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Influence of Orthodontist's Gender and Experience on the Perception of Dentoskeletal Parameters Using Cephalometric Radiographs: A Questionnaire Study

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Abstract

AIM: The aim of this study was to evaluate the influence of orthodontist's gender and experience on the perception of dentoskeletal parameters through cephalometric radiographs.

METHODS: An online survey was developed using six laterals cephalometric radiographs. The survey included questions about clinicians' demographics as well as questions about the selected radiographs. The survey was distributed through Egyptian association of orthodontist's partner to 200 members.

RESULTS: Comparison between orthodontists with three levels of experience showed that there was a statistically significant difference between the three groups regarding total score of conformity of eyeball tracing with digital tracing results (p = 0.004, effect size = 0.085). Pair-wise comparisons revealed that orthodontists with more than 10 years of experience showed the statistically significantly highest median score. There was no statistically significant difference between orthodontists with experience <5 years and those with 5–10 years of experience; both showed statistically significantly lower median scores.

CONCLUSION: Orthodontists with more than 10 years of experience showed higher prevalence of perception of dentoskeletal parameters on lateral cephalometric radiographs than the less experienced groups. No association was found between clinician's gender and perception of dentoskeletal parameters.

Introduction

Successful orthodontic treatment begins with the correct diagnosis. Many different factors play a role in the treatment planning process and they vary greatly from one patient to another and from one orthodontist to another. Clinicians' gender and experiences are perceived as central factors that play a substantial role in diagnosis and treatment planning [1]. The significance of clinician's experience becomes apparent when different orthodontists are given the same patient scenario to evaluate. While different philosophies have developed over the years, the reason behind the inconsistencies in diagnosis for borderline cases is still unclear [2].

Cephalometric radiography analysis is considered to be part of the "gold" standard for diagnosis at the start of orthodontic treatment together with dental casts, intra- and extra-oral photographs, and panoramic radiographs [3].

Literature on what orthodontist characteristics may affect case perception, diagnosis, and treatment decisions is limited. The few studies that have looked at which clinician's traits influence the treatment decision were usually done as part of larger studies focusing on patient differences. The data from these few studies were conflicting. Some have discovered an association between clinicians' gender and experience with extraction treatment decisions while others did not find any relationship between the two. Some has attributed the differences among clinicians to either judgmental or perceptual variations [1].

It was reported that perceptual differences result from two people interpreting the same thing differently while judgmental variations were seen when two people agree on what they see, but disagree on the treatment. Clinician's past experiences can influence both the perceptual and the judgmental aspects of the decision-making process. The influence of clinician's educational background and philosophy, gender, and level of experience in diagnosis and treatment planning cannot be ignored. There is a paucity of data in literature concerning influence of orthodontist's gender and experience on the perception of dentoskeletal parameters. Therefore, this study was conducted to investigate this issue.

The null hypothesis for the current study was that there is no difference between orthodontists of different level of experience as far as perception of dentoskeletal parameter on lateral cephalometric radiographs.

Materials and Methods

The study was performed in the outpatient clinic of the Orthodontic Department in the Faculty of Oral and Dental medicine of the Future University in Egypt. Fifty lateral cephalometric radiographs were collected randomly from Orthodontic Department Future University in Egypt and stored in computer database then imported to the digital cephalometric analysis software (AudaxCeph advantage, 4.1.2.3052). Before digital tracing of landmarks with AudaxCeph, the films were calibrated by digitizing two points on the ruler within the digital cassette. Variables were automatically generated by the program once a set of landmarks have been digitized. Digital tracings and measurements were performed by single orthodontist 4 times and the mean of reading of the 4 times for each radiograph was considered as golden standard for that case table (Tables 1-6). The golden standard tracing of the cases was given score [1], while incorrect tracing was recorded as score [0]. If the orthodontist's eyeballs tracing was the same as golden standard score, so he/she was given score 1 and if it was incorrect, he/she was given score 0. The collected radiographs were categorized into three groups, Group 1: Included records of patients with Class I dentoskeletal relation, Group 2: Included records of patients with Class II dentoskeletal relation, and Group 3: Included records of patients with Class III dentoskeletal relation.

Out of 50 collected radiographs, six lateral radiographs were selected with the best patient orientation, exposure, and printing quality. Each group included two lateral cephalometric radiographs, one with horizontal growth pattern and the second with vertical growth pattern (Figures 1-6)

These radiographs were chosen by the coauthor of this study. Inclusion criteria for radiographs were as follows: Orthodontic patients (from 10 to 30 years old), orthodontic patients with skeletal Class I, II, and III and good quality radiographs without any defect, radiographs with correct head position, good contrast, magnification ratio 1:1, and patient biting in occlusion (maximum intercuspation).

The electronic survey was developed using SurveyMonkey®. The questionnaire was consisted of two sections. Section one included demographic data related to the participant orthodontists including years of experience, gender, and place of education. The second section included patient's records (six cases) to be evaluated.

The questionnaire was distributed through Egyptian association of orthodontist's partner to 200 members, 105 have responded and agreed to participate in this research. Each clinician was required to answer section 1 and the go to section 2.

Table 1: The cephalometric digital tracing results for case (1)

Variable	1st tracing	2nd tracing	3rd tracing	4th tracing	Mean	Egyptian norms
SNA	87.5	87	89	88.3	87.7	83° [±3]
SNB	90	89	88	88.4	88.8	80° [±3]
ANB	−1	−1.6	−1	−1.1	−1.1	3° [±2]
SN/PP	10	10.7	8.3	9	9.5	8.5° [±4]
SN/Man	22.8	19.2	24	22.5	22.1	33° [±5]
U1/PP	132.4	131	128	130	127	114° [±4]
L1/Man	89	94.4	90.5	91	91.2	95° [±6]
U1/L1	110	111	125	111	114.2	126° [±7]
Nasolabial angle [Cm-Sn-Ls°]	106	104	103	107	105	104° [±10]
Facial convexity angle [G-Sn-Pg]	175	176	174.2	175	175	166° [±5]

Table 2: The cephalometric digital tracing results for case (2).

Variable	1st tracing	2nd tracing	3rd tracing	4th tracing	Mean	Egyptian norms
SNA	84	83	82.7	83.7	83.3	83° [±3]
SNB	80.2	80	80.4	80.6	80.3	80° [±3]
ANB	4.4	4	3.1	4	3.8	3° [±2]
SN/PP	2.6	3.7	2.2	2.5	2.3	8.5° [±4]
SN/Man	26	26.5	26	26.3	26.2	33° [±5]
U1/PP	113	113.7	113	115	113.6	114° [±4]
L1/Man	98	97	96	99	97.5	95° [±6]
U1/L1	127	125.4	126	121	124.8	126° [±7]
Nasolabial angle [Cm-Sn-Ls°]	100	99	104	100.4	100.8	104° [±10]
Facial convexity angle [G-Sn-Pg]	171	170	127.4	170	171	166° [±5]

Table 3: The cephalometric digital tracing results for case (3)

Variable	1st tracing	2nd tracing	3rd tracing	4th tracing	Mean	Egyptian norms
SNA	91	90	90.3	90.5	90.4	83° [±3]
SNB	81	81	80.3	80.9	80.8	80° [±3]
ANB	10	9	10	9.7	9.6	3° [±2]
SN/PP	3.5	3	3.4	3.2	3.3	8.5° [±4]
SN/Man	26.3	26	26.5	26.1	26.2	33° [±5]
U1/PP	119.8	120	121	120.1	120	114° [±4]
L1/Man	104.7	117	103	105	104	95° [±6]
U1/L1	112	111	112.9	111.5	111.8	126° [±7]
Nasolabial angle [Cm-Sn-Ls°]	84	83	86	85	84.5	104° [±10]
Facial convexity angle [G-Sn-Pg]	162	163	163	162	162.5	166° [±5]

Table 4: The cephalometric digital tracing results for case (4)

Variable	1st tracing	2nd tracing	3rd tracing	4th tracing	Mean	Egyptian norms
SNA	77.6	79	75.4	78.06	78.3	83° [±3]
SNB	75.5	78	78	76.19	76.9	80° [±3]
ANB	2.1	1	0.4	2	1.4	3° [±2]
SN/PP	12	11	11.5	11.7	11.5	8.5° [±4]
SN/Man	42	41.5	40	41.6	41.3	33° [±5]
U1/PP	125	123	120.5	126	123.6	114° [±4]
L1/Man	104	99	101	101	101.3	95° [±6]
U1/L1	106	107	110	103	106.5	126° [±7]
Nasolabial angle [Cm-Sn-Ls°]	109	112	115	114	112	104° [±10]
Facial convexity angle [G-Sn-Pg]	165	164.7	163.7	162	163.8	166° [±5]

Table 5: The cephalometric digital tracing results for case (5)

Variable	1st tracing	2nd tracing	3rd tracing	4th tracing	Mean	Egyptian norms
SNA	75	80	74.9	75.2	76.3	83° [±3]
SNB	69	73	68.8	69.3	70	80° [±3]
ANB	6	7	6.1	5.9	6.3	3° [±2]
SN/PP	6	7.6	7.6	6.7	6.9	8.5° [±4]
SN/Man	38.5	39	40.4	40.1	39.5	33° [±5]
U1/PP	115	114.7	113	115	114.5	114° [±4]
L1/Man	97.5	95	93	93.1	94.65	95° [±6]
U1/L1	115	119	118	118.2	117.6	126° [±7]
Nasolabial angle [Cm-Sn-Ls°]	95	94	100	96	96.2	104° [±10]
Facial convexity angle [G-Sn-Pg]	164.3	163	164	164.3	163.9	166° [±5]

Table 6: The cephalometric digital tracing results for case (6)

Variable	1st tracing	2nd tracing	3rd tracing	4th tracing	Mean	Egyptian norms
SNA	79	79	78.8	78.5	78.8	83° [±3]
SNB	80	80.2	80	80.3	80.1	80° [±3]
ANB	−1	−1.2	−1.2	−1.8	−1.3	3° [±2]
SN/PP	11.5	11	11.8	11.5	11.45	8.5° [±4]
SN/Man	39.7	39.5	40	40	39.8	33° [±5]
U1/PP	109	108	109	108.7	108.8	114° [±4]
L1/Man	89	88.4	88	88	88.35	95° [±6]
U1/L1	135	135.4	135.6	134.5	135.1	126° [±7]
Nasolabial angle [Cm-Sn-Ls°]	93	93.2	93.8	93.5	93.4	104° [±10]
Facial convexity angle [G-Sn-Pg]	177	176	175	177.2	176.3	166° [±5]

Figure 1: *Case (1) skeletal Class III with horizontal facial pattern.*

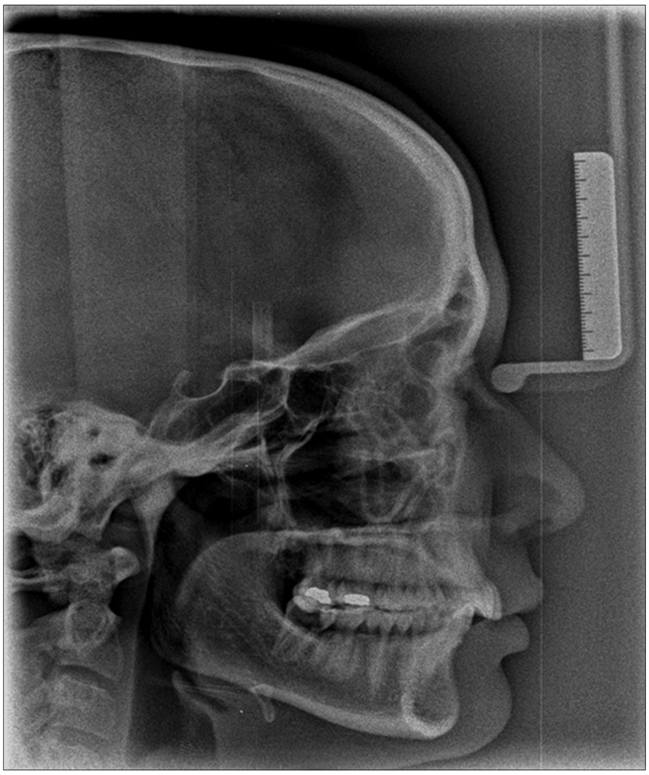

Figure 2: Case (2) skeletal Class I with horizontal facial pattern.

Accordingly, the recruited sample was 105 orthodontists divided equally into three groups. Group 1: Included orthodontists with more than 10 years of experience, Group 2: Included orthodontists with 5–10 years of experience, and Group 3: Included orthodontists with <5 years of experience.

All orthodontists were asked about 8 items for each case skeletal class, facial pattern, upper incisor

Figure 3: *Case (3) skeletal Class II with horizontal facial pattern.*

inclination, lower incisor inclination, AP maxillary position, AP mandibular position, nasolabial angle, and facial profile. Then, the results were sent to first author through e-mail and then collected together for statistical analysis.

Figure 4: Case (4) skeletal Class I with vertical facial pattern.

Figure 5: *Case (5) skeletal Class II with vertical facial pattern.*

Sample size

The power analysis used in this study was based on the results of Niousha *et al*. [2]. Sample size of 35 orthodontists per group was needed to detect a

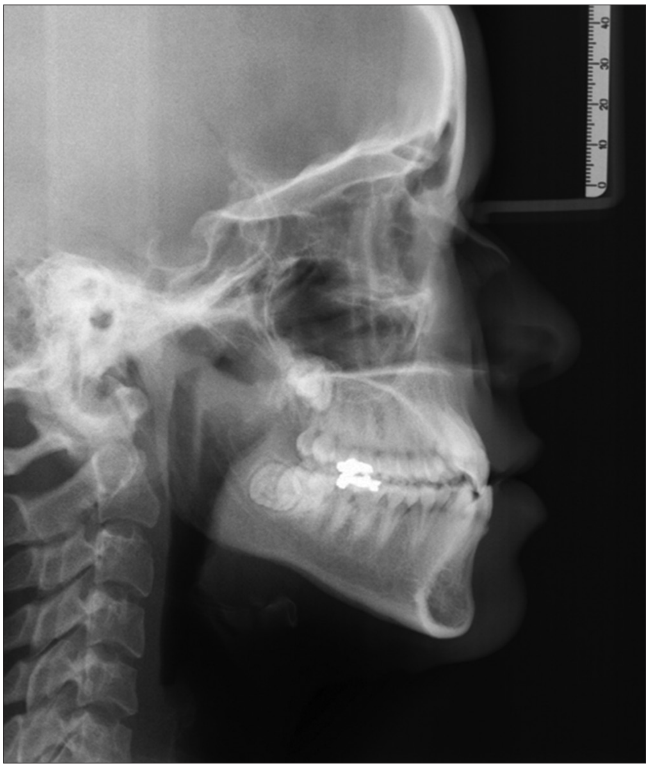

Figure 6: *Case (6) skeletal Class III with vertical facial pattern.*

difference of 20% between any of the three different experience level groups (<5 years, 5–10 years, and more than 10 years of experience) and the golden reference assuming a 0.05 significance level and 80% power.

Statistical analysis

Qualitative data were presented as frequencies and percentages. Quantitative data were presented as median, range, mean, and standard deviation values. Chi-square test or Fisher's exact test (when more than 20% of the cells have expected frequencies <5) was used for comparisons regarding qualitative data. Kruskal–Wallis test was used to compare between scores of orthodontists with different years of experience. Dunn's test was used for pair-wise comparisons when Kruskal–Wallis test is significant. Mann–Whitney U-test was used to compare between scores of female and male orthodontists.

The significance level was set at $p \leq 0.05$. Statistical analysis was performed with IBM® SPSS® Statistics Version 20 for Windows.

Results

Demographic data

The present study was conducted on 105 orthodontists; 69 males (65.7%) and 36 females (34.3%). Thirty-six orthodontists (34.3%) teach in a graduate program while 69 orthodontists (65.7%) were private practices.

Comparison between tracing behaviors of orthodontists with different years of experience

There was a statistically significant difference between percentages of traced cases in the three groups ($p < 0.001$, effect size = 0.430). Orthodontists with more than 10 years of experience reported that the percentage of cases traced in their practices was between 0 and 25%. On the other hand, the orthodontists with 5–10 years of experience reported that 50% of the cases were traced in their practices while orthodontists with <5 years of experience showed higher prevalence of tracing (100%) of the cases (Table 7).

There was a statistically significant difference between percentages of requesting pre-treatment lateral cephalometric radiographs in the three groups ($p < 0.001$, effect size = 0.395). Orthodontists with more than 10 years of experience reported percentage of requesting pre-treatment lateral cephalometric radiographs between 25 and 50% of the cases.On the other hand, the orthodontists with 5–10 years of experience reported that 75% of the cases were requested pre-treatment lateral cephalometric radiographs while orthodontists with <5 years of experience showed higher prevalence of requesting pre-treatment lateral cephalometric radiographs (100%) of the cases (Table 7).

Orthodontists with more than 10 years of experience reported percentage of requesting post-treatment lateral cephalometric radiographs between 0 and 25% of the cases. On the other hand, the orthodontists with 5–10 years of experience reported that 50% of the cases were requested post-treatment lateral cephalometric radiograph while orthodontists with <5 years of experience showed higher prevalence of requesting post-treatment lateral cephalometric radiographs between 75 and 100% of the cases (Table 7).

Comparison between correct tracing of the six cases by orthodontists with different years of experience

Participants in the present study analyzed six cases with eight points for each case so that the total score was 48 points.

- Skeletal class: There was a statistically significant difference between the three groups regarding correct identification of the skeletal class ($p < 0.001$, effect size = 0.374).

Table 7: Descriptive statistics and results of Fisher's exact test for comparison between tracing behaviors of orthodontists with different years of experience

	<5 years (n = 36)		5–10 years (n = 36)		More than 10 years (n = 36)		p-value (between groups)	Effect size (v)
	N	%	N	%	N	%		
Tracing cases (%)							<0.001*	0.430
0%	1	2.8	1	2.8	3	8.3		
25%	2	5.6	2	5.6	13	36.1		
50%	4	11.1	13	36.1	11	30.6		
75%	6	16.7	6	16.7	6	16.7		
100%	23	63.9	4	11.1	3	8.3		
Request pre-operative lateral cephalometric radiograph							<0.001*	0.395
25%	0	0	4	11.1	7	19.4		
50%	1	2.8	5	13.9	9	25		
75%	3	8.3	14	38.9	8	22.2		
100%	32	88.9	13	36.1	12	33.3		
Request post-operative lateral cephalometric radiograph							<0.001*	0.365
0%	4	11.1	3	8.3	5	13.9		
25%	1	2.8	14	38.9	18	50		
50%	2	5.6	3	8.3	3	8.3		
75%	7	19.4	5	13.9	6	16.7		
100%	22	61.1	11	30.6	4	11.1		

Table 8: Descriptive statistics and results of Chi-square test or Fisher’s exact test for comparison between correct tracing of the six cases by orthodontists with different years of experience

Correct tracing (out of six cases)	<5 years (n = 36)		5–10 years (n = 36)		More than 10 years (n = 36)		p-value (between groups)	Effect size (v)
	N	%	N	%	N	%		
Skeletal class							<0.001*	0.374
2/6	0	0	2	5.6	1	2.8		
3/6	4	11.1	14	38.9	1	2.8		
4/6	16	44.4	9	25	8	22.2		
5/6	14	38.9	10	27.8	18	50		
6/6	2	5.6	1	2.8	8	22.2		
Maxillary position							0.089	0.288
0/6	2	5.6	0	0	0	0		
1/6	3	8.3	9	25	2	5.6		
2/6	13	36.1	13	36.1	15	41.7		
3/6	15	41.7	14	38.9	16	44.4		
4/6	3	8.3	0	0	1	2.8		
6/6	0	0	0	0	2	5.6		
Mandibular position							0.370	0.234
1/6	2	5.6	2	5.6	2	5.6		
2/6	9	25	12	33.3	7	19.4		
3/6	12	33.3	15	41.7	16	44.4		
4/6	12	33.3	4	11.1	6	16.7		
5/6	1	2.8	3	8.3	3	8.3		
6/6	0	0	0	0	2	5.6		
Growth pattern							0.002*	0.352
1/6	0	0	2	5.6	0	0		
2/6	8	22.2	8	22.2	7	19.4		
3/6	9	25	17	47.2	8	22.2		
4/6	18	50	5	13.9	10	27.8		
5/6	0	0	3	8.3	6	16.7		
6/6	1	2.8	1	2.8	5	13.9		
Upper incisor inclination							0.169	0.226
2/6	2	5.6	0	0	3	8.3		
3/6	18	50	11	30.6	9	25		
4/6	11	30.6	18	50	14	38.9		
5/6	5	13.9	5	13.9	8	22.2		
6/6	0	0	2	5.6	2	5.6		
Lower incisor inclination							0.118	0.286
1/6	3	8.3	0	0	0	0		
2/6	4	11.1	3	8.3	2	5.6		
3/6	10	27.8	11	30.6	12	33.3		
4/6	16	44.4	20	55.6	12	33.3		
5/6	3	8.3	2	5.6	8	22.2		
6/6	0	0	0	0	2	5.6		
Nasolabial angle							0.257	0.255
1/6	3	8.3	1	2.8	1	2.8		
2/6	11	30.6	6	16.7	12	33.3		
3/6	12	33.3	16	44.4	10	27.8		
4/6	9	25	8	22.2	10	27.8		
5/6	1	2.8	5	13.9	1	2.8		
6/6	0	0	0	0	2	5.6		
Facial profile							0.102	0.265
0/6	13	36.1	13	36.1	10	27.8		
1/6	9	25	12	33.3	7	19.4		
2/6	7	19.4	9	25	11	30.6		
3/6	4	11.1	0	0	6	16.7		
4/6	3	8.3	2	5.6	0	0		
6/6	0	0	0	0	2	5.6		

Orthodontists with more than 10 years of experience showed higher prevalence of correct eyeball tracing results of 5/6 and 6/6 cases?.

- Maxillary position: There was no statistically significant difference between the three groups regarding correct eyeball tracing results of maxillary position (p = 0.089, effect size = 0.288).
- Mandibular position: There was no statistically significant difference between the three groups regarding correct eyeball tracing results of mandibular position (p = 0.370, effect size = 0.234).
- Growth pattern: There was a statistically significant difference between the three groups regarding correct identification of the growth pattern (p = 0.002, effect size = 0.352). Orthodontists with more than 10 years of experience showed higher prevalence of correct t eyeball tracing results of 5/6 and 6/6 cases?.
- Upper incisor inclination: There was no statistically significant difference between the three groups regarding correct tracing of upper incisor inclination (p = 0.169, effect size = 0.226).
- Lower incisor inclination: There was no statistically significant difference between the three groups regarding correct eyeball tracing results of lower incisor inclination (p = 0.118, effect size = 0.286).
- Nasolabial angle: There was no statistically significant difference between the three groups regarding correct eyeball tracing results of nasolabial angle (p = 0.257, effect size = 0.255).
- Facial profile: There was no statistically significant difference between the three groups regarding correct eyeball tracing results of facial profile (p = 0.102, effect size = 0.265).

Total score

There was a statistically significant difference between the three groups regarding total score of score of conformity of eyeball tracing with digital tracing results (p = 0.004, effect size = 0.085). Pair-wise comparisons revealed that orthodontists with more than 10 years of experience showed the statistically significantly highest median score. There was no statistically significant difference between orthodontists with experience <5 years and those with 5–10 years of experience; both showed statistically significantly lower median scores.

Comparison between tracing behaviors of female and male orthodontists

There was no statistically significant difference between percentages of in practice traced cases by female and male orthodontists (p = 0.663, effect size = 0.155) (Table 9).

Table 9: Descriptive statistics and results of Fisher’s exact test for comparison between tracing behaviors of female and male orthodontists

	Females (n = 36)		Males (n = 69)		p-value (between groups)	Effect size (v)
	n	%	n	%		
Tracing cases (%)					0.663	0.155
0%	1	2.7	4	5.6		
25%	13	35.1	17	23.9		
50%	7	18.9	20	28.2		
75%	9	24.3	19	26.8		
100%	7	18.9	11	15.5		
Request pre-operative lateral cephalometric radiograph					0.301	0.184
25%	3	8.1	8	11.3		
50%	6	16.2	9	12.7		
75%	5	13.5	20	28.2		
100%	23	62.2	34	47.9		
Request post-operative lateral cephalometric radiograph					0.502	0.178
0%	2	5.4	10	14.1		
25%	10	27	23	32.4		
50%	4	10.8	4	5.6		
75%	6	16.2	12	16.9		
100%	15	40.5	22	31		

There was no statistically significant difference between percentages of requesting pre-treatment lateral cephalometric radiographs by female and male orthodontists (p = 0.301, effect size = 0.184) (Table 9).

There was no statistically significant difference between percentages of requesting post-treatment lateral cephalometric radiographs by female and male orthodontists (p = 0.502, effect size = 0.178) (Table 9).

Comparison between correct tracing scores of the six cases by orthodontists with different years of experience

There was no statistically significant difference between females and males regarding dentoskeletal and soft-tissue parameter that evaluated in this study (Table 10).

Table 10: Descriptive statistics and results of Chi-square test or Fisher's exact test for comparison between correct tracing of the six cases by female and male orthodontists

Correct tracing (Out of 6 cases)	Females (n = 36) N	%	Males (n = 69) N	%	p-value (between groups)	Effect Size (v)
Skeletal class					0.331	0.203
2/6	1	2.7	2	2.8		
3/6	4	10.8	15	21.1		
4/6	9	24.3	24	33.8		
5/6	19	51.4	23	32.4		
6/6	4	10.8	7	9.9		
Maxillary position					0.841	0.127
0/6	1	2.7	1	1.4		
1/6	3	8.1	11	15.5		
2/6	15	40.5	26	36.6		
3/6	16	43.2	29	40.8		
4/6	1	2.7	3	4.2		
6/6	1	2.7	1	1.4		
Mandibular position					0.789	0.150
1/6	1	2.7	5	7		
2/6	12	32.4	16	22.5		
3/6	13	35.1	30	42.3		
4/6	8	21.6	14	19.7		
5/6	2	5.4	5	7		
6/6	1	2.7	1	1.4		
Growth pattern					0.387	0.210
1/6	1	2.7	1	1.4		
2/6	10	27	13	18.3		
3/6	9	24.3	25	35.2		
4/6	9	24.3	24	33.8		
5/6	5	13.5	4	5.6		
6/6	3	8.1	4	5.6		
Upper incisor inclination					0.646	0.155
2/6	2	5.4	3	4.2		
3/6	12	32.4	26	36.6		
4/6	18	48.6	25	35.2		
5/6	4	10.8	14	19.7		
6/6	1	2.7	3	4.2		
Lower incisor inclination					0.807	0.146
1/6	2	5.4	1	1.4		
2/6	2	5.4	7	9.9		
3/6	11	29.7	22	31		
4/6	17	45.9	31	43.7		
5/6	4	10.8	9	12.7		
6/6	1	2.7	1	1.4		
Nasolabial angle					0.184	0.250
1/6	3	8.1	2	2.8		
2/6	9	24.3	20	28.2		
3/6	16	43.2	22	31		
4/6	8	21.6	19	26.8		
5/6	0	0	7	9.9		
6/6	1	2.7	1	1.4		
Facial profile					0.333	0.228
0/6	13	35.1	23	32.4		
1/6	13	35.1	15	21.1		
2/6	7	18.9	20	28.2		
3/6	3	8.1	7	9.9		
4/6	0	0	5	7		
6/6	1	2.7	1	1.4		

Discussion

Diagnosis and treatment planning carry great significance in orthodontic treatment. Various factors affect them and they vary considerably from one orthodontist to another, among these factors are the clinician's trait and experience. One of the major problems in orthodontic diagnosis and assessment of orthodontic treatment need is that an orthodontic anomaly is not a disease with a series of well-recognized symptoms it is a variation from the norm in which treatment is based on the evaluation of certain dental characteristics in an otherwise healthy patient [6].

The importance of clinician's trait becomes evident when different orthodontists are given a patient scenario of a border line case. Some clinicians choose to extract while others option for non-extraction [2].

The concerns about treatment quality and reducing treatment costs has been an important subject of current scientific discussion in orthodontics over the last decade and a half [7].

Examinations concerning the prevalence or necessity of malocclusion treatment often have contradictory results. This is partly due to differing attempts and methods of examination but also to variations between the examiners [8].

With the advent of cephalometric head films, various analyses were developed in an attempt to qualitative and quantitative esthetic facial profiles.

The cephalometric analysis has been used as the standard method because of the ease of procuring, measuring, and comparing (superimposition) hard tissue structures. These perceived advantages of cephalometric analysis have led to heavy reliance on cephalometry in all aspects of orthodontic treatment [9].

The purpose of this study was to evaluate the influence of orthodontist's gender and level of experience on the perception of dentoskeletal parameters. Six cases for evaluation were included in this study which were distributed among 105 orthodontists with different level of experience to assist their perception to different dentoskeletal parameters as stated in the objective for current study.

The cases were utilized from the records of patients in the Orthodontic Department of the Faculty of Oral and Dental Medicine at Future University in Egypt. This study was approved by the ethical committee of the faculty of dental medicine, Future University in Egypt.

The variables used in this study were commonly used cephalometric variables for orthodontic diagnosis, treatment planning, and evaluation of treatment results. Steiner's, Wit's, Tweed's, McNamara, Rakosi, and

Jarabaks analyses are commonly used for orthognathic surgical planning, hard tissue, dental variables, and soft-tissue variables.

The accuracy of cephalometric analysis is important in the diagnosis of malocclusion and for treatment planning. Rapid advances in computer technology have led to increasing use of digital systems in cephalometry. The most important criteria for using mechanical or digital method are that it should be accurate, precise, and must show a high rate of reproducibility in both tracing and analysis [11]. Studies comparing digital and manual cephalometric analysis methods revealed that computer-assisted cephalometric analysis yielded comparable results to the manual method [7], [11].

Digital cephalograms obtained by various digitization processes or digital radiography. The clinician needs only to identify the landmarks and let the program calculate the cephalometric measurements [12].

There are many errors with the traditional method arise from radiographic acquisition, landmark identification, measurement, and observer experience [13], [14], [15]. A previous study revealed that computer-aided cephalometric analysis did not introduce more measurement errors when localization of the landmarks was determined by hand [16]. A more recent study concluded that the differences between all skeletal and dental measurements derived from the landmarks on original cephalometric radiographs and those identified on their digitized counterparts were statistically significant but clinically acceptable [12].

Landmark identification is as important as the tracing method itself because interoperator error has in general been found to be greater than intraoperator error as indicated by Sayinsu *et al*. [17]. To avoid such errors, measurements were carried out by single orthodontist (main investigator EE). The identification process was performed with low luminosity and under the same conditions, as recommended by Houston [18].

The electronic survey was developed using SurveyMonkey®. The advantages of online surveys are that being faster, cheaper, easy to use, more accurate, more quick, more selective, and more flexible [19].

The present study was conducted on 105 orthodontists; 69 males (65.7%) and 36 females (34.3%). Thirty-six orthodontists (34.3%) teach in a graduate program while 69 orthodontists (65.7%) do not teach in any graduate programs. Exploring the association between the perception of dentoskeletal parameters and experience a clear trend was observed. Orthodontists with more than 10 years of experience showed higher prevalence of correct eyeballs tracing more than orthodontists with less experience hence were the idea of distributing the sample into three groups with different years of experience.

The result of this study indicated that there could be an association between clinician's experience and the perception of dentoskeletal parameters. A few other studies have evaluated the influence of the clinician's experience on extraction treatment decision-making. In all three scenarios, clinicians with more than 15 years of experience choose an extraction treatment option almost twice more often than those with less experience. Baelum *et al*. [1] have found that orthodontic experience was the only factor that could be correlated with differences in treatment plans by different orthodontists.

Niousha *et al*. [2] have found that orthodontics with more than 15 years of experience choose an extraction treatment option more frequently than clinician's with <5 or 15 years of experience so it is reasonable to assume that orthodontists' past experiences may play a role in their treatment decisions.

The results of this study suggested that gender does not play a role perception of dentoskeletal parameters. In every case, there was no statistically significant difference between females and males regarding correct identification of the skeletal class, growth pattern, lower incisor inclination, maxillary position, upper incisor inclination, mandibular position, nasolabial angle, and facial profile. The same results were achieved when our data were stratified based on gender and experience. Baelum *et al*. [1] have also shown that gender does not influence treatment decision-making. Niousha *et al*. [2] in 2017 have found that there is no association between gender and place of education and the decision to extract in the selected borderline cases.

According to the results aforementioned, the experience plays an important role in perception of dentoskeletal parameters on lateral cephalometric radiographs. Orthodontist with more than 10 year of experience showed higher prevalence of perception of dentoskeletal parameters while there was no correlation between clinician's gender in perception of dentoskeletal parameters.

Conclusion

Orthodontists with more than 10 years of experience showed higher prevalence of perception of dentoskeletal parameters on lateral cephalometric radiographs than the less experienced groups. No association was found between clinician's gender and perception of dentoskeletal parameters.

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Appendix

Appendix1: Survey questions

Clinician' demographic questions:
1- What's your name?
2- What's your gender? A. Male B. Female
3- How many years have you practiced orthodontics? A. <5 years B. 5–10 years C. More than 10 years
4- What is the percentages of case you trace? A. 100% B. 75% C. 50% D. 25% E. 0%
5- What is the percentages of cases you requested pre-treatment lateral cephalometric radiograph? A. 100% B. 75% C. 50% D. 25% E. 0%
6- What is the percentages of cases you requested post-treatment lateral cephalometric radiograph? A. 100% B. 75% C. 50% D. 25% E. 0%
7- Do you currently teach in a graduate program? A. Yes B. No
8- Which orthodontic program did you attend?