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**Psychological Causes of Medical Signs Decrease Perceived Severity, Support for Care, and  
Donations**

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## Abstract

How do people assess the severity of health problems? How do they decide whether these merit medical attention? We investigate how beliefs about psychological and physical causes of *medical signs* affect their perceived severity. Three studies showed that people perceive medical signs, objective and observable evidence of illnesses, as less severe if they originate from psychological rather than physical causes. For instance, participants rated the same cough as less harsh and scratchy when they believe it was caused by anxiety rather than by drinking contaminated tap water. As a result, participants were less likely to recommend care for medical signs with psychological origins, less likely to prioritize their care among multiple health problems, and reluctant to financially support scientific research for their cure.

*Keywords:* medical decision-making, donations, mind-body dualism, mental health stigma, lay beliefs, psychosomatic illnesses

How do people assess health problems? How do they decide whether these merit medical attention? One factor that influences attitudes, perceptions, and behaviors towards health problems is their perceived severity or seriousness (Rosenstock 1974; Keller and Block 1996; Block and Keller 1998; Bolton, Cohen, and Bloom 2006). Forming valid judgments of severity is often not straightforward, however, and can be affected by people's lay understanding of their causes (Sloman 1994; Preston and Epley 2009; Fernbach et al. 2013). Furthermore, some health problems are multiply determined, making it difficult for people to identify the reason behind their occurrence. For example, several causes are suggested for hair loss and various skin conditions (Hay et al. 2014; Phillips, Slomiany, and Allison 2017), and the origins of persistent pain or fatigue are debated among medical professionals (Hayes et al. 2010).

An aspect these health problems share is their potential association with both physical and psychological antecedents (Hayes et al. 2010; Kwon et al. 2018). For instance, psoriasis, a common skin condition, can be caused by physical factors such as a throat infection or dry weather, or by psychological factors such as stress. Similarly, hair loss can be caused by iron deficiency, but also by emotional trauma. In the present research, we investigate how beliefs about psychological and physical causes of health problems affect their perceived severity. Different from past work on mental health stigma (e.g., Phelan et al. 2000; Corrigan et al. 2002; Link et al. 2004), we focus on health problems that are objectively observable, or medical *signs* (e.g., cough, skin rash), rather than on medical *symptoms*, which are subjective (e.g., pain, fatigue; Felman 2018). We find that, despite having identical bodily demonstrations, observers perceive another person's medical signs as less severe if they originate from psychological rather than physical causes. We demonstrate three consequences of discounting the perceived severity of psychologically caused medical signs: Observers are less likely to recommend patients to seek

care for these medical signs, less likely to prioritize their care among multiple health problems, and less likely to donate for medical research for their cure.

We study the perceptions and actions of lay observers for several reasons. The opinions and attitudes of others, such as family and friends, as well as those of the general public, influence the mental models that patients construct regarding health problems, and how they feel about their circumstances (Rosenstock 1974; Petrie and Weinman 2006; Champion and Skinner 2008). Moreover, consumers often seek recommendations and advice from other individuals, or delegate their decisions (Gershoff, Broniarczyk, and West 2001; Fitzsimons and Lehmann 2004; Steffel and Williams 2018). This is particularly true for complex decisions, as in the case of health (Gino and Moore 2007; Botti, Orfali, and Iyengar 2009). Inaccurate or biased perceptions by others can adversely affect the treatment of psychologically caused medical signs and symptoms, encouraging delay or avoidance (Corrigan 2004; Vogel, Wade, and Hackler 2007). Observers' perceptions of severity may also affect public resources allocated to psychological health problems (Corrigan et al. 2004; Smith et al. 2012).

With increased life pressures, even individuals without a history of mental illness experience medical signs and symptoms caused by psychological factors. Features of contemporary life (e.g., media consumption habits, precarious employment, deteriorated social ties) increase stress or anxiety, causing not only symptoms such as sleeplessness or fatigue, but also a variety of medical signs such as inflammation, increased heart rate, and high blood pressure (Schwartz 2004; Nichols 2017). Recent lockdowns and social distancing measures due to Covid-19 pandemic have intensified these pressures. Our predictions relate to Covid long-haulers who experience medical signs such as cough and breathlessness long after their body stopped carrying the virus. In the absence of a physical cause (i.e., the virus), these medical signs

are often attributed to psychological factors such as anxiety (Rubin 2020), with patients not receiving sufficient healthcare, sick pay, or benefits (Alwan and Johnson 2021).

Our work contributes to medical decision-making by documenting a difference in the perceived severity of medical signs depending on whether they are deemed to have psychological or physical causes. Thus, it draws attention to causal explanation and perceived severity as unexplored factors by which psychological illnesses can be neglected and under-resourced by society.

## **THEORETICAL BACKGROUND**

How can people judge the severity of medical signs? One possibility is that they rely on the physical evidence. For instance, people may judge the severity of a cough by noting its sound and frequency (Birring and Spinou 2015), and a skin rash by its appearance (Louden et al. 2004). Research has shown that even clinicians often forgo such evidence-based judgments, relying instead on pre-existing beliefs (Kim and Ahn 2002; De Kwaadsteniet and Hagmayer 2018). This is consistent with research showing that even when consumers physically experience products, they make judgments and decisions based on general knowledge such as categories, stereotypes, price, and brands (e.g., Allison and Uhl 1964; Gerstner 1985; Shiv, Carmon, and Ariely 2005; Lee, Frederick, and Ariely 2006; Berger, Draganska, and Simonson 2007).

Lacking sufficient medical knowledge and expertise to make evidence-based health judgments (Kahn et al. 1997; Keller and Lehmann 2008), consumers rely instead on lay beliefs when making decisions about medical products and treatments (Bolton et al. 2008; Wang, Keh, and Bolton 2010; Kramer et al. 2012; Ilyuk, Block, and Faro 2014; Scott, Rozin, and Small 2020), responding to health-related messages (Raghubir and Menon 1998; Agrawal, Menon, and

Aaker 2007; Zhang, Mathur, and Block 2021), or supporting health-related causes (Kogut and Ritov 2005; Puntoni, Sweldens, and Tavassoli 2011).

In the case of health problems, a lay theory that dominates people's intuitions is that of mind-body dualism (Bloom 2004; Forstmann and Burgmer 2017). Whereas the mind and the body are often closely linked in the demonstration of medical signs and symptoms (Ray 2004), individuals hold a lay belief that mental phenomena and physical matter are independent. This argument dates back to the 16th-century philosopher René Descartes (1596-1650), who argued that people consider matters of the mind as nonphysical phenomena distinct from matters of the physical body (Forstmann and Burgmer 2017; Zheng and Alba 2019).

What might mind-body dualism imply for judgments of severity for medical signs? When reasoning about biological phenomena, people tend to rely on a mechanical understanding of causation (e.g., as when a moving object collides with another; Springer and Keil 1991; Inagaki and Hatano 1993; Au and Romo 1999; Faro, McGill, and Hastie 2010). A key notion in this form of causation is the requirement of physical contact between cause and effect, allowing for the transmission of causal force (Michotte 1963; McCloskey 1983; Scholl and Tremoulet 2000). In the current context, a mechanical understanding of causation would involve the illness coming in contact and impelling the body, leading to a medical sign. However, if mind and body are viewed as separate entities, a psychological cause, compared to a physical one, might not be seen as able to transmit its force to have impact. For example, in one study, children judged psychological factors (e.g., misbehaviors) to be less important than physical factors (e.g., imbalanced diet) in protecting the body from catching a cold (Inagaki and Hatano 2002). In a similar vein, people may believe that psychological causes result in relatively weaker medical signs on the body compared to physical causes.

Our prediction concerns the effect different types of causes have on the perceived severity of medical signs. However, it is possible that rather than making different inferences about the causes of health problems, observers make different attributions about the persons reporting these. When medical signs originate from psychological causes, observers may believe that patients bear responsibility for their occurrence and are thus in greater control of their circumstances. This is consistent with people with mental illnesses being blamed for their conditions and seen responsible to overcome their difficulties (e.g., Corrigan et al. 2002; Link et al. 2004). It could thus be that medical signs with psychological causes are seen to require less medical attention, and are seen as less severe, because people reporting these are expected to be able to manage these by themselves.

On a different account, medical signs originating from psychological causes may be seen to be short-lived compared to those originating from physical causes. People expect emotional states, for instance, to dissipate over time and to be transient (Igou 2004; Labroo and Mukhopadhyay 2009). Similarly, medical signs caused by psychological reasons may be judged as transient, therefore less severe, and less worthy of medical attention. Conversely, people may believe that psychological problems may take longer time to treat compared to physical ones. They may also not be as aware that there are medical treatments available for psychological problems. These beliefs about length and feasibility of treatment, rather than their lower perceived severity, may underlie people's reluctance to recommend and prioritize care for psychological health problems. We address these alternative accounts in our studies.

Although no prior research examined how the perception of medical signs is affected by their cause, the downstream consequences of our predictions are thematically consistent with research on the mental health stigma. Stereotypes about mentally ill individuals lead to skepticisms about their health problems, and act as a barrier to parity of health outcomes: the



mentally ill have lower hospitalization rates, fail to receive necessary medical interventions, and have less frequent screenings than the general population (Jones, Howard, and Thornicroft 2008; Corrigan et al. 2014). Similarly, psychosomatic illnesses such as chronic fatigue syndrome and irritable bowel syndrome are considered “medically unexplained” due to lack of physical evidence, leading to them being overlooked (Duncan 2000; Looper and Kirmayer 2004). In one empirical demonstration of this, people perceived the pain reported by others as less intense when it lacked a physical reason such as an inflammation or an injury (De Ruddere et al. 2012). Such findings are driven by observers’ doubts about the credibility of patients, and the validity of their pain, an inherently subjective symptom measured with self-reports (Ruben, Blanch-Hartigan, and Shipherd 2018).

This past work focused on the stigmatization of people with mental illnesses, or those with medical symptoms lacking physical explanation. We instead study reactions to medical signs having a psychological explanation. Past research also focused on patient credibility, while we aim to hold such person-based attributions constant and focus on the role of causal explanation. Our experiments make this possible in three ways. First, rather than focusing on the absence of physical explanation, we contrast psychological and physical causal explanations. Second, rather than focusing on subjective symptoms such as pain or fatigue about which issues of credibility can arise, we study observable medical signs such as cough and rash. Third, we assess judgments of severity using both perceptual (i.e., how a medical sign sounds or looks) and non-perceptual (i.e., how severe and serious a medical sign is) measures. We find that an identical objectively demonstrable medical sign is perceived as less severe when observers believe its cause is psychological rather than physical.

Across three preregistered studies ( $N = 2,202$ ), we document the discounting of the severity of psychologically caused medical signs and study its consequences. First, we examine

the extent to which observers recommend that a person with the medical sign seek professional treatment. Past research has demonstrated a positive relationship between perceived severity of health problems and intentions to take preventative and treatment measures (Rosenstock 1974; Champion and Skinner 2008). We show that people are less likely to recommend care when the same medical sign has a psychological rather than a physical cause (Study 1).

Second, we study prioritization of treatment when a patient exhibits multiple health problems, but when one of these occurs first and carries a causal role. Focusing on causes rather than symptoms when prioritizing care is a norm that both doctors and the general public aim to follow (e.g., Roberts Stoler 2017). However, we show that observers are less likely to prioritize the treatment of a psychological health problem compared to a physical one, even when the former occurred first and is the likely cause (Study 2).

Finally, we study people's donations for medical research. Research on charitable giving documented factors that inhibit donations, including lack of identifiability (Small and Loewenstein 2003), low entitativity (Smith, Faro, and Burson 2013), low proximity or similarity (Cryder and Loewenstein 2010), and low perceived efficacy (Sharma and Morwitz 2016; Berman et al. 2018). Disease severity was shown to influence allocation of healthcare resources (Kolasa and Lewandowski 2015). We show that people are less likely to donate money to support research on a medical sign if it has a psychological cause compared to when the same sign has a physical cause (Study 3).

We preregistered the design, sample size, and analysis plan of all studies on AsPredicted.org. No conditions were dropped from any of our studies and all measures assessed are reported (Simmons, Nelson, and Simonsohn 2011). The data and the pre-registrations can be accessed at [https://osf.io/xm2jw/?view\\_only=696bfe4e6b8b43f3a19dc01badee21df](https://osf.io/xm2jw/?view_only=696bfe4e6b8b43f3a19dc01badee21df).

## **STUDY 1: PERCEIVED SEVERITY AND RECOMMENDATION FOR MEDICAL CARE**

Study 1 investigates how beliefs about physical and psychological causes of a medical sign affect its perceived severity and, in turn, influence recommendations for others to seek professional care. To assess some of the alternative accounts noted, this study also includes measures of self-manageability and transience.

We recruited 600 participants via Prolific in exchange for payment and, per our preregistration plan, excluded 11 who failed the attention check, leaving us with 589 participants (49.8% female;  $M_{age} = 34.9$  years,  $SD = 12.9$ ).

Participants listened to a sound clip of a person coughing and read that this person has been complaining of a persistent cough. They read that this person searched for information about the cough online. Participants in the psychological-cause condition read that such cough develops in reaction to “a period of anxiety” and that this person “had an intense work schedule” in the past week. Participants in the physical-cause condition instead read that this type of cough develops in reaction to “contaminated tap water” and that this person has been “drinking tap water in a different country” in the past week. Across both conditions participants read that this person had to “travel for client visits” and will go back to their routine when they “return home at the end of the week.”

Participants indicated whether they would recommend this person to visit a doctor or wait for a few days to see if the cough disappears. Next, they evaluated the cough’s perceived severity on the following six dimensions: the extent to which the cough “sounds loud,” “sounds harsh,” “feels scratchy,” “feels irritating,” “is severe,” and “is serious” on 7-point scales from “1 = not at all” to “7 = to a great extent” ( $\alpha = .87$ ).

To measure self-manageability, participants rated their agreement (1 = strongly disagree, 7 = strongly agree) with the following three statements “There is a lot that [name] can do to control his/her cough,” “The course of [name]’s cough depends on [name],” and “[name] has the power to influence the development of his/her cough” ( $\alpha = .80$ , adapted from the personal-control measure in the revised illness perception questionnaire, Moss-Morris et al. 2002). To measure transience, participants assessed the cough on the following 7-point bi-polar scales: chronic-temporary, enduring-short-lived, and persistent-transient ( $\alpha = .78$ ).

A logistic regression with choice of recommendation as the dependent variable and cause of the cough as the independent variable revealed that individuals were less likely to recommend that the person seek care for their cough when they believed it to be caused by anxiety (34.7%) than by contaminated tap water (54.03%;  $\beta = -.79$ ,  $SE = .17$ ,  $p < .001$ ,  $OR = .45$ ).

Next, we tested whether participants’ perceptions of severity for the cough were influenced by its cause. Participants perceived the cough as less severe when it was caused by anxiety ( $M = 3.98$ ,  $SD = 1.14$ ) than by contaminated tap water ( $M = 4.37$ ,  $SD = 1.09$ ;  $F(1, 587) = 18.18$ ,  $p < .001$ ,  $\eta^2 = .03$ ).<sup>1</sup>

We ran a mediation analysis to test whether perceived severity mediated the effect of type of cause on the recommendation to seek care. Bootstrap analyses (SPSS Macro PROCESS Model 4; Hayes 2017; 5,000 samples) showed that the 95% confidence interval for the indirect effect of perceived severity excluded zero (indirect effect =  $-.30$ ,  $SE = .08$ , 95%  $CI = [-.47, -.16]$ ), indicating significant mediation. Having a psychological (vs. physical) reason decreased perceived severity of the cough ( $a = -.39$ ,  $p < .001$ ), which in turn led to lower likelihood to recommend a visit to the doctor ( $b = .76$ ,  $p < .001$ ).

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<sup>1</sup> It is possible that participants listening to the recording had difficulty judging some of the measures. Overall, the effect was observed across all the measures, though it was stronger on the less perceptual items ( $p_{\text{feels scratchy}} = .029$ ,  $p_{\text{feels irritating}} = .011$ ,  $p_{\text{sounds loud}} = .083$ ,  $p_{\text{sounds harsh}} = .052$ ,  $p_{\text{is severe}} < .001$ ,  $p_{\text{is serious}} < .001$ ).

Participants did not perceive the cough as more or less self-manageable when it was caused by anxiety ( $M = 4.21$ ,  $SD = 1.21$ ) rather than by contaminated tap water ( $M = 4.20$ ,  $SD = 1.34$ ;  $F(1, 587) = .03$ ,  $p = .86$ ). Similarly, they perceived the cough equally transient when it was caused by anxiety ( $M = 4.79$ ,  $SD = 1.29$ ) and contaminated tap water ( $M = 4.81$ ,  $SD = 1.17$ ;  $F(1, 587) = .02$ ,  $p = .90$ ). The mediation results above held when these factors were included in a parallel-mediation model with perceived severity (indirect effect of severity =  $-.25$ ,  $SE = .07$ , 95%  $CI = [-.41, -.12]$ ).

In sum, this study showed that participants judged a medical sign experienced by another person as less severe when it had a psychological versus a physical cause. These lower judgments of severity in turn reduced recommendation for medical care. Perceptions of self-manageability did not differ across physical and psychological causes, nor did perceptions of transience.

## **STUDY 2: PRIORITIZATION OF MEDICAL CARE**

In addition to documenting the basic effect of discounting the severity of medical signs that have psychological causes, Study 1 showed a reduced inclination to recommend treatment for a medical sign driven by a psychological (vs. physical) cause. Study 2 examines instead whether people are less likely to prioritize medical treatment for psychological relative to physical causes.

Participants read about a person experiencing two health problems. In accordance with people's tendency to attribute causality through temporal precedence (Einhorn and Hogarth 1986), this study endowed a potential causal role to the health problem presenting first. It then examined people's beliefs about the need to prioritize medical care for the initially demonstrated health problem, depending on whether it is physical or psychological. We predicted that people

would tend to prioritize the health problem that occurred first and holds a causal role (e.g., Roberts Stoler 2017), but that this tendency would be mitigated when it is psychological.

We recruited 1002 participants via Prolific in exchange for payment and, per our preregistration plan, excluded 83 who failed the attention check, leaving us with 919 participants (52.7% female;  $M_{age} = 34.2$  years,  $SD = 12.5$ ).

To test our predictions, we presented participants in the two focal experimental conditions with a person showing two health problems, manipulating their order of occurrence. In these focal conditions, participants read about a person who had developed a skin rash (physical problem) and anxiety (psychological problem). One group of participants (F1) learned that anxiety was the initial problem, and that anxiety could lead to skin rash. The other group of participants (F2) learned that the skin rash was the initial problem, and that skin rash could lead to anxiety.

In order to investigate whether there is something unique in a skin rash (or anxiety) that prompts priority (or deferral) in medical treatment, we included two control conditions. In one, participants read that the person developed two physical problems, strep throat and skin rash, and that strep throat could lead to skin rash (physical-physical, C1). In the other, participants read that the person developed two psychological problems, anxiety and sleeplessness, and that anxiety could lead to sleeplessness (psychological-psychological, C2).

Participants read that the person called the local clinic and learned that they could book one specialist appointment next week and another three weeks later. Participants indicated whether they would recommend that this person first see a specialist for the health problem that occurred initially, or the one that occurred later.

A set of chi-squared tests of independence showed that, across all conditions, the majority of participants prioritized caring for the initial health problem ( $p < .006$ ). However, the proportion prioritizing treatment for the initial problem was lower in F1, when a psychological

problem (anxiety) led to a physical problem (skin rash) (59.19%), compared with all other conditions (F2: 91.56%; C1: 95.40%; C2: 91.36%). Figure 1 displays these results.

--- Insert Figure 1 here ---

In order to further uncover this pattern, we first compared the two focal conditions, F1 (anxiety leading to rash) versus F2 (rash leading to anxiety), which held the two health problems constant and manipulated their order of occurrence. A smaller group of participants chose to prioritize the initial problem in F1 (59.19%) compared to F2 (91.56%;  $\chi^2(1) = 62.38, p < .001$ ). Thus, when anxiety (a psychological problem) preceded the skin rash (a physical problem), and may have led to it, it did not warrant a priority in medical treatment as much as the rash did, when it preceded anxiety.

In order to test whether these results can be explained by a tendency to uniquely prioritize the treatment of the skin rash, or uniquely defer the treatment of anxiety, we compared F1 with the two control conditions, C1 (strep throat leading to rash) and C2 (anxiety leading to sleeplessness). Across F1 and C1, the problem that occurred second was constant (skin rash), while the first problem varied between anxiety and strep throat. This comparison showed that the high tendency to prioritize care for the skin rash in F1 is not due to it being viewed as uniquely requiring medical priority because when it was preceded by strep throat in C1, strep throat received the priority ( $\chi^2(1) = 88.91, p < .001$ ). Lastly, across F1 and C2, the problem that occurred first was constant (anxiety), while the second problem varied between rash and sleeplessness. This comparison showed the tendency to defer of anxiety in F1 did not reflect a prejudice against it per se because in C2, when anxiety led to sleeplessness, anxiety received priority ( $\chi^2(1) = 55.91, p < .001$ ). These set of comparisons suggest that, rather than being driven

by the specific choice of skin rash and anxiety, the results in the focal conditions are due to the former being physical and the latter being psychological.

The results of this study show that, when patients exhibited two health problems, observers prioritized care for one that occurred first, but that this tendency was significantly reduced when the first problem was psychological. People were thus reluctant to prioritize medical treatment for psychological relative to physical causes, a finding consistent with discounting the severity of the impact of psychological causes.

An alternative interpretation of these results is that people believe psychological problems (e.g., anxiety) may take longer time to treat compared to physical ones (e.g., skin rash). They may also not be as aware that there are medical treatments available for psychological problems. Thus, people may choose to seek care for the physical ones first because doing so would ‘solve’ one of the problems faster. While the basis of such reasoning is not obvious (e.g., one may argue that starting care for a problem that will take longer to solve is preferable), we ran a follow-up study to examine this interpretation. Participants ( $N = 464$ , Prolific) were assigned to one of the two focal conditions, F1 (anxiety leading to rash) and F2 (rash leading to anxiety). In addition to the original scenario, participants read that the treatment of each health problem was expected to last one month. They also read that, during this time, a specialist would prescribe an appropriate medicine for the treatment of the specific health problem. Participants then chose whether they would recommend seeing a specialist for skin rash or for anxiety first. We replicated the previous results: Participants were less likely to prioritize care for the initial symptom when anxiety led to skin rash (64.32%, F1) compared to when skin rash led to anxiety (88.61%, F2),  $\chi^2(1) = 38.31, p < .001$ . Thus, our results do not appear to be driven by perceptions of the length and the feasibility of medical treatments for psychological and physical health problems.



### STUDY 3: PRIORITIZATION OF FINANCIAL SUPPORT

Study 3 investigates preferences to financially support scientific research to find cures for medical signs that have psychological or physical causes.

We recruited 600 participants via Prolific in exchange for payment and, per our preregistration plan, excluded 24 who failed the attention check, leaving us with 576 participants (46% female;  $M_{age} = 34.5$  years,  $SD = 12.6$ ).

Participants first completed an unrelated task. They saw four images and reported which corner of each image, they found most appealing. Next, we told them that in addition to their participation fee to complete this task, we would donate \$0.25 on their behalf to a healthcare charity. They read that this charity currently funds scientific research on two medical signs, “widespread skin rashes on the face and the body” and “persistent coughs.” In addition, they saw a skin-rash picture and listened to a cough audio (used in Study 1). In condition 1, participants read that the skin rashes were caused by “exposure to a high stress environment” (psychological cause) and that the persistent coughs were caused by exposure to “high levels of pollution in the environment” (physical cause). In condition 2, they read the opposite. They then chose which medical sign to support with their donation and reported how severe each medical sign was on a 7-point scale (“1 = not at all severe,” “7 = extremely severe”). At the end, participants were debriefed that we would donate \$0.25 either to the American Lung Association (if they chose to donate to persistent coughs), or to the American Skin Association (if they chose to donate to skin rashes).

A chi-squared test of independence revealed that participants were less likely to donate to support scientific research on skin rashes when they thought that these were caused by stress (25.77%) rather than pollution (67.72%;  $\chi^2(1) = 101.83$ ,  $p < .001$ ). In other words, when skin rashes were caused by pollution, and persistent coughs were caused by stress, participants were

more likely to donate to research on skin rashes. However, when skin rashes were caused by stress, and persistent coughs were caused by chemicals, they were more likely to donate to research on persistent coughs. Thus, across both conditions, preferences for donation depended on the causes of the medical signs. Figure 2 displays these results.

--- Insert Figure 2 here ---

Next, a 2 (medical sign: skin rash vs. cough)  $\times$  2 (cause: physical vs. psychological) mixed ANOVA on perceived severity, with medical sign as the within-subjects factor and cause the between-subjects factor, revealed a significant Medical Sign  $\times$  Cause interaction,  $F(1, 574) = 161.82, p < .001, \eta^2 = .22$ . When skin rashes were caused by stress and persistent coughs were caused by pollution (Condition 1), participants perceived skin rashes ( $M = 4.44, SD = 1.37$ ) as less severe than persistent coughs ( $M = 5.47, SD = 1.11; t(290) = -11.02, p < .001, d = -.46$ ). However, when skin rashes were caused by pollution and persistent coughs were caused by stress (Condition 2), participants perceived skin rashes ( $M = 5.02, SD = 1.24$ ) as more severe than persistent coughs ( $M = 4.44, SD = 1.37; t(284) = 6.83, p < .001, d = .29$ ). Thus, perceptions of severity also depended on the causes of medical signs. Figure 3 displays these results.

--- Insert Figure 3 here ---

Although not pre-registered, we ran an exploratory mediation analysis that included cause as the independent variable, perceived-severity difference between skin rashes and persistent coughs as the mediator variable, and donation choice to support research on skin rashes as the dependent measure. Bootstrap analyses (SPSS Macro PROCESS Model 4; Hayes 2017; 5,000

samples) showed that the 95% confidence interval for the indirect effect of perceived severity difference excluded zero (indirect effect =  $-1.55$ ,  $SE = .23$ , 95%  $CI = [-2.05, -1.17]$ ), indicating significant mediation. Having a psychological reason for skin rashes and a physical reason for persistent coughs (vs. a physical reason for skin rashes and a psychological reason for persistent coughs) decreased the perceived-severity difference ( $a = -1.61$ ,  $p < .001$ ), which in turn led to lower likelihood to donate for research on skin rashes ( $b = .97$ ,  $p < .001$ ).

This study showed that people were less likely to donate for a medical sign that had a psychological cause, compared to a medical sign that had a physical cause, independent of what the specific medical sign was. In addition, these donation preferences were explained by the effect of causal beliefs on the perceived severity of the medical signs.

In order to test whether these results are robust to general causes of medical signs rather than the specific causes we chose, we ran a pre-registered study ( $N = 319$ ) that had the same experimental design with one difference: Instead of providing participants with the specific causes (e.g., stress or pollution) of medical signs, we told them that each medical sign was caused by either “physiological” or “psychological” factors. Replicating previous findings, participants were less likely to donate for skin rashes ( $\chi^2(1) = 7.01$ ,  $p = .008$ ) and perceived them as less severe ( $F(1, 317) = 26.29$ ,  $p < .001$ ,  $\eta^2 = .08$ ) when they were caused by psychological factors rather than physiological factors (see Web Appendix Supplementary Studies). As before, perceived severity mediated the effect of the causal beliefs on donation preferences (indirect effect =  $-.76$ ,  $SE = .19$ , 95%  $CI = [-1.19, -.45]$ ).

## GENERAL DISCUSSION

This research showed that medical signs are perceived as less severe when they have psychological (vs. physical) causes. As a result, people are less likely to recommend professional

care for psychologically caused medical signs, less likely to prioritize their care among multiple health problems, and less likely to donate to research for their cure.

This research makes several contributions. Past consumer research examined how lay beliefs influence perceptions of medical products and procedures (Wang et al. 2010; Ilyuk et al. 2014; Scott et al. 2020), and how perceived severity affects the response to health communications (Keller and Block 1996; Block and Keller 1998; Bolton et al. 2006). Our studies instead focused on the role of causal explanations in shaping lay beliefs and affecting the perceptions of health problems. Second, the mental health stigma literature focused on person-based attributions to account for the neglect of *subjective medical symptoms* (e.g., Corrigan et al. 2002; Link et al. 2004). Our work contributes by showing that psychological explanations to *objective medical signs* lead to lower perceived severity and neglect. Finally, the charitable-giving literature has documented several characteristics that increase donations by signaling neediness of individuals suffering from those problems (e.g., Cryder and Loewenstein 2010; Smith et al. 2012; Berman et al. 2018). We instead explore causal beliefs about medical problems as a factor that affects donations through perceived-severity judgments.

Our findings relate to several societal problems in healthcare provision. First, while we focused on common medical signs, these results relate to medical issues with complex antecedents. For instance, researchers debate whether conditions such as fibromyalgia are caused by physiological or psychological factors (Hayes et al. 2010). Our research suggests that support for such illnesses will depend on subjective causal beliefs of others even when patients present with identical medical signs and symptoms. Second, our findings concern avoidance of healthcare, which inhibit patient recovery and increase healthcare costs (Kannan and Veazie 2014). Our results propose lower social support as a factor that may contribute to resistance to seeking care by those patients. Lastly, this research is relevant to the historical underfunding of

health problems with psychological antecedents. This issue has gained renewed relevance during the Covid-19 pandemic, with increased levels of stress and anxiety due to economic uncertainty, social distancing, and home-schooling. Psychological explanations were also provided for the lingering effects of Covid once the body no longer shows evidence of the virus. Our findings provide a potential explanation for the scarcity of attention and resources allocated to people in such circumstances (Holmes et al. 2020).

Future research could explore ways to address the neglect of psychologically caused medical signs. To combat stigma, previous research has suggested emphasizing genetic and biological explanations for mental illnesses. While such interventions increased the treatment of mental illnesses (Phelan et al. 2000), they also led to the mentally ill being seen as abnormal compared with the general population (Lebowitz and Ahn 2014). Our focus on the causal explanation rather than patient-based stigma suggests that there may be value in educating the public about the interrelatedness of physical and psychological causes of health problems. A similar argument has motivated transformation of the medical system from a biomedical model that treats mental and physical health issues separately to a biopsychosocial model that acknowledges the synergies between biological, psychological, and social factors leading to health problems (Ray 2004). While this aims to avoid the discounting of medical signs and symptoms by the medical professionals, future research can investigate how educating the public can similarly influence judgment of medical signs in the society.

In conclusion, this research draws attention to a discrepancy in public perceptions and treatment of medical signs. It emphasizes how psychological origins underlying medical signs adversely affect perceptions of their severity and reduce support for their care. We hope this work motivates additional research on how society deals with psychological illnesses.

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