



**Supplementary Table 1** Articles not included in the study and reason for exclusion

Study no.	Authors	Title
1	Rocha et al	Analysis of gingival margin esthetic clinical conditions by dental students
2	Orce-Romero et al	Do the smiles of the world's most influential individuals have common parameters?
3	Mokhtar et al	The perception of smile attractiveness among the Saudi population
4	Machado et al	Variations between maxillary central and lateral incisal edges and smile attractiveness
5	Pausch and Katsoulis	Gender-specific evaluation of variation of maxillary exposure when smiling
6	Wang et al	Esthetics and smile-related characteristics assessed by laypersons
7	Borges et al	Influence of different width/height ratio of maxillary anterior teeth in the attractiveness of gingival smiles
8	Zagar and Zlatarić	Influence of esthetic dental and facial measurements on the Caucasian patients' satisfaction
9	Crawford et al	Smile esthetics: the influence of posterior maxillary gingival margin position
10	Caramello et al	Influence of maxillary incisor level of exposure on the perception of dentofacial aesthetics among orthodontists and laypersons
11	Chotimah et al	Differences between male and female adolescents in the smile aesthetics perceptions regarding smile arc, gingival display, and buccal corridor
12	Rodríguez-Martínez et al	Effect of posterior gingival smile on the perception of smile esthetics
13	An et al	Comparing esthetic smile perceptions among laypersons with and without orthodontic treatment experience and dentists
14	Akyalcin et al	Analysis of smile esthetics in American Board of Orthodontic patients
15	Hu et al	Analysis of soft tissue display in Chinese subjects during an enjoyment smile
16	Cotrim et al	Perception of adults' smile esthetics among orthodontists, clinicians and laypeople
17	Sam et al	Comparison of gingival exposure during smile between different South Indian populations
18	Alhammadi et al	Perception of facial, dental, and smile esthetics by dental students
19	España et al	Smile esthetics from odontology students' perspectives
20	Al-Jabrah et al	Gender differences in the amount of gingival display during smiling using two intraoral dental biometric measurements
21	Van der Geld et al	Smile attractiveness. Self perception and influence on personality
22	Kau et al	Rating of smile attractiveness of patients finished to the American Board of Orthodontics standards
23	Hu et al	Analysis of soft tissue display during enjoyment smiling: part 1 – Caucasians
24	Kolte et al	Association of the gingival line angle with the gingival and interdental smile line: a gender based evaluation
25	Souccar et al	Smile dimensions in adult African American and Caucasian females and males
26	Pithon et al	Upper incisor exposure and aging: Perceptions of aesthetics in three age groups
27	Armalaitė et al	Smile aesthetics as perceived by dental students: a cross-sectional study

Citation	Reason for exclusion
Acta Odontol Latinoam 2011;24:279–282	Perception of laypersons' (ideal/range) not mentioned
J Oral Rehabil 2013;40:159–170	Perception of laypersons' (ideal/range) not mentioned
Clin Cosmet Investig Dent 2015;7:17–23	Perception of laypersons' (ideal/range) not mentioned
Am J Orthod Dentofacial Orthop 2016;150:425–435	Excessive gingival display not assessed independently
J Craniomaxillofac Surg 2017;45:913–920	Laypersons not included as evaluators
J Esthet Restor Dent 2018;30:136–145	Perception of laypersons' (ideal/range) not mentioned
Dental Press J Orthod 2012;17:115–122	Anterior excessive gingival display not evaluated
J Esthet Restor Dent 2011;23:12–20	Frontal photographs not used
J Prosthodont 2012;21:270–278	Anterior excessive gingival display not evaluated
J World Fed Orthodont 2015;4:108–113	Incisor exposure evaluated, but not excessive gingival display
J Int Dent Med Res 2017;10(special issue):481–485	Perception of laypersons' (ideal/range) not mentioned
Med Oral Patol Oral Cir Bucal 2014;19:e82–e87	Anterior excessive gingival display not evaluated
Korean J Orthod 2014;44:294–303	Anterior excessive gingival display not evaluated
Angle Orthod 2014;84:486–491	Perception of laypersons' (ideal/range) not mentioned
Quintessence Int 2012;43:105–110	Excessive gingival display not evaluated by laypersons Enjoyment smile shown, but no posed smile photographs
Dental Press J Orthod 2015;20:40–44	Fewer than 10 layperson evaluators
Drug Intervention Today 2018;10:880–882	Perception of laypersons' (ideal/range) not mentioned
J Esthet Restor Dent 2018;30:415–426	Laypersons not included as evaluators
Angle Orthod 2014;84:214–224	Laypersons not included as evaluators
J Prosthodont 2010;19:286–293	Perception of laypersons' (ideal/range) not mentioned
Angle Orthod 2007;77:759–765	Perception of laypersons' (ideal/range) not mentioned
J Orofac Orthop 2020;81:239–248	Perception of laypersons' (ideal/range) not mentioned
Int J Periodontics Restorative Dent 2013;33:e9–e15	Perception of laypersons' (ideal/range) not mentioned
J Esthet Restor Dent 2019;31:601–607	Perception of laypersons' (ideal/range) not mentioned
Orthod Craniofac Res 2019;22(suppl 1):186–191	Perception of laypersons' (ideal/range) not mentioned
J World Fed Orthod 2015;4:57–62	Incisor exposure evaluated, but not excessive gingival display
BMC Oral Health 2018;18:225. doi: 10.1186/s12903-018-0673-5	Laypersons not included as evaluators



**Supplementary Table 1, cont** Articles not included in the study and reason for exclusion

Study no.	Authors	Title
28	Van der Geld et al	Smile line assessment comparing quantitative measurement and visual estimation
29	Namratha et al	Comparative evaluation of upper lip length and the commissural height in Chennai population
30	Almanea et al	Perception of smile attractiveness among orthodontists, restorative dentists, and laypersons in Saudi Arabia
31	Hata and Arai	Dimensional analyses of frontal posed smile attractiveness in Japanese female patients
32	da Silva Barros et al	The ability of orthodontists and laypeople in the perception of gradual reduction of dentogingival exposure while smiling
33	Paula et al	Effect of anterior teeth display during smiling on the self-perceived impacts of malocclusion in adolescents
34	Golshah et al	Smile attractiveness of Persian women after orthodontic treatment
35	Zaaba and Pandian	Influence of lip height and incisal gingival height in relation to smile aesthetics in orthodontically treated individuals
36	Al-Habahbeh et al	The effect of gender on tooth and gingival display in the anterior region at rest and during smiling
37	Kapagiannidis et al	Teeth and gingival display in the premolar area during smiling in relation to gender and age
38	Cracel-Nogueira and Pinho	Assessment of the perception of smile esthetics by laypersons, dental students and dental practitioners
39	Farzanegan et al	Which has a greater influence on smile esthetics perception: teeth or lips?
40	Malhotra et al	Characterization of a posed smile and evaluation of facial attractiveness by panel perception and its correlation with hard and soft tissue
41	Koidou et al	Quantification of facial and smile esthetics
42	Sepolia et al	Visibility of gingiva – an important determinant for an esthetic smile
43	Kaya and Uyar	The impact of occlusal plane cant along with gingival display on smile attractiveness
44	Ayyildiz et al	Esthetic impact of gingival plastic surgery from the dentistry students' perspective
45	Suzuki et al	An evaluation of the influence of gingival display level in the smile esthetics
46	Ioi et al	Influence of gingival display on smile aesthetics in Japanese
47	Hu et al	Measurement and analysis of smile line of 62 Han-Chinese [in Chinese]
48	Cavalcanti et al	Esthetic perception of smiles with different gingival conditions
49	Bolas-Colvee et al	Relationship between perception of smile esthetics and orthodontic treatment in Spanish patients
50	Simões et al	Does the vertical position of maxillary central incisors in men influence smile esthetics perception?

Citation	Reason for exclusion
Am J Orthod Dentofacial Orthop 2011;139:174–180	Excessive gingival display not evaluated Raters evaluated the difference between posed and spontaneous smiles
J Adv Pharm Edu Res 2017;7:222–223	Lip length evaluated, but not excessive gingival display
J Conserv Dent 2019;22:69–75	Perception of laypersons' (ideal/range) not mentioned
Angle Orthod 2016;86:127–134	Laypersons not included as evaluators
Dental Press J Orthod 2012;17:81–86	Incisor exposure evaluated, but not excessive gingival display
Angle Orthod 2011;81:540–545	Perception of laypersons' (ideal/range) not mentioned
Am J Orthod Dentofacial Orthop 2020;158:75–83	Perception of laypersons' (ideal/range) not mentioned
Research J Pharm and Tech 2018;11:5581–5586	Layperson group not separately mentioned
Eur J Esthet Dent 2009;4:382–395	Perception of laypersons' (ideal/range) not mentioned
J Oral Rehabil 2005;32:830–837	Anterior excessive gingival display not evaluated
Int Orthod 2013;11:432–444	Perception of laypersons' (ideal/range) not mentioned
Iran J Otorhinolaryngol 2013;25:239–244	Perception of laypersons' (ideal/range) not mentioned
Orthodontics (Chic) 2012;13:34–45	Anterior excessive gingival display not evaluated
J Prosthet Dent 2018;119:270–277	Perception of laypersons' (ideal/range) not mentioned
J Indian Soc Periodontol 2014;18:488–492	Perception of laypersons' (ideal/range) not mentioned
Orthod Craniofac Res 2016;19:93–101	Excessive gingival display not assessed independently of other variables
Eur J Dent 2016;10:397–402	Laypersons not included as evaluators
Dental Press J Orthod 2011;16:37.e1–e10	Layperson data not presented separately
Eur J Orthodont 2010;32:633–637	Laypersons not included as evaluators
Zhonghua Kou Qiang Yi Xue Za Zhi 2011;46:660–664	Perception of laypersons' (ideal/range) not mentioned
Gen Dent 2019;67:66–70	Perception of laypersons' (ideal/range) not mentioned
PLoS One 2018;13:e0201102. doi: org/10.1371/journal.pone.0201102	Assessed excessive gingival display after an intervention
Am J Orthod Dentofacial Orthop 2019;156:485–492	Incisal step evaluated, but not excessive gingival display



Supplementary Table 2 Characteristics of the included studies

Study no.	Authors	Citation	Sample size	Evaluators: 1 = layperson 2 = dentist 3 = orthodontist 4 = other	Mean age (in years) of laypersons
1	Ioi et al <sup>5</sup>	J Esthet Restor Dent 2013;25:274–282	168	1, 3	Japanese (J): 21.5 ± 3.8 Korean (K): 22.2 ± 3.2
2	Talic et al <sup>18</sup>	Saudi Dent J 2013;25:13–21	30	1, 2	20 to 40
3	Sriphadungporn and Chamnannidiadha <sup>4</sup>	Prog Orthod 2017;18:8. doi: 10.1186/s40510-017-0162-4	240	1	Group 1: 15 to 29 Group 2: 36 to 52
4	Springer et al <sup>19</sup>	Am J Orthod Dentofacial Orthop 2011;139:e91–e101	541	1	18 to 72 (mean = 25)
5	Öz et al <sup>6</sup>	Turk J Orthod 2017;30:50–55	69	1, 2, 3	22.8 ± 3.7
6	Oliviera et al <sup>7</sup>	Int J Esthet Dent 2018;13:494–514	27	1, 2, 3	NM
7	Ousehal et al <sup>20</sup>	Saudi Dent J 2016;28:174–182	30	1, 2	NM
8	Guo et al <sup>21</sup>	J Craniofac Surg 2011;22:909–913	23	1, 2	25 to 30
9	Cracel-Nogueira and Pinho <sup>22</sup>	Int Orthod 2013;11:432–444	292	1, 2, 4 (4 = dental students)	23.7 ± 6.454
10	Oshagh et al <sup>23</sup>	Eur J Esthet Dent 2013;8:570–581	69	1, 2	NM
11	Geron and Atalia <sup>24</sup>	Angle Orthod 2005;75:778–784	100	1	Male = 31.4 Female = 32.1
12	Anwar and Fida <sup>25</sup>	J Coll Physicians Surg Pak 2012;22:375–380	25	1, 2, 3, 4 (4 = arts/fashion designers)	27.9 ± 3.2
13	Pinzan-Vercelino et al <sup>26</sup>	J Prosthet Dent 2020;123:314–321	31	1, 2, 3	34.7 ± 7.32
14	McLeod et al <sup>9</sup>	Angle Orthod 2011;81:198–205	103	1	NM
15	Al Taki et al <sup>27</sup>	Int J Dent 2017;2017:2637148. doi: 10.1155/2017/2637148	30	1, 2, 3	40.07 ± 15.07
16	Hunt et al <sup>28</sup>	Eur J Orthod 2002;24:199–204	120	1	19.8
17	Lima et al <sup>29</sup>	Am J Orthod Dentofacial Orthop 2019;155:224–233	24	1, 2, 3	Male = 46.5 Female = 33.5
18	Chang et al <sup>30</sup>	Am J Orthod Dentofacial Orthop 2011;140:e171–e180	576	1	> 18
19	Tosun and Kaya <sup>31</sup>	Am J Orthod Dentofacial Orthop 2020;157:340–347	105	1, 2, 3	33.6 ± 8.7
20	Pithon et al <sup>17</sup>	Oral Surg Oral Med Oral Pathol Oral Radiol 2013;115:448–454	50	1, 2, 3, 4 (4 = dental students)	16 to 45



Gender: 1 = male 2 = female	Which photo was used*	Alterations/modifications done on images for gingival display†	Increments of alteration of images	Scale for rating attractiveness	Strength of the scale used
1 = 69 (36J + 33K) 2 = 105 (66J + 39K)	1a	-5 to +5 mm	1 mm	VAS	50 mm
1 = 15 2 = 15	2a	0 to 5 mm	1 mm	VAS	100 mm
1 = 120 2 = 120	2a	-4 to +6 mm	2 mm	VAS	10 cm
1 = 51% 2 = 49%	2b	-6 to +2 mm	-	VAS	Sliding ruler
NM	2a	3 to +3 mm	1 mm	VAS	10 cm
NM	2b	No alterations	-	VAS	100 mm
NM	2a	0 to +5 mm	1 mm	VAS	150 mm
NM	2b	0 to +7 mm	1 mm	VAS	100 mm
NM	2a	0, 4, 9, -1, and -4 mm	-	VAS	0 to 10
1 = 48 2 = 26	1b	-3 to +3 mm	1.5 mm	Likert	1 to 5
1 = 50 2 = 50	1a	-2 to +3.3 mm	Teeth were moved digitally within the lip frame	Likert	1 to 10
1 = 13 2 = 12	1b	-2 to +4 mm	2 mm	VAS	1 to 5
1 = 14 2 = 17	2b	-5 to +5 mm	2 mm	VAS	100 mm
1 = 61 2 = 42	2a	-5.1 to +5.8 mm	-	Slider	-
1 > 2	1b	-4 to +4 mm	2 mm	Numerical rating scale	1 to 5
1 = 26 2 = 94	1b	-2 to +4 mm	1 mm	10-point numerical rating scale	1 to 10
1 = 8 2 = 16	1a	0 to 6 mm	1 mm	Likert	1 to 5
-	1a	-6 to +3 mm	-	Slider	-
1 = 45 2 = 60	2a	-2.5 to +2 mm	0.5 mm	VAS	100 mm
1 = 28 2 = 22	2a	0 to 4.5 mm removal of maxilla	0.5 mm	VAS	10 mm



Supplementary Table 2, cont Characteristics of the included studies

Study no.	Authors	Citation	Sample size	Evaluators: 1 = layperson 2 = dentist 3 = orthodontist 4 = other	Mean age (in years) of laypersons
21	Abu Alhajia et al <sup>32</sup>	Eur J Orthod 2011;33:450–456	200	1, 2, 3	26.5 ± 6.4
22	Saffarpour et al <sup>33</sup>	J Dent (Tehran) 2016;13:85–91	10	1, 2	-
23	Ngoc et al <sup>34</sup>	Int J Environ Res Public Health 2020;17;1638. doi: 10.3390/ijerph17051638	51	1, 2	-
24	Kumar et al <sup>35</sup>	Indian J Dent Res 2012;23:295. doi: 10.4103/0970-9290.100456	40	1, 2, 3	31.3
25	Kaya and Uyar <sup>16</sup>	Am J Orthod Dentofacial Orthop 2013;144:541–547	70	1, 2, 3	31.1
26	Geevarghese et al <sup>36</sup>	J Orthod Sci 2019;8:14. doi: 10.4103/jos.JOS_103_18	100	1, 2	42
27	Gul-e-Erum and Fida <sup>37</sup>	World J Orthod 2008;9:132–140	12	1, 3, 4	22.83
28	Zawawi et al <sup>38</sup>	Clin Cosmet Investig Dent 2013;5:77–80	100	1, 4 (4 = dental/medical students/pharma/nursing)	20.8 ± 1.4
29	Aldhorae et al <sup>39</sup>	J Int Soc Prev Community Dent 2020;10:85–95	213	1, 4 (4 = dental students)	-
30	Ker et al <sup>10</sup>	J Am Dent Assoc 2008;139:1318–1327	300	1	> 18
31	Al Taki et al <sup>40</sup>	Int J Dent 2016;2016:7815274. doi: 10.1155/2016/7815274	47	1, 2, 3	32 ± 9.53
32	Dutra et al <sup>41</sup>	Dent Press J Orthod 2011;16:111–1118	30	1, 2, 3	33.9
33	Akhare and Daga <sup>15</sup>	Indian J Dent Res 2012;23:568–573	30	1, 3	-
34	Niaki et al <sup>42</sup>	Aust Orthod J 2015;31:195–200	60	1	25.5 ± 3.2

NM = not mentioned; NA = not applicable; VAS = visual analog scale; NRS = numerical rating scale; GE = gingival exposure

\*: 1 = full-face photo/2 = only smile photo; a = single digitally modified/b = different photos of patients

†: + indicates GE/excessive gingival display; - indicates tooth coverage



Gender: 1 = male 2 = female	Which photo was used*	Alterations/modifications done on images for gingival display†	Increments of alteration of images	Scale for rating attractiveness	Strength of the scale used
1 = 100 2 = 100	2a	1 to 4 mm	1 mm	Likert	1 to 5
-	2b	NM	-	VAS	10 mm
-	2a	0.5 to 5 mm	1 mm	VAS	100 mm
1 = 20 2 = 20	2a	1 to 4 mm	1 mm	VAS	100 mm
1 = 25 2 = 45	2a	-4 to +2 mm	2 mm	VAS	80 mm
1 = 50 2 = 50	2a	0 to +5 mm	1 mm	VAS	10 mm
NM	1a	Maxillary and mandibular incisal display, half maxillary incisal display, full maxillary incisal display, and incisal display with 2 and 4 mm GE	-	Visual grading scale	1 to 5
2 to 100 (arts and science)	2a	-4 to +4 mm	2 mm	NRS	1 to 10
1 = 131 2 = 82	2a	0 to 5 mm	1 mm	VAS	1 to 5
2 = 66%	2a	-5.1 to +5.8 mm	-	Slider	NA
1= majority	2a	0 to 4 mm	1 mm	VAS	1 to 5
NM	1a	-4 to +4 mm	2 mm	Five esthetic interpretations	Very poor to very good
1 = 15 2 = 15	2a	0 to 5 mm	1 mm	Esthetic scale	0 to 9
1 = 30 2 = 30	1a	2 mm incisor show to +4 mm GE		Likert	1 to 5





**Supplementary Table 3** Categorization of results as per male/female model photographs

Study no.	Authors	Citation	Male smile	Female smile
1	loi et al <sup>5</sup>	J Esthet Restor Dent 2013;25:274–282	-5 to -1 mm	-2 to 0 mm
2	Talib et al <sup>18</sup>	Saudi Dent J 2013;25:13–21	-	0 to 1 mm
3	Sriphadungporn and Chamnannidiadha <sup>4</sup>	Prog Orthod 2017;18:8. doi: 10.1186/s40510-017-0162-4	-	0 to 2 mm
4	Springer et al <sup>19</sup>	Am J Orthod Dentofacial Orthop 2011; 139:e91–e101	Ideal: -2.3 mm (minimum GE -0.8 mm to maximum GE -4.5 mm)	
5	Öz et al <sup>6</sup>	Turk J Orthod 2017;30:50–55	Most attractive: +1 mm	Most attractive: -3 mm
6	Oliviera et al <sup>7</sup>	Int J Esthet Dent 2018;13:494–514	0 mm	0 to 0.13 mm
7	Ousehal et al <sup>20</sup>	Saudi Dent J 2016;28:174–182	-	0 to 3 mm
8	Guo et al <sup>21</sup>	J Craniofac Surg 2011;22:909–913	-	0 to 2.3 mm
9	Cracel-Nogueira and Pinho <sup>22</sup>	Int Orthod 2013;11:432–444	-	0 to 1 mm
10	Oshagh et al <sup>23</sup>	Eur J Esthet Dent 2013;8:570–581	-	-1.5 to +1.5 mm (most consistent = 0 mm)
11	Geron and Atalia <sup>24</sup>	Angle Orthod 2005;75:778–784	-1 to 0 mm	-1 to 0 mm
12	Anwar and Fida <sup>25</sup>	J Coll Physicians Surg Pak 2012;22: 375–380	0 mm in dolichofacial and mesiofacial; 2 mm in brachyfacial (for both male and female smiles)	
13	Pinzan-Vercelino et al <sup>26</sup>	J Prosthet Dent 2020;123:314–321	-3 to 1 mm	-3 to +3 mm
14	McLeod et al <sup>9</sup>	Angle Orthod 2011;81:198–205	-2.7 to +2.52 mm (sexually ambiguous)	
15	Al Taki et al <sup>27</sup>	Int J Dent 2017;2017:2637148. doi: 10.1155/2017/2637148	Short face: 2 to 4 mm Long face: -2 to +2 mm	
16	Hunt et al <sup>28</sup>	Eur J Orthod 2002;24:199–204	0 to 2 mm (ideal: 0 mm)	
17	Lima et al <sup>29</sup>	Am J Orthod Dentofacial Orthop 2019; 155:224–233	-	0 to 6 mm
18	Chang et al <sup>30</sup>	Am J Orthod Dentofacial Orthop 2011; 140:e171–e180	-0.5 to -1 mm	-0.5 mm
19	Tosun and Kaya <sup>31</sup>	Am J Orthod Dentofacial Orthop 2020; 157:340–347	-	0 to 2 mm
20	Pithon et al <sup>17</sup>	Oral Surg Oral Med Oral Pathol Oral Radiol 2013;115:448–454	-	0 mm to 2/3 to full crown
21	Abu Alhaja et al <sup>32</sup>	Eur J Orthod 2011;33:450–456	-	0 to 2 mm
22	Saffarpour et al <sup>33</sup>	J Dent (Tehran) 2016;13:85–91	-	0 to 1 mm
23	Ngoc et al <sup>34</sup>	Int J Environ Res Public Health 2020;17; 1638. doi: 10.3390/ijerph17051638	-	0 mm
24	Kumar et al <sup>35</sup>	Indian J Dent Res 2012;23:295. doi: 10.4103/0970-9290.100456	-	0 to 4 mm
25	Kaya and Uyar <sup>16</sup>	Am J Orthod Dentofacial Orthop 2013; 144:541–547	-	-2 mm
26	Geevarghese et al <sup>36</sup>	J Orthod Sci 2019;8:14. doi: 10.4103/jos. JOS_103_18	-	0 to 3 mm

Study no.	Authors	Citation	Male smile	Female smile
27	Gul-e-Erum and Fida <sup>37</sup>	World J Orthod 2008;9:132–140	0 mm	2 mm
28	Zawawi et al <sup>38</sup>	Clin Cosmet Investig Dent 2013;5:77–80	-	2 mm
29	Aldhorae et al <sup>39</sup>	J Int Soc Prev Community Dent 2020;10:85–95	0 mm	
30	Ker et al <sup>10</sup>	J Am Dent Assoc 2008;139:1318–1327	-2 mm (3.6 to -4 mm)	
31	Al Taki et al <sup>40</sup>	Int J Dent 2016;2016:7815274. doi: 10.1155/2016/7815274	-	1 mm (0 to 4 mm)
32	Dutra et al <sup>41</sup>	Dent Press J Orthod 2011;16:111–1118	0 mm	
33	Akhare and Daga <sup>15</sup>	Indian J Dent Res 2012;23:568–573	0 mm (0 to 2 mm)	
34	Niaki et al <sup>42</sup>	Aust Orthod J 2015;31:195–200	-	-6 mm tooth display <sup>†</sup> to 2 mm GE

GE = gingival exposure

\*: + indicates GE/excessive gingival display; - indicates tooth coverage (TC)

†: Mentioned in the study as 'tooth display'