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SMILE AND ORAL HEALTH

ACHMAD HENDRA HARTAWAN WAWAN[1,2*], VISKASARI PINTOKO KALANJATI[3] AND ABDURACHMAN[3]

[1]Master Degree Program in Basic Medical Science, Universitas Airlangga, Surabaya, Indonesia
[2] Laboratorium of Anatomy, Faculty of Medicine, Universitas Surabaya, Surabaya, Indonesia
[3] Department of Anatomy and Histology, Faculty of Medicine, Universitas Airlangga,

Jl. Prof Moestopo 47 Surabaya 60132, Indonesia.

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Abstract– Smile is a facial expression that can modulate the immune system including secretory immunoglobulin A saliva (SIgA). Previous research showed various levels of SIgA according to the smile type, but the effect of smile on SIgA has not been widely reported. Here we analyzed the correlation between smile shape and SIgA levels in males and females. Nineteen males and 45 females' students of The Faculty of Medicine in Surabaya, Indonesia, between 18-21 y.o with healthy dental and mouth conditions were selected. A front face photo was taken in non-smiling and smiling positions, then the three component of smile measurement namely smile extent (SE), mouth angle (MA), smile index (SI) with the SIgA were measured. Data were analyzed using Spearman test to find correlation between SE, MA and SI with the SIgA levels (SPSS 17). We found that the non-smiling and smiling SE and MA, non-smiling SI and SIgA in males were greater than in females with significant difference in SE and SI ($p<0,05$). There are significant correlations between the SIgA levels and the smiling SE also with the non-smiling SI in all students. The smile measurements were different according to the gender but not the SIgA.

INTRODUCTION

The ability to express emotionthrough facial expressions is a basic aspect of social interaction via non-verbal communication (Helwig *et al.,* 2017). Smile is a facial expression that has a very important social and psychology roles, a successful smile would result in a good and positive effect to the giver and receiver (Van der Geld, 2007). Smile is also the most studied facial expression, considering a smile is most commonly used during interpersonal interaction. Previous studies have shown that a person's inability to smile effectively, would increase the risk of depression, which ultimately raises an important role of smile for health (Van Swearingen *et al.,* 1999).

Gender seems to have an effect on the smile quality: females are likely more comfortable expressing there emotion which contrast to the males. This resulted in an arguably better smile quality in females than males which affecting the facial expression muscle growth (Mufidah, 2008; LaFrance *et al.,* 2003).

There are positive correlations between smiling and immune system (Argyle, 1997; Dantzer and Mormede, 1995; Hillhouse & Adler, 1991). Lefcourt (2009) reported that there was significant increase in SIgA levels in the smiling group compared to the control group (Lefcourt *et al.,* 2009). However, another study showed a negative correlation between smiling and SIgA levels (Dillon *et al.,* 1985). Jafarzadeh *et al.* (2010) reportedthe differences in SIgA levels between men and women, although statistically insignificant (Jafarzadeh *et al.*, 2010). The IgA saliva (SIgA) is the first line of host defense against pathogenic microorganisms that attack the intraoral mucosal surfaces (Abbas *et al.,* 2015; Roitt, *et al.,* 2001).

In this current study, the correlation between the SIgA levels and three smile measurement namely SE, MA and SI would be measured in the young adults.

***Corresponding author's email :** achmad_hendrahw@yahoo.co.id

MATERIALS AND METHODS

This study already has an ethical approvement from the KEPK, The Faculty of Medicine in Surabaya, Universitas Airlangga, Indonesia, on April 30, 2018 with No. 134/ EC/ KEPK/ FKUA/ 2018.

Nineteen male and 45 female students of The Faculty of Medicine in Surabaya, Indonesia between 18-21 y.o with healthy dental and mouth conditions (examined by a professional dentist) were selected. Three component of smile shape namely smile extent (SE), mouth angle (MA) and smile index (SI) and the SIgA levels were measured and analyzed details were explained elsewhere (Helwig et al., 2017; Ackerman & Ackerman, 2002; Chard, 1995). The SE was measured from the middle point of lower lip to the commissure of the lips (in mm). The MA was measured from the angle made by SE line and parallel line of lower lip (in º). And the SI was measured from the proportion of width intercommisure (in mm) divided by the height interlabial gap (in mm) on a face front photos of individual student faces using the Adobe Photoshop CC Software application (Helwig *et al.*, 2017; Ackerman and Ackerman, 2002). The SIgA levels were measured using saliva from individual students through the ELISA (Enzyme Linked Immuno Sorbant Assay) method, and the Salimetrics, USA brand Enzyme Immuno Assay Kit (Chard, 1995). The correlations between these variables were statistically analysed using The Spearman Correlation Test after The Kolmogorov Smirnov Normality Test (SPSS 17).

RESULTS

The SE, MA and SI in males and females

We measured the SE, MA and SI in two positions: non-smiling and smiling positions (Fig. 1).

In non-smiling position, all three SE, MA and SI were higher in males than in females. The greatest SE and MA were observed in males with smiling position whilst the higher SI was observed in females than in males with smiling position (Table 1a). We found that the SE and SI both positions were significantly different between males and females ($p<0.05$), using Independent t-test (Table 1b).

The levels of SIgA in males were higher than in

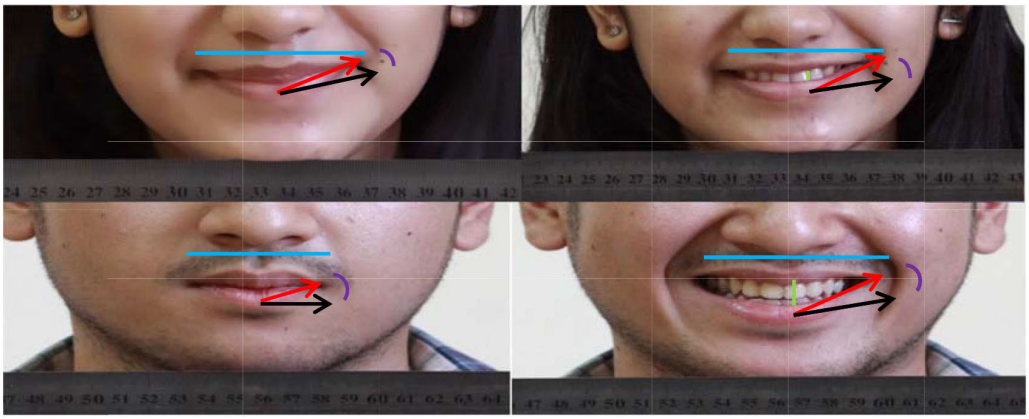

Fig. 1. Measurement of SE, MA, and SI in males and females.

Table 1a. The SE, MA and SI in non-smiling and smiling position in males and females (median data).

Smile shape components	Males(n = 19) Median±SD	Females (n = 45) Median±SD
Non-Smiling Position		
Smile Extent (SE)	28.06±1.62	27.02±2.5
Smile Index (SI)	19.7±1.1	19.33± 1.7
Mouth Angle (MA)	15.0±3.2	12.0 ±3.6
Smiling Position		
Smile Extent (SE)	35.87 ± 4.3*	33.98±4.2
Smile Index (SI)	5.8±2.6	7.0± 1.6
Mouth Angle (MA)	23.0±3.4*	20.0±3.4

Note. *The greatest value.

Table 1b. The SE, MA and SI in non-smiling and smiling position in males and females (mean data).

Smile shape components	Males(n = 19) Mean±SD	Females (n = 45) Mean±SD	p
Non-Smiling Position			
Smile Extent (SE)	28.3±1,6	26.9±2,5	0.044[a]
Smile Index (SI)	19.9±1.2	19.1±1.8	0.042[b]
Mouth Angle (MA)	13.6±3.3	12.5±3.6	0.266
Smiling Position			
Smile Extent (SE)	36.6±4.4*	34.1±4.2	0.040[a]
Smile Index (SI)	6.8±2.7	7.5±1.7	0.000[b]
Mouth Angle (MA)	22.6±3.5*	20.9±3.4	0.136

Note. [a] SE both positions were significantly different between males and females ($p<0.05$).
[b]SI both positions were significantly different between males and females ($p<0.05$).
The SIgA levels in males and females

Table 2. The SIgA levels in males and females (median and mean data).

	Males (n = 19)	Females (n = 45)	p
SIgA levels (Median±SD)	12.8±1.2	5.0±1.32	
SIgA levels (Mean±SD)	16.7±12.3	13.5±13.2	0.342

Note. *The SIgA levels in males were higher compared to the females.

females although not significant statistically (p>0,05), using Independent t-test (Table 2).

The correlation between the SE, MA, SI and the SIgA levelsin all students

All data were analysed using The Kolmogorov Smirnov Normality Test: the MA and SIgA levels in females were non-parametric. Thus, we use The Spearman Correlation Test. The correlation tests were done in both non-smiling and smiling positions measurements (Table 3).

Table 3. Correlation of smile shape components with the SIgA levels in all students.

Smile shape components	SIgA levels	
	Spearman correlation coefficient/ rho	p
Non-Smiling Position		
Smile Extent (SE)	0.117	0.358
Smile Index (SI)	0.268	0.033[a]
Mouth Angle (MA)	0.130	0.306
Smiling Position		
Smile Extent (SE)	0.260	0.038[b]
Smile Index (SI)	-0.040	0.752
Mouth Angle (MA)	0.015	0.904

Note. [a] SI data of non-smiling position there is significant difference (rho= 0.268 and $p< 0.05$).
[b] SE data smiling position there are significant difference (rho= 0.260 and $p< 0.05$).

All smile shape components, except the SI in smiling position, have positive correlation with the SIgA levels.These correlation were significant between the SIgA levels and the non-smiling SI and the smiling SE (p=0.33 and p=0.38, respectively).

DISCUSSION

From this study, we observed greater smile shape components in males compared to the females both in non-smiling and smiling positions, except the smiling SI that was greater in females than in males. The smile shape components namely SE, MA and SI are the measurements that based on the position and size of the lips of each individual (Helwig et al., 2017; Ackerman & Ackerman, 2002). These variables are determined by many factors, while the size of the lips is very determined by the shape and size of the bones that form the basis of the lips, namely the mandible. In generally, maleshave a bigger face size and angle of the pro tuber antiamental is in the os mandible compared to females (Artaria, 2008).Facial expression muscles surrounding the mouth also contribute in the size and the shape of the lip i.e. the zygomaticus major, levator anguli oris, depressor anguli oris, risorius, buccinator and orbicularis oris muscles (Moore, Persaud & Torchia, 2016).

In this study, we found that the SIgA levels in males were higher than in females. In previous

study by Narhi (1994), the SIgA levels in females were significantly higher than those observed in males (Narhi, 1994). The contrast result between the current and previous study may due to the differences in race, age, and study method. Other study showed that the SIgA levels are more likely correlated to the age rather than gender (Jafarzadeh *et al*., 2010; Eliasson *et al*., 2006).

From this study, the SIgA levelswere positively correlated to the SE, MA and SI both in non-smiling andsmiling position, except with the SI in smiling position. Two strongest correlations were shown between the SIgA levels and the non-smiling SI and with the smiling SE. These may mean that people who have bigger smile shape would have better oral health expressed from higher levels of SIgA.

The SIgA levels are determined by several factors including general immune system and hormonal states. Previous study showed the SIgA levels relationship with humorous videotape, which is shown inversely related to changes in the SIgA levels after subjects viewing of the humorous videotape (Dillon, *et al*., 1985). Furthermore, smile can increase the natural endorphine in the brain which can modulate the Hypothalamic Pituitary Adrenal axis. Thus, smiling people would have better tolerance to stressor (Hillhouse and Adler, 1991). In Lefcourt (2009), people who were smiling more due to watching funny video would have higher SIgA levels, although this study was not reporting the correlation between the SIgA levels and smile shape component as analyzed in this current study (Lefcourt *et al*., 2009).

CONCLUSION

Smiling can promote better oral health shown by higher SIgA levels in people with bigger smile components in this study.

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