish *et al.*, 2007); the present study showed only 17 per cent correctly answered this question. However, the finding that almost 9 out of 10 students could not correctly utilize a chi-square test, and even less were able to identify a case–control study, emphasizes the importance of the need for substantial comprehensive education on biostatistics in postgraduate orthodontic education. Although the above finding is in agreement with the participants' self-assessment outcome, which revealed a lack of understanding of biostatistical terms as well as their desire to acquire further knowledge on the subject, it is still surprising because of the widespread use of chi-square test in both applied and clinical orthodontic research.

Table 4 Knowledge scores by selected participants' characteristics.

Characteristic	Category	Mean correct %	Mean correct 95% confidence interval	*P*-value
Gender (%)	Male	40.8	34.8–46.8	NS*
	Female	45.6	41.2–50.0	
Age range (years)	≤26	52.1	40.7–63.5	NS**
	27–29	42.1	36.6–47.6	
	30–32	45.3	38.5–52.2	
	≥33	40.4	32.4–48.3	
Other advanced degrees	Doctorate	34.4	25.4–43.3	NS**
	Master of Science	44.7	38.3–51.1	
	Other	47.2	35.4–59.0	
	None	45.9	40.4–51.4	
Years since Dental School graduation	≤2	43.9	34.0–53.8	NS**
	3–4	46.5	39.8–53.2	
	5–6	43.7	37.1–50.4	
	≥7	41.2	34.1–48.2	
Current level of training/year (%)	First	41.1	35.0–47.2	NS**
	Second	41.3	31.7–50.8	
	Third	49.2	43.7–54.6	
	Fourth	44.4	29.9–58.9	
	Other/fellow	25.9	−2.8 to 54.6	
Previous training/ coursework in epidemiology/ biostatistics	No	39.5	35.1–43.9	<0.001
	Yes	51.9	46.5–57.2	

*Analysis by *t*-test.
**Analysis by one-way analysis of variance.

Table 5 Multiple regression-derived estimate of knowledge score difference related to previous statistical training and corresponding 95 per cent confi dence interval (95% CI) among 127 participants.

Predictor	Category	Adjusted score difference (%)*	95% CI	*P*-value
Previous training/ coursework in epidemiology/ biostatistics	No	Baseline		
	Yes	11.8	4.3–19.4	0.002

*Score difference adjusted for gender, age, training level, other advanced degree, and time since graduation.

It may be worth noting that the literature is replete with studies reporting that medical and dental students and instructors do not understand basic statistics and usually provide wrong interpretations of statistical statements, despite the growth in statistical use (Weiss and Samet, 1980; Berwick *et al.*, 1981; Wulff *et al.*, 1987; Altman and Bland, 1991; O'Donell 2004; Estellat *et al.*, 2006; Windish *et al.*, 2007; El Tantawi, 2009). This lack of understanding may lead to both an erroneous interpretation of research findings and a lack of ability to critically review the evidence presented in relevant articles. This raises a question on the applicability of clinical research in practice and the necessity for authors to emphasize the findings in a clear and concise manner in the Results and Conclusions sections.

Questionnaires were not directly sent to students but were distributed to the participating directors at a meeting, and no follow-up took place. Of the 61 directors, 21 distributed the questionnaire (cooperation rate: 34.4 per cent) to 129 students. After receiving the questionnaires from the directors that participated in the survey, only 2 of the 129 that received the questionnaire failed to participate (response rate: 98.4 per cent). Selection bias is a possibility whenever correlates of the outcome capable of influencing study participation exist in some individuals at the beginning of the study. The common element of such bias is that the relationship between exposure and outcome is different for those who participate and those who would be theoretically eligible but do not eventually participate. In the present investigation, it is unlikely that issues related to the questions under investigation led programme directors not to distribute the questionnaire. Moreover, it could be implied that the questionnaires were distributed in programmes with extended student exposure to biostatistical/epidemiological issues (volunteer bias and subtype of selection bias). In this scenario, the results may underestimate the true level of statistical knowledge, thus presenting a more conservative approach.

Previous studies have shown that biostatistics are considered important but not to such an extent as other components of the orthodontic curriculum (West and Ficalora, 2007). This could be explained by the fact that biostatistics is most often taught as an independent undergraduate course (West and Ficalora, 2007), which may preclude the appropriate emphasis being placed on the clinical application of terms.

One of the advantages of the present survey is that it included a broad range of training backgrounds, as the results derive from 21 universities and 10 European countries. However, it should be noted that the invitation to participate in this survey was extended to 61 universities in 17 countries.

Despite the variation in postgraduate curricula among the countries included in this survey, the inability to identify a chi-square test or a case–control study showed decreased variance with a 95% CI of 11–17 and 0–6 per cent, respectively. This finding implies a need to modify the current curriculum format on biostatistics in orthodontics and to include topics that would focus on research design of methods most frequently encountered in orthodontic research (materials and applied research, clinical trials, and basic research). This idea is further supported by the finding that no differences were found between doctoral and master level students. Knowledge of the English language may not constitute a factor influencing the responses since there was an agreement in the false answers in this specific question regardless of origin. The argument that the example reported in the question on chi-square might have been affected by the assumption of the variable 'flossing' as quantitative is not valid because firstly, for dental care professionals, the term flossing implies a correct exercise of this hygiene effect and secondly, even if that was considered as a quantitative variable, the appropriate response should have been different, that is analysis of variance, from that recorded by the majority of participants.

This survey was addressed exclusively to orthodontic postgraduate students and the questionnaire content was derived from research published in orthodontic journals. Nonetheless, the results might be generalized to dental specialty training, since biostatistics at the graduate level is usually taught within the core course programme, and as such is directed to postgraduate students in general. The validity of this hypothesis is confirmed by the results of a recent survey (El Tantawi, 2009), where the statistical knowledge of dental postgraduate students was not influenced by the curriculum of a specific dental specialty.

The present study identified the attendance of a biostatistics/epidemiology course as the sole factor that influenced the mean correct score of participants. The association of statistical knowledge and previous training in this field is a common finding in related research (West and Ficalora, 2007; Windish *et al.*, 2007). Interestingly, in medicine, this advantage in students who have received training in statistics tends to diminish with the increasing number of years following graduation from the statistical course, a finding, which was not observed in the present study. This might be explained by the fact that specialty training in medicine exceeds the duration of the average orthodontic postgraduate programme in Europe. Similarly, this study showed no effect of gender, years since graduation, other advanced degree, or year of study on knowledge mean score. Nonetheless, an effect of gender on the statistical knowledge is an isolated finding in some studies (Godwin and Seguin, 2003; Windish *et al.*, 2007), whereas many studies lack gender comparison (Weiss and Samet, 1980; Berwick *et al.*, 1981; Wulff *et al.*, 1987; Cheatham, 2000; Ambrosius and Manatunga, 2002; Estellat *et al.*, 2006).

Conclusions

The mean correct answers of postgraduate orthodontic students to a biostatistics questionnaire was 43.8 per cent This score was not influenced by gender, years elapsed from graduation, other advanced degree, or year of study; the sole parameter, which seemed to influence this score was attendance at a biostatistics/epidemiology course (51.9 versus 39.5 per cent score of participants who had previously taken a course versus those who had not, $P < 0.001$). A surprising finding was the inability of the responders to identify the appropriate use of the chi-square test (11.8 per cent, 95 per cent CI: 6.1–17.5 per cent).

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Appendix

The questionnaire used in the survey.

BIOSTATISTICAL KNOWLEDGE SURVEY IN ORTHODONTIC EDUCATION

Country [ ]

University [ ]

Gender Male [ ] Female [ ]

Age [ ] years

Advanced Degrees MS [ ] Doctorate [ ] Other [ ]

Specify other [ ]

Years since graduation from Dental school [ ] years

Current level of training 1st year [ ] 2nd year [ ] 3rd year [ ]

4th year [ ] Other/fellow [ ]

Ever taken a postgraduate course in epidemiology/biostatistics? No [ ] Yes [ ]

For questions 1-6 please circle the number, which best describes your preference/opinion

1. I would like to gain more knowledge on biostatistics

1	2	3	4	5
Strongly agree		Neutral		Strongly disagree

2. I understand all the statistical terms seen in journal articles

1	2	3	4	5
Strongly agree		Neutral		Strongly disagree

3. I often use statistical information to formulate decisions in orthodontic treatment

1	2	3	4	5
Strongly agree		Neutral		Strongly disagree

4. I can interpret the p value for a given result

1	2	3	4	5
No		Fairly		Confidently

5. I can assess the soundness of a statistical method used in research

1	2	3	4	5
No		Fairly		Confidently

6. I can interpret the results of a statistical analysis reported in journal articles

1	2	3	4	5
No		Fairly		Confidently

For questions 7-20 please choose the best answer

7. A study wishes to assess dental characteristics in an orthodontic clinic population. Which of the following variables describes the appropriate measurement scale or type?
Fill in each blank below with your answer. Use each letter as many times as is appropriate
A. discrete
B. dichotomous
C. ordinal
D. nominal
E. continuous
a. _____ Age at first visit in years
b. _____ Type of orthodontic problem classified as Angle class I, class II, and class III
c. _____ Orthodontic treatment need classified as present or absent

8. To determine if eruption sequencing is associated with lower incisor crowding, data from 100 orthodontic patients with lower arch crowding were collected. The dental charts of these patients were then reviewed to determine whether unusual eruption patterns were observed. This study type is known as:
a. Cross-sectional
b. Case-control
c. Retrospective cohort
d. Randomized clinical trial

9. The results of several clinical studies are combined into a summary comparison of the association between type of bonding agent and orthodontic bracket adherence. This summary is best described as:
a. Decision analysis
b. Correlation analysis
c. Matched analysis
d. Meta-analysis

10. A randomized clinical trial was designed to compare two different treatment approaches for palatal expansion. The purpose of randomization in this study was to:
a. Select a representative study sample
b. Decrease the likelihood that observed outcome differences are due to chance
c. Obtain treatment groups of equal size
d. Obtain treatment groups with comparable baseline prognosis

11. Any systematic error in the design, conduct or analysis of a study that results in a mistaken estimate of an exposure's effect on the risk of disease is called:
a. Interaction
b. Bias
c. Misclassification
d. Stratification

12. In a clinical study, the age of the orthodontic patients was 11 ± 2 years (mean ± standard deviation). Which of the following is the most correct?
a. Approximately 95% of the patients were aged between 7 and 15 years
b. Most of the patients were aged 11 years; the remainder was aged between 9 and 13 years
c. It is 95% certain that the true mean lies within the interval of 7-15 years
d. No patients were younger than 7 or older than 15 years

13. The purpose of a double-blind orthodontic trial is to:
a. Reduce the effect of sampling variation
b. Achieve comparability of untreated and treated participants
c. Avoid observer and subject bias
d- Avoid observer bias and sampling variation

14. Characteristics of the null hypothesis include:
a. Is a statement of no difference between/among groups
b. Is a statement of difference between/among groups
c. If the null hypothesis is rejected, there is no difference
d. If the null hypothesis is accepted, there is difference

15. A case control investigation explores risk factors for lower incisor crowding. To employ parametric methods of statistical analysis the data must be:
a. Age-matched
b. Normally distributed
c. Nominal
d. Linear

16. In a randomized clinical trial of the use of aspirin and placebo to prevent mild post banding pain, 47% of the patients receiving aspirin and 48% of those receiving placebo reported pain. In reporting this overall finding the authors stated that p>.05. This means:
a. The chance is 95% that the study is correct
b. The chances are greater than 1 in 20 that a difference would be found again if the study were repeated
d. The probability is less that 1 in 20 that a difference this large could occur by chance alone
d. The probability is greater than 1 in 20 that a difference large could occur by chance alone

17. In the same randomized clinical trial the researchers wished to assess further if there were any differences between groups over time with respect to the duration of pain while controlling for other potential confounders. What analytic method would be the most appropriate in assessing their question?
a. Chi-square test
b. Kaplan-Meier analysis
c. Cox proportional hazard regression
d. Linear regression

18. A prospective study investigated new caries development, dietary habits and oral hygiene habits among orthodontic adolescents. Match the appropriate analytic method for each of the following hypotheses.
Fill in each blank below with your answer. Use each letter as many times as is appropriate
A. T-test
B. Chi-square test
C. ANOVA
D. Logistic regression
a. _______ Mean daily sugar intake does not vary across 3 groups of decay (i.e. absent, moderate, severe)
b._______ Use of dental floss does not vary across 3 groups of decay (i.e. absent, moderate, severe)
c._______ Mean daily sugar intake is the same for those with decay development as compared to those with no decay

19. A case control study investigated the possible relationship between thumb sucking and orthodontic treatment need. If the estimated odds ratio for treatment was 1.5 in the presence of habit compared to the absence, with a 95% confidence interval of (1.1, 2.2), it can be inferred that there is:
a. A biological plausible relationship
b. A clinically important finding
c. A statistically significant result
d. A statistically non significant result

20. In the previous case control study, information on sucking habit was based on child's self-report. If exposure information could also be obtained from an independent source (such as dental records, or reports from parents), then the agreement between these two methods could be compared. Which of the following measures would be most appropriate to quantify the reliability between the two methods?

a. A kappa coefficient
b. Correlation coefficient of reproducibility
c. Intraclass correlation coefficient
d. Product-moment correlation

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