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Approachability and Mask-wearing During the COVID-19 Pandemic: A Systematic Literature Review

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Abstract

The COVID-19 pandemic greatly impacted many aspects of life. Studying the sociological impact of COVID-19 serves to inform both mental health professionals and sociologists about the effects of the pandemic on socialization. This review examined existing research pertaining to how facial features and individual mask-wearing habits affect factors of perceived approachability. We then related these findings to the observed changes in sociability during the COVID-19 pandemic. Prior to our research, it was anticipated that mask-wearing would improve one's perceived attractiveness but decrease their ability to communicate through verbal and nonverbal behaviors. The results from the current literature indicated that, in general, mask-wearing a) averaged appearances and increased perceived attractiveness most significantly for individuals with low baseline attractiveness and b) negatively impacted verbal and nonverbal communication, acting as a deterrent to approachability. In conclusion, masking during the COVID-19 pandemic impacted individuals' perceived approachability.

Keywords: masks, COVID-19, approachability, attractiveness, communication

Approachability and Mask-Wearing During the COVID-19 Pandemic

Introduction

In March of 2020, the spread of the coronavirus disease 2019 (COVID-19) was declared a pandemic in the United States by the World Health Organization (WHO) (WHO, 2020). Due to the airborne transmission of this respiratory disease, the Centers for Disease Control and Prevention (CDC) released a statement in early April of 2020 recommending that people wear face masks and socially distance themselves from others in order to reduce the spread of the virus (CDC, 2020). This recommendation became mandatory in January of 2021 as recently-inaugurated president Joe Biden required that masks be worn in "federal buildings" and on "federal grounds," as well as by "federal employees" and "federal contractors" (The White House, 2021). Later that same month, the CDC released an order that masks be worn on public transportation, with the refusal to wear a mask in public spaces categorized as an offense that was punishable by law (CDC, 2021).

During the height of the COVID-19 pandemic, the United States enforced mask-wearing and social distancing, causing our communication styles to change. For example, many classes, work meetings, and gatherings were conducted through online video-conferencing sites. Socialization, or interacting with others, dramatically decreased. Researchers found that there was a 5% increase, on average, in reports of loneliness (Ernst et al., 2022). A vaccine was created to combat the transmission of the virus, and states began to independently end their mask mandates through March of 2022, with Hawaii being the final state to do so (CDC, 2023). Since the removal of mask and social distancing mandates, Americans and others across the globe have resumed public activities and in-person meetings; is it possible, however, that the drastic effects

of mask-wearing and social distancing on social relationships still permeates our current social climate?

In this literature review, we study the effect that mask-wearing has on an individual's approachability. Beginning our search, we broke the concept of "approachability" into two parts–physical attractiveness and communication–in order to analyze both physical and social aspects that contribute to one's overall approachability. One's perceived attractiveness is linked to their perceived sociability and altruism, meaning that a more attractive person is seen as someone who is more desirable to approach (Griffin & Langlois, 2006). Along with this, the ease of communication matters: if an individual finds it easy to talk to another, they are more likely to have a longer conversation or more frequently approach that person to communicate.

We address four topics of study in our literature review. First, we examine the effect that masks have on one's perceived attractiveness. Prior to the COVID-19 pandemic, researchers found that people were rated as less attractive when they wore a mask compared to when they did not wear a mask (Miyazaki & Kawahara, 2016). This became known as the "sanitary-mask effect," which stated that faces became less attractive due to: a) the obstruction of attractive facial features (if the person's face was rated as attractive overall) and b) the appearance that the person is unhealthy, which lowered facial attractiveness (Miyazaki & Kawahara, 2016). However, this phenomenon may no longer be present during the COVID-19 pandemic because mask-wearing can be mandatory for the general population and may not necessarily be indicative of illness.

Even without the presence of the sanitary-mask effect, facial occlusion likely still alters perceptions of physical attractiveness. Studies have demonstrated the importance of the eye and mouth regions of one's face in determining their attractiveness (Pazhoohi & Kingstone, 2022).

When facial visibility is limited to the eye region, the face is perceived as more attractive than when facial visibility is limited to the mouth region (Pazhoohi & Kingstone, 2022). Given that masks block the visibility of the mouth region while allowing visibility of the eye region, masks are likely to have an effect on how attractive a face is perceived to be.

Second, we examine the effect that masks have on the ability to communicate. Masks cover the lower face region, notably covering the mouth. This obstruction would muffle the sound of one's voice, affecting the ability of a listener to hear what the speaker is saying. Communication barriers likely have an effect on approachability: one would be less likely to initiate an interaction with another if they believe that conversing will be difficult.

Third, we examine the effect that masks have on other perceivable qualities. We examine factors, such as one's perceived trustworthiness and dominance, that could be affected by wearing a mask. Trustworthiness and dominance would both affect one's likelihood to socialize with another: increased trust in an individual promotes communication, while viewing a communication partner as too dominant discourages communication. First impressions can affect how willing a person is to begin an interaction with an individual. Last, we examine moderators, such as politics and social anxiety, that can impact a person's perception of a mask-wearing individual's attractiveness and approachability.

The purpose of this literature review is to contribute to the anthology of knowledge regarding the effects of the COVID-19 pandemic. This research is important to the field of sociology because it reveals how COVID-19-related mask mandates affected social behaviors. Knowing these impacts can help health care providers in the future, as they will be able to create more effective interventions and therapeutic practices to lessen the individual and societal impacts that pandemics would create.

Methods

Information Sources

An electronic database from Western Michigan University's library was used to collect articles for our literature review. Keyword searches for article collection were conducted from October 22, 2022 to November 22, 2022. We restricted the publication dates of our search to January 1, 2020 to November 22, 2022 in order to capture relevant articles written during the COVID-19 pandemic.

Keyword Search

Two keyword searches were conducted to gather articles on topics relevant to our topic of study. Our two determined areas of interest were the effects of medical masks on one's perceived attractiveness and the effects of medical masks on one's ability to communicate. Both of these factors–attractiveness and ease of communication–contribute to one's approachability. Our first keyword search included the terms "mask," "attractiveness," "approachability," and "COVID-19." Our second keyword search included the terms "mask," "communication," "approachability," and "COVID-19."

Study Selection

Inclusion criteria included: a) peer reviewed journal articles; b) examinations of approachability, attractiveness, or communication skills (including verbal and nonverbal communication, as well as facial expressions); c) studies on individuals within medical and nonmedical settings; d) research on the effects of mask-wearing on approachability in regard to both masked and unmasked people. Publications were required to be peer-reviewed to ensure that the research findings were produced by credible sources. Studies were not limited to medical settings in order to generalize findings to social settings.

Omitted publications were: a) studies on the culture and politics of mask-wearing; b) publications instructing caretakers and physicians about how to interact and communicate with patients while wearing masks; c) discussions of the marketing of mask-wearing through media and other channels; d) research on the effects of body modification and cosmetics on approachability and attractiveness. Articles that were not accessible to the public or not accessible through a university account were not included. Publications that did not describe a research study were excluded.

Sample

23 peer-reviewed articles from Western Michigan University's electronic database met our search criteria and were deemed appropriate for systematic review. These articles represent research from a wide variety of countries, including the United States of America, Australia, England, Canada, Spain, and Japan. While the introduction of this paper addressed mask-wearing policies of the United States of America, research from other countries was included because mask-wearing was a largely universal experience that may affect approachability across cultures.

Table 1

Summary of Reviewed Research

Article	Results Summary
Theme 1: Masks' Effect on Physical Attractiveness	
Miyazaki & Kawahara (2016)	Masking decreased perceived attractiveness ratings due to negative primary and connotations of illness, called the sanitary mask effect.
Hies & Lewis (2022)	Masking increased perceived attractiveness ratings for both medical and cloth masks.
Kamatani et al. (2021)	Masking increased perceptions of attractiveness and healthiness, countering sanitary mask effect.
Bassiri-Tehrani et al. (2022)	Masking resulted in a regression to the mean: individuals with low baseline attractiveness ratings were perceived as significantly more attractive and individuals with high baseline attractiveness ratings were perceived as significantly less attractive when masked.

Patel et al. (2022)	Masking generally increased perceived attractiveness, but there was a slight regression to the mean: 100% of low baseline and 70% of average baseline increased in perceived attractiveness; while one male face (25%) and one female face (12.5%) of high baseline attractiveness decreased in perceived attractiveness ratings when masked.
Mills & Guo (2022)	Masking decreased the perceived attractiveness of avatars with happy facial expressions, increased perceived attractiveness for slimmer avatars with angry facial expressions, and did not change perceived attractiveness for avatars with neutral facial expressions.
Parada-Fernández et al. (2022)	Masking decreased perceived attractiveness for all facial expressions except happiness. For angry facial expressions, perceived attractiveness of male faces was not affected by masking, while perceived attractiveness was higher for female faces when unmasked.
Dayan et al. (2022)	Women were rated as more attractive when masked both in-person and online, while participants rated men as more attractive when masked online, but more attractive unmasked in-person.
Kramer & Jones (2022)	Masking increased perceived attractiveness–Participants were significantly more likely to select an average version for both upper and lower regions of the face. There was a strong association between perceived typicality and attractiveness.
Theme 2: Masks' Effect on Communication and Emotion Perception	
Gutierrez-Sigut et al. (2022)	Mask-wearing affected the communication capabilities of Hard of Hearing and deaf adults, particularly for late-onset deaf adults.
Poon & Jenstad (2022)	Mask-wearing made communication and speech comprehension difficult for over 80% of D/deaf and Hard of Hearing adults, with the majority of those with severe and profound hearing loss (>50% of both categories) reporting communication was "very difficult" with masks.
Homans & Vroegop (2021)	Mask-wearing was reported to impair the daily communication of 80% of participants, who were cochlear implant users.
Homans & Vroegop (2022)	Mask-wearing most significantly decreased speech perception for Hard of Hearing adults, compared to the decrease seen when the speaker wore a transparent face shield.
Malzanni et al. (2021)	Mask-wearing decreased the quality of life for normal-hearing adults and created more communication difficulty than social distancing, particularly due to the muffled sound volume and difficulty recognizing facial expression.
Galvin et al. (2022)	Mask-wearing lowered all aspects of communication quality across multiple communication settings, such as home, the community, and the workplace.
Lau & Huckauf (2021)	Mask-wearing decreased emotion perception and made expressions appear more neutral, particularly for expressions of happiness.
Parada-Fernández et al. (2022)	Mask-wearing decreased emotion perception–particularly for the

	expression of happiness–for most emotions, but did not have a significant impact on the perception of surprise.
Chu et al. (2021)	Mask-wearing impaired communication for deaf and Hard of Hearing adults in health care settings, and transparent masks improved factors of communication, such as emotion recognition and lipreading.
Mheidly et al. (2020)	Mask-wearing inhibits communication abilities, but there are many verbal and nonverbal methods that can be used to overcome obstacles created by masking.
Theme 3: Masks' Effect on Other Relevant Factors	
Guo et al. (2022)	Mask-wearing increased the perceived trustworthiness of the individual but did not significantly impact their perceived dominance.
Oldmeadow & Koch (2022)	Mask-wearing increased the perceived trustworthiness of the masked individual, particularly for baseline untrustworthy faces, but had no significant effect on perceived dominance.
Dayan et al. (2022)	Mask-wearing decreased the first impressions of both men and women when meeting in-person; however, men had better first impressions while wearing a mask when meeting online.
Mills & Guo (2022)	Mask-wearing did not have an effect on the accuracy of estimation of an individual's body size.
Theme 4: Moderators of Perceived Attractiveness and Communication	
Oldmeadow and Koch (2021)	Masking had no significant impact on perceptions of trustworthiness dependent on race; participants rated both Black or white subjects as equally trustworthy when wearing masks.
Dudarev et al. (2022a)	Participants rated individuals of their same race as more attractive when masked than unmasked, and individuals of other races as less attractive than when masked than unmasked.
Dudarev et al. (2022b)	Frequent mask-wearing was associated with positive appraisal of masks and related objects. Increased positive appraisal was predicted by higher frequency and longer history of masking.
Guo et al. (2022)	Participants with higher state or trait anxiety scores found faces were less approachable or trustworthy regardless of mask-wearing. Participants rated female faces as more approachable, more trustworthy, more attractive, and less dominant than male faces regardless of mask-wearing and participant gender.
Bassiri-Tehrani et al. (2022)	Regression to the mean was most notable for the study's female subgroup–Women may experience more significant difference in perceived attractiveness ratings due to masking because features of the lower portion of the face may play a more significant role in female attractiveness.
Dayan et al. (2022)	In-person faces received higher attractiveness ratings regardless of masking. When rating the faces of men online, raters preferred men

	wearing masks because it created a more mysterious, intriguing persona.
Poon & Jenstad (2022)	Communication was most heavily affected for those with an increased degree of hearing loss–80% of profoundly deaf participants stated that communication with masks was "very difficult."

Results

Theme 1: Masks' Effect on Perceived Physical Attractiveness

Prior to mask mandates resulting from the COVID-19 pandemic, research by Miyazaki and Kawahara (2016) found a "sanitary mask effect," which indicated that people were viewed as less physically attractive while wearing masks due to priming and connotations of illness and infection. In this study, 210 Japanese graduate and undergraduate volunteers participated across five experiments in which male and female faces of varying attractiveness levels, facial expressions, hairstyles, and clothes were rated based on attractiveness and healthiness under non-occlusion, mask, notebook, and card-occluded conditions (Miyazaki & Kawahara, 2016). This phenomenon may no longer be in effect in pandemic research due to commonplace, enforced mask-wearing. Universal mask mandates create an environment in which masking is no longer associated with poor health because it is enforced regardless of health status (Hies & Lewis, 2022). Environmental and contextual differences may result in different perceptions.

To assess these differences, Kamatani et al. (2021) compared the effects of mask-wearing on perceptions of facial attractiveness since the onset of COVID-19 to the sanitary mask effect found in Miyazaki and Kawahara's non-pandemic research by replicating the previous study's methods. 286 adults answered survey questions regarding the effects of mask-wearing on perceptions of female attractiveness and healthiness on a seven-point Likert-type scale, ranging from 1 = greatly decreased, 4 = no change, to 7 = greatly increased. Results indicated significant change in masking effects during the COVID-19 pandemic. Facial attractiveness and perceptions of health status were closely related to mask-wearing. After the onset of COVID-19, individuals

wearing masks were seen as more attractive and healthy while individuals not wearing masks were seen as less attractive and unhealthy. In general, responses indicated that it was uncommon for participants to view mask-wearers as less attractive or less healthy, demonstrating that the sanitary mask effect is no longer in effect in the post-COVID-19 world (Kamatani et al., 2021).

With the sanitary mask effect no longer present, Kamatani et al. (2021) determined that any differences in attractiveness ratings with and without masks were likely attributed to facial occlusion. These differences in attractiveness ratings due to masks were influenced by the baseline attractiveness of mask wearers. Baseline attractiveness was measured by 59 participants, rating 66 unmasked, Japanese, female faces from 1 (most unhealthy/unattractive) to 100 (most healthy/attractive). Individuals with high baseline attractiveness ratings were perceived as less attractive when wearing masks. By contrast, individuals with low baseline attractiveness ratings were perceived as more attractive when wearing masks. For individuals with moderate baseline attractiveness ratings, there was no significant difference in perceived attractiveness with and without masks (Kamatani et al., 2021). The discovered phenomenon of masking altering attractiveness dependent on baseline attractiveness was referred to as regression to the mean: decreasing variance in attractiveness by making attractive individuals less attractive, making unattractive individuals more attractive, and making no change to moderate individuals.

Other researchers also reported this phenomenon of regression to the mean. Bassiri-Tehrani et al. (2022) conducted a similar study to compare the effects of masking based on the wearer's level of baseline attractiveness. 207 participants rated the attractiveness of 57 physically diverse faces on an ordinal scale from 1 (least attractive) to 10 (most attractive), both with and without masks. While there was no significant difference found for the attractiveness ratings for the overall study population, faces with low baseline attractiveness were perceived as

significantly more attractive when masked and faces with high baseline attractiveness were perceived as significantly less attractive when masked (Bassiri-Tehrani et al., 2022). This phenomenon of regression to the mean was most notable for the female subgroup, indicating that gender moderates the effects of mask-wearing on perceived attractiveness– this moderator will be discussed in depth in Theme 4.

With similar methods and procedures, Patel et al. (2020) conducted a study of 496 participants that rated 60 faces, diverse in age, race, and gender, with and without masks on an ordinal scale from 1 (least attractive) to 10 (most attractive). When comparing the differences in attractiveness ratings with and without masks, Patel et al. (2020) also found a slight regression to the mean. Specifically, 100% of faces with low baseline attractiveness and 70% of faces with average baseline attractiveness increased in perceived attractiveness; while only one male face (25%) and one female face (12.5%) with high baseline attractiveness decreased in perceived attractiveness ratings when masked (Patel et al., 2020). In general, masking increased perceived attractiveness for the overall study population.

Researchers Hies and Lewis (2022) conducted a study in the United States specifically to analyze this regression towards the mean. In their study, 40 female participants ranked 40 of the most attractive and unattractive male faces from the Chicago Face Database on a 7-point Likert scale (1: very unattractive, 7: very attractive) with and without masks. The researchers found that faces covered by both medical and cloth masks were significantly more attractive than uncovered faces. Contrary to the findings of the previously mentioned studies, there was no evidence of a regression to the mean dependent on baseline attractiveness, suggesting that effects of facial occlusion were equally as influential in improving attractiveness ratings for both unattractive faces as attractive faces (Hies & Lewis, 2022).

Researchers have also examined how masks affect perceived attractiveness ratings with consideration to other factors than baseline attractiveness. When assessing the impact of facial expression, body size, and masking on attractiveness ratings of 72 images of computer-generated avatars, Mills and Guo (2022) found that masking decreased attractiveness of avatars with happy facial expressions with dress size 8 (small) or 16 (large) bodies. Masking increased attractiveness ratings for slimmer avatars with angry facial expressions (Mills & Guo, 2022). Similarly to the regression noted in other studies, avatars with neutral facial expressions did not experience a difference in attractiveness dependent on masking.

To further analyze the effect of facial expression on perceived attractiveness when masked, Parada-Fernández et al. (2022) gathered 202 male and female participants of the general population of Spain, aged 18 to 63, with a range of educational backgrounds and socio-economic statuses to assess the attractiveness of 24 female and 24 male faces with and without masks, portraying a variety of facial expressions. The four facial expressions were happiness, sadness, surprise, and anger. The participants rated the attractiveness of each face on a scale from −5 (extremely unattractive) to +5 (extremely attractive) with 0 being neutral. Overall, perceived attractiveness was highest when faces were not masked for all facial expressions except happiness, in which there was no difference (Parada-Fernández, 2022). When assessing gender effects on this phenomenon, Parada-Fernández et al. (2022) observed that male attractiveness was not affected by mask-wearing with an angry facial expression, while female attractiveness was higher when unmasked.

Additionally, Dayan et al. (2022) assessed the impact of mask-wearing on perceived attractiveness in addition to first impressions online and in-person. The study consisted of 200 live raters and 750 online raters that rated eight models after observing the smiling model for a

maximum of 15 seconds with and without masks. Women were rated as more attractive when masked both in-person and online, while participants rated men as more attractive when masked online, but more attractive unmasked in-person (Dayan et al. 2022). Gender and mode of perception moderate differences in perceived attractiveness. These moderators and more will be discussed in Theme 4. Overall, masking increased attractiveness ratings in all conditions except for perceptions of men online.

Due to a lack of agreement in research regarding the effects of masking on perceived attractiveness, Kramer and Jones (2022) sought to understand the mechanism at which onlookers complete masked faces in their imagination. The researchers hypothesized that onlookers would use their schema of all faces to complete the missing portion of the face using a facial average or prototype, meaning that onlookers would likely choose the most average option when tasked with selecting the lower portion of the face that most closely resembles how they imagine or perceive the masked individual. 110 volunteer participants assessed 60 images of white models, aged 18-30. Kramer and Jones (2022) also created two average faces–male and female–by combining landmark features of both the upper and lower parts of each of the 60 faces, including the cheeks, eyes, eyebrows, hairline, mouth, and jawline, using morphological editing software (Kramer & Jones, 2022). The researchers then created a morphology continuum using a series of 21 facial images that gradually became -50% to +50% more distinctive from the average. 160 volunteers rated the typicality and attractiveness of the original 60 images on an ordinal scale from 0 (does not deviate from the typical face) to 100 (deviates very much) and from 0 (very unattractive) to 100 (very attractive) (Kramer & Jones, 2022). Once baseline ratings were collected, the researchers obstructed either the upper or lower region of the face and asked the original 110 volunteers to indicate what they believe the individual actually looks like, by

changing the occluded portion of the face using the continuum. Overall, participants were significantly more likely to select a version that had been morphed towards the average for both upper and lower regions of the face. There was a strong association between perceived typicality and attractiveness, meaning that faces with high ratings of typicality also had high ratings of attractiveness. Kramer and Jones (2022) indicated that, because averageness was closely associated with attractiveness and all faces were averaged regardless of their original typicality or attractiveness ratings, masking should increase perceived attractiveness for all faces.

In sum, the literature reviewed demonstrates that perceptions of masking and attractiveness have changed since the spread of COVID-19 and sanitary mask effect is no longer present. Although the reviewed findings were mixed, the majority of research indicated that masking now increases perceptions of attractiveness for the majority of individuals but most significantly for individuals with low baseline attractiveness as some studies observed a regression to the mean. Deviations from this takeaway are likely the result of numerous moderators that impact the effects of masking on attractiveness. In addition to attractiveness, masking also affects social interactions like verbal and non-verbal communication as well as emotional perception which impact overall approachability.

Theme 2: Masks' Effect on Communication and Emotional Perception

Masks have been found to have a significantly negative effect on communication and emotional perception. By covering the lower region of one's face with cloth, aspects of communication–such as tone and enunciation–are lost to the listener. Essential elements of emotion involving the mouth and cheeks are also suppressed. These effects were particularly profound for the deaf and Hard of Hearing communities, which have been emphasized populations of study when studying communication difficulties during the pandemic.

The more profound one's hearing loss, the more communication disadvantages they reported experiencing when communicating with mask-wearing individuals (Gutierrez-Sigut, 2022). Furthermore, late-onset deaf individuals–individuals who developed deafness sometime after birth–reported increased difficulty in communicating with others and decreased well-being compared to early-onset deaf individuals (Gutierrez-Sigut, 2022). In a survey of 650 Canadian deaf or hard of hearing adults, 81% of participants reported "difficulty with understanding others who wore face masks" (Poon & Jenstad, 2022, pg. 4). They also found that those with severe and profound hearing loss had the majority of participants (more than 50% of participants in each category) reporting communication was "very difficult" with masks (Poon & Jenstad, 2022, pg. 4). The primary cause of communication difficulty, as indicated by the participants, was that "face masks hindered speech comprehension" (Poon & Jenstad, 2022, pg. 4).

These findings are supported by Homans and Vroegop (2021), who surveyed 221 adult cochlear implant users. Subjects answered a series of questions compiled from three questionnaires: a face mask questionnaire, one question from the Center for Epidemiological Studies of Depression Scale (CES-D) (Radloff, 1977), and the Nijmegen Cochlear Implant Questionnaire (NCIQ) (Hinderink et al., 2000). In the face mask questionnaire, 80% of participants responded "regularly" to "almost always" problems with communication with face masks, with 83% rating the seriousness of problems as moderate to severe (Homans & Vroegop, 2021). Additionally, 59% of participants indicated face masks make them feel insecure about their communication "often" to "almost always." Individuals rated their level of loneliness higher during the masking phase of the COVID-19 pandemic compared to their level of loneliness before masking mandates (Homans & Vroegop, 2021). The results of the questions pulled from the NCIQ showed that every domain of quality of life for cochlear implant users ("Advanced

Sound Perception," "Activity," and "Social Interaction") were substantially worsened as a result of masking.

Homans and Vroegop (2022) later studied 42 adults with hearing loss, all of whom used hearing aids or cochlear implants. This study included three speaker conditions: speaking without a face mask, speaking with a surgical mask, and speaking with a clear, plastic face shield. The hard of hearing subjects reported that speech was harder to perceive when the speaker wore a surgical mask compared to when the speaker wore a face shield, due to the inability for the speaker to see the speaker's mouth and facial expressions; this is despite the fact that the face shield had a greater impact on the quality of the sound of speech (Homans & Vroegop, 2022).

Fewer studies have been conducted on subjects with medically normal hearing. An Italian study of "normal hearing" subjects found that facial coverings contributed more to communication difficulties than social distancing, and a statistically significant increase in difficulty communicating and perceiving speech was attributed to mask-wearing (Malzanni et al., 2021). Another study, conducted with Australian subjects, supports these findings: subjects reported an increased level of "fatigue and frustration" when communicating with individuals wearing a mask (Galvin et al., 2022, p. 8). Additionally, the subjects reported a decreased sense of connection with others and indicated that they spent less time out of the house engaging in activities with others. This study also found that the subjects reported "a decrease in the number of individuals communicated with" when the subjects attempted to communicate while wearing masks (Galvin et al., 2022, p. 9).

The perception of emotion is also hindered by mask-wearing. In a study by Lau and Huckauf (2021), 196 adult participants of various ethnicities (57.7% of participants were Asian)

were recruited. Two phases of rating were implemented; the participants would first rate the sex (ranging from definitely male to definitely female) and age (selection options were: less than 30 years old, 30-39, 40-49, 50-59, over 60 years old) of the model before rating the emotional expression of the model (Lau & Huckauf, 2021). The first part of the study was conducted online and consisted of eight picture stimuli: two males and two females, each with a masked and unmasked condition, with neutral expression. The second part used these models but added the emotional aspect, so each model displayed a happy, neutral, and sad expression (Lau & Huckauf, 2021). Expressions were rated with the Self-Assessment Manikin (SAM) scales of valence and arousal (Bradley & Lang, 1994).

The results of this study showed that masking had a significant effect on the perception of emotion. Participants' responses on the SAM scales indicated that masks weakened the perception of a happy expression (Lau & Huckauf, 2021). Neutral faces that were masked were also rated as less happy than neutral faces that were unmasked (Lau & Huckauf, 2021). Masks, in covering the lower face region, make emotional facial expressions harder to recognize and identify.

These findings are supported by Parada-Fernández and colleagues (2022), who conducted a research study with 202 Spanish participants. This study had participants identify one of four emotions–happiness, surprise, sadness, or anger–on the faces of 24 male and 24 female faces of varying races. This study was conducted online through a Google Form, where participants selected which emotion they believed the face was presenting (Parada-Fernández et al., 2022). The faces were presented in a random order, each with a mask-off and mask-on condition, with the masks photoshopped over their face. The study found that masks interfered with the

recognition of all emotions except for surprise (Parada-Fernández et al., 2022). This could be due to the increased expression in the upper-facial region associated with surprise.

There are ways to combat masks' effect on communication and perception of emotion, most notably the use of transparent masks or face shields. These masks are made with clear sheets of polycarbonate or polyethylene plastic in the mouth area instead of cloth. This allows for the listener to lip-read, as well as see the mouth region of the speaker's facial expressions. A study conducted virtually across the United States illustrated improvement of emotional recognition when using transparent masks instead of opaque masks (Chu et al., 2021). The survey consisted of the general population, health care workers, and Deaf or Hard of Hearing individuals watching two videos: one with the speaker wearing a non-transparent N95 mask, and another with the speaker wearing a transparent N95 mask. The results showed that emotion recognition increased with the clear masks by an average of 62% across the three populations (Chu et al., 2021).

Mheidly and colleagues (2020) also acknowledge transparent masks as a useful tool in increasing effective communication while wearing masks. They also recommend intensifying use of the upper half of the face–including "the eyebrows, eyes, and upper cheeks"–in emotional expression (Mheidly et al., 2020, p. 5). Emphasis was also placed on the importance of acknowledging communication difficulties and using other non-verbal forms of communication, such as gesturing, emoting, and texting (Mheidly et al., 2020). These findings suggest that, while masking has a detrimental effect on interpersonal communication, there are many methods that can be utilized to decrease communication difficulties.

Overall, studies have shown that masking had a negative impact on communication, therefore decreasing a mask-wearing individual's approachability. This is markedly true for the

Deaf and Hard of Hearing community, who rely on more facial and nonverbal communication than those with medically normal hearing. The dimensions of communication that have been emphasized are sound perception, as well as the perception of facial expressions and other non-verbal factors. In studying masks' effects on communication and emotional perception, it was discovered that masks also had an impact on other relevant factors, such as the perception of one's level of trustworthiness or dominance. Studies have been conducted to examine these effects.

Theme 3: Masks' Effect on Relevant Factors

Other psychosocial aspects that are not directly associated with attractiveness or communication can also affect one's perceived approachability. Research has examined how some of these factors are affected by mask-wearing. For instance, Guo and colleagues (2022) studied the effect that masks have on one's perceived trustworthiness. The 130 participants who took part in this study filled out the State-Trait Anxiety Inventory Form (Spielberger et al., 1983) to measure their baseline apprehension, tension, worry, and anxiety proneness (Guo et al., 2022). Along with rating the model's perceived attractiveness, as discussed prior, the participants rated each face's perceived approachability and trustworthiness on a scale from 1-9. The results of this study revealed that masks increased perceived trustworthiness (Guo et al, 2022). A second experiment conducted by these researchers produced results that supported their previous conclusion, finding that participants thought the faces wearing masks were more trustworthy than the faces without masks (Guo et al., 2022).

Results from a study conducted by Oldmeadow and Koch (2022) yielded similar results. The stimuli in their study consisted of 20 Black and 20 White faces, each with a neutral expression facing forward, and each with a masked and unmasked condition, with the masked

condition being created by photoshopping a white mask onto the image of the face (Oldmeadow & Koch, 2022). This study had 251 participants of varying nationalities (British, Mexican, Polish, North American, Italian, Chilean, and Australian) complete an online survey, which had two parts. The first section of the study had participants rate the trustworthiness of the faces; the second section had participants rate the dominance, which will be discussed later. The participants rated the trustworthiness of the faces on a 9-point scale (Oldmeadow & Koch, 2022). Results indicated that faces that were shown wearing a mask were rated as more trustworthy than faces that were not wearing a mask (Oldmeadow & Koch, 2022).

The study conducted by Guo and colleagues also examined the impact that masks have on one's perceived dominance. Along with the approachability and trustworthiness ratings in the first experiment in their study, their study also had the participants rate each face's perceived dominance on a scale from 1-9 (Guo et al., 2022). Despite the effect that masks had on perceived trustworthiness, it was found that mask-wearing did not significantly impact one's perceived dominance, which was influenced by facial features that indicate strength (Guo et al, 2022).

These results were reinforced by the findings of Oldmeadow and Koch (2021) from the second part of their study. 123 of the participants were instructed to rate the dominance of the same masked and unmasked faces on the same 9-point scale. However, two new conditions were added: a mask with an upward-curved line in the shape of a smile (added with photoshop) and a mask with the upward-curved line offset to only one side of the mask (Oldmeadow & Koch, 2022). The results of their study indicated that only race impacted the perception of dominance, not masking or trustworthiness rating (Oldmeadow & Koch, 2022).

Dayan et al. (2022) assessed the impact of mask-wearing specifically on first impressions online and in-person. The study consisted of 750 online raters who rated eight models after

observing the smiling model for a maximum of 15 seconds with and without masks. For the in-person portion of the study, 200 live raters rated the same eight models, who walked out individually and smiled for 15 seconds with and without masks. The presentation of the models was randomized between mask conditions. Online, men had better first impressions when masked compared to when they were unmasked, whereas women had better first impressions when unmasked (Dayan et al., 2022). In-person, men had better first impressions unmasked compared to when they were masked, and women still had better first impressions when unmasked (Dayan et al., 2022). The reasoning behind this will be explored during the discussion of moderators in Theme 4. Masks appear to decrease a person's first impression of the masked individual when meeting in person.

The effects of masks were also examined in regards to perception of body size by Mills and Guo (2022). Their study involved 97 white women with no history of eating disorders estimating the body size of 72 white female avatars. This array of avatars consisted of four different white female avatars, each with three facial expressions (happy, neutral, and angry), three dress sizes (size 8, size 12, and size 16), and mask-on and mask-off conditions. The study found that masks had no effect on the estimation and perception of body size (Mills & Guo, 2022).

To summarize, wearing a mask had an effect on several factors of socialization. For instance, masks have been found to affect the wearer's perceived trustworthiness (Guo et al., 2022). They also decreased the quality of the individual's first impression when meeting another person in person (Dayan et al., 2022). Factors that are largely unaffected by mask-wearing included one's perceived dominance (Guo et al., 2022) and body size (Mills & Guo, 2022). It is

important to consider that a participant's ratings of a masked individual throughout these studies may have been affected by personal or external factors, such as race, gender, and social anxiety.

Theme 4: Moderators of Perceived Attractiveness and Communication

Certain variables, called moderators, can alter the nature of the independent variable's effect. In this case, the independent variable of mask-wearing is affected by numerous moderators, namely masking ideology of the perceiver, race and gender of both the perceiver and perceived, social anxiety of the perceiver, mode of perception, and degree of hearing loss. These moderators are important to be mindful of and assess because they impact the main effects of mask-wearing.

Race. While examining the intersections of masking, face race, and trustworthiness, Oldmeadow and Koch (2021) discovered that masking had no significant impact on perceptions of trustworthiness dependent on race; participants rated both Black or white subjects as equally trustworthy when wearing masks. Dudarev et al. (2022a) examined the effects of masking on perceived attractiveness with respect to race and masking ideology (pro or anti masking). Overall, the researchers discovered that participants rated individuals of their same race as more attractive when masked than unmasked, and individuals of other races as less attractive than when masked than unmasked.

Masking Ideology. When compared, participants with pro-mask ideology rated masked individuals as more attractive and participants with anti-mask ideology rated masked individuals as less attractive. To isolate masking ideology as a key moderator, Dudarev et al. (2022a) also conducted a control procedure that used a notebook to cover the faces instead of a mask. The results of this control procedure verified that perceived attractiveness is affected by the viewer's masking ideology and race specifically within the context of the pandemic when individuals

wear masks. Related to masking ideology, Dudarev et al. (2022b) further analyzed how personal mask use affects attraction and emotional arousal towards masks and related objects associated with COVID-19, including hygiene products and surgical gloves, in comparison to neutral objects. Frequent mask-wearing was associated with positive appraisal of masks and related objects. Increased positive appraisal was predicted by higher frequency and a longer history of masking (Dudarev et al., 2022b).

Social Anxiety. Researchers Guo et al. (2022) measured the impact of mask-wearing on perceptions of approachability, trustworthiness, attractiveness, and dominance with regard to anxiety type and level. Participant anxiety was evaluated using the State-Trait Anxiety Inventory (Spielberger et al., 1983) and Social Interaction Anxiety Scale (Mattick et al., 1998) then participants rated images of unfamiliar, neutral faces based on all four domains, approachability, trustworthiness, attractiveness, and dominance, on a Likert scale from 1-9. Correlational analyses concluded that participants with higher state or trait anxiety scores found faces were less approachable or trustworthy regardless of mask-wearing, indicating that participant anxiety plays a significant role in perception differences (Guo et al., 2022).

Gender. In this same study, Guo et al. (2022) also discovered that gender influences onlookers perceptions of all four domains of approachability. Overall, participants rated female faces as more approachable, more trustworthy, more attractive, and less dominant than male faces regardless of mask-wearing and participant gender (Guo et al., 2022). Gender also had a significant impact on attractiveness ratings. The phenomenon of regression to the mean found by Bassiri-Tehrani et al. (2022) was most notable for the study's female subgroup. In the study's discussion, it was hypothesized that women may experience more significant difference in perceived attractiveness ratings due to masking because features of the lower portion of the face

that are affected by masking, like face shape and jaw structure, may play a more significant role in female attractiveness; while features of the upper portion of the face that are not altered by masking, like eye size, eye depth, and brow prominence, are more significant in male attractiveness (Bassiri-Tehrani et al., 2022). There was a difference in perception of attractiveness when wearing a mask online compared to wearing a mask in-person between men and women in the study conducted by Dayan et al. (2022). The researchers suggested that, when rating the faces of men online, raters preferred men wearing masks because it created a more mysterious, intriguing persona (Dayan et al. 2022).

Mode of Perception. As previously mentioned, Dayan et al. (2022) observed differences in perceptions when online or in-person. In-person faces received higher attractiveness ratings regardless of masking. The researchers proposed that this difference could be due to decreased body visibility, decreased intimacy, and an absence of body language and nonverbal cues (Dayan et al. 2022).

Degree of Hearing Loss. As discussed previously, the severity of one's hearing loss affected how large of an impact masking has on communication. Poon and Jenstad's study (2022) highlights this. The responses from their survey indicated that around 80% of profoundly deaf participants stated that communication with masks was "very difficult"; in comparison, the same level of difficulty was reported by around 60% of severely deaf participants, around 25% of moderately deaf participants, and around 15% of mildly deaf participants (Poon & Jenstad, 2022, figure 1). Profoundly and severely deaf participants were also the only demographics that had the majority of participants indicate that masking made communication "very difficult" (Poon & Jenstad, 2022, figure 1). Individuals with mild hearing loss had the highest percentage of individuals (≈25%) compared to the other demographics reporting that communication with a

mask-wearing individual was "somewhat easy" (Poon & Jenstad, 2022, figure 1). This illustrates that, while masking made communication more difficult for all individuals with hearing loss, communication was most heavily affected for those with an increased degree of hearing loss.

Discussion

The present literature review aimed to provide a comprehensive and systematic review of the research relating to the effect of mask-wearing on approachability in terms of both physical attractiveness and social communication. The review identified 23 research articles that objectively quantified the effect of mask-wearing in our relationships with strangers and their perceived approachability. The findings indicated multiple ways in which mask-wearing impacted approachability.

First, Miyazaki and Kawahara (2016) demonstrated that the sanitary-mask effect they had previously observed in 2016 has changed with the onset of COVID-19. Kamatani et al. (2021) found that mask-wearing was no longer indicative of illness or incurred negative connotations and priming. Instead, mask-wearers were perceived to be more attractive and healthy (Kamatani et al., 2021). Overall, masking increased perceived attractiveness (Kramer & Jones, 2022; Dayan et al., 2022; Hies & Lewis, 2022), but multiple researchers observed a phenomenon of regression to the mean in which masking caused baseline-attractive individuals to be rated as less attractive and baseline-unattractive individuals to be rated as more attractive (Bassiri-Tehrani et al., 2022; Patel et al., 2020; Kamatani et al., 2021). Second, researchers found that communication was made more difficult in the presence of mask-wearing, as the speakers' sound productions were harder to detect and to understand (Poon & Jenstad, 2022; Gutierrez-Sigut, 2022; Malzanni et al., 2021). The perception of emotion was also worsened by the use of masks, as they covered parts of the face that are essential for emoting facial expressions (Chu et al., 2021). Third, masks were

found to have an effect on other related factors, such as perceived trustworthiness (Guo et al., 2022) and the quality of one's first impression (Dayan et al., 2022). Last, researchers observed multiple moderators that alter masking effects, including masking ideology and race (Dudarev et al., 2022a; Dudarev et al., 2022b), social anxiety, gender, and mode of perception (Guo et al., 2022), and degree of hearing loss (Poon & Jenstad, 2022).

These findings are important because they display the social impacts of masking policies during the COVID-19 pandemic. This research highlights aspects of facial perception and communication that are important in deciding to approach another person for everyday interaction, and it demonstrates how social behavior is affected by obscuring part of an individual's face. This information can be used in the future when making social policies regarding masking.

Future Directions of Research

There is currently a lack of research assessing how individuals with compromised immune systems may vary in their perceptions of approachability in relation to mask-wearing. We expect that individuals who are more vulnerable to COVID-19 infection–and therefore are at higher risk of mortality–would have stronger positive opinions towards masking and would find individuals wearing masks to be more approachable. This phenomenon could be related to a measure of perceived safety or comfortability in the presence of masked or unmasked individuals.

As rates of COVID-19 mortality decline and mask mandates are retracted, future research should be created to examine post-pandemic stance toward mask-wearing. These perceptions should be compared to the attitudes toward wearing a mask before and during the pandemic. For example, the sanitary-mask effect, observed by researchers Miyazaki and Kawahara in 2016,

may have potential to return. This could cause a reversal of the trends in research we observed in this literature review during the height of the COVID-19 pandemic.

Conclusion

Research has revealed that mask-wearing during the COVID-19 pandemic affected approachability. Masking during COVID-19 was found to average appearances and increase perceived attractiveness primarily for individuals with low baseline attractiveness ratings. However, mask-wearing decreases an individual's ability to communicate effectively with another. By reducing the quality of one's voice and obstructing their facial expressions, socializing with others became more difficult. Other factors that impact socialization, such as perceived trustworthiness and quality of another's first impression, were affected by masking. The social effects of masking are impacted by factors such as masking ideology, race, social anxiety, gender, and degree of hearing loss. These findings are important because they reveal how mask mandates affect social behaviors, and this information can be used to help reduce societal impacts of pandemics in the future.

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