

Assessment of the Expression of Smile Intensity with or without Wearing Mask

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Abstract

Introduction: Smile is the most important means of communication of our feelings and emotions. The usage of a mask for prevention of respiratory illness can hamper the basic communication to some extent. This study was conducted to assess the smile intensity with or without wearing mask.

Method: Photographs of 6 participants were taken in no smile, mild smile, moderate smile and full smile intensity were taken and mask was added to them using adobe photoshop. 95 participants (32 Interns, 32 UG and 31PG) rated these masked and unmasked photographs on a scale of 0-3 based on the smile intensity perceived by them. Comparisons of rating of the same photographs were done for masked and unmasked group.

Results: Ratings for the unmasked photographs were more accurate compared to their masked version. The actual rating and the ratings given by the participants were similar in case of unmasked photos. Masked photographs ratings were dissimilar from the actual ratings.

Conclusion: Mask usage causes difficulty in accurately assessing the smile intensity and limits the recognition of facial expressions.

Keywords: Smile Intensity, face mask, surgical mask, perception, facial expression, emotions.

Introduction

The use of face masks has become very essential as mask wearing is a convenient way to reduce the spread of diseases which are contagious. The mask affects our communication via facial expression because the lower third of the face is covered and has a negative impact on interpersonal situations.^{1, 2}

Facial expression is one of the most efficient channels to communicate our feelings to others. Among these expressions, smiling is a

fundamental facial expression to communicate positive affect.¹

To convey the emotions smile is very important and with the mask, the smile will be hidden so it may impair the correct expression of the intensity of the smile and the feelings of the individual will not be communicated well. In doctor patient relationship, mother to child relationship and even in social relations, non-verbal communications plays a vital role. Facial expression and smile are one of those non

verbal communications to express the feelings and emotions.

The purpose of the study was to study the effect of wearing facemask on the perception of smile intensity. The smile intensity was assessed with mask, without mask and compared with each other. The ratings obtained from the participants were compared with the actual rating of the photos validated by the expert panel.

MATERIALS AND METHOD

This study was a cross-sectional study conducted in Yenepoya Dental College. The study was approved by institutional review board and written informed consent was taken from the participants. Simple random sampling method was used for data collection.

Materials: The photographs were taken using high definition DSLR camera (Canon EOS 800D II DSLR). Adobe Photoshop was used to create a masked version by placing an image of a surgical mask over the nose and mouth with reference points of the chin, bridge of the nose, and face edge. For the standardization of the photographs a white sticker of 10mm× 10mm was placed on the forehead.

Methodology:

Two types of participants took part in this study:

(1) Dental Students (Undergraduate students and interns) whose photographs were taken,

6 participants have been considered for taking the photographs

(2) Participants (Undergraduate Students, Postgraduate students and interns) who scored the photos of the (1) participants with mask and without mask.

95 participants to rate the photographs with or without mask (32 undergraduate students, 32 interns, 31 Postgraduate Students)

The photographs of the 6 dental students (Undergraduate students - I,II, III,IV year and Interns) aged between 18-30 years were taken with which can be graded on a scale of (0-3) based on the intensity of the smile (0-Non smiling, 1-mild smile intensity, 2-moderate smile intensity, 3-full smile intensity). The mask was added to the photos with adobe Photoshop. This provided us with photographs with and without mask for each sample.(Fig.1)

A panel of 3 experienced orthodontists validated the reliability of the smile intensity rating scale.

The author scored the photographs based on the actual intensity of the smile for each sample and this data was used later to compare with the data received from the study participants (2).

The study participants (2) (Undergraduate students, postgraduate students and Interns) rated the photographs with mask and without mask using the (0-3) scale based on smile intensity perceived by them.

Inclusion Criteria:

For Participants (1)- Dental Students of age 18-30 years who are undergraduate or interns.

For participant (2)-Dental students (undergraduate, interns and postgraduates)

Exclusion Criteria:

- Individual with head cover covering the hair and ears
- Individuals with Missing Anterior teeth
- Individuals with gross facial asymmetry
- Individuals with orthodontic braces

Statistical analysis: Simple descriptive and summary measures will be used to describe the data. Kappa statistics will be used to estimate the proportion of actual agreement.



Fig1. Participant with and without mask posing with no smile (0), mild smile(1) and moderate smile(2) and full smile intensity(3), (left to right)

RESULTS

The ratings of the participants were found to be independent of the status of the rater be it undergraduate, postgraduate or an intern while rating the masked photos (Table 1). Among the three participants (UG, PG and interns) PGs and UGs gave almost similar ratings in their respective groups whereas the interns differed in rating the masked photos (Table 2). High value of kendell’s coefficient of concordance was seen in each group of participants (Table 3),(Fig 2).

In the without mask ratings of the photos the rating were independent of the status of the rater. (Table 4) The PGs, UGs and Interns gave almost similar ratings for the photos with mask (Table 5). High value of kendell’s coefficient of concordance was seen in each group of participants (Table 6). The ratings given by the participants for without mask photos matched with the actual rating of the photos (Table 7). At 10% significance value the ratings given by the participants differed from the actual rating when the photographs were masked among PGs,UGs and interns(Table 8),(Fig 3).

Table 1: Rating by the participants for the with mask group

GROUPS	SMILE INTENSITY			
	Non smile	Mild smile	Moderate smile	Full smile
Subject (24)	6	6	7	5
INTERNS (32)	258	240	104	166
PG’S (31)	287	240	97	120
UG’S (32)	270	257	115	126

X² value= 12.494 DF=6 p-value=0.05182

Table 2: Kappa statistics of masked group

	Kappa	z-value	p-value
Intern	0.489	88.8	0.000
Non-smiling	0.574	62.638	0.000
Mild smiling	0.428	46.650	0.000
Moderate smiling	0.203	22.132	0.000
Full smiling	0.653	71.292	0.000
UG	0.461	82.8	0.000
Non-smiling	0.568	61.945	0.000
Mild smiling	0.408	44.498	0.000
Moderate smiling	0.241	26.282	0.000
Full smiling	0.573	62.525	0.000
PG	0.477	81.7	0.000
Non-smiling	0.549	57.981	0.000
Mild smiling	0.432	45.602	0.000
Moderate smiling	0.274	28.996	0.000
Full smiling	0.593	62.676	0.000

Table 3: Kendall’s coefficients of concordance in the with mask group

Group	Concordance wt.	Chi sq	p-value	Inference
Interns	0.768	565	7.99e-105	Highly significant
UG	0.714	525	1.99e-96	Highly significant degree of rating reliability
PG	0.701	500	3.29e-91	Highly significant degree of concordance

Table 4: Rating by participants for the without mask group.

Groups	Smile intensity			
	Non smile	Mild smile	Moderate smile	Full smile
Subject (24)	6	6	7	5
INTERNS(32)	169	304	154	141
PG'S(31)	187	307	136	114
UG'S(32)	182	325	133	128

X² value= 5.9631 DF=6 p-value=0.4273

Table 5: Kappa statistics without mask group

	Kappa	z-value	p-value
Intern	0.442	81.2	0.000
Non-smiling	0.565	61.604	0.000
Mild smiling	0.340	37.092	0.000
Moderate smiling	0.252	27.463	0.000
Full smiling	0.666	72.630	0.000
UG	0.438	79.4	0.000
Non-smiling	0.563	61.408	0.000
Mild smiling	0.376	41.012	0.000
Moderate smiling	0.233	25.476	0.000
Full smiling	0.595	64.957	0.000
PG	0.42	73.7	0.000
Non-smiling	0.564	59.611	0.000
Mild smiling	0.349	36.862	0.000
Moderate smiling	0.233	24.656	0.000
Full smiling	0.560	59.167	0.000

Table 6: Kendall's coefficients of concordance in the without mask group

Group	Concordance wt.	Chisq	p-value	Inference
Interns	0.707	520	2.39e-95	Highly significant

				association exists between ratings
UG	0.671	494	6.1e-90	Highly significant association exists between ratings
PG	0.651	464	1.1e-83	Highly significant association exists between ratings

Table 7: Comparison with true rating in without mask group

Groups	Smile intensity			
	Non smile	Mild smile	Moderate smile	Full smile
Subject (24)	6	5	7	6
INTERNS (32)	169	304	154	141
PG'S (31)	187	307	136	114
UG'S (32)	182	325	133	128

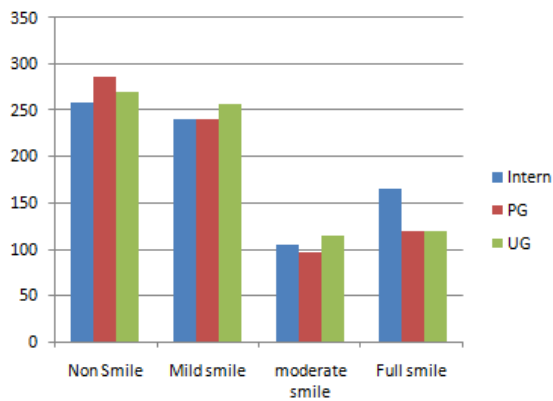
X² value= 10.723 DF=9 p-value=0.2952

Table 8: Comparison with true rating in the with mask group

Groups	Smile intensity			
	Non smile	Mild smile	Moderate smile	Full smile
Subject (24)	6	6	7	5
INTERNS (32)	258	240	104	166
PG'S (31)	287	240	97	120
UG'S (32)	270	257	115	126

X² value= 14.766 DF=9 p-value=0.09757

Rating by the participants for the with mask group



Rating by participants for the without mask group

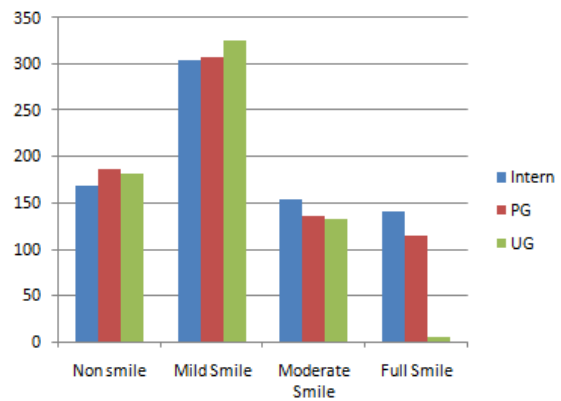
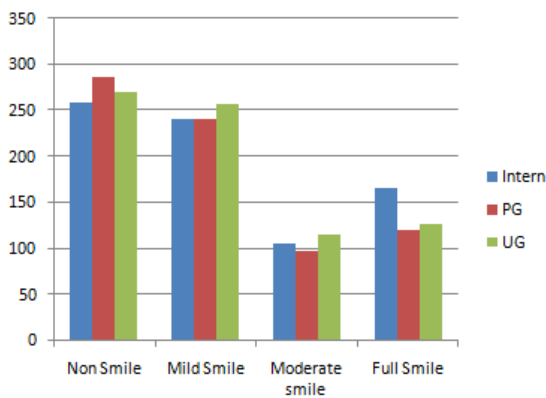


Fig 2. Rating of the participants in with mask and without mask group

Comparison with true rating in the with mask group



Comparison with true rating in without mask group

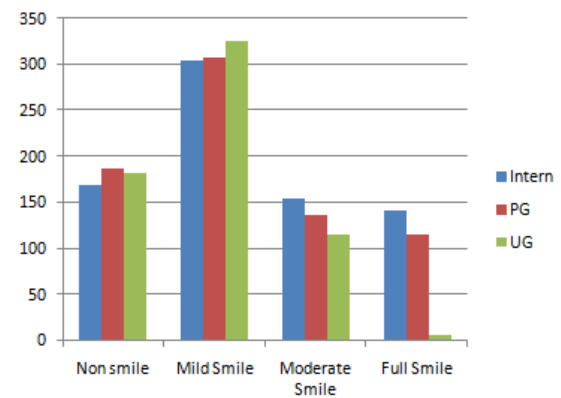


Fig 3. Comparison with the true rating in with mask and without mask group.

DISCUSSION

The present study showed that usage of facemask impairs the ability to assess the smile intensity as well as the recognition of emotion and feelings through facial expressions mainly smile. These results are largely consistent with previous studies reporting such impairments due to wearing a surgical mask. Miyazaki et al (2022), Carbon(2020), Grenville & Dwyer(2022), Grundmann et al., (2021), Kim et al.,(2022), Marini et al., (2021), and showing the importance of the mouth region on emotion recognition. Saumure et al.,(2018), Schurgin et al., (2014), Schyns et al., (2002); Wegrzyn et al.,(2017). Marini et al., (2021) found that

wearing a surgical mask (vs. no-mask) impaired recognition accuracy of fear, happy, and sad faces and miyazaki et al (2022) studied the effects of wearing a transparent mask on recognition of facial emotion and the perceived intensity of emotions. They found that by wearing a transparent mask, moderated the reduction in perceived intensity of emotions. Sheldon et al., (2021) documented that usage of a surgical mask reduces the perceived intensity in both genuine (Duchenne) and social (non-Duchenne) smiles. The present study showed that the status of the rater be it intern, PG and UG did not affect the smile ratings, they were independent for both masked and unmasked photos. When compared with the

actual rating of the masked and unmasked photographs the ratings were more accurate in case of unmasked photographs when compared to masked photographs.

Usage of facemask helps in preventing the transmission of respiratory illnesses and their usage was widely seen when the Covid-19 pandemic became prevalent. Mask usage became an everyday practice all over the world. Facemask complicate the social interaction as they impair emotion reading from facial expressions but humans can interpret a other person's state of mind by reading their body language and posture. This cannot be used as a excuse to wearing mask in medical situations whenever required.

CONCLUSION

The usage of facemask impairs the ability of non-verbal communication by facial expressions and smile intensity perceived is also hampered. Transparent masks can help to a certain extent but it is the bare face which allows best expressions of emotions, feelings and smile characteristics.

Conflict of Interest: The authors declare no conflict of interest.

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