THE INFLUENCE OF GINGIVAL EXPOSURE ON SMILE ATTRACTIVENESS

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ABSTRACT

Objective: *To evaluate the influence of gingival exposure on smile attractiveness.*

Methods: Photograph of one male and female volunteer with gummy smile, ideal occlusion and no dental anomalies were taken and manipulated on the computer with different gingival exposure levels ranging from +4mm to -4mm. The photographs were then printed and numbered 1-10 [Male=1-5 and Female=6-10] with the relevant gingival exposure 1= +4 mm, 2= +2 mm, 3= 0 mm, 4= -2 mm, 5= -4 mm, 6= +4 mm, 7= +2 mm, 8= 0 mm, 9= -2 mm and 10= -4 mm. Assessment was independently done on each picture using 5point attractiveness scale scored as very attractive, attractive, neither attractive nor unattractive, unattractive, very unattractive.

Results: *The highest mean attractiveness was reported on +4mm and +2mm gingival exposure for the male picture while +2mm and +4mm gingival exposure for the female picture. The mean attractiveness for picture 1 was significantly higher in younger than older participants (4.95±0.02 versus 4.81±0.02). The mean attractiveness for picture 4 was significantly higher in dental professionals than laypersons (3.96±0.08 versus 3.09±0.06). The mean attractiveness for picture 5 was significantly higher in younger than older participants (2.04±0.06 versus 1.53±0.04) and also in laypersons than dental professionals (1.79±0.04 versus 1.34±0.05). The mean attractiveness for picture 6 was significantly higher in younger than older participants (3.18±0.09 versus 2.83±0.07), males than females (3.10±0.08 versus 2.84±0.08) and also in lay persons than dental professionals (3.16±0.06 versus 2.01±0.10). The mean attractiveness for picture 7 was significantly lower in younger than older participants (2.90±0.07 versus 3.09±0.05). The mean attractiveness for picture8 was significantly higher in younger than older participants (2.03±0.05 versus 1.85±0.04) and also in laypersons than dental professionals (1.68±0.06 versus 1.96±0.03). The mean attractiveness for picture 9 was significantly lower in younger than older participants (1.39±0.05 versus 1.54±0.03). The mean attractiveness for picture 10 was significantly higher in dental professionals than laypersons (1.36±0.06 versus 1.23±0.02).*

Conclusion: *Smile attractiveness influenced by the gingival exposure had major variations between younger and older participants, moderate variation between dental professionals and laypersons have similar opinions regarding the gingival exposure between gender.*

Key words: *Attractive, gingiva, unattractive, smile*

INTRODUCTION

Communication involves two or more people exchanging verbal and non-verbal cues to reach a point of shared understanding. Facial expressions which include smiling, frowning, eye rolling, making eye contact, raising eyebrows, eyebrow flash, winking, scowling, opening one's eyes or mouth widely, yawning, startle, the coy display, and embarrassment and shame displays, are very important part of communication as they constitute subtle signals of the larger communication process.[1] Smile is a facial expression that plays a central part in human communication and is the cornerstone of social interaction. It is the most recognized expression used to convey to a sense of compassion and understanding[2] and

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one of the most important facial expressions essential in the expression of joy, gratefulness and moods. Smile also denotes pleasure, sociability, happiness, or amusement, approval of a message, and can help transmit a silent message of connection and kindness. This facial expression is formed primarily by flexing the muscles at the sides of the mouth but sometimes may include the contraction of the muscles at the corner of the eyes.[3] It is classified as Duchenne and or Duchenne smile based on whether it includes contraction of both the zygomatic major muscle and orbicularis oculi muscle or only zygomatic major muscle respectively. Duchenne smile is the unposed or emotional smile which is usually spontaneous, involuntary and dynamic. It is elicited by joy or mirth, hardly reproducible and are characterized by more lip elevation than posed smile.[4] Non-Duchenne smile is the posed or social smile which is intentional smiles that are given with consent and with preparation. It is voluntary involving the use of conscious muscle stimulation, static, not elicited by emotion and fairly reproducible.[4,5] Smile is the most recognized expression, used to convey a sense of compassion and understanding to human beings.[2]

An attractive smile has been the focal point of attention in improving aesthetic appearance and self-esteem because it conveys a confident, optimistic and friendly personality. It also plays a huge part in good first impression creation potential because individuals mainly focus on the mouth and eyes of individuals during interpersonal interaction.[6]

Attractive smile requires a perfect integration of facial composition and dental composition. The facial composition relates to the hard and soft tissues of the face while dental composition relates more specifically to teeth and their relationship to gingival tissues. The different dental composition factors that affect the smile aesthetics include tooth color, shape, position, quality of restoration, and general arrangement of the dentition, especially of the anterior teeth, upper lip position, visibility of teeth, and amount of gingival display.[7] Although these factors can be considered in concert and judged aesthetically as a unit in terms of symmetry and harmony but any of the factors can be considered separately. One variable considered as part of the smile analysis is the degree of gingival display, both at rest and while smiling.[8] The quantity of gingival exposure during smile, is one of the characteristics of interest for smile aesthetics.[9] The amount of gingival exposure is fundamentally important for a pleasant smile, but most people consider excessive gingival exposure during smile tagged 'gummy smile' as an unpleasant and unaesthetic smile.[10] A normal gingival display between the inferior border of the upper lip and the gingival margin of the maxillary anterior teeth during a posed smile is 1-2mm[9] but maxillary anterior teeth are completely displayed during a full smile. Although, in Western and Asian societies, it has been suggested that no more than 2 mm of the maxillary gingiva should be visible when a person smiles,[11,12] there has been no scientific evidence to support this view in the African communities, particularly in the Nigerian population. The concept of beauty is known to be unique to each individual, and is established based on values related to gender, race, education and personal experiences. It is thus necessary to study the influence of gingival exposure among Nigerians as investigating the aesthetic standards of the smile in dental professional and laypersons are of paramount importance. Hence the objective of this study was to investigate the influence of gingival exposure on smile aesthetics among dental healthcare professionals and laypersons.

MATERIALS AND METHODS

Ethical consideration

Informed consent was obtained from the participants. Participation was voluntary and no incentive was offered.

Study setting/design

This cross-sectional study was conducted in

University of Benin Teaching Hospital, Benin City among the dentists, dental auxiliaries, final year dental students rendering dental healthcare services in the hospital and the patients receiving dental healthcare in the hospital.

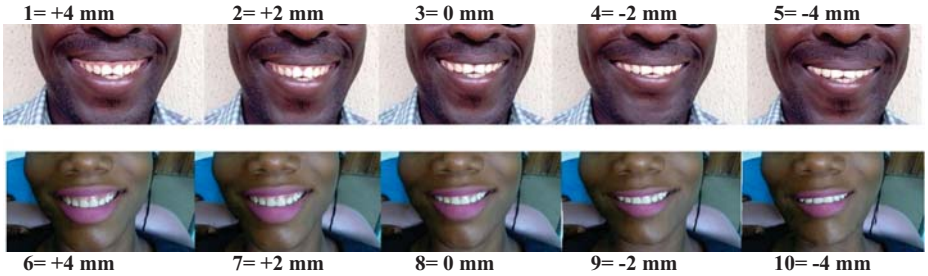
Sample size/sampling

The minimum sample size calculated using Cochran formula[13] ($N = Z^2pq/d^2$) for epidemiological studies and added 10% to compensate for non-response and incorrectly filled questionnaire was 462. Z = 1.96 set at 95% confidence interval, p = Prevalence = 50%=0.5, q=1-p=0.5 and d = Acceptable degree of error=0.05. The sample included all the dental healthcare professionals working in University of Benin Teaching Hospital because of their small number and the remaining sample were consecutively recruited from the patients attending the Oral Diagnosis Clinic, University of Benin Teaching Hospital.

Data collection tool

After obtaining informed consent, colour photographs of full face of one male (MS) and female (FS) in frontal view and with spontaneous smile, using Apple i-phone camera were taken. The original photographs were manipulated with the software Adobe Photoshop CS 8.0, and the resting position of the upper lip in relation to the maxillary incisors was modified. These modifications provided 5 levels of gingival exposure, being: 4 mm coverage of the maxillary incisors by the upper lip measured from the gingival margin (-4 mm); 2 mm coverage of the maxillary incisors by the upper lip (-2 mm); upper lip at the level of the maxillary incisors gingival margin (0 mm); 2 mm gingival exposure (+2 mm), and 4 mm gingival exposure (+4 mm) (Figure 1). The ten photographs, five from each individual, were printed, organized and interposed in an album. Photographs were evaluated through a questionnaire using a 5 point attractive Likert scale: very attractive (5), attractive (4), neither attractive nor unattractive (3), unattractive (2) and very unattractive. Other variable assessed are demographic characteristics and perception of smile.

FIGURE 1: SMILE PICTURE OF MALE (MS) AND FEMALE (FS)



Data analysis

Data was analyzed using IBM SPSS version 20.0. The studied dentists, dental auxiliaries, final year dental students were regarded as dental professionals while the studied patients were regarded as laypersons. The mean attractive scores were compared between ages, gender and status using independent t-test. The significance level was be set at $P< 0.05$.

RESULT

In this study, 462 individuals (35.9% females and 64.1% males) aged between 15 and 60years completed the study. The majority of the participants were older than 20 years, laypersons, frequently take selfies, reported non-receipt of aesthetic compliment on their smile, comfortable with their smile and had no intention to fix their smile (Table 1). The mean attractive was highest for picture 1 followed by picture 2, picture 3, picture 4 and picture7. The mean attractiveness for picture 1 was significantly higher in younger than older participants (4.95±0.02 versus 4.81±0.02). The mean attractiveness for picture 4 was significantly higher in dental professionals than laypersons (3.96±0.08 versus 3.09±0.06). The mean attractiveness for picture5 was significantly higher in

TABLE 1: DEMOGRAPHIC CHARACTERISTICS AND SELF-ASSESSMENT OF SMILE AMONG THE PARTICIPANTS

Characteristics	Male n (%)	Female n (%)	Total n (%)	P-value
Age (years)				0.000
15-20	58(29.7)	92 (39.8)	150 (35.2)	
21-30	103 (52.8)	126 (54.5)	229 (53.8)	
31+	34 (17.4)	13 (5.6)	47 (11.0)	
Status				0.000
Dental	51 (26.2)	26 (11.3)	77 (18.1)	
Non Dental	144 (73.8)	205 (88.7)	349 (81.9)	
Take selfies				0.283
Yes	164 (84.1)	185 (80.1)	349 (81.9)	
No	31 (15.9)	46 (19.9)	77 (18.1)	
Receipt of aesthetic compliment on smile				0.633
Yes	94 (48.2)	106 (45.9)	200 (46.9)	
No	101 (51.8)	125 (54.1)	226 (53.1)	
Comfortable with smile				0.332
Yes	145 (74.4)	181 (78.4)	326 (76.5)	
No	50 (25.6)	50 (21.6)	100 (23.5)	
Intention to fix smile				0.001
Yes	23 (11.8)	56 (24.2)	79 (18.5)	
No	172 (88.2)	175 (75.8)	347 (81.5)	
Total	195 (100.0)	231 (100.0)	426 (100.0)	

TABLE 2: RATINGS OF SMILE AMONG THE PARTICIPANTS

PICTURE	Total	=20years	>20years	Male	Female	Dental professional	Layperson
1	4.86±0.02	4.95±0.02	4.81±0.02	4.83±0.03	4.89±0.02	4.91±0.03	4.85±0.12
2	4.29±0.02	4.29±0.04	4.28±0.03	4.27±0.03	4.30±0.03	4.31±0.05	4.28±0.02
3	3.59±0.03	3.59±0.05	3.58±0.04	3.61±0.05	3.56±0.04	3.56±0.08	3.59±0.04
4	3.25±0.05	3.13±0.09	3.310.06	3.28±0.08	3.22±0.05	3.96±0.08*	3.09±0.06
5	1.71±0.04	*2.04±0.06	1.53±0.04	1.70±0.06	1.71±0.05	1.34±0.05*	1.79±0.04
6	2.96±0.06	*3.18±0.09	2.83±0.07	3.10±0.08*	2.84±0.08	2.01±0.10*	3.16±0.06
7	3.02±0.04	*2.90±0.07	3.09±0.05	3.04±0.06	3.01±0.05	3.00±1.00	3.03±0.04
8	1.91±0.03	*2.03±0.05	1.85±0.04	1.86±0.04	1.95±0.04	1.68±0.06*	1.96±0.03
9	1.49±0.03	*1.39±0.05	1.54±0.03	1.52±0.04	1.46±0.04	1.53±0.06	1.48±0.03
10	1.25±0.02	1.31±0.04	1.22±0.03	1.24±.0.03	1.27±0.03	1.36±0.06*	1.23±0.02

*=Significant (P<0.05)

younger than older participants (2.04±0.06 versus 1.53±0.04) and also in laypersons than dental professionals (1.79±0.04 versus 1.34±0.05). The mean attractiveness for picture6 was significantly higher in younger than older participants (3.18±0.09 versus 2.83±0.07), males than females (3.10±0.08 versus 2.84±0.08) and also in laypersons than dental professionals (3.16±0.06 versus 2.01±0.10). The mean attractiveness for picture 7 was significantly lower in younger than older participants (2.90±0.07 versus 3.09±0.05). The mean attractiveness for picture8 was significantly higher in younger than older participants (2.03±0.05 versus 1.85±0.04) and also in dental professionals than laypersons (1.68±0.06 versus 1.96±0.03). The mean attractiveness for picture 9 was significantly lower in younger than older participants (1.39±0.05 versus 1.54±0.03). The mean attractiveness for picture 10 was significantly higher in dental professionals than laypersons (1.36±0.06 versus 1.23±0.02) (Table 2).

DISCUSSION

The ability of an individual to express his or her emotion with the structure and movement of the teeth and lips through smile, determine how well the individual can function in the society because smile can allow one to have more influence and impact on others.[7] This is anchored on the fact that smile has a constructive effect on all interactions by portraying a sort of friendliness, openness, approachability. However when considered unattractive, it can exert major negative psychological and emotional influences. The negative perception by others may make the individual to appear timid, hesitant, withdrawn, sad and/or angry. Unattractive smile also makes an individual self-conscious, unhappy, inadequate and insecure. The creation and restoration of attractive smile is among the main concerns among dental patients.

This study with set objective to investigate the influence of gingival exposure on smile attractiveness among dental healthcare professionals and laypersons found that Nigerians are vast becoming aware of their smile aesthetics with invention of selfie picture technology on smart phones as 60.6% reported taking selfies. Although high proportion (67.3%) and (73.2%) of the participants reported comfortability with smile and received compliment for the beauty of the smile respectively, a reasonable proportion (86.6%) of them reported desire for further improvement on their smile (Table 1). This may related to the fact that and smile attractiveness is strongly connected to facial attractiveness[6] as smile ranks second only to the eyes as the most important feature in facial attractiveness.[14]

The amount of gingival exposure considered attractive differs among various studies.[15-18] Evaluation showed that among the levels of gingival exposure, (+4mm and +2mm) gingival exposure for the masculine picture received the highest mean attractiveness rating while (+2mm and +4mm) gingival exposure for the feminine picture highest mean attractiveness rating. This implies the gummy smile is highly attractive among the studied Nigerians which contrasted with findings of Hunt et al.[15] study among university students in Ireland where no gingival exposure (0 mm of gingiva) was considered as the most attractive and those with more than +2mm gingival exposure as less attractive. This confirms that aesthetic perception variation from race to race ad country to country as midline diastema contribution to beauty in Nigeria is upheld in contrast to other populations.[19,20]

Laypersons have been reported to be tolerant of a gummy smile up to 4 mm.[21-23]but increasing from 4 to 6 mm has been reported to negatively impacts smile attractiveness in varied ages.[23] Japanese adolescences and adults showed a threshold of acceptability for upper incisor coverage of 0–5 mm in males.[24] Overall, younger participants significantly reported lower attractiveness for gummy smile in this study which is a sharp contrast with In contrast, adolescents and young adults rated upper lip coverage as unattractive at any level. Even when gummy smiles are more

common among younger than older people.[25,26]

The influence of smile attractiveness on gingival exposure perception varied amongst gender with significantly higher mean attractiveness for +4mm gingival exposure for males than females. This contrasted findings of previous studies where female raters are more tolerant of effect of gingival exposure on smile attractiveness.[16] Although, no significant difference was found when judging the effects of gingival display on the smile attractiveness between the male and the female raters for both orthodontists and dental students[24], this study finding confirms that males and females rate with gingival exposure on smile attractiveness differently.[16] The higher attractiveness of gummy feminine smile among males is in conformity with studies that had layperson reporting better aesthetics for gummy smile. In this study, -2mm gingival exposure in the masculine picture and -4mm gingival exposure in the feminine picture significantly higher mean attractiveness in dental professionals than laypersons. In this study, -4mm gingival exposure in the masculine picture and +4mm and 0mm gingival exposure in the feminine picture significantly higher mean attractiveness in laypersons than dental professionals. Although the smile, dental professionals consider beautiful or attractive based on their experience and training, may not agree with the perceptions of other individuals.[27] Many orthodontists and surgeons have the opinion that a gummy smile is unattractive,[21] this perception was the same for dental professionals in this study. Dutra, et al.[28] found laypersons rating gummy female smile as most attractive which collaborated this study finding. The findings of this study may have limited by the gingival pigmentation and skin colour variation between masculine and feminine photographs. However the high prevalence of gingival pigmentation and skin colours among Nigerian make a relevant standard for comparison with further studies.

CONCLUSION

Data from this status ranked gummy smile in males as the most attractive smile and also revealed that the significant differences in the influence of gingival exposure on smile attractiveness were few between males and females, moderate between dental professionals and layperson, and huge between younger and older participants.

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