

## Children's perceptions of smile esthetics and their influence on social judgment

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### ABSTRACT

**Objective:** To define a threshold of acceptance of smile esthetics for children and adolescents.

**Materials and Methods:** A systematic search in the medical literature (PubMed, PubMed Central, National Library of Medicine's Medline, Embase, Cochrane Central Register of Controlled Clinical Trials, Web of Knowledge, Scopus, Google Scholar, and LILACs) was performed to identify all peer-reviewed papers reporting data regarding the evaluation of children's and adolescents' perceptions of dental esthetic factors. The search was conducted using a research strategy based on keywords such as "children," "adolescents," "smile aesthetics perception," "smile aesthetics evaluation." Studies analyzing smile esthetics involving at least 10 observers younger than 18 years of age were selected.

**Results:** Among the 1667 analyzed articles, five studies were selected for the final review process. No study included in the review analyzed perception of smile anomalies in a quantitative or qualitative way, thus no threshold was identified for smile features. Among the analyzed samples, unaltered smiles were always significantly associated with better evaluation scores when compared with altered smiles.

**Conclusions:** Smile esthetics influence social perception during childhood and adolescence. However, thresholds of smile esthetic acceptance in children and adolescents are still not available. (*Angle Orthod.* 2016;86:1050–1055)

**KEY WORDS:** Smile esthetics; Social perception; Children; Adolescents

### INTRODUCTION

The psychological impact of facial esthetics is of great influence on the overall quality of life. Thus, smile esthetics plays a key role in overall esthetics.<sup>1</sup> The importance of correcting malocclusion to improve smile

and facial appearance has been confirmed by several authors.<sup>2–4</sup> In 2000, Sarver et al.<sup>5</sup> stated the importance of the esthetic paradigm when planning orthodontic treatment. On the other hand, some authors have observed that subjective perception can greatly influence the judgment of facial and smile features. Several clinical studies<sup>6–8</sup> as well as systematic reviews<sup>9</sup> have been performed to define the threshold values of acceptance for different smile characteristics from the point of view of laypeople. The majority of studies have been conducted involving adult observers, with few studies considering the perceptions of children and adolescents. However, in pediatric and pubertal ages, the alteration of body self-image may have a great impact on all aspects of life, such as socialization, emotional and functional aspects, and familiar interrelationships.<sup>3</sup> Furthermore, several authors confirmed that others' perceptions can influence the way a person acts and even result in long-term developmental changes.<sup>10–12</sup>

In 2011, Witt and Flores-Mir<sup>9</sup> analyzed laypeople's perceptions of tooth-related esthetic factors in a

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Accepted: March 2016. Submitted: October 2015.

Published Online: May 2, 2016

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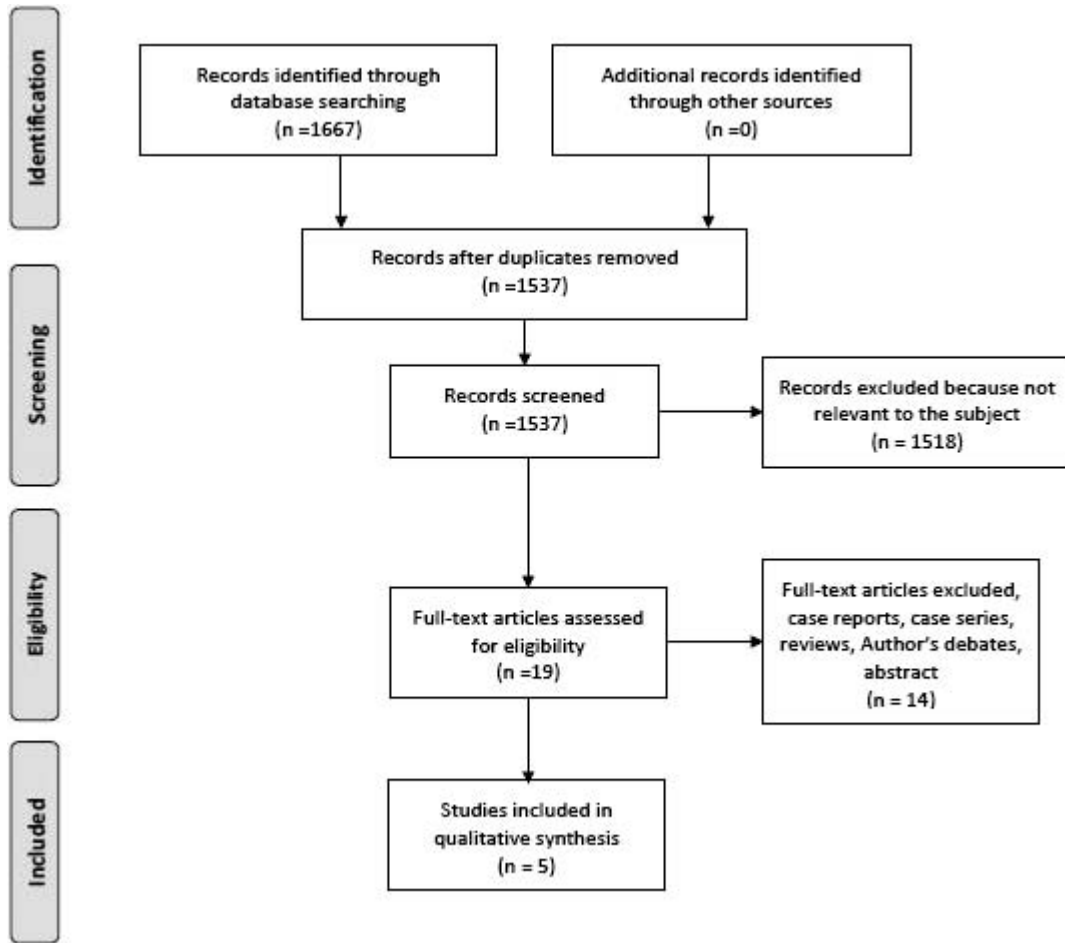


Figure 1. Flow chart according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement.

systematic review, which concluded that “Laypeople have varying degrees of sensitivity to certain dental esthetic issues. Consequently, clinicians can expect their patients to be more attentive to some esthetic factors than to others.” However, no systematic review analyzed the perception of smile esthetics from the point of view of children and adolescents, and neither evaluated the impact of smile appearance on social perception features.

Thus, the aim of this systematic review is to answer the following clinical research questions:

- Could children’s and adolescents’ thresholds of acceptance of smile esthetics anomalies be defined?
- How are children’s and adolescents’ social perceptions influenced by smile esthetics?

Table 1. Search Strategy

(child\* OR adolesc\*) AND smil\* AND (esthetic\* OR aesthetic\*) AND (perception OR perspective OR evaluation OR awareness OR attention)

**MATERIALS AND METHODS**

This systematic review protocol was registered in the International Prospective Register of Systematic Reviews (<http://www.crd.york.ac.uk/PROSPERO/>; protocol CRD42015027274).

On October 1, 2015, a systematic search in the medical literature was performed to identify all peer-reviewed papers reporting data regarding the evaluation of laypeople’s perceptions of dental esthetic factors. To retrieve lists of potential papers to be included in the review, the search strategy illustrated in Table 1 was used in the following databases (Figure 1):

- PubMed
- PubMed Central
- National Library of Medicine’s Medline
- Embase
- Cochrane Central Register of Controlled Clinical Trials
- Web of Knowledge
- Scopus
- Google Scholar
- LILACS

**Table 2.** Study Selection Criteria

Inclusion Criteria	Exclusion Criteria
Randomized and nonrandomized prospective, retrospective, and observational original studies analyzing the perception of children and adolescents (younger than 18 years of age) about dental and smile esthetics	Studies that investigated only facial esthetics without any dentoalveolar link
Studies with adequate statistical analysis	Studies that investigated dental esthetics from a lateral aspect rather than from a frontal aspect
Studies with an analyzed sample of at least 10 observers	Studies that investigated self-perception of esthetics
	Studies that compared laypeople's esthetic perspectives with those of another group, without reporting the laypeople's specific opinions
	Descriptive studies
	Editorials
	Letters
	Reviews

The medical libraries of Turin University as well as the authors' personal libraries were thoroughly analyzed in a search for additional papers. Title and abstract screening was performed to select articles for full-text retrieval. If a paper could not be obtained through the Internet and libraries, the study authors were asked to send a copy for the review process.

The inclusion and exclusion criteria for admittance in the systematic review were based on the review by

Witt and Flores-Mir<sup>9</sup> and are reported in Table 2. This systematic review analyzed only papers that considered children's perceptions of smile esthetics. The reference lists of these articles were perused, and references related to the articles were used to retrieve papers that met the inclusion criteria. However, no additional study has been selected this way.

Duplicate papers were removed, and the studies were selected for inclusion independently by two of the

**Table 3.** Summary of Results

Author, Year	Population	Study Methods	Evaluation Scale
Shaw, 1981	840 children, age range: 11–13 y	Digitally altered full frontal photographs	100 mm VAS <sup>1</sup>
Verdecchia et al., 2010	121 (65 F–56 M), mean age 9.2 y	Digitally altered full frontal photographs	SPQ 8–10 Questionnaire <sup>2</sup>
Henson et al., 2011	221 children, mean age: 14.4 ± 1.6 y, age range: 10–16 y	Digitally altered full frontal photographs	100 mm VAS <sup>1</sup>
Lombardo et al., 2011	180 children (81 F–99 M), age range: 8–10 y	Digitally altered full frontal photographs	SPQ 8–10 Questionnaire <sup>2</sup>
Pithon et al., 2014	200 ch (105 M–95 F), age range: 10–16 y	Digitally altered full frontal photographs	100 mm VAS <sup>1</sup>

<sup>1</sup> 1VAS: Visual Analog Scale; <sup>2</sup> SPQ 8-10: Smile perception questionnaire for children between the ages of 8 and 10; <sup>3</sup> P-C: proclinated upper incisors - crowding; <sup>4</sup> IOTN: Index of Orthodontic Treatment Needs; <sup>5</sup> N: ideal incisal occlusion; <sup>6</sup> A: crowding; <sup>7</sup> D: diastema; <sup>8</sup> P: proclined incisors; <sup>9</sup> OK: Children with well-aligned teeth

\* P < 0.05

\*\* P < 0.001

authors. Disagreements were solved by discussions between all of the authors.

The data extraction was performed following the Population Intervention Comparison Outcome (PICO) template, modified according to the review necessities. The outcomes from each study were extracted and are reported in Table 3. Primary outcomes included children's perceptions of esthetics. The secondary outcome included the thresholds of acceptance for every study.

According to the Centre for Reviews and Dissemination, University of York<sup>13</sup> and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statements,<sup>14</sup> an evaluation of methodological quality was performed to weigh the analyzed studies and the level of evidence coming from each of them. Criteria, according to Witt and Flores-Mir's<sup>9</sup> review, were used to conduct the methodological scoring of samples. This scoring method involved the analysis of the following study aspects: number of judges, selection of judges, type of judged images, viewing protocol, intraexaminer reliability, scoring technique.

## RESULTS

Among the 1667 analyzed articles, five studies were selected for the final review process.<sup>15-19</sup>

Regarding data extraction, no standard template (eg, PICO) perfectly fit all of the included studies, so a customized template was created according to the review requirements (Table 2). Nevertheless, this was the best possible approach to a systematic assessment of the included papers. All of the studies were assessed separately by the investigators, and in cases of divergent assessments with regard to the assignment of strengths and weaknesses, consensus was reached by discussion.

The mean age of the evaluated samples ranged from 8 to 16 years, and the sample size among the selected studies ranged from 121 to 840 children and adolescents. The overall mean quality of the studies was 19.5 of 22 possible points. The highest score assigned to an article was 21 points,<sup>19</sup> and the lowest score assigned was 18 points.<sup>16</sup>

Three studies<sup>15,16,19</sup> used a 100-mm visual analog scale to score smile photographs, and the other two

**Table 3.** Extended

Values (SD <sup>a</sup> )	Standard Error	95% Confidence Interval	Methodological Score
Aligned teeth vs altered dental conditions Attractiveness: 43.1** Desirability as a friend: 52.1* Perceived aggressive tendency: 73.5**			21
OK <sup>b</sup> vs P-C <sup>c</sup> Honesty, altruism/dishonesty, selfishness: -0.0674* Personal happiness: -0.0842* Intelligence: -0.2161*			20
Ideal versus nonideal smile according to IOTN <sup>d</sup> Athletic performance: 3.42*	Ideal vs Non-ideal smile according to IOTN <sup>d</sup> Athletic performance: 1.39	Ideal vs Non-ideal smile according to IOTN <sup>d</sup> Athletic performance: 0.69-6.15	19
Popularity: 8.26** Leadership ability: 5.92**	Popularity: 1.31 Leadership ability: 1.31	Popularity: 5.69-10.84 Leadership ability: 3.35-8.50	
Talkative attitude* N <sup>e</sup> vs D <sup>f</sup> , A <sup>g</sup> , P <sup>h</sup> ** Smile preference order: N <sup>e</sup> -D <sup>f</sup> -A <sup>g</sup> -P <sup>h</sup> **			19
Ideal vs Non-ideal smile according to IOTN <sup>d</sup> Performance in sport: 0.32 (2.00)*		Ideal vs Non-ideal smile according to IOTN <sup>d</sup> Performance in sport: 0.04-0.60	18
Popularity: 0.62 (1.75)** Leadership: 0.61 (1.93)** Intelligence: 0.47 (2.23)* Health: 0.71 (2.06)**		Popularity: 0.30-0.87 Leadership: 0.35-0.88 Intelligence: 0.16-0.78 Health: 0.42-1.00	

studies<sup>17,18</sup> adopted the Smile Perception Questionnaire for Children Between the Ages of 8 and 10.

No study included in the review analyzed perception of smile anomalies in a quantitative or qualitative way, thus no threshold was identified for smile features.

## DISCUSSION

This systematic review was conducted to evaluate children's and adolescents' perceptions of smile anomalies and their impact on social perception. A total of five studies<sup>15–19</sup> were selected for the final review process. The quality assessment of the selected studies revealed a good level of evidence. Minor methodological biases were related to the frequently not mentioned interexaminer reliability analysis and to the heterogeneity of viewing protocols among the samples.

The studies included in the final sample did not answer the first clinical question. Thus a need for well-designed studies analyzing children's and adolescents' thresholds of acceptance of smile esthetic anomalies emerged from the present review.

Regarding social perception, the heterogeneity of analyzed categories made it impossible to perform the meta-analysis required to assess the extent of the influence of smile esthetics. Among the analyzed samples, an unaltered smile was always significantly associated with better evaluation scores.

In 1981, Shaw<sup>19</sup> evaluated the smile perceptions of 840 children aged 11 to 13 years with a 100-mm visual analog scale. The author highlighted a significant preference for aligned teeth smile when compared with altered smiles regarding perceived attractiveness (43.1 mm,  $P < .01$ ), desirability as a friend (52.1 mm,  $P < .05$ ), and less perceived aggressive tendency (73.5 mm,  $P < .01$ ). In 2010, Verdecchia et al.<sup>17</sup> investigated the influence on social perception in a sample of 121 evaluators. Children with well-aligned teeth resulted in having significantly stronger characteristics of honesty, personal happiness, and intelligence ( $P < .05$ ) with respect to those with crowding and proclined upper incisors.

According to Henson et al.,<sup>15</sup> on the basis of the Index of Orthodontic Treatment Needs, significant differences were registered for athletic performance (3.42 mm, standard error [SE] 1.39, 95% confidence interval [CI] 0.69–6.15,  $P < .05$ ), popularity (8.26 mm, SE 1.31, 95% CI 5.69–10.84,  $P < .01$ ), and leadership ability (5.92 mm, SE 1.31, 95% CI 3.35–8.50,  $P < .01$ ) between ideal and nonideal smiles. Furthermore, in 2001 DiBiase and Sandler<sup>20</sup> observed that young participants reported teasing associated with malocclusion and unfavorable self-perceptions related to their teeth.

In 2011, Lombardo et al.<sup>18</sup> analyzed a sample of 180 children aged between 8 and 10 years and revealed that a perception of talkative attitude was significantly associated with ideal incisal occlusion when compared with crowding, diastema, and proclined incisors ( $P < .05$ ). Furthermore, an ideal smile was characterized with a significant preference when compared with the other three types of smile concerning various aesthetic features ( $P < .05$ ). In their study from 2014, Pithon et al.<sup>16</sup> reported significantly better scores for ideal smiles regarding performance in sport (0.32 mm, standard deviation [SD] 2.00, 95% CI 0.04–0.6,  $P < .05$ ), popularity (0.62 mm, SD 1.75, 95% CI 0.3–0.87,  $P < .01$ ), leadership (0.61 mm, SD 1.93, 95% CI 0.35–0.88,  $P < .01$ ), intelligence (0.47 mm, SD 2.23, 95% CI 0.16–0.78,  $P < .05$ ), and health (0.71 mm, SD 2.06, 95% CI 0.42–1,  $P < .01$ ), when compared with crooked smiles.

As reported by several authors, physical attractiveness also plays a key role for social interaction, influencing the perception of an individual's social skills.<sup>21–23</sup> Perceptions of more intelligence and talkative attitude in ideal smile participants have been confirmed by several studies.<sup>16,17</sup> However, Lombardo et al.<sup>18</sup> did not report significant changes for the previously debated features. These contrasting results may be a result of the fact that background facial attractiveness has a significant influence on overall esthetic assessments, thus the whole face is predominant over single dental features.<sup>5</sup>

Seehra et al.<sup>24</sup> measured the frequency and severity of bullying among a sample of British adolescents. The authors highlighted a significant correlation between bullying and malocclusion as well as a significant negative impact on oral health-related quality of life (OHRQoL) resulting from oral symptoms. The psychosocial impact of malocclusion is not age related, as stated by Marques et al.<sup>25</sup> in their study on Brazilian children.

In a recent study, Twigge et al.<sup>26</sup> assessed a small association between objective orthodontic treatment needs indexes and OHRQoL. Furthermore, no evidence was found regarding higher index-determined occlusal scores (increased severity) causing worse OHRQoL experiences. The authors stated that the lack of significance could be explained by the absence of a control group. However, in the same study, the discrepancy between subjective and occlusal-related treatment needs was confirmed together with the association of esthetics and psychological-expected improvements after orthodontic treatment from the point of view of adolescent patients.<sup>26</sup>

According to our results, the smile appears to be important among overall esthetics for adolescents as well as for children younger than 10 years of age. On the basis of the current evidence, an integrated



diagnosis that involves the psychological impact of malocclusion as well as occlusal alterations could represent a significant improvement in patient care. Furthermore, correcting smile alterations, even in young children, may be fundamental in preventing bullying or teasing from others and in improving the quality of social interactions, preserving healthy psychological development.<sup>27</sup>

## CONCLUSIONS

- The overall quality of evidence is of a moderate or high level despite the small analyzed sample.
- No threshold was identified regarding the perceptions of smile esthetic defects.
- Poor smile esthetics influence social interactions negatively during childhood.

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