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Analysis of the Mechanisms of Social Group Prejudice Construction under Certain Cirumstances

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Abstract. The behavioral immune system (BIS) detects the pathogen-related cues and can trigger emotional responses such as fear and disgust, but this mechanism does not operate in isolation. This paper integrates Error Management Theory (EMT), which suggests that cognitive adaptations evolved to minimize the cost of false negative and false positive errors in detections of consequential environmental conditions. Together, BIS and EMT operate as a coordinated system, shaping human responses under conditions of disease threat. These adaptations manifest as biases tailored to specific environmental conditions. This paper proposes that the same selection pressure fostered the evolution of a self-biasing ability, allowing us to minimize such costs based on experience and culturally transmitted information. The research indicates that this ability specifically applies to the formation of beliefs or doubts about the existence of an environmental condition that is not adequately perceptible to the senses, e.g., doubt that the man is being honest. A model of this self-biasing process, rooted in signal detection theory, is developed and its explanatory reach is demonstrated through many diverse examples from epistemological and social psychological literatures. These examples feature shifts in evidentiary standards for belief, resulting in systematic over- or under-attribution of environmental conditions. For example, during the COVID-19 pandemic, lowered evidentiary thresholds for detecting infection risk contributed to the tendency to associate Asians with disease transmission, despite insufficient individual-level evidence. This study aims to correct and significantly enhance EMT by introducing this evolved self-biasing ability.

Keywords: Behavioral immune system, Error Management Theory, Covid-19, Outgroup avoidance

1. Introduction

The COVID-19 pandemic, caused by the coronavirus SARS-CoV-2, rapidly spread globally beginning in late 2019 and created one of the most significant public health crises in modern history. Beyond its medical consequences, the pandemic also generated widespread social tensions and discrimination [1]. Taking the Asian population as an example, the incidents of discrimination and prejudice they faced have increased significantly [2]. These phenomena are not merely acts of malice and hostility towards specific groups. Instead, they may reflect broader psychological mechanisms that arise among the general population during periods of heightened fear of infectious

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diseases. During severe disease outbreaks, humans tend to become more sensitive to potential sources of infection and more vigilant towards outgroups [3]. One explanation for this response is the behavioral immune system (BIS). The BIS is a psychological mechanism that detects infection cues in the environment and triggers emotional responses such as disgust and avoidance to reduce the risk of disease transmission [4]. When the perceived threat of disease increases, this system may become more active, leading individuals to avoid people or groups that they perceive as unfamiliar or potentially risky. Another framework is Error Management Theory (EMT). The EMT suggests that humans have evolved cognitive biases that favor over-detecting potential threats because the cost of failing to detect a real danger is often greater than the cost of making a false alarm [5]. In the context of infectious diseases, this bias may lead individuals to exaggerate possible sources of infection and develop heightened vigilance towards certain social groups. Together, BIS and EMT may contribute to outgroup avoidance, which is the active tendency to evade contact or engagement with those perceived as different during heightened threat or societal stress [6]. While these mechanisms may have evolved to help humans avoid disease, they can also contribute to the formation of prejudice and discrimination.

In contemporary society, social media is a primary channel through which people obtain information about diseases. When media-related information about diseases spreads rapidly, it intensifies perceptions of threat and uncertainty, thereby amplifying the effects of BIS and EMT. Most existing studies on the COVID-19 pandemic have primarily focused on its direct impacts on physical health; only a little attention has been paid to the social consequences of COVID-19. This paper, therefore, examines how BIS and EMT help explain the emergence of social group prejudice during the COVID-19 pandemic, with particular attention to the role of social media in amplifying fear and reinforcing outgroups. Understanding these mechanisms may contribute to the development of more inclusive and effective public health communication strategies.

2. Social group prejudice during the COVID-19 pandemic

During the pandemic, there is evidence in many countries that discrimination against Asians has significantly increased. When investigating the relationship between racial discrimination against Asian Americans and their mental health within the United States, it was found that among 410 Asian American respondents, over 30% reported experiencing significantly more discrimination during the peak of the pandemic. Even more strikingly, over 40% of the respondents indicated that the discrimination they faced had exacerbated their anxiety symptoms and sleep problems [7]. By the sixth month of the COVID-19 pandemic, over 1.8 million cases had been confirmed in the United States alone, with fatalities exceeding 105,000. These staggering figures continued to rise at an alarming rate, reflecting the relentless spread of the virus across the nation. This has led to a majority of the public believing that Asians are carriers of the disease. NBC News reported that over 30% of American respondents said they had witnessed the discrimination against Asians [2]. Tessler et al. once found that over 1,000 incidents of verbal abuse and harassment against Asians were recorded on Stop AAPI Hate within just four weeks, and the themes of such attacks usually linked Asians and the COVID-19 pandemic in a negative way [2]. Such biases are often closely related to the public's perception of diseases. According to the BIS, people often unconsciously avoid and reject those they consider to be at risk of infection [4]. In the early stage of the pandemic, as the virus originated in Wuhan and Hubei Province, China, people readily associated the COVID-19 pandemic with the people of Wuhan and Hubei. A survey by He et al. found that some tourist hotels that had already received millions of customers refused to accommodate tourists from Wuhan and Hubei who had made reservations in advance, even ignoring the actual health status of these tourists

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[8]. Such phenomena reflect the connection between people's perception of the disease and BIS, as well as how prejudice is triggered by perceived risks rather than actual dangers.

3. The BIS and disease-driven social avoidance

3.1. The operation of BIS and the emotions it evokes

The BIS refers to a special set of psychological mechanisms in humans. It is used to detect cues of threats and the presence of pathogens in the environment, thereby triggering emotions and cognitive responses related to disease, resulting in behaviors that avoid infection and the avoidance of pathogens. Unlike the biological immune system, which only reacts after pathogens have already entered the body, the behavioral immune system does not activate the immune system by detecting pathogens. Instead, it responds based on surface cues. A distinctive feature of the BIS mechanism is that it functions based on possible disease-related cues, which are not necessarily definite evidence of infection. But they are mostly observed characteristics. In the context of the COVID-19 pandemic, foreigners and out-groups are often among the first to be identified by BIS as having potential infection risks, which is why in the previous examples, many Asians were deliberately avoided and shunned. This pattern reflects the cost asymmetry of EMT. During disease outbreaks, people are more likely to avoid individuals who are perceived as potentially infected rather than risk failing to avoid someone who is infected, because the potential cost of infection is much higher. A crucial part of the behavioral immune system is a specific aversion and repulsion emotion [9]. When an individual perceives a signal, the BIS triggers a series of emotional responses, with the most obvious ones being aversion, fear, and panic, leading to the occurrence of avoidance behavior. Such a response is very similar to the mechanism of a smoke detector [4]. People will show obvious aversion to things that they consider may pose an infection risk and have negative emotions towards food that they think has "pathogen" characteristics but actually poses no risk [4]. For example, during the epidemic, people may instinctively and subconsciously keep a distance from those who look like they may carry the novel coronavirus pathogen. And when the disease is highly threatening ain the COVID-19 Pandemic, individuals are more likely to show aversion and panic emotions [3]. Such a mechanism and emotion generation are also one of the underlying logics of the BIS.

3.2. The origin of BIS

The evolution of BIS into an adaptive evolutionary mechanism is not without reason. From an evolutionary perspective, it is quite reasonable to view BIS as an adaptive mechanism. Throughout human history, infectious diseases have posed a significant threat to human survival and reproduction, and the COVID-19 pandemic is one of the most severe diseases and infectious diseases in human history [10]. Therefore, this mechanism can enhance survival ability by reducing the risk of infection. The operating principle of the BIS avoidance mechanism is very similar to the "smoke detector principle" [11], both aiming to minimize potentially fatal errors and thus having more opportunities to stay away from potential disease crises. Therefore, BIS makes humans subconsciously avoid things that they perceive as having disease signals and take sufficient avoidance behaviors, even showing emotions such as disgust. Disgust may be triggered by simple visual cues, and this emotion is the core defensive emotion of the BIS. As a result, people might mistakenly avoid those who display unfamiliar physical features or whom they perceive as carrying a disease. Since BIS makes humans extremely sensitive to most things carrying danger signals, false alarms and the phenomenon of people avoiding individuals who are not contagious will occur. This

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kind of phenomenon can also be illustrated by the "smoke detector principle" [11]: since the harm caused by a real accident far exceeds the inconvenience of a false alarm, this leads humans to tend to make false alarm errors, thereby minimizing the harm caused by errors [12]. However, such mechanisms also lead to the "false positive" phenomenon, which brings us to another theory inseparable from BIS, which is the "error management theory".

4. Error management theory and social prejudice

4.1. Error management theory and how it operates in diseases context

The false alarm phenomenon brought by the behavioral immune system that was mentioned earlier can also be explained by the "error management theory" (EMT). The role of EMT is to minimize the inconvenience and cost of decision-making errors in an uncertain environment, usually manifested as biases and avoidance behaviors in specific situations [5]. Specifically, EMT includes two types of errors, namely the false positive and the false negative [12]. A false positive, which is a false alarm, refers to the situation where the system issues a prompt or alarm, but there is no threat present. False negative, or "missed alarm", refers to the situation where there is a certain threat or risk, but the system fails to issue an alarm due to a lapse in judgment [12]. Just like the "smoke detector principle" mentioned earlier, the cost of a false negative is often much higher than that of a false positive [11]. Since the cost of failing to detect real danger (such as being close to the pathogen) was often higher than a false alarm, EMT occurred frequently during the period of the COVID-19 pandemic. From an evolutionary perspective, both EMT and BIS are adaptive psychological mechanisms that lead humans to be more cautious, even if it sometimes sacrifices accuracy and results in false alarms. In the field of infectious diseases, EMT often influences individuals' judgment of the possibility of infection and their attitudes towards things in ambiguous situations. When encountering others in uncertain circumstances, individuals need to quickly determine potential dangers to ensure their physical safety. Comparing false negatives and false positives, false negatives may lead to serious illness or even death, while false positives only result in missed interaction opportunities. Due to the asymmetry of the costs of these two types of errors, EMT makes people more prone to false positives. During the COVID-19 pandemic, the risk of infection was widely perceived as high due to various media reports, and individuals thus interpreted ambiguous or superficial signals as danger signals (such as outsiders or Asians), thereby increasing their vigilance and preventive measures, leading to frequent occurrences of EMT and false positives. This also explains why people were often highly vigilant and overestimated the risk of infection during ordinary daily social activities during the COVID-19 pandemic. However, humans are not passive recipients of such evolutionary processes. Instead, they actively adjust their cognitive biases and judgment standards based on personal experience and cultural information, which is a process referred to in this paper as self-biasing. During the COVID-19 pandemic, because the cost of false negatives was high, people tended to interpret ambiguous cues as signs of infection. Later, as individuals encountered more scientific information, many revised their assessments of infection risk and adjusted the balance between false positive and false negative judgments.

4.2. False positives and their social consequences

During the COVID-19 pandemic, perceived threats and infection risks significantly increased. According to EMT, when the cost of failing to detect a potential infection is high, people tend to adopt lower thresholds for identifying danger [12]. In such circumstances, BIS makes individuals

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more sensitive to any disease-related cues, potentially misinterpreting neutral cues and characteristics, such as unfamiliar appearances or group identities as pathogen-related signals. This heightened sensitivity can trigger a range of emotions, including disgust and fear, leading people to avoid groups perceived as possibly carrying disease. Consequently, even in the absence of actual infection risk, social consequences such as outgroup avoidance, prejudice and discrimination are likely to emerge.

5. From BIS and EMT to outgroup avoidance

Based on the mechanisms and theories of BIS and EMT, these will eventually transform into systematic social avoidance behaviors. BIS is primarily responsible for detecting potential threat signals and triggering a series of emotions, such as rejection, while EMT shapes how individuals perceive and interpret these signals and make final decisions in uncertainty (people tend to make false positive errors). These two mechanisms together form a coherent self-protection process, but often manifest as avoidance and, to some extent, discrimination against out-groups. However, a key question in this process is why outgroups are more likely to be avoided and discriminated against. Firstly, outgroups themselves are full of uncertainty and unknowns. In an uncertain environment, individuals highly rely on the surface clues they see and make quick judgments [12]. Moreover, in the evolutionary history of humans, contact with outsiders often meant exposure to new pathogens that the group had not been immune to. Outgroup members often appear unfamiliar with local culture and behavioral norms. Because BIS relies heavily on superficial cues rather than concrete evidence, these behavioral differences may be interpreted by individuals as signs of potential disease risk, even though no actual threat exists. Therefore, humans have evolved mechanisms like BIS and EMT to be alert, avoid, and reject outgroups that may carry diseases. Even today, strangers or outgroups are still classified as potential threats and sources of infection. This also explains why, during the COVID-19 pandemic, Asians in other countries were regarded as virus carriers, simply because their visible features were associated with the origin of the virus [2]. Moreover, the interaction between BIS and EMT is amplified by social and cultural factors. Media reports and social media often play a crucial role in shaping public perception. It should be emphasized that misleading or exaggerated information on social media can amplify disease cues, increase individuals' perceived threat, and reinforce risk assessments driven by EMT. In an uncertain environment, individuals highly rely on the surface clues they see, so unfamiliar content on social media can intensify feelings of uncertainty and fear. Against this backdrop, EMT-driven biases are no longer merely personal judgments and choices but are magnified within the social and cultural context. As a result, avoidance behaviors became more widespread and normalized during the COVID-19 pandemic, further reinforcing prejudice and discrimination against out-groups [1]. It is important to note that neither BIS nor EMT is directly responsible for causing prejudice and discrimination. Instead, they are adaptive systems that humans have evolved to protect themselves from harm in unknown environments. However, when such adaptive mechanisms operate in the complex modern society, limited information may lead to misunderstandings and misjudgments, ultimately resulting in out-group avoidance and adverse social outcomes. Therefore, a clear understanding of the operation mechanisms of BIS and EMT can provide a more comprehensive perspective on the avoidance and exclusion events that occurred during the COVID-19 pandemic.

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6. Conclusion

In conclusion, this paper argues that the rise of social group prejudice during the COVID-19 pandemic (manifested as an increase in discrimination and avoidance incidents) should be understood as the result of various interacting psychological mechanisms (namely, the behavioral immune system and error management theory) rather than merely as deliberate harm and hostility. By combining BIS with EMT, it becomes clear that humans typically follow a structured pattern and make predictable responses when facing disease threats. Although these mechanisms themselves are adaptive, under various conditions in modern society, they often result in certain social consequences. In the absence of accurate information for most people, misinformation in the media and on social media may strengthen the connection between specific groups and disease threats, thereby deepening stereotypes, normalizing outgroup avoidance behavior, and promoting the formation of prejudice and discrimination. Moreover, this paper has several limitations. First, it primarily relies on theoretical explanations and existing literature to discuss the relationship between BIS, EMT, and social prejudice during the COVID-19 pandemic, without directly testing these mechanisms through empirical research. Second, since this study focuses mainly on the COVID-19 pandemic and outgroup discrimination, the findings may have limited applicability to other disease outbreaks and social contexts. Future research could explore how psychological mechanisms such as BIS and EMT operate across different cultural populations and environmental conditions. Additionally, researchers might examine how social media influences individuals' perceptions of disease threats and contributes to the formation of false positive judgments. Such research may help to further understand the interaction between disease-avoidance mechanisms and social prejudice, while also contributing to the development of more effective strategies for reducing bias and discrimination.

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