What's Behind the Mask?

"Am I happy? Am I sad?"

Students' Names: Elena Jafari & Elika Jafari

Project Summary:

This study was conducted to determine if wearing face masks interferes with perceiving the mask-wearer's emotions by others. Pictures were taken from 7 volunteers wearing face masks after asking them to have neutral, happy or sad feelings. The pictures were displayed in an online survey to the study participants who were requested to rate each picture as Neutral, Happy or Sad.

129 participants (mean age 39.8 years, 75.2% female) completed the online survey, providing 2709 ratings. Participants rated 72.0% (95%CI 70.3-73.7%) of the pictures correctly (90.8% [95%CI 88.9-92.7%] of Happy, 70.9% [95%CI 67.9-73.8%)] of Neutral and 54.3% [95%CI 51.0-57.5%] of Sad pictures). There was no significant difference between males and females in correct ratings.

While masks interfered with perceiving emotions of mask wearers, study participants were still able to correctly determine the emotions in over two-third of the pictures, with higher correct rates for pictures expressing happy emotions.

Introduction

- Wearing face masks is an effective strategy to limit the transmission of many infections including Coronavirus that spread through respiratory route. Due to the current pandemic, wearing face masks is highly recommended or required in many places including schools and work places.(1)

- However, wearing face masks might interfere with social interactions and communications as they cover large parts of face and might prevent others from understanding the mask wearer's facial expressions.(2)

- Studies have suggested that we might still be able to understand other peoples' emotions when parts of face is covered.(3,4)

- We conducted this study to determine how wearing face masks affect the understanding and perceiving of emotions and facial expressions of the mask-wearers by others.

- Our hypothesis: Wearing face masks does not interfere with perceiving the mask-wearer's emotions (being happy, sad or neutral) by other people.

Methods

- We recruited 7 adult volunteers (4 women and 3 men who gave us permission) to model for our pictures:
    - For each volunteer, we took pictures after asking them to first have neutral feelings, then think of a very happy memory, then think of a very sad memory while giving them a few moments to adjust each time.
    - All pictures were taken using same device with similar lighting and background.

- We created a website to host the research survey (located at www.guesswhatsbehindthemask.com/survey)
    - We used Google random number generator to randomly order the models and their pictures (7 Happy, 7 Neutral, 7 Sad).

- After obtaining approval from OCSEF SRC on 3/1/21, we launched the study survey and it has been live and publicly available since then.
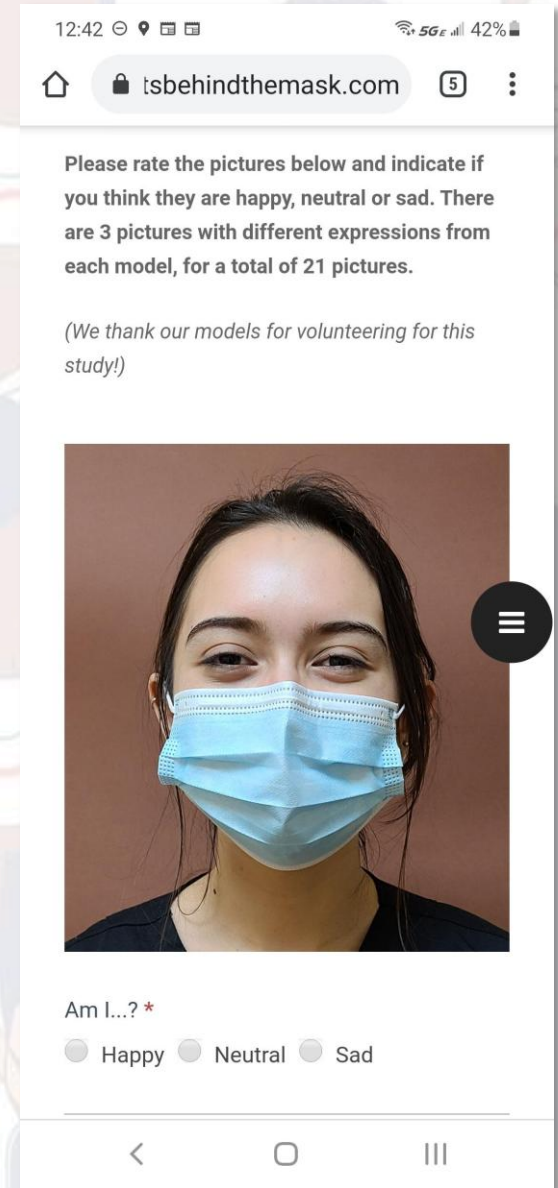
Methods

- We asked family members and friends to participate in our research survey and also asked them to share it with others.

- The data collected from the study participants include name, email (optional, for further communication of the study results), age, gender, agreement to the consent to participate in the study, time and IP address of the device used to complete the survey.

- The study database was created in spreadsheet to perform study analysis.
  - All data entered into the database were anonymized.
  - We calculated percentage of correct ratings and their mean, standard deviation, minimum, maximum, median and interquartile range (IQR).

- We used the calculator at www.mathsisfun.com/data/confidence-interval-calculator.html to calculate the 95% Confidence Intervals (95%CI) around % of correct ratings.
  - If the 95%CI includes 100%, the hypothesis that masks does not interfere with perceiving emotions is accepted.

- We used the calculator at www.socscistatistics.com/tests/chisquare/default.aspx for Chi-square analysis. P values ≤0.05 were considered to be significant.

Results

- As of March 23, 2021, 135 total entries were received to our online survey
  - 6 entries were excluded (due to answering the same to all ratings from the same IP address)
  - The current results are based on 129 participants/entries rating 21 pictures (2709 total ratings)
  - Participants mean age was 39.8 years (range 7 to 62); 97 females, 32 males

- Overall 1950 out of 2709 (72.0%, 95%CI 70.3-73.7%) ratings were correct (meaning that for example a "Happy" expression was correctly rated as "Happy" by the participant):

	Correct Ratings (%)	P Value (vs. Neutral Pics)	P Value (vs. Sad Pics)
Happy Pictures	820/903 (90.8%, 95%CI 88.9-92.7%)	<0.00001*	<0.00001*
Neutral Pictures	640/903 (70.9%, 95%CI 67.9-73.8%)	--	<0.00001*
Sad Pictures	490/903 (54.3%, 95%CI 51.0-57.5%)	(Same as ↗)	--

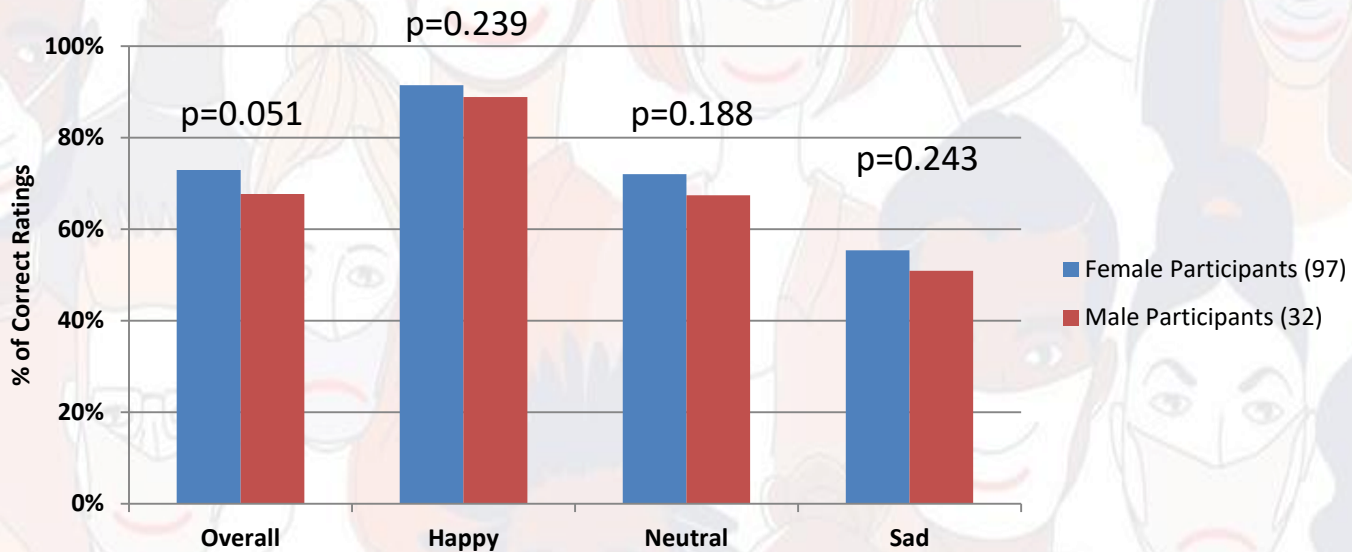*) Chi square p values <0.05 are considered significant.

Results

- Among 129 participants, there was great variation in distribution of % of correct ratings.
  - Some participants were able to rate most pictures correctly while some performed relatively poorly. Below is a summary of individual participants' correct ratings:

	Min	Median	Max	IQR
% of Correct Rating of All Pictures	33.3%	76.2%	100.0%	19.0%
% of Correct Rating of Happy Pictures	28.6%	100.0%	100.0%	14.3%
% of Correct Rating of Neutral Pictures	28.6%	71.4%	100.0%	28.6%
% of Correct Rating of Sad Pictures	0.0%	57.1%	100.0%	28.57%

- The number of participants with perfect (100%) correct ratings:
  - All pictures: 2 participants (1.5%)
  - Happy pictures: 82 participants (63.6%)
  - Neutral pictures: 11 participants (8.5%)
  - Sad pictures: 3 participants (2.3%)

Results

- While female participants had more correct ratings than male participants, the difference was not significant:

(Chi square p values <0.05 are considered significant)

Results

- Among 7 volunteers who provided pictures for the survey, there was variation in % of correct ratings of their pictures by the study participants and some were easier to correctly rate than others:
    - Overall: 52.2% (Model 5's pictures) to 92.5% (Model 1's pictures) had correct ratings
    - For Happy pictures: 76.7% (Model 5) to 99.2% (Model 1) had correct ratings
    - For Neutral pictures: 45.0% (Model 6) to 93.8% (Model 1) had correct ratings
    - For Sad pictures: 24.8% (Model 5) to 86.8% (Model 3) had correct ratings

Discussions

- In our study, participants were commonly able to guess the emotions of the models correctly. However, the 95%CI of the correct ratings did not include 100% and as such, our hypothesis that masks do not interfere with perceiving emotions was rejected.

- Pictures expressing happy emotions were the easiest to rate correctly (90.8%).

- Pictures expressing sad emotions were most challenging to rate correctly (54.3%) although pictures with neutral expression were also quite challenging (70.9% correct) and in many times, it was difficult to distinguish neutral from sad expressions.

- Differences in correct ratings between happy, neutral and sad pictures were all significant.

- While female participants had more correct ratings than male participants, the difference was not significant (although the difference became almost significant for overall ratings).

Discussions

- We observed great variations between different participants in their ability to correctly rate the pictures, and also great variations between models in their expressions being correctly rated by the participants:

  - Pictures from our Model #1 had the highest correct ratings over 90%) whole our Model #5 had the lowest correct ratings (just over 50%)

  - While some participants were able to correctly rate almost all pictures, some participants did very poorly.

- The initial submission of this study to OCSEF was based on 57 entries collected between 03/01/21 and 03/09/21. The initial results were largely consistent with the current results (e.g. overall correct ratings of 71.6% in initial submission vs. 72.0% in the current updated results). Consistency of the results is suggestive of robustness and validity of our findings.

Conclusions

➢Our study shows that while wearing masks does interfere to some degrees with perceiving the emotions of the mask wearer by others (overall, as well as in Happy, Neutral and Sad pictures), most people (regardless of gender) are still able to perceive the feelings of a person wearing mask in the majority of times despite the mask covering large parts of face.

➢It is generally much easier to do so when the mask-wearer is happy and understanding neutral or sad expressions are far more challenging.

➢Additionally, some people do much better in understanding others' emotions behind the masks, while some people also appear to be far more capable of conveying their feelings while wearing masks.

➢Further study on the impact of other factors such as age, color/shape of masks, background and lighting conditions on the ratings is needed.

➢This study can have important real world implications. Since it shows that perceiving neutral or sad emotions behind masks are far more challenging than happy emotions, we should remain more vigilant on other people's feeling and expressions and use other clues when we suspect they might be sad. Likewise, we should be aware than when we are feeling sad while wearing masks, others might not be able to perceive that easily and hence we need to be more open and vocal to express our feelings.

➢We hope that our study inspires further research into finding more effective ways of communicating feelings while wearing masks (e.g. development of clear masks)

References

1) CDC – Use Masks to Slow the Spread of COVID-19. (www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html)

2) Spitzer M. Masked education? The benefits and burdens of wearing face masks in schools during the current Corona pandemic. Trends Neurosci Educ. 2020 Sep;20:100138. (pubmed.ncbi.nlm.nih.gov/32917303/)

3) Ruba AL, Pollak SD. Children's emotion inferences from masked faces: Implications for social interactions during COVID-19. PLoS One. 2020 Dec 23;15(12):e0243708. (pubmed.ncbi.nlm.nih.gov/33362251/)

4) Calbi M, Langiulli N, Ferroni F, Montalti M, Kolesnikov A, Gallese V, Umiltà MA. The consequences of COVID-19 on social interactions: an online study on face covering. Sci Rep. 2021 Jan 28;11(1):2601. (pubmed.ncbi.nlm.nih.gov/33510195/)

Supplementary Information:

Our study survey is publicly available at the following address:

www.guesswhatsbehindthemask.com/survey