

Evaluation of the Application of Various Concepts of Teeth Selection among Dental Practitioners in Central India

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ABSTRACT

Introduction: The most important factor for the patients coming to the dentist for rehabilitation with the prosthesis is the way they look and the way their smile is perceived. The basic requirement of any patient is the desire for “life-like” appearance of the prosthesis. One of the most significant challenges was to discover how often all the concepts of teeth selection can be practically applied in daily practice and to evaluate their application among dental practitioners.

Materials and methods: A questionnaire was circulated on the Google platform as a form of survey to determine the application of various concepts of teeth selection among dental practitioners. It was statistically evaluated on the basis of the majority of answers given. Correlation between the knowledge, attitude, and experience-based questions was determined.

Results: A statistically significant correlation was found between the knowledge-based, attitude-based, and experience-based questions. There was a linear correlation seen as a graphical representation. The way knowledge, attitude, and experience of the dental practitioners affect the treatment was also determined and correlated.

Conclusion: Esthetic rehabilitation is a wholesome process. All the factors should be given equal importance at every step from selection of the teeth to the teeth arrangement and the final results. Knowledge of all the concepts of teeth selection is important to add to the experience and attitude of the dentist. A combination of all the three values of the dental practitioner is the need of the hour to provide the superior esthetics to the patient.

Keywords: Cross-sectional study, Dental, Dental education, Dental students, Dentistry, Esthetic, Esthetic rehabilitation, Facial proportions, Maxillary anterior esthetics, Smile.

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INTRODUCTION

Esthetic appearance of the individual has always been the most important factor for the patients coming to the dentist for the rehabilitation with the prosthesis. The primary requirement of any patient begins with the demand for “life-like” appearance of the prosthesis. Dental esthetics as well as the facial esthetics should be attuned for the desired appearance. Therefore, the choice of arrangement of the maxillary and mandibular anterior teeth is the critical step for esthetic rehabilitation.¹ However, the knowledge and the literature about teeth selection still need to be upgraded gradually to be used as a definite guide to provide the most accurate esthetics with defined shape and size in accordance with the personality of the patient.

“According to Young, it is apparent that beauty, harmony, naturalness, and individuality are major qualities of esthetics.” They play a vital role in the natural-looking smile and the confidence that comes along with the personality of the patient.² Facial esthetics are always enhanced by a beautiful and well-contoured design of a smile. The smile architect popularly known as the dentist plays a pivotal role in fabricating a natural smile following all the prerequisites.³ The establishment of a synchronous correlation between tooth shape and form in accordance with the facial features of the individual poses a challenge to the dentist.⁴

Teeth selection often becomes a demanding procedure when the patient presents with no history of pre-extraction records, pre-op photos, or any history of previous configuration of teeth. Thus, the procedure of clinical judgment of the prosthodontist

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and the esthetic preferences of the patient become the major step on which the clinician relies upon. The goal is to consummate an esthetic makeover wherein the facial muscles and joints, soft and hard tissues, all are in a harmonious relationship.⁵ A definite correlation has been discovered in several studies that talk about the relationship between tooth form, facial contours, and arch relationships in edentulous and dentulous individuals.⁶ These

parameters have been correlated with the temperament of the patients, known as Visagism or temperamental theory, and have aided in the teeth selection procedure.⁷ With the application of this concept, there has been an enhancement of the smile esthetics and one has been able to achieve the desired, patient-centric dentofacial esthetics.

Many authors were in accordance with fundamentals, but a few contrasting results were also seen. As teeth selection forms the most vital part of the rehabilitation process, the involvement of the patient in the selection of the same along with the dentist enhances the overall outcome of the treatment given. Therefore, a need was felt to evaluate and assess how various dental practitioners perform the teeth section procedures and how it affects the overall quality of the esthetic rehabilitation.⁸

A properly diagnosed and planned dental treatment changes the facial esthetics in the individuals seeking for rehabilitation with minimal invasion. Dentists are smile designers who work for natural-looking or an exact mimic of the oral structures that are to be replaced.⁹ The prime requisite to achieve proper proportions, alignments, and symmetry of dental esthetics in their biological form.¹⁰ Teeth selection becomes a tedious process when patients do not present with their pre-extraction records or any previous pictures or data. Thus, a clinician must count upon his/her experience and judgment to rehabilitate the exact appearance of the patients.^{11,12} Esthetics in complete denture construction is known to be bodacious by their absence. The analogy depicts the value of selecting maxillary and mandibular teeth for the treatment. Proportion is regarded as the study of synchrony or coordination of a particular framework in space. Golden proportion and RED proportion have existed from earlier times. With the emerging technology and trends, these ancient concepts and recurrent esthetic proportions have been debated.^{13,14}

There was a need felt to determine the accuracy with which the application of various concepts is successful in customization of smile esthetics. One of the most significant challenges was to discover how often all the concepts of teeth selection can be practically applied in daily practice and to evaluate their application among dental practitioners.

MATERIALS AND METHODS

Study Design

This observational study was performed in the Department of Prosthodontics and Crown and Bridge, Sharad Pawar Dental College, Sawangi (Meghe), Wardha, India. The Institutional Ethics Committee of Datta Meghe Institute of Medical Sciences (deemed to be a university) approved the study protocol (Ref. No. DMIMS (DU)/IEC/2020-21/261). The authors have declared that no competing interests exist.

The participants of the study were registered dental practitioners and postgraduate students in Central India who were willing to participate. All the undergraduate students were excluded from the study. A sample size of 200 participants had been selected for the study.

Methodology

After Institutional Ethical Committee approval, the study was conducted on dental practitioners and postgraduate students. An electronic survey was conducted using the Google Forms platform. One set of a customized questionnaire was prepared

taking into account the various aspects of teeth selection, the experience of the dentist during the teeth arrangement procedure, and expectations of the patient during teeth selection encountered by the dentist.

A validated questionnaire was conducted that helped to discover the different concepts dentists were applying in day-to-day practice. Twenty-five close-ended questions and one open-ended question were included in the study. The participants were asked to answer the questions honestly. All questions were answered on a dichotomous scale and on an objective scale. They were asked to refer to their natural instincts and their present practice. They were also asked to answer the questions based on their experience of practice and knowledge gained over the years and the practical applications of the same.

A three-part questionnaire was sent to the practitioners. The first part included knowledge-based questions regarding the teeth selection procedure. The second part dawned upon the attitude of the practitioners toward the procedure. The third part was designed to know about the experience during all the years of clinical practice. Data derived from the present study were statistically analyzed using SPSS 22.0 version software. For the data presentation of the respondents' findings, descriptive tabulations were used. The Pearson's Chi-square test was used to find the statistical correlation between categorical variables, and the Pearson's correlation coefficient (*r*) was applied to find the linear association between the participants' knowledge experience and attitudes. $P < 0.05$ was taken to be significant based on statistical analysis.

The answers were evaluated on the basis of maximum responses to the particular question and responding to all the questions was a pre-requisite for submission of response. The results so obtained helped to assess the application of various concepts of teeth selection applied by dental practitioners.

RESULTS

After evaluating the questionnaire that was distributed among the dental practitioners, descriptive statistics of the answers by the informants was done. Answers that had the maximum responses were taken into consideration for the evaluation and statistical purposes.

The questions of the first section were knowledge-based (Table 1), which revealed the knowledge aptitude of the dental practitioners. When asked about selection of anterior teeth, 41.5% opted for the patient's facial form and shape, 46% preferred the complexion (color of skin, eyes, or hair), and 43.5% chose the bizygomatic width for the size of the teeth. When selecting the posterior tooth form, 51% opted for semi-anatomic tooth form, and 65% responded to using acrylic resin as the material for an artificial tooth. About 83.5% population asked the patients about their expectations of teeth, 81% evaluated the personality or temperament before the selection, and 86% asked the patient about their preference for specific smile design.

The second part of the questionnaire discussed about the attitude of the dental practitioners toward the patients during the teeth selection procedure (Table 2). About 52.5% practitioners responded affirmatively when asked about the patient's satisfaction with the esthetics of the prosthesis after final delivery. About 76% have explained to the patient about the criteria of teeth selection. The participation level and enthusiasm of the patient were found to be 72.5% during the teeth selection procedure. About 82% of dental

Table 1: Knowledge-based information of the dental practitioners [Total (n) = 200]
Percentage (%) of the maximum responses has been mentioned

1. What method do you use to select the mould (form and shape) of anterior teeth?	
a) Pre-extraction records	28
b) Patient's facial form and shape	83 (41.5%)
c) Gender	62
d) Age	27
2. What method do you use to select the shade (color) of anterior teeth?	
a) Pre-extraction records	19
b) Complexion (color of skin, eyes, or hair)	92 (46%)
c) Gender	58
d) Age	31
3. What is the way of selecting the size (width) of the maxillary anterior teeth?	
a) Pre-extraction records	20
b) Bizygomatic width	87 (43.5%)
c) Inter canine distance	79
d) Patient's gender	14
4. For selecting the posterior tooth form, what is your preference?	
a) Nonanatomic (flat)	9
b) Semianatomic (10°, 12°, 15°)	102 (51%)
c) Anatomic (20°, 30°, 33°)	89
5. What is the quality of material you have been using for teeth arrangement?	
a) Porcelain	69
b) Acrylic resin	131 (65%)
6. Do you ask the patients about their expectations of the teeth?	
a) Yes	167 (83.5%)
b) No	33
7. Do you evaluate the personality of the patient or temperament before selecting the teeth?	
a) Yes	162 (81%)
b) No	38
8. Do you ask the patient about his or her preference for specific smile design?	
a) Yes	172 (86%)
b) No	28

practitioners do the teeth selection after the patient's concern. When asked whether any standardized proportions were used to select any particular tooth/shape/size and form, 75.5% responded affirmatively to it. About 93.5% of the population used natural light for shade selection. About 57.5% used gray color background for shade selection. About 67.5% of the population have considered using age, sex and personality, all three factors for selecting the form of teeth.

The third part of the questionnaire focused on the experience of the dentist during the years of practice (Table 3). About 86.5% of the population responded affirmatively to using a standard shade guide. About 74% agreed upon giving an option to the patient about the material of the tooth selected. About 62% of the population had the patients who were the

exacting type of the MM House classification regarding the teeth selection. About 56% of the dental practitioners had the patients complaining about the teeth feeling unnatural. About 87.5% did the verification of the facial esthetics during the try-in stage. The population that showed patients the trial denture or mock-up before finalizing the definitive restoration was found to be 89%. The concept of Visagism was known only to 46% of the population. About 41% applied the concept of Visagism in day-to-day practice. It was found that 50.5% of the population used the dentogenic concept for the selection of teeth in day-to-day practice.

There was a significant correlation found in the knowledge-based, attitude-based, and experience-based questions based on the statistics (Table 4). The results of the cross-tabulation

Table 2: Attitude-based information of the dental practitioners [Total (n) = 200]
Percentage (%) of the maximum responses has been mentioned

9.	Has the patient ever complained about the aesthetics after final delivery of the prosthesis?	
a)	Yes	95
b)	No	105 (52.5%)
10.	Have you ever explained the patient regarding the criteria of teeth selection?	
a)	Yes	152 (76%)
b)	No	48
11.	Is there a significant participation level and enthusiasm of the patient when it comes to the selection of teeth for the patient?	
a)	Yes	145 (72.5%)
b)	No	55
12.	Is the teeth selection done after patient's concern?	
a)	Yes	164 (82%)
b)	No	36
13.	Is any standardized proportions used to select any particular tooth/shape/size and form?	
a)	Yes	151 (75.5%)
b)	No	49
14.	Under what kind of light is the shade selection done?	
a)	Natural light	187 (93.5%)
b)	Chair lamp	9
c)	Flash light	0
d)	Standard light	4
15.	Which color background is used for the shade selection?	
a)	Grey	115 (57.5%)
b)	White	61
c)	Off-white	15
d)	Black	
16.	The form of the teeth is selected using?	
a)	Sex	17
b)	Age	21
c)	Personality	27
d)	All of the above	135 (67.5%)

showed that there is a definite correlation between the attitude and experience (p -value = 0.001), knowledge and experience (p -value = 0.001), knowledge and attitude (p -value = 0.0001). Figures 1 to 3 showing a strong positive linear association between knowledge and attitude, experience and attitude, and experience and knowledge, respectively, were discovered using bivariate correlation analysis ($p > 0.05$).

DISCUSSION

The necessary factors conferring to a harmonious relationship of maxillary and mandibular teeth are the shape, form, size, and shade of the teeth in the frontal region of the jaw. They are the most visible teeth during any of the functional movements of the patient.¹ While restoring the teeth or in the teeth selection

procedure, a wide range of concepts are there that the clinician must keep in mind in accordance with the new technological age and trends. However, keen attention to detail is the primary step in duplicating the natural dentition confined within the parameters essential in designing of a smile artistically. It is obligatory and mandatory for the clinicians to interpret the proportions and balance, art, and beauty in harmony as required by the society prior to the treatment planning process.²

The most consequential factors contributing to esthetics of anterior dentition are the size, shape, and arrangement of the maxillary anterior teeth, particularly the maxillary central and lateral incisors as viewed from the front. Sharma et al. in their study found a definite correlation between the temperament and different smile parameters. The parameter of tooth form

Table 3: Experience-based information of the dental practitioners [Total (n) = 200]
Percentage (%) of the maximum responses has been mentioned.

17. Is any particular standard shade guide used?		
a) Yes	173 (86.5%)	
b) No	27 (13.5%)	
18. Is any option given to the patient about the material of the tooth selected?		
a) Yes	148 (74%)	
b) No	52 (26%)	
19. According to house classification which among the following ask a lot of questions during the procedure?		
a) Philosophical	38	
b) Exacting	124 (62%)	
c) Hysterical	33	
d) Indifferent	5	
20. Has any patient ever complained of the teeth feeling unnatural?		
a) Yes	112 (56%)	
b) No	88	
21. Are any verifications done during try-in stage regarding the facial esthetics of the patient?		
a) Yes	175 (87.5%)	
b) No	25	
22. Have you ever shown the patient the trial denture or mock-up before finalizing the definitive restoration?		
a) Yes	178 (89%)	
b) No	22	
23. Are you aware of the concept of Visagism?		
a) Yes	92 (46%)	
b) No	108	
24. Have you applied the concept of Visagism in day to day practice?		
a) Yes	82 (41%)	
b) No	118	
25. Which of the following concept do you most often use in daily practice?		
a) White's concept	33	
b) Dentogenic concept	101 (50.5)	
c) Leon Williams concept	49 (24.5)	
d) Winkler's concept	17	

Table 4: Correlation between knowledge-, attitude-, and experience-based among subjects

	Mean	Std. deviation	N
Knowledge	9.08	1.63	200
Attitude	12.44	2.69	200
Experience-based	6.24	1.13	200

was more closely related to the personality of the individual.³ Harshakumar et al. and Sudhakar et al. reported that different parameters need to be considered to attain properly fabricated dentures, and application of the golden proportion and red proportion can be systematically applied to evaluate and to

improve smile esthetics in predictable ways.^{4,5} Visagism is an unprecedented concept that applies the principles of visual art to the composition of a customized smile. With this, clinicians can virtually construct a smile that blends the patient's appearance with his personality fulfilling his/her expectations and desires. Similarly, in this study, it was found that 81% of the practitioners evaluated the personality and temperament before teeth selection and 86% asked the preference of the patient for the smile design. Arora et al. and Zakkula et al. reported that the decision has to be made considering the individual temperament rather than the facial outline alone, which is the main concept behind the Visagism theory.^{6,7} Similarly, in this study, 46% were aware of the concept of Visagism and 41% applied it in day-to-day practice. Although only 41.5% used the patient's facial form and

Table 5: Pearson's correlation coefficient

		Knowledge	Attitude	Experience-based
Knowledge	r-value		0.230**	0.318**
	p-value		0.001 ^S	0.0001 ^S
	N		200	200
Attitude	r-value	0.230**		0.182**
	p-value	0.001 ^S		0.010 ^S
	N	200		200
Experience-based	r-value	0.318**	0.182**	
	p-value	0.0001 ^S	0.010 ^S	
	N	200	200	

**Significant correlation of r-value; S, Significant p-value

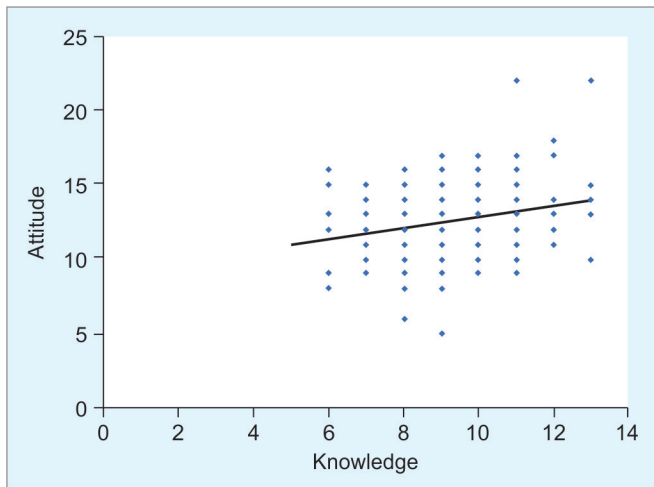


Fig. 1: Linear correlation between attitude and knowledge-based questions

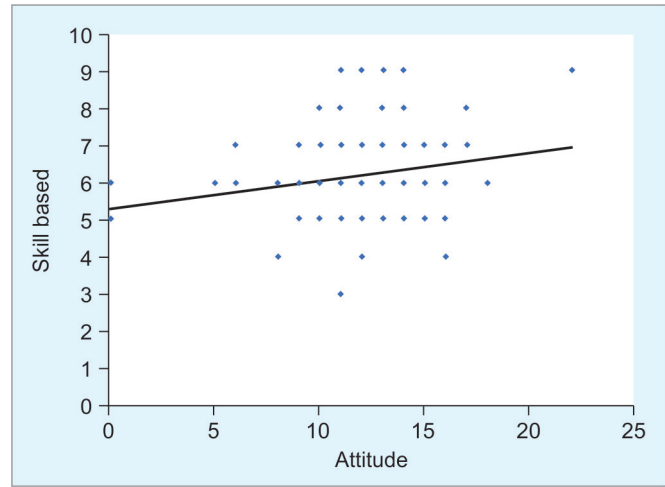


Fig. 3: Linear correlation between skill/experience and attitude-based questions

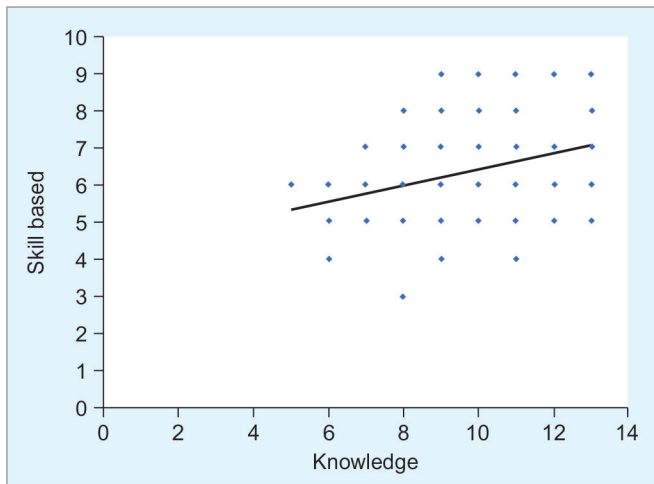


Fig. 2: Linear correlation between skill/experience and knowledge-based questions

shape for the selection of teeth, and 43.5% used the bizygomatic width for the tooth size.

These results were contradictory to the study conducted by Rambabu and his colleagues who reported that although the

concept of combining the principles of smile design and mental temperaments through visagism is a discernable idea, it lacks a practical approach to create a personalized smile for each patient by including mental temperaments at the present stage.⁸

In accordance with the above studies, it can be asserted that the criteria for the teeth selection have always been explained to the patient by 76% of dental practitioners and 75.5% used standardized proportions for selecting any particular tooth/shape/size and form.

Therefore, more research needs to be conducted regarding the application of this concept.

Kumar and his colleagues reported that the dentogenics has been perceived as the prosthodontic interpretation of three major factors, which every patient possesses. The factors are personality, age, and sex of the individual, and have been widely used by the dentist.¹³ A similar finding was reported in this study where 50.5% of the population used the dentogenic concept in their day-to-day practice followed by the Leon Williams concept used by 24.5%. About 67.5% used all the three factors that are sex, age, and personality for selecting the form of teeth.

Confidence comes from physical appearance that enhances the beauty that is glorified by a smile. Spalj et al. and Diener et al. concluded that there is an evident psychosocial impact of dental esthetics and culture, personality, and subjective well-being govern

emotional and cognitive perceptions of life.^{15,16} Likewise, in this study, 56% of the dental practitioners encountered patients that could identify if the teeth looked unnatural, which affected the patient psychologically and socially. About 62% of the population experienced the patients being of the exacting type according to MM house classification and were curious about the treatment plan.

Therefore, 87.5% of the dental practitioners were reported that verified the facial esthetics during the try-in stage, and 89% verified the trial denture or mock-up before finalizing the definitive restoration.

The combined effects of a smile and facial makeovers can be improvised by cosmetic-restorative procedures, and a doorway to this is a dedicated clinician who replaces the denture esthetically and psychosocially, thereby enhancing the well-being of the patient.^{17,18}

About 86.5% used the standard shade guide for teeth selection. About 93.5% performed the shade selection process in natural daylight and 57.5% used the gray-colored background for shade selection. The color or shade selection of missing teeth that matches with the adjacent teeth, and the surrounding gingival tissue, governing the emergence profile, is the most challenging step in prosthetic dentistry.¹⁹ The increasing demand of the patient, particularly the rehabilitation by laminates and veneers, signifies the importance of shade selection in esthetic dentistry.²⁰

A definite and significant correlation was found between the knowledge, attitude, and experienced-based questions. All the three factors affected the treatment plan of the dentist and a collaboration and confederation of the knowledge, attitude, and the experience can enhance and exemplify the smile design, smile analysis, and ultimately the dentofacial esthetics of the patient. It was found in congruence with the study done by Mohan and McLaren et al.^{21,22}

The visual shade guide is the most commonly used method. It is very economical, widely available, and efficiently compares tooth color with a standardized reference shade guide.²³

About 74% of the dental practitioners gave the option to the patient for selecting the material of the tooth, and 65% chose acrylic resin for the same. There are numerous options for the tooth-colored materials in the dental market. Therefore, the one most feasible by the dentist and suitable for the patient is used.²⁴

Among these restorative materials, resin-based composites have been broadly and comprehensively used as dental materials due to their ability to withstand high compressive forces in the mouth along with excellent esthetic properties.²⁵ Still, the research is going on about the various factors important in teeth selection, and a blend of traditional and modern approaches should be made to provide the superior and life-like esthetics to the patient.

According to the results, it can be said that knowledge about the various concepts and theories of the teeth selection procedure adds up to the experience of the dentist. The experience of the treatment provided to a wide variety of patients increases the value and quality of the clinical expertise, which thereby enhances the patient satisfaction. The successful postoperative results vary widely and largely with the attitude of the dentist and encourage him/her to forge-forward with confidence and adapt with the new technology and techniques to change the dynamics of the esthetic rehabilitation and take it to a superior level.

The limitations of this observational study were small sample size. The study was also limited to the population of Central India. Hence, studies with increased sample sizes and including the maximum population of different regions of India need to be considered for further investigation.

CONCLUSION

The esthetic concept is a science as well as philosophy. It considers age, gender, and personality to recreate the patient's unique individuality. It has been studied and discussed from time immemorial and still needs to be pondered upon to achieve the best of the treatment mimicking the natural realms of dentofacial esthetics.

There are two worlds: the world we can measure with line and ruler, and the world that we feel with our hearts and imagination. The esthetics concept, when applied, provides a more natural prosthesis, which not only is truly desired by patients, but also is a quality of care they deserve. Outstanding esthetics can be achieved by simple guidelines: using tooth molds specifically sculpted for males and females, arranging prosthetic teeth to correspond to the sex, personality and age, and sculpting the matrix (visible denture base) with more natural contours.

By employing various principles and concepts, it is possible to restore their dignity and individuality.

Dentogenics is the guide and not a compulsion, and thus, our imaginative perception eventually is given more freedom. However, the rules must be learned first, and only practice, in their application will lead to successful treatment. Updating the knowledge from time to time adds up to the experience of the dentist and successful results elevate the attitude of the practitioners and encourage him/her to excel in the treatment. The dentist must take full advantage of all concepts to create dentures that restore the natural appearance of their patients.

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