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Improving masked communication: the case for transparent masks

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Clear and compassionate communication is tantamount to quality of care and patient wellbeing. Yet, much of communication in healthcare occurs with lower faces visually hidden behind opaque face masks. Visual occlusion of the face by masks impairs both verbal and nonverbal communication, including recognition of basic emotions, perceptions of trustworthiness, emotional understanding, and empathic responding. This piece presents a brief overview of the new COVID-19 inspired literature which shows that visual face occlusion creates significant communication barriers which can be reduced by wearing transparent instead of opaque masks.

KEYWORDS

face occlusion, transparent masks, nonverbal communication, verbal communication, doctor-patient interactions, clear masks, healthcare, face masks

Introduction

“The face is a picture of the mind with the eyes as its interpreter.” Marcus Tullius Cicero

The impact of opaque face masks on communication

Much of human communication is nonverbal and relies on reading the rich set of visual cues from our faces. Visually, and without a word, human faces convey a range of diverse messages ranging from personal attributes like trustworthiness, identity, and gender, to mental state information like attentional focus or interest (e.g., Palermo and Rhodes, 2007; Itier and Batty, 2009). Faces are also one of the most salient visual indicators of human emotions, with accurate recognition of each of the six basic emotions – happiness, sadness, anger, disgust, surprise, and fear – critically resting on the perception of face features (Ekman, 1999; Smith et al., 2005; Calvo and Nummenmaa, 2008; Nusseck et al., 2008; Blais et al., 2012; Kret and de Gelder, 2012; Schurgin et al., 2014; Wegrzyn et al., 2017). For example, the emotional state of happiness is often conveyed by a smile, while the emotional state of fear is often conveyed by widening of the eyes (e.g., Ekman, 1999). Thus, while looking at our interactive partners, our mind spontaneously extracts this emotional information from the visually diagnostic regions of the lower and upper face, respectively, (Eisenbarth and Alpers, 2011; Schurgin et al., 2014).

In healthcare settings, clear and compassionate communication is tantamount to quality of care, patient wellbeing, and training effectiveness (Sinclair et al., 2016; Marler and Ditton, 2021; Malenfant et al., 2022). Yet, much of communication in these contexts occurs with lower faces visually hidden by opaque face masks. While wearing face masks in healthcare remains

critical for preventing contagion (Eikenberry et al., 2020; Prather et al., 2020; Leung et al., 2021), individuals both within and outside of healthcare report that one of their main concerns about face masks is a struggle to identify important nonverbal cues (Chu et al., 2021; Aurégan et al., 2023). Supporting this notion, recent COVID-19-inspired psychological research demonstrates that visually occluding face parts with face masks results in significant impairments in nonverbal communication (Pavlova and Sokolov, 2022 and Mheidly et al., 2020 for reviews). Face occlusion by masks leads to increased perceptions of unhealthiness (Cartaud et al., 2020; Olivera-La Rosa et al., 2020), and impairs recognition of age (Fitousi et al., 2021; Wong and Estudillo, 2022), gender (Fitousi et al., 2021; Wong and Estudillo, 2022), and facial identity (Fitousi et al., 2021; Noyes et al., 2021) especially when having to re-identify an unmasked individual who was previously wearing a mask (Marini et al., 2021; Or et al., 2023). Masks also bias social judgments of trustworthiness, in some cases negatively (Biermann et al., 2021; Marini et al., 2021; Bylianto and Chan, 2023) and in others positively (Cartaud et al., 2020).

Perhaps most strikingly, humans have been found to be significantly impaired at recognizing all six basic emotions when faces are covered with face masks (e.g., Carbon, 2020; Noyes et al., 2021; Pazhoohi et al., 2021; Aguillon-Hernandez et al., 2022; Blazhenkova et al., 2022; Ramachandra and Longacre, 2022; Ramdani et al., 2022; Rinck et al., 2022; Wong and Estudillo, 2022; McCrackin et al., 2022a; Proverbio et al., 2023 for a review). This general emotion recognition detriment varies with individual emotions, such that the largest impairment is typically reported for disgust (e.g., Carbon, 2020; Rinck et al., 2022; Wong and Estudillo, 2022; McCrackin et al., 2022a) and the smallest for fear (e.g., Carbon, 2020; McCrackin et al., 2022a). This negative effect of facial occlusion by masks on emotion recognition is also relatively consistent across individuals, appearing to vary little with the individual level of social competence (Pazhoohi et al., 2021; Blazhenkova et al., 2022; Carbon et al., 2022; Ramachandra and Longacre, 2022; McCrackin et al., 2022a) or extended mask exposure time (Carbon et al., 2022).

Critically, the impairment in basic emotion recognition from masked faces further exerts negative effects on more complex social processes that depend on visually recognizing emotions, such as understanding of emotions in masked others (McCrackin et al., 2022b; McCrackin and Ristic, 2022), mimicking their facial expressions (Kastendieck et al., 2022, 2023), and sharing the emotions empathetically with them (McCrackin et al., 2022b). In other words, a masked medical professional interacting with a masked patient may struggle to identify that patient's frown, infer from that frown that the patient may be distressed, and fail to empathize with them accordingly. Conversely, the patient may struggle to identify empathy from the physician's face, which both Wong et al. (2013) and Kratzke et al. (2021) reported in patient surveys. As identifying and responding to emotional states is a key part of effective communication, opaque masks seem to significantly impair this ability and consequently also significantly lower the quality of doctor-patient relationships (Wong et al., 2013, Kratzke et al., 2021; reviewed by Marler and Ditton, 2021).

The impact of face occlusion by masks extends beyond nonverbal communication to verbal communication and speech comprehension. As reviewed by Francis et al. (2024) and Marler and Ditton (2021), face masks occlude lip movements and physically dampen the sound (e.g., Bottalico et al., 2020; Cruz et al., 2022; Moon et al., 2022; Zhou

et al., 2022) and prosody (Sinagra and Wiener, 2022) of speech. This makes it more difficult for individuals to discriminate speech when the speaker is masked (e.g., Bandaru et al., 2020; Bottalico et al., 2020; Giovanelli et al., 2021; Homans and Vroegop, 2022; Kim and Thompson, 2022; Kumar et al., 2022; Moon et al., 2022; Ritter et al., 2022; Zhou et al., 2022) and results in increased effort required to process speech (Giovanelli et al., 2021; Mendel et al., 2022). This detriment in verbal comprehension seems to disproportionately impact those with hearing loss (Atcherson et al., 2017; Aguillon-Hernandez et al., 2022; Mendel et al., 2022; Ritter et al., 2022) and is exacerbated when there is background noise competing with the speaker (Kumar et al., 2022).

In summary, while face masks remain one of the best strategies for disease spread mitigation (Eikenberry et al., 2020; Prather et al., 2020; Leung et al., 2021), they have an unfortunate social side effect in that they create significant barriers in both nonverbal and verbal communication, which is especially important for healthcare settings (e.g., Wong et al., 2013; Chu et al., 2021; Kratzke et al., 2021; Pandya et al., 2022; Aurégan et al., 2023). Working to reduce mask hesitancy and to improve masked communication should be high priority in healthcare, especially given that the prevalence of face masks may be increasing with pandemic frequency projections (Marani et al., 2021; Haileamlak, 2022). In the next section, we review evidence showing that wearing transparent masks is a promising strategy for reducing some of these key communication impairments.

Transparent masks reduce communication barriers

Wearing transparent instead of opaque face masks can restore some of the most critical aspects of nonverbal communication due to allowing the parts of the face which communicate emotionally diagnostic information to remain visible. Indeed, Marini et al. (2021) found that emotion recognition with transparent masks was just as good as unmasked emotion recognition. Similarly, Chu et al. (2021) reported that while only 20.3% of healthcare workers and the general population could identify an opaque mask wearer's emotion, 79.5% could do so if the mask was visually transparent. Not only do transparent masks restore basic emotion recognition, but they also restore the ability to make more complex emotional inferences, including the ability to integrate emotional context and facial expressions when judging a protagonist's emotions (McCrackin et al., 2022b). The ability of transparent masks to restore emotion perception likely contributes to other positive social effects. For example, it may help to explain why patients feel that surgeons wearing transparent masks are more empathetic (Kratzke et al., 2021). Transparent masks have also been found to restore judgments of trustworthiness to unmasked levels (Marini et al., 2021), and accordingly, patients may trust surgeons wearing transparent masks more than surgeons wearing opaque masks (Kratzke et al., 2021).

In addition to nonverbal communication benefits, transparent masks also facilitate speech comprehension. While most studies suggest that transparent masks attenuate the sound of speech more than other mask types (Bottalico et al., 2020; Atcherson et al., 2021; Kumar et al., 2022; Ritter et al., 2022), the restoration of visual mouth cues seems to compensate for this detriment (e.g., Atcherson et al., 2017; Thibodeau et al., 2021; Zhou et al., 2022; Yi et al., 2023). Indeed,

Thibodeau et al. (2021) found that although transparent masks impaired verbal comprehension relative to opaque masks when speech was presented in auditory only format, verbal comprehension was significantly improved by transparent masks when both visual and auditory cues were provided. Importantly, this was true for those with typical hearing and those with hearing loss, regardless of whether they used assistive technology. Similarly, both Yi et al. (2023) and Atcherson et al. (2017) found that those with hearing loss benefited from speakers wearing transparent masks as opposed to opaque masks. While those with hearing loss may benefit from transparent masks more than those with typical hearing (Atcherson et al., 2017), transparent masks have also been found to restore the speech comprehension of typically hearing nurses to unmasked levels (Zhou et al., 2022).

Transparent masks are generally well received by healthcare professionals and the public. Most report feeling either positive or neutral about transparent masks (Chu et al., 2021), and both healthcare workers and patients report liking transparent masks more than opaque ones (Bradbury and Pines, 2021; Chu et al., 2021). This is possibly driven both by a preference for seeing a physician's face [as demonstrated with physician photos by Wiesmann et al. (2021)] and by improved nonverbal and verbal communication with transparent masks (Bradbury and Pines, 2021; Chu et al., 2021; Kratzke et al., 2021), which is reported by individuals both with and without hearing impairments (Bradbury and Pines, 2021; Chu et al., 2021). Accordingly, the National Association for the Deaf lists transparent masks as a service that hospitals should provide to facilitate communication.¹ Transparent masks also appear to facilitate a feeling of connection to the mask wearer (Bradbury and Pines, 2021), and healthcare workers believe that wearing transparent masks would put patients more at ease (Chu et al., 2021).

Caveats and outstanding questions

Despite the many benefits of transparent masks, it should be noted that they are not a perfect solution and important questions about transparent mask use remain. For example, transparent masks do not appear to restore re-identification (Marini et al., 2021) or empathy for the mask wearer (McCrackin et al., 2022b) to unmasked levels. That is, transparent masks may not improve the ability of a doctor to recognize an unmasked patient if they had previously been masked, or to share the patient's emotional states (McCrackin et al., 2022b). To compensate for this, a combination of transparent mask wearing and additional communicative strategies like inclusion of verbal context which explicitly describes the situation (e.g. verbal confirmation of emotions, "I am very *sorry/happy* to let you know."; McCrackin and Ristic, 2022) or body language, which reduces the impact of face masks on emotion perception (Ross and George, 2022) have been shown to be effective in reducing the negative effects of facial occlusion.

While there is no current research suggesting that transparent masks impact nonverbal communication more negatively than opaque masks, the ability of transparent masks to restore other social abilities that are often impaired by opaque masks, such as facial mimicry

(Kastendieck et al., 2022, 2023), gender (Fitousi et al., 2021; Wong and Estudillo, 2022) or age recognition (Fitousi et al., 2021; Wong and Estudillo, 2022) is yet to be investigated.

Finally, transparent masks differ in material, design, and amount of visual occlusion, and at present it remains unclear which design is best. From a communicative standpoint, transparent masks which allow most of the face to remain visible likely provide the most benefit (e.g., the whole lower face visible as opposed to just the mouth), while the type of material used likely impacts the acoustic properties for speech. Successful transparent mask design must also maximize both safety and comfort, which is one of the largest factors that healthcare workers report impacting transparent mask compliance (Dempster et al., 2024). In other words, it is important that transparent mask designs facilitate communication while also optimizing disease protection and wearability.

Discussion

In summary, face occlusion by opaque masks creates important communication barriers in healthcare that may increasingly extend to everyday life with the predicted rise in pandemic frequency (Marini et al., 2021; Marler and Ditton, 2021; Haileamlak, 2022). Adopting transparent instead of standard opaque masks may help to restore the basic nonverbal communicative functions of recognizing (Chu et al., 2021; Marini et al., 2021) and understanding (McCrackin et al., 2022b) emotions in others, as well as inferring trustworthiness (Kratzke et al., 2021; Marini et al., 2021). Transparent masks also appear to benefit verbal comprehension, as they allow visual access to the mouth movements accompanying speech (Atcherson et al., 2017; Thibodeau et al., 2021; Zhou et al., 2022; Yi et al., 2023). Transparent masks are well received by both healthcare workers and patients (Bradbury and Pines, 2021; Chu et al., 2021; Kratzke et al., 2021), suggesting that they may also help reduce mask hesitancy and benefit doctor-patient relationships. While most individuals in healthcare contexts would benefit from wearing transparent masks, this practice may especially be useful for communication with individuals who may have difficulties in perceiving and interpreting visual communicative cues from faces, such as young children, elderly individuals, or those with visual, hearing, neuropsychological, or psychiatric disorders. Future investigations are needed to understand why some aspects of visual communication are not restored by transparent masks (e.g., Marini et al., 2021; McCrackin et al., 2022b), and to determine which transparent mask design maximizes communicative benefits, safety, and comfort.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

Ethics statement

The studies involving humans were approved by McGill University Research Ethics Board. The studies were conducted in accordance

¹ <https://www.nad.org/covid19-communication-access-recs-for-hospital/>

with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

SM: Conceptualization, Funding acquisition, Writing – original draft, Writing – review & editing. JR: Conceptualization, Funding acquisition, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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