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Experimental Examination of Social Transmission of Health Information using an Online Platform

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ABSTRACT

The "viral" nature of information transmission has the potential to transmit both accurate and inaccurate information. The present experiment examines the social transmission of health information, focusing on disorder etiology. Participants were placed in one of three generations of social transmission chains. The first generation read information concerning one of four fictitious disorders, pairing one disorder (Physiological or Psychological) with one etiology (Genetic or Environmental). Then, to ensure minimal loss of information (which is common in open-ended recollections), participants recalled key aspects of the disorders through multiple-choice questions. Their selections were used to modify the vignettes for the second generation and the third generation read the second’s recollections. All participants also evaluated diagnosed patients on social distance and disgust. Findings suggest that genetic etiology was better recalled when paired with a psychological disorder than a physiological one. Participants desired more social distance from psychological disorders’ patients (regardless of etiology) and showed higher disgust for environmental etiological patients (regardless of disorder). Implications focus on the role of content biases in the transmission of health information and misinformation.

Many folklores have common features, shared by various groups around the world (e.g., talking animals, dangerous predators, and listening to one’s elders; Tehrani, 2013). The essential elements of these stories may remain, but over time, differences arise due to local contextual factors, such as talking animals specific to a local species (Tehrani, 2013). The cultural evolutionary framework stipulates that these shared and diverging elements also indicate that humans are likely biased to specific kinds of content – where they pay attention to, transmit, and retain specific types of information (Broesch, Barrett, & Henrich, 2014). Specific content types are likely preferred because they consume less cognitive resources – resources that are needed for more pressing decisions. For example, ideas that elicit strong emotions (e.g., disgust), and provide vital social information, are memorable, which also makes them more culturally contagious (Broesch et al., 2014; Heath, Bell, & Sternberg, 2001; Norenzayan et al., 2016). This acquisition and morphing of information through intergenerational transmission, in a broken telephone (or Chinese whispers) fashion, extends beyond folklore into areas that have immediate, meaningful outcomes, such as in the context of health and diseases.

Social transmission of health information

In line with the cultural evolutionary framework, the social transmission of health information, particularly among laypeople, is influenced by people’s biases and beliefs. These biased narratives concerning particular disorders can impact social cognitions concerning diagnosed patients, such as gay men being seen as more blameworthy than heterosexual men for contracting AIDS (Anderson, 1992). As there is less research intersecting the transmission of health information with beliefs associated with stigma, mainly disgust and social distance, the present study aims to address this gap.

In less stigmatized diseases, social transmission has both negative and positive effects, particularly in the transmission of online information (Scholz et al., 2017). On the one hand, bogus or incorrect information is more likely to spread online than correct information (Vosoughi, Roy, & Aral, 2018). On the other hand, the transmission of information through social media has demonstrated some effectiveness in certain situations such as viral dissemination of information related to public health campaigns (Gosselin & Poitras, 2008) and support for specific health conditions (Shaw & Johnson, 2011). In addition to social transmission effects, a health condition framed in a particular way also influences health-related behaviors, with both positive and negative effects (Knobloch-Westerwick, Johnson, & Westerwick, 2013; Smith, Zhu, & Fink, 2017). For instance, when obesity was attributed to a genetic cause experimentally, unhealthy eating increased (Dar-Nimrod, Cheung, Ruby, & Heine, 2014), while highlighting (bogus) personal genetic susceptibility to alcoholism resulted in an increased likelihood of joining
a responsible drinking workshop (Dar-Nimrod, Zuckerman, & Duberstein, 2013). Thus, the framing of a health condition, together with the selective transmission of health information has the potential to create biased knowledge networks concerning disorders.

In social transmission situations, people choosing to share or transmit information may evaluate their own worldview as well as the social consequences of sharing that health information (Capella, Kim, & Albarracin, 2015; Scholz et al., 2017). As with folklores, the messenger believes this information is vital for another to better face challenges in their environments (whether physical or digital). In such situations, the origins of health conditions provide important health and social information (Broesch et al., 2014), such as whether a group of people wishes to welcome a stranger to share their food. For example, well-intentioned people may share misinformation about vaccinations because they believe it is essential for others to know, but also because the information reinforces their own worldview. Consequently, people who share misinformation are also sharing their social and cultural reality with people within their network. Based on the notion that social (and health) information, which is relevant for facing challenges in one’s environment, is more likely to be retained over generations (Mesoudi, Whiten, & Dunbar, 2006), we examined whether disorders’ type and etiology both influence the transmission of health information.

Both genetic and environmental etiologies can inform individuals of challenges in their environment, but which etiology is preferred may be context-dependent. Findings focusing on etiologies, as highlighted above, suggest that genetic-based etiologies (e.g., Knobloch-Westerwick et al., 2013; Smith et al., 2017) have distinct effects on health cognition. Notably, these effects are not always replicated in non-industrialized societies (Legare & Gelman, 2008; Moya, Boyd, & Henrich, 2015), where they are often reversed, with preferences leaning toward environmental information. Additionally, the findings for the recollection of genetic over environmental etiologies in transmissions have, thus far, been mixed, with research showing either minimal recollection differences (Ganesan, Kashima, Kiat, & Dar-Nimrod, 2019) or preferences for genetic information (Green & Clémence, 2008). Though both genetic and environmental etiologies provide important information on health conditions, we expect the participants in our study (drawn from an industrialized population) to preferentially retain and transmit genetic etiology – although not overwhelmingly so.

**Individuals’ perceived vulnerability to diseases**

Prior work underscores the importance of individuals’ beliefs that they are vulnerable to infectious diseases as influencing factors in health cognition (Curtis, de Barra, & Auinger, 2011; Duncan, Schaller, & Park, 2009). Such beliefs are demonstrated to be stable, trait-like individual characteristic (Duncan et al., 2009), and have been linked to higher instances of avoidance and feelings of disgust in health- or disease-related situations (Murray & Schaller, 2012; Schaller & Park, 2011). These vulnerability beliefs seem to affect health cognition even when contamination dangers are not directly apparent (e.g., Huang, Ackerman, & Sedlovskaya, 2017). As such, one’s perceived vulnerability toward diseases may influence health-related cognition both in the type of health information that is remembered and in how patients are evaluated (Ackerman, Hill, & Murray, 2018).

In a given situation, we can expect individuals to differ in their perceived vulnerabilities to diseases and how it affects their health cognition (Duncan et al., 2009). Research indicates that when people believe they are more vulnerable to diseases, they show stronger preference for healthy-looking stimuli (Welling, Conway, DeBruine, & Jones, 2007), increased avoidance of potential infection others (Mortensen, Becker, Ackerman, Neuberg, & Kenrick, 2010; Prokop & Fančovičová, 2011), and increased negative attitudes toward their out-groups (Huang, Sedlovskaya, Ackerman, & Bargh, 2011) – the latter expressed through avoidance-based emotions, such as disgust. The role of perceived vulnerability to diseases in relation to genetic etiology has primarily received theoretical focus (e.g., Tybur & Gangestad, 2011). Experimental studies examine this link through proxies for genes or genetic etiology, such as the preference for mates who appear to have “good genes” (Lee & Zietsch, 2011), but not directly through avoidance of disorders with genetic etiologies or biased recollection of disorder etiologies.

**The present study**

The present study aims to further understanding of how social transmission of disorder-related information influences content-specific recollections and social assessments of individuals diagnosed with those disorders and whether perceived vulnerability to disease further moderates these relationships. For that purpose, we used participants’ recollections of health disorder and etiological information as a measure of content-specific recollections. Fictitious health conditions were chosen as the main topic of message transmission as well-known diseases may have varying levels of familiarity among a given group of individuals, which is likely to introduce undesirable noise to our exploration of how the messages are transmitted within social networks. Furthermore, we used two separate measures of social evaluation, disgust (Murray & Schaller, 2012; Schaller & Park, 2011) and social distance (Jorm & Oh, 2009; Sikorski et al., 2015), as both are evidenced to be particularly common reactions in health-related situations. Lastly, given the important role of beliefs regarding one’s perceived vulnerability to diseases, we have explored their effect on desired social distance and feelings of disgust with regards to the patients.

Most of the studies (e.g., Seymour, Getman, Saraf, Zhang, & Kalenderian, 2015; Vosoughi et al., 2018) involved in the examination of health information transmission are large-scale research (see Lewandowsky, Ecker, & Cook, 2017, for a review). Unlike these important studies, the present study attempts to unpack the broader dynamics involved in the social transmission of health information by focusing specifically on a specific element of content – disorder etiological information. Furthermore, past studies (see Whiten, Caldwell, & Mesoudi, 2016, for a review) have examined the
transmission of socially-relevant information such as stereotypes (Lyons & Kashima, 2006), identification of dangerous animals (Broesch et al., 2014), or genetic causal information (Ganesan et al., 2019; Green & Clémence, 2008), but the information utilized in the studies is highly susceptible to loss, decay, and noise, as in a broken telephone game (Griffiths, Lewandowsky, & Kalish, 2013). To allow research to explore such transformations for specific content, the present study targeted the current folly by only replacing those key aspects of health-related narratives. In this way, the larger narrative concerning a particular disorder remains the same for each participant in a transmission line, but specific parts of the disorder (e.g., etiology) may change depending on the information transmission. This method provides a more controlled way to examine the micro-evolution of disorder-related information, complementing existing works that have examined the macro-evolution.

The present study follows-up on previous research (Ganesan et al., 2019), by identifying whether specific types of health-related information, namely genetic information, is preferentially transmitted. More specifically, the current design addresses inconclusiveness that arise from Ganesan et al.’s (2019) design limitations by (1) using a between-subjects design with two vignettes for each condition to ensure there was no exposure to different etiologies, (2) increasing the number of individuals in each generation, (3) removing the need for open-ended coding that can be hard to interpret at times. The number of generations was also reduced to 3, given that in (Ganesan et al., 2019), the effects between Generations 3 and 4 were comparable. Finally, contrasting a between-subjects design with a within-subjects one helps with making generalizations across design types (Lakens, 2013). More specifically, the present study tested whether participants preferentially recollect genetic etiology over environmental etiology in a community sample. Participants in Generation 1 were exposed to the original version of the vignettes, whereas participants in Generation 2 were exposed to modified versions, based on responses of Generation 1. Participants in Generation 3 were exposed to the modified versions based on responses of Generation 2 participants. We focused on transmission fidelity (i.e., the amount of correct information transmitted) of the etiological accounts. To ensure the amount of information transmitted is comparable across groups, the original vignettes were modified (based on participants’ responses) by only replacing key phrases. After each vignette, participants evaluated a diagnosed patient on social distance and disgust measures.

**Hypotheses**

We hypothesized that participants would retain and transmit more information on genetic etiology compared to environmental etiology over generations, across both disorder types. We also expected the selective transmission of health information over generations to affect participants’ social distance and disgust ratings for each of the disorders. Past research suggests that patient evaluations vary by disorder type, but the loss of information over generations leads to more positive evaluations over generations (Ganesan et al., 2019). Furthermore, previous findings indicate that individuals’ perceived diseases’ vulnerability influences social evaluations in the context of health (Ackerman et al., 2018; Huang et al., 2017). Thus, we predicted a two-way interaction of Generation and Disorder Type on both social distance and disgust ratings, and expected perceived vulnerability to diseases scores to moderate these two-way interactions. Specifically, participants higher on the perceived vulnerability to diseases measure were expected to make more negative evaluations of patients – desiring more social distance and feeling more disgust toward patients of disorders with the environmental etiology compared to genetic etiology, leading to more positive ratings over generations.

**Method**

Before data collection, we conducted an a priori power analysis for the studies, pre-registered on the Open Science Framework (https://osf.io/gjku8/). An institutional ethics committee approved all procedures. Due to an unexpected change in access to the undergraduate participant pool, the undergraduate sample included in the pre-registration comprised a smaller sample of individuals. Thus, the social transmission method was not used in this study, and the data (and other additional information) are reported in the Supplemental File, rather than the main text.

**Participants**

Participants were recruited via TurkPrime (Litman, Robinson, & Abberbock, 2017), using the Mechanical Turk platform. Participation was limited to U.S. residents, who had at least 5000 approved tasks (termed Human Intelligence Tests or HITs), and with a minimum 97% completion rate (termed approval ratings). They were compensated with USD$2.00. The study consisted of 299 participants (158 men, 141 women, $M_{\text{age}} = 40.96$ years, $SD = 11.70$, range = 21–73 years), who identified as European/White (238), African American (24), Mixed ethnicity (9), Northeast Asian (8), Hispanic/Latino (7), Native American/Alaska Native (3), Southeast Asian (4), Middle Eastern/North African (2), South/Central Asian (1), and Other or unreported (3). Most participants were born in the U.S. (291) and had lived in the U.S. for more than five years (297).

**Materials and measures**

**Vignettes**

Participants were exposed to a set of two vignettes describing one of the four fictitious health conditions (adapted from Kim & Ahn, 2002): a Physiological Disorder with Genetic Etiology, a Physiological Disorder with Environmental Etiology, a Psychological Disorder with Genetic Etiology, and a Psychological Disorder with Environmental Etiology. Each disorder within the vignette set had a unique name, symptoms, and afflicted population. For example, one of the physiological disorders was characterized as a condition that causes vision loss, whereas a psychological disorder was described using symptoms such as anxiety, mild obsession, and nightmares. Both disorder types were described as either...
having a genetic etiology (e.g., abnormality of spatial structure of genetic code) or an environmental etiology (e.g., infection from parasites in untreated water).

Social distance
As a measure of social distance desired (adapted from Bogardus, 1933), participants rated their willingness to engage with a diagnosed patient in various social situations using six items (e.g., *Spend an evening socializing with John or Share a meal with John*), on a 7-point scale (1 – definitely not, 7 – definitely will). A lower score is indicative of more social distance desired ($\alpha = .97$).

Disgust
Participants rated how much disgust or repugnance they would experience when engaging with a diagnosed patient using four items (e.g., *Sit next to John on a 10-hour flight*), on a 5-point scale (0 – No disgust or repugnance at all, 4 – Extreme disgust or repugnance). A lower score is indicative of lower disgust ratings ($\alpha = .94$; adapted from Bogardus, 1933).

Perceived vulnerability of diseases (Duncan et al., 2009)
Participants completed a 15-item scale measuring their perceived susceptibility to infectious diseases with items such as “In general, I am very susceptible to colds, flu, and other infectious diseases.” They rated the items using a 7-point Likert scale (1 – strongly disagree, 7 – strongly agree), with higher scores indicating higher perceived vulnerability of diseases ($\alpha = .80$).

Procedure
Participants were directed to a Qualtrics webpage. There, they were presented with details of the study and provided informed consent. Then, participants were provided with a language-check question to ascertain that they are aware that English proficiency is a requirement for the study.

The following is the procedure for the first generation of participants. Participants were randomly assigned to one of the health conditions, with each set consisting of two vignettes. After reading the vignette and moving to the next screen, participants completed the multiple-choice recognition question consisting of 21 options (see details below). Next, they completed the patient evaluation items as well as the patient social distance and feelings of disgust measures followed by the second vignette in an identical fashion to the first. The order of the vignettes was randomized. After all the vignettes were completed, participants completed the Perceived Vulnerability to Diseases scale, attention checks, and the demographic items. Finally, participants were provided an open-ended feedback box and were debriefed on the true purpose of the study.

We note that Generation 1 of the main study initially included three vignettes. Due to an instrumentation issue, the third vignette was omitted in the second and third generations and excluded from the overall analyses.

Transmission method
The social transmission method was implemented by using the multiple-choice responses of the first-generation’s participants to replace key points in the original form of the vignette. Participants’ responses, whether correct or incorrect, were used as replacements to ensure standardized forms of transmission. For example, the etiological information for a Genetic-Physiological Disorder was characterized as “a condition caused by mutations in four different genes.” In the multiple-choice responses, participants had three incorrect choices related to etiology (e.g., *caused by mutations in a single gene*) in addition to the one correct choice. If participants made an incorrect choice, the related sentence was replaced with this incorrect information (e.g., *a condition caused by mutations in a single gene*). After modifying these key phrases in all first-generation participants’ vignettes, each participant in the second generation randomly received one of the first-generation’s participants’ responses. This random assignment ensured that each participants’ response is only seen by one other participant in the subsequent generation. This process was repeated for the third and final generation by replacing the second-generation’s vignettes with the responses of the second-generation’s participants. All multiple-choice answer options remained the same for all three generations. We provide a sample of responses from one transmission line in the Supplemental File.

The study was implemented online, in stages, and each participant only took part in one generation. Participation filters were included to ensure that those who have previously participated were not able to join again. Once the first-generation participation quota was met, the first part of the study ended. The vignettes were then edited with the responses of the first-generation participants. The second part of the study commenced at that point for the second generation with those revised vignettes. These steps were replicated in part three of the study – for the third generation.

Computing correct etiological recollections
Overall, each of the two vignettes had seven correct and 14 incorrect multiple-choice options for all elements (see Supplemental File for examples). Of those options, four were associated with disorder etiology – one correct choice and three incorrect choices – the main element examined in this study. Participants were given 1 point for each instance when they (1) selected of correct etiology choice and (2) did not select incorrect etiology choices. Participants who did not select the correct choice or selected the incorrect choices were given a 0 for each error instance. Across the two vignettes, participants were able to get a maximum score of eight correct etiological recollections. Participants’ overall correct etiological recollection ratios were determined by their total number of correct responses relative to this maximum score of eight.

Results
Data management and analytic strategy
Detailed data management strategies and preliminary analyses are reported in the Supplemental File. There were three separate generalized linear models for the three dependent variables: (1) percentage correct on etiological recollection (out of
eight possible correct recollections), (2) social distance desired, and (3) feelings of disgust. The first dependent variable, bounded between 0 and 1, was analyzed with a logit link function and a binomial conditional outcome distribution. The second and third dependent variables were continuous outcomes modeled with perceived vulnerability to diseases as a moderator. Normality in residual distribution for models was assessed by scatter and Quantile-Quantile plots. No extreme outliers were found for both continuous outcomes, but they showed skewed residuals. Thus, the models were tested with a log-normal distribution.

For each dependent variable, we examined the combined effects of Disorder Type (between-subjects; Genetic-Physiological, Environmental-Physiological, Genetic-Psychological, and Environmental-Psychological), and Generation (between-subjects; 1, 2, and 3). All p-values for the main analyses are reported after applying the Bonferroni-correction. All analyses were performed using PROC GLIMMIX and PROC MIXED in SAS 9.4 for Windows. Effect size estimates for the simple effects are odds ratio (OR) for the binomial outcome and Cohen’s d for the two continuous outcomes (Lakens, 2013). Means and standard errors for all main analyses are reported in Table 1.

### Etiological recollection

For the binomial outcome of etiological recollection, the main effect of Generation was significant, $F(2, 287) = 15.81$, $p < .001$. Participants in Generation 1 were significantly more likely to recall accurate etiology than Generation 2, $t(287) = 4.54$, $p < .001$, $OR = 1.77$, 95% CI [1.38, 2.26] and Generation 3, $t(287) = 5.35$, $p < .001$, $OR = 1.95$, 95% CI [1.52, 2.45] (see Figure 1). However, there was no significant difference between the etiological recollections of Generations 2 and 3, $t(287) = 0.85$, $p = .395$, $OR = 1.10$, 95% CI [0.88, 1.38]. The main effect of Disorder Type was also significant, $F(3, 287) = 9.63$, $p < .001$. Simple effects analyses indicated that participants exposed to the genetic-physiological disorder showed lower etiological recollections probabilities than those exposed to genetic-psychological disorder, $t(284) = −3.95$, $p < .001$, $OR = 0.58$, 95% CI [0.45, 0.77] (see Figure 2). Participants were also significantly less likely to correctly recall etiologies of genetic-physiological disorder compared to both environmental-physiological disorder, $t(284) = −4.60$, $p < .001$, $OR = 0.52$, 95% CI [0.39, 0.69] and environmental-psychological disorder, $t(284) = −3.02$, $p = .017$, $OR = 0.67$, 95% CI [0.51, 0.87]. Contrary to our predictions, the interaction effect between Generation and Disorder Type was not significant, $F(6, 287) = 0.26$, $p = .956$.

### Social distance

Based on the results of the generalized linear model, participants’ social distance ratings were significantly influenced by Disorder Type, $F(3, 285) = 6.26$, $p < .001$ (see Figure 3). Participants desired more social distance from a genetic-psychological patient, $t(285) = 2.95$, $p = .021$, $d = 0.50$, 95% CI [0.16, 0.83], and an environmental-physiological patient, $t(286) = 4.16$, $p < .001$, $d = 0.68$, 95% CI [0.36, 1.01], compared to a genetic-physiological patient. All other simple effects were nonsignificant. Both the main effect of Generation, $F(2, 285) = 1.74$, $p = .178$ and interaction of Disorder Type and Generation, $F(6, 285) = 0.16$, $p = .987$, were nonsignificant, contrary to our hypotheses. Perceived vulnerability to diseases did not significantly moderate the two-way interaction of Disorder Type and Generation, $F(6, 273) = 168$, $p = .127$.

### Feelings of disgust

Based on the generalized linear model, the main effect of Disorder Type had a significant effect on disgust ratings, $F(3, 287) = 6.09$, $p < .001$ (see Figure 4). Participants rated environmental-physiological disorder as more disgusting than genetic-psychological disorder, $t(287) = −3.51$, $p = .003$, $d = 0.50$, 95% CI [0.27, 0.89]. Furthermore, participants rated the environmental-physiological disorder as more disgusting than the

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### Table 1. Mean and standard errors for main effects of disorder type and generation.

<table>
<thead>
<tr>
<th>Disorder Type</th>
<th>Proportion of Etiological Recollection Mean (SE&lt;sub&gt;mean&lt;/sub&gt;)</th>
<th>Social distance a Mean (SE&lt;sub&gt;mean&lt;/sub&gt;)</th>
<th>Disgust b Mean (SE&lt;sub&gt;mean&lt;/sub&gt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic – Physiological Disorder</td>
<td>.69 (.02)</td>
<td>35.45 (1.03)</td>
<td>4.00 (0.51)</td>
</tr>
<tr>
<td>Environmental – Physiological Disorder</td>
<td>.79 (.02)</td>
<td>31.82 (0.98)</td>
<td>6.42 (0.47)</td>
</tr>
<tr>
<td>Genetic – Psychological Disorder</td>
<td>.81 (.02)</td>
<td>29.44 (1.05)</td>
<td>3.53 (0.51)</td>
</tr>
<tr>
<td>Environmental – Psychological Disorder</td>
<td>.77 (.02)</td>
<td>28.33 (0.98)</td>
<td>5.21 (0.48)</td>
</tr>
<tr>
<td>Generation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.83 (.02)</td>
<td>30.90 (0.87)</td>
<td>5.14 (0.42)</td>
</tr>
<tr>
<td>2</td>
<td>.74 (.02)</td>
<td>30.40 (0.97)</td>
<td>5.03 (0.42)</td>
</tr>
<tr>
<td>3</td>
<td>.72 (.02)</td>
<td>32.48 (0.88)</td>
<td>4.16 (0.42)</td>
</tr>
</tbody>
</table>

aHigher score is indicative of less social distance desired. bHigher score is indicative of more feelings of disgust.
genetic-psychological etiology, $t(287) = 4.18, p < .001, d = 0.68, 95\% CI [0.36, 1.01]$. All other simple effects were nonsignificant. Contrary to our hypotheses, both the main effect of Generation, $F(2, 287) = 0.48, p = .617$, and the interaction of Disorder Type and Generation, $F(6, 287) = 0.59, p = .742$ were nonsignificant. Perceived vulnerability to diseases also did not significantly moderate the two-way interaction of Disorder Type and Generation, $F(6, 275) = 1.34, p = .238$.

**Discussion**

We examined whether participants’ recollections of disorder etiology and social evaluations of diagnosed patients is influenced by the type of disorder they were exposed to and their generational position in a social transmission chain. In a community sample, participants showed the highest number of accurate recollections for genetic etiology when it was associated with a psychological disorder, but lowest for genetic etiology paired with a physiological disorder. The recollection of both disorders with environmental etiology was comparable. Contrary to prior work (Ganesan et al., 2019) and our hypothesis, participants showed greater recollection accuracy for genetic etiology only when it was paired with a psychological disorder (an effect only significant relative to the other genetic disorder, the genetic-physiological disorder). Those exposed to the disorders with an environmental cause were also more likely to recall the etiology accurately compared with individuals in the genetic-physiological disorder condition.

Furthermore, participants desired significantly more social distance from a patient diagnosed with a psychological disorder (regardless of etiology) than a genetic-physiological one. Because symptoms associated with psychological disorders are often more threatening to an observer (e.g., aggression, unpredictability) compared to physiological disorders, they may elicit more negative responses. This effect did not occur when the physiological disorder was explained by environmental causes, potentially indicating that participants want to distance themselves from a person whose environment gives rise to a disorder – as a way of managing a potential threat in one’s own environment. This possibility is further supported by previous works (Murray & Schaller, 2012; Schaller & Park, 2011) as well as the present study’s findings on feelings of disgust; participants rated an environmental-physiological disorder as the most disgusting – significantly more so than a genetic-psychological one.

These social evaluations of patients further varied by the features of the disorders. Participants did not show a significant desire for social distance in the comparisons between both genetic disorders with an environmental-physiological disorder but rated it as more disgust-inducing than the two genetic disorders. The contrasting evaluations of patients based on etiological and disorder information suggest that when assessing social distance, participants may have relied on multiple disorder-based features, as psychological disorders were rated the highest on social distance desired, regardless of their etiology. When assessing feelings of disgust, participants may have been concerned with infectiousness and made their evaluations based on the etiology.

Contrary to the hypothesis regarding the moderating effect of individual characteristics, results indicated a nonsignificant association between perceived vulnerability to diseases and both social distance and disgust ratings. The findings suggest that environmental etiologies are more self-relevant than genetic etiologies, particularly in situations where there are no imminent threats. Genetic etiologies, if interpreted as familial, are more relevant to the patient in the vignette,
Unlike environmental etiologies, which may be infectious, and thus, relevant to the participants in this study. However, given that these effects did not vary by levels of perceived vulnerability, it is likely that participants did not view the information as being self-relevant or directly related to facing environmental challenges. On a positive note, the present study shows that at least one form of disorder, genetic-psychological, may be less prone to etiological inaccuracies.

Assessing the effects of Generation, participants in Generation 1, who read the unmodified source material, recalled the most accurate etiology compared to Generation 2 and 3, but these effects did not vary across Disorder Type. The findings suggest that participants without exposure to the source material and without opportunities to verify information may transmit erroneous as well as accurate health information. The lack of a difference in correct etiological recollections between Generations 2 and 3 (despite receiving a comparable amount of information), may indicate that in social transmissions, more intuitive information is more likely to be passed on. In such a situation, the information is evaluated for its plausibility, and these highly-plausible aspects may be transmitted with more fidelity (Miton & Mercier, 2015). Therefore, after the initial errors made by Generation 1, the transmitted information does not significantly change because the information selected by Generation 1 participants is likely more intuitive (but not necessarily more accurate), leading to increased fidelity over time.

Understanding this intuition-based transmission further has potential to disentangle more complex questions in the area of health information transmission, particularly in why misinformation is transmitted alongside accurate information. For example, because vaccination or the act of injecting oneself with a foreign body to protect against disease, it is a counter-intuitive task, anti-vaccine beliefs are likely to spread because it is the more counterintuitive counterpart (Miton & Mercier, 2015). The shared beliefs of those who are anti-vaccine (e.g., vaccines have contaminants or have side effects) center on the effects of being injected with that foreign body, thus increasing the potential for transmission of misinformation concerning vaccines (Miton & Mercier, 2015).

To address these issues outside the lab, examining the role of experts such as clinicians and health professionals in the transmission process is a necessary next step, mainly because experts themselves have etiology-based biases in health information transmission (e.g., Lebowitz & Ahn, 2014). Content and contextual factors related to the expert can also influence how the audience receives health messages. The audience better receives messages from experts who use accessible language or signal their credibility in online comments (Kareklas, Muehling, & Weber, 2015). Thus, the role of experts in improving transmission fidelity by strategically being placed in communication chains at specific intervals may counteract continual transmission of health-related misinformation.

Conclusions

In sum, the present study tentatively provides evidence for how targeting specific informational features in the transmission of health information has the potential to add nuances understanding of their relative importance to communicators. Because individuals may have specific content biases in the processing and transmitting of health information (Lewandowsky et al., 2017), measures need to be placed to ensure the accurate transmission of specific kinds of information that are more susceptible to errors (e.g., information on genetic-physiological disorders). Both orally-transmitted folklore and online-transmitted scientific information influence, and are influenced, by cultural narratives (Mesoudi et al., 2006). As such, the high-fidelity transmission of health information is a vital avenue to continue exploring for both academics and practitioners alike.

Limitations

The present study’s design is limited by only indirectly addressing whether etiology affects retention. This effect was one of our aims, but past research also suggests that disorder type significantly influences etiology recollection (Ganesan et al., 2019). Thus, we combined both disorder and etiology types for the health conditions used in this study. However, a more tailored experiment to address the effect of etiology type on retention can further bolster inferences, particularly in complementing research on etiology-based retention in non-industrialized societies (Broesch et al., 2014). Such a study could extend the current one by including recollections of different expressions of genetic etiology in health conditions. It can expand to areas beyond the type of genetic etiology used in this study – genetic mutation – to include genetic testing and familial transmissions, which may be more salient in comparisons with non-industrialized societies.

The present study is also limited by the use of an artificial, non-interacting transmission method. The purpose of this method in the study was twofold. First, this transmission method minimizes additional loss of information, a common effect in transmission-based studies (Griffiths et al., 2013) as well as in everyday communications. Minimizing information loss enabled a focus on the types of content biases that are transmitted and how they influence social cognition concerning afflicted individuals. Second, though the participants did not have any social interactions with the individuals on the same transmission chain, the lack of interactions between participants reduced the effects of potential contextual factors, such as physical and social attributes of the communicator, which often influence receptiveness of health information. Both these aspects are likely intermingled in social transmissions (Broesch et al., 2014), but the purpose of the study was to tease apart and examine content-specific biases. However, the artificiality of the design may have weakened the extent to which individual beliefs influenced social evaluations. Future research can extend the present study to a behavioral experiment, where individuals’ recollections and evaluations of patients are assessed, while potentially being exposed to cues alluding to the presence of infectious pathogens within the lab (see Schaller & Park, 2011).

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Data availability statement
The data that support the findings of this study are openly available in Open Science Framework at https://osf.io/gjku8.

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