The Influence of Disease Cues on Preference for Typical versus Atypical Products

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This article examines how exposure to disease-related cues influences consumers' preference for typical (vs. atypical) product options. Merging insights from evolutionary psychology with research on preference for typicality in consumer products, we predict that disease salience decreases relative preference for typical versus atypical options, because typical products are implicitly associated with many people, misaligning them with the people-avoidance motive triggered by disease cues. We further build on this conceptualization to identify situations in which this preference shift might be eliminated. Specifically, we argue that the focal effect will not manifest when the disease in question is explicitly described to be noncontagious, or when an anti-infection intervention is introduced, or when the decision context involves minimum infection. Results from six studies provide support for our predictions, advancing basic knowledge on the evolutionary strategies guiding disease avoidance, while also documenting how such strategies can affect consumer preferences.

Keywords: evolutionary psychology, behavioral immune system, disease cues, typicality

As you are walking along the street on a hot summer afternoon, you receive a call from a friend who has just fallen sick from an infectious disease. Shortly afterward, you spot an ice-cream stand with two of its flavors on sale: one is the ubiquitous chocolate flavor and the other is an unusual cherry dark chocolate. Which one will you choose?

Questions such as these have become particularly relevant in recent times as Covid-19 rages across the world, making it ever-more important to understand how infection-related cues shape consumer behavior. Indeed, such cues, albeit less starkly threatening than the pandemic, have always been present: whether via a family member coming down with the common cold, or being exposed to a coughing stranger, or simply reading about the onset of flu season. This research proposes that such reminders of infection (even those that are relatively innocuous compared to Covid-19) exert a systematic effect on product preference, decreasing consumers' relative preference for typical versus atypical product options. In the example above, therefore, we predict that you will be more likely to choose the cherry dark chocolate after hearing about your sick friend.

Our thesis derives from an evolutionary perspective of human behavior, which argues that many current behaviors have their origins in deep-seated evolutionary motives and

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corresponding adaptive strategies, albeit in subtle and non-obvious ways (Argo, Dahl, and Morales 2006; Griskevicius and Kenrick 2013; Morales and Fitzsimons 2007). Evolutionary scholars (Anderson, Roy, and May 1991) postulate that one such adaptive strategy is the development of a psychological disease-avoidance system, which has evolved in response to the threat of infection that for millennia has posed a challenge to human survival and indeed, as shown by Covid-19, continues to do so to the present day.

A burgeoning stream of research based on this premise suggests that exposure to disease-related cues, by activating a safety-seeking motive, triggers a host of instinctive reactions in interpersonal contexts. For instance, disease cues have been shown to increase preference for symmetric faces, which are evolutionarily associated with better physical health (Young, Sacco, and Hugenberg 2011); in contrast, such cues increase visual attention to disfigured faces, because of their association with disease (Ackerman et al. 2009). Such effects of disease cues—as compared to cues related to other types of threats, such as accidents and related hazards—have been observed on a variety of other interpersonal processes, ranging from stigma and prejudice (Duncan and Schaller 2009; Park, Schaller, and Crandall 2007) to social influence (Murray and Schaller 2012; Wu and Chang 2012) and moral judgments (Horberg et al. 2009).

However, the possible impact of disease concerns on consumer behavior has been understudied. This is surprising both given the evolutionary importance of disease avoidance, and the ubiquitous nature of disease cues around us, even prior to the pandemic. The current research addresses this gap by exploring how exposure to disease cues uniquely influences consumers' preference for typical versus atypical products, as compared to other, disease-unrelated threats. We merge the evolutionary perspective on disease-induced motives with research on product typicality to propose that disease salience evokes fear of infection, which triggers the wish to avoid other people. This people-avoidance motive, in turn, should reduce relative preference for typical versus atypical options, because typical products are conceptually associated with more consumers. We also build on this theoretical platform to identify situations in which this preference shift might be eliminated.

In examining these issues, we contribute to current knowledge in several directions. First, we provide insight into an underexamined aspect of consumer decision-making by showing how disease cues—a widely prevalent environmental factor whose importance has been distressingly highlighted by the ongoing pandemic—can exert an influence in a variety of choice contexts. Second, this research advances our understanding of disease-avoidance motives. In contrast to past research that mainly examines how concerns about parasites and diseases influence the way people interact with other individuals, we demonstrate that the basic human motive to guard against disease threats can have far-reaching effects—manifesting even in completely unrelated product preference contexts. Third, by identifying a set of boundary conditions for the predicted effect, our work advances fundamental knowledge in the extant disease-avoidance literature by providing an empirical examination of hitherto-untested theoretical tenets. Finally, this investigation contributes to the literature on relative preference for typical versus atypical products (Ariely and Levav 2000; Berger and Heath 2007; Loken and Ward 1990) by identifying a novel influence on this preference—exposure to disease cues.

THEORETICAL BACKGROUND

Behavioral Immune System and People Avoidance

The human need for self-protection and survival causes people to seek safety when faced by threat (Griskevicius and Kenrick 2013). One such threat, over millions of years, has been posed by disease-causing parasites (Fumagalli et al. 2011). In response, the fundamental human need for safety has developed evolutionarily adaptive strategies, such as the physiological immune system, which reacts against disease-causing organisms (Janeway 2001). However, the immune system is not foolproof. Moreover, its use is physiologically costly (e.g., it causes fever) and thus consumes limited bodily resources that could have been used for other important evolutionary goals (e.g., mating; Klein and Nelson 1999).

Consequently, evolutionary psychologists posit the development of a psychological behavioral immune system (BIS), a safety-seeking mechanism that consists of a suite of motivations, emotions, cognitions, and behaviors designed to avoid infectious diseases in the first place (Murray and Schaller 2016; Schaller 2016). Thus, the sight of another individual coughing up phlegm (a disease cue that activates BIS) is likely to instinctively trigger not only the disease-avoidance motive but also an affective (disgust and fear), a cognitive (worry about getting infected), and a behavioral response (moving away).

Because humans are a species for whom communicable diseases can easily transmit from one person to another, it is reasonable to deduce that the activation of the BIS, by inducing a desire for safety, is most likely to sensitize individuals against other individuals who are likely to be potential carriers of infection—as in the example above. In support, people have been found to socially reject those who are diseased (Crandall and Moriarty 1995). The safety motive activated by disease threat has even wider ramifications, however. Because diseases have been such a major threat to survival, the BIS has developed into an oversensitive defense system that induces an aversion even of stimuli that are actually noninfectious but in some way (even if irrationally) evoke the threat of disease—a phenomenon termed the "smoke-detector" effect (Murray and Schaller 2016). This overdefensiveness stems from the evolutionary need to avoid one type of error (failure to detect actual infection risk) more than the other—that of false alarms (Haselton and Nettle 2006).

As one manifestation of such oversensitivity, the safety motive activated by the BIS can induce an avoidance of other individuals *in general* (even noninfected ones). For example, individuals who are concerned about disease have been found to be less likely to seek the company of others (Mortensen et al. 2010; Sacco, Young, and Hugenberg 2014).[1] Relatedly, concerns with disease threats reduce people's preference for extraverted individuals, simply because such individuals are seen as being associated with more people, even though they carry no actual threat of disease (Brown and Sacco 2016).

To summarize, the extant research on the BIS indicates that the safety motive induced by disease salience causes people to avoid not only individuals associated with disease cues but also other individuals in general (Sawada, Auger, and Lydon 2018). The current inquiry posits that this other-avoidance motive will also lower disease-primed individuals' preference for products that are conceptually associated with relatively more people—such as those typical versus atypical of a product category.

Disease Salience and Relative Aversion to Typical versus Atypical Products

The typicality of a choice option is defined in terms of the extent to which an option is perceived to represent a category (Mervis and Rosch 1981); for instance, orange juice is likely to be deemed more representative of and therefore more typical of fruit juices than pomegranate juice. The categorization literature has identified several antecedents of typicality perception, a frequently studied one being family resemblance, which refers to the degree to which a category member has attributes in common with other category members (Mervis and Rosch 1981; Nedungadi and Hutchinson 1985). Another antecedent, of particular relevance to the product context, is the frequency of instantiation—thus, product options that are encountered more often (e.g., in stores) are perceived to be more typical of the category (Loken and Ward 1990).

We draw on this distinction to posit that product options that are typical (atypical) of the category are conceptually associated with many (few) people. Because frequency of instantiation is a key determinant of typicality perceptions, a product variant is likely to be seen as typical if it is dominantly represented in the marketplace. For example, in most supermarkets, one would see more brands of orange juice than pomegranate juice and the former would also be perceived as more typical of fruit juices. This overrepresentation of the typical option should produce a corresponding belief regarding higher market share—that is, an association with a greater number of people—than the atypical option. Relatedly, because category-typical products lack unique aspects (e.g., conventional cars), they are usually aimed at the mass market, whereas atypical products offer specialized benefits (e.g., hybrid cars) and appeal to a narrower niche market (Dalgic and Leeuw 1994; Schaefers 2014). This view also supports a likely conceptual association between typical products and *many people* (compared to atypical products and *few people*).

This association carries implications for how disease cues will affect preference between typical and atypical products. Basic principles of associative memory posit that the activation of a particular concept triggers related concepts (Hastie 1988). A typical (atypical) product is therefore likely to trigger the concept of many people (few people)—as we confirm in pretests described later. This premise, when viewed from the perspective of the BIS, leads to our key prediction: when having to choose between a typical product and an atypical product, disease threat evokes a desire to avoid other people, which should then shift relative preferences away from the typical option toward the atypical option, because of the former's conceptual association with more people. Note that while this prediction is new to the literature, some support derives from past research, which finds that the wish to avoid others (e.g., caused by confining architectural elements) shifts consumer preferences from default, commonly chosen options toward the unusual, distinctive options in a choice set (Levav and Zhu 2009; Xu, Shen, and Wyer 2012).

It is important to note that the preference shift we predict is not based on a rational evaluation of disease threat—unlike, for instance, when disease salience causes consumers to avoid used versus new products, because the former are more likely to be contaminated (Huang, Ackerman, and Sedlovskaya 2017). In the preference contexts we study (consumers choose between two new products), it is not the case that the typical variant has actually come into contact with more people than the atypical product. A reduced preference for the typical product is thus irrational. However, such irrationality is consistent with the "smoke-detector" aspect of the BIS discussed earlier—that is, the oversensitivity borne of survival needs that causes humans to take protective action even against targets associated with cues that are only superficially linked to disease.

[1] Of course, for exceptionally virulent infections such as the ongoing Covid-19 pandemic, such people avoidance is not a manifestation of oversensitiveness. Rather, in such cases, it is indeed rational to engage in social distancing given the extremely rapid modes of transmission of the virus, even from asymptomatic individuals. This research, however (which was conducted before the pandemic's onset), focuses on many other less serious infections that do not actually require social distancing to mitigate the threat. In fact, the immediacy and intensity of the pandemic might well influence the nature of the effect itself, an issue addressed in the General Discussion.

Our prediction regarding lowered preference for typical (vs. atypical) products, because of a mere conceptual association with more people, constitutes another example of such overdefensiveness—akin to the avoidance of extraverted individuals who are mentally represented as being associated with more people (Brown and Sacco 2016).

Boundary Conditions

Our theorizing allows us to delineate a set of boundary conditions that illuminate the underlying process. First, our conceptualization hinges on the premise that the disease should be contagious—it is this that underlies the wish to avoid others, as manifested in the reduced preference for typicality. The instinctively oversensitive nature of the BIS suggests that it will be activated by all disease cues regardless of their contagiousness. However, we argue that explicitly highlighting that the disease in question is noncontagious (e.g., cancer) will engage deliberative thought, which should decrease the fear of infection. In dual-system terminology (Kahneman 2011), although BIS produces an automatic system 1 response to all types of disease cues, it should be overridden by analytical system 2 processing when the noncontagious nature of the disease is made salient. Consequently, exposure to diseases explicitly described as noninfectious should not induce the other-avoidance motive to the same extent; the predicted preference shift away from typical products should thereby be attenuated (study 2).

Relatedly, factors that limit the fear of infection (e.g., public health interventions, such as vaccination, frequent hand washing) should dampen the influence of the BIS. Indeed, in an interpersonal context, Huang et al. (2011) find that infection-combating actions such as hand cleaning attenuate the heightened prejudice that is otherwise induced by disease cues against stigmatized individuals (e.g., obese people). Along similar lines, we predict that the predicted change in preference for typical versus atypical products following exposure to disease cues will be mitigated if anti-disease interventions are made salient (study 3).

A final boundary condition specifies the decision context within which the hypothesized effect is most likely to operate. In particular, we propose that the predicted preference shift under disease threat is only likely to manifest when the nature of the product category is such that its use carries the risk of infection (e.g., products involving oral consumption or frequent touch). It is for such products that the fear of infection evoked by disease threat is particularly applicable to the consumers' decision, and the other-avoidance motive triggered by the disease cues, therefore, is likely to be manifested in a shift in product preference. In contrast, when the decision does not imply any such risk, the other-avoidance motive should be less salient and therefore unlikely to affect product preference. For example, a set of elegant dishes may be viewed as utensils on which to eat one's food (infection relevant) or as a wall decoration (infection irrelevant)—we would expect our predicted effect to obtain in the former case but not in the latter case (study 4).

In fact, as we discuss later, the infection-irrelevant decision context offers an opportunity to reconcile the current predictions with a contrasting one that also seems intuitive: namely, that in the face of any threat (whether related to disease or not), consumers will gravitate toward *safe* options. To the extent that typical products are considered safer than atypical ones, one could argue that preference for typical options should actually increase upon exposure to threat (Campbell and Goodstein 2001; Murray and Schaller 2012). The General Discussion offers a detailed explanation of how infection-irrelevant contexts are particularly conducive to such a reversal (an explanation for which we also provide empirical support; web appendix K).

The Experimental Setting

Six studies were run to assess our conceptualization of how the salience of disease threats influences consumers' relative preference for typical versus atypical products, as well as the various boundary conditions discussed above. Across all of the studies, we report all stimuli, manipulations, data exclusions, and all measures in each study.

A general point about our experimental paradigm is worth making. Our focal prediction argues for a relative change in preference for the typical versus atypical option following disease exposure—thus, the prediction can be framed interchangeably in terms of disease salience inducing typicality aversion, or atypicality preference. We are agnostic as to whether this preference shift is caused by a decreased preference for the typical option or an increased preference for the atypical option. The underlying BIS-based conceptualization does not distinguish between these possibilities, since disease salience can equally be held to induce a relative avoidance of stimuli associated with negative health signals (e.g., physically unattractive individuals) or a preference for stimuli that appear healthy (e.g., physically attractive individuals; Little, DeBruine, and Jones 2011; Young et al. 2011).

Because a forced-choice context, in which participants are shown two options and asked to indicate their preference between them, is sufficient to examine relative preference change, BIS-based research typically uses such a context (Brown and Sacco 2016; Little et al. 2011; Young et al. 2011). For the same reason, our focal paradigm also used forced choice, with participants asked to indicate preference between a typical versus an atypical product option. In addition to this paradigm being suitable for our focal prediction, it is worth noting that there are several circumstances in which a forced-choice is realistic, such as when one's consumption needs are urgent (e.g., your computer mouse breaks suddenly and you need a replacement soon) or when the purchase is time-sensitive (e.g., buying a stuffed toy as a gift on your child's birthday, taking advantage of a limited-time sale when you are on a budget). In such cases, an immediate purchase can be necessary.

At the same time, because the ecological validity of our findings would be further enhanced by including a no-choice option, we include this option in a final study (study 5). We expect our prediction to hold in that setting as well—that is, disease cues should decrease relative preference for the typical versus atypical option. Furthermore, even though we do not have an a priori prediction on the issue, that paradigm also offers us some initial, data-based insights on the extent to which the findings are driven by a change in preference for the typical option versus a change in preference for the atypical option.

PRETESTS

Several pretests were carried out to confirm important underlying assumptions and also to validate our choice of typical and atypical product options. The full details of these pretests are presented in the web appendix. Pretest 1 (web appendix D) established the suitability of the four pairs of products used in our studies. These four pairs were: orange juice versus pomegranate juice (fruit juices); usual-shaped mouse versus unusual-shaped mouse (computer mouse); gray bunny toy versus red dragon toy (stuffed toys); and round china plates versus square glass plates (plate sets; web appendix C). In each case, the former (latter) option was expected to be rated more typical (atypical) of the category—that is, tailored to the mass (niche) market. Note that in line with our thesis that the effect of disease threat is likely to manifest for products whose use carries some risk of infection, the four product categories involve either oral consumption or frequent touch (two means by which infections are often spread).

In addition to typicality perceptions, pretest 1 also assessed whether there was any difference in quality perceptions between the typical versus atypical product in each pair. If a systematic difference exists, any observed effects of disease threat on product preference in our main studies could be attributed to such a difference in quality. Results from the pretest confirmed that, within each product pair, the stimuli differed along perceptions of typicality but not in quality.[2] These product pairs were thus deemed suitable for use in the main studies.

Pretest 2 (see web appendix E) then used an implicit association test (IAT; Greenwald, McGhee, and Schwartz 1998) to assess a key assumption in our theorizing: that atypicality (typicality) is associated with few (many) people. The IAT allows one to assess the existence of an association between mental representations of concepts in memory (Raghunathan, Naylor, and Hoyer 2006). Using standard IAT procedures, this pretest obtained good evidence for an implicit association between the concept of typicality/atypicality, on the one hand, and many/few, on the other hand, supporting our assumption.

Finally, pretest 3 (web appendix F) assessed whether this general association existed at an explicit level as well, for the specific pairs of typical/atypical products used in our studies. Participants rated each pair of products on two items (which option is more likely to have a mass appeal/a niche appeal?). Results confirmed that within each pair, typical (atypical) options were perceived as appealing to the mass (niche) market, again supporting the notion that the former is mentally associated with more people than the latter.

STUDY 1A: THE EFFECT OF DISEASE SALIENCE ON TYPICALITY PREFERENCE

Study 1A was designed to test our basic hypothesis that exposure to disease cues decreases consumers' relative preference for typical options (as noted, in the two-option context of interest, this can also be seen as an increase in relative preference for atypical options). Participants were asked to read either an article about various ways that diseases can get transmitted, or a neutral article about the process of organizing one's workspace. They were then asked to make a consequential choice between typical and atypical product options across three product-category replicates: portable mouse, fruit juice, and stuffed toys. We predict that exposure to a disease-related versus neutral article will decrease the choice share of the typical options—or, alternately, increase the choice of atypical options—across product categories. Note that our hypothesis does not concern absolute preference. Instead, our prediction is about the *relative* decrease in preference for typicality induced by disease threat. Given that typical options are generally preferred over their atypical counterparts (Barsalou 1985; Loken and Ward 1990), it is likely that the choice share of the typical options will still exceed 50% across conditions.

2 Note that there is no a priori reason to believe that typicality should influence quality perceptions. Thus, orange juice may be associated with more people than pomegranate juice; however, this does not necessarily imply that the former is intrinsically superior in quality to the latter. Indeed, in light of the correspondence between the mass/niche distinction and the typical/atypical distinction (see pretest 3), it is even conceivable that an atypical product might at times be of higher quality—for example, environmentally friendly cars (which are more of a niche product) often cost more than regular cars and might therefore be deemed higher quality.

Method

A total of 298 Amazon Mechanical Turk participants were randomly assigned across a 2 (article: disease vs. neutral; between subjects) × 3 (product category: fruit juice vs. stuffed toys vs. computer mouse; within subjects) mixed design—a relatively large sample size was used in this study since larger samples are typically required to detect reliable differences in the choice dependent variable (as compared to scale measures of relative preference; Dell, Holleran, and Ramakrishnan 2002). Participants were told that they would complete two independent tasks. Disease salience was manipulated first via a reading comprehension task. Those in the disease condition were presented with an article about three different ways that infectious diseases could get transmitted: airborne, contact, and fecal–oral (accompanied with example diseases for each; see web appendix B). The control condition featured a neutral article that described how a student organized his/her workspace to get prepared for class (Ackerman, Tybur, and Mortensen 2018).[3] Next, as an attention check, participants answered a simple reading comprehension question based on the article they had read (disease transmission vs. workspace organization).

Afterward, participants proceeded to the second task in which they were presented with three pairs of products—one category typical and the other category atypical—for fruit juice, stuffed toys, and portable mouse (this order was randomly decided and was the same for all participants). Participants chose between the two options in each pair. To make their choice consequential, we informed participants that they would be entered into a lottery in which the winner would get one of their chosen options for free. Eventually, for logistical reasons, the winner, who was randomly selected, was instead rewarded with a 20 USD bonus through the MTurk platform. Next, to control for people's general preference for uniqueness, participants reported the extent to which they generally prefer unique versus popular products (1/7 = definitely prefer popular/unique products). This individual difference measure did not affect any of the results in the studies that measured it (the current study, study 2, study 5, and the two replication studies reported in web appendices H and I) and is therefore not discussed further. Finally, all participants provided demographic information.

Results

Three common filtering criteria were used for this and subsequent studies (where applicable): (a) failure to follow instructions (e.g., playing with one's smartphones in the laboratory sessions; writing meaningless or no content when asked to summarize the manipulation articles); (b) failing the attention check (e.g., in this study, the simple reading comprehension question); and (c) for laboratory studies, being enrolled as a short-term exchange student in the university where the studies were run (this criterion was employed because being exposed to a foreign culture itself can sensitize people to possible infection possibilities; Markel and Stern 2002). Additional filters, if any, are mentioned in each specific study. Seventeen participants were excluded via the common filtering criteria in this study (see Appendix G for full details of exclusions across studies). Accordingly, analyses were run with the remaining 281 participants (M_{age} = 37.60, 49.8% females).

Choice. We coded the participants' choices, giving the atypical options a value of 1 and the typical options a value of 0. Using a generalized estimating equation procedure, we conducted a repeated-measure logistic regression, with disease condition as a predictor. Consistent with our hypothesis, the participants who read the disease article were less likely to choose the typical options (M = 57.3%) than those who read the neutral article (M = 66.9%; Wald = 8.02, p = .005; odds ratio = 1.51). As similar patterns of results were observed across the three different categories (see table 1 for category-specific results), we also summed up the participants' choices to form an index of preference for typical product options (with a range of 0–3, higher score indicates higher preference for typical options). An ANOVA on this index yielded a very similar result: participants in the disease condition reported fewer choices of typical options (M = 1.72, SD = 0.82) relative to those in the control condition (M = 2.01, SD = 0.87; $F(1, 279)$ = 8.14, p = .005; d = 0.34). Phrased differently, participants in the disease condition reported more choices of atypical options (M = 1.28) relative to those in the control condition (M = 0.99). For space reasons, the remaining studies that use the two-option choice context (studies 1B–4) only report the findings from the perspective of the typical option.

Discussion

Consistent with our prediction, disease salience produced a substantial decrease in the choice share of the typical option. A replication, reported in web appendix H, obtained similar results.

In these two studies, however, the disease condition was compared to a neutral one; thus, we cannot rule out the possibility that the observed preference shift is manifested for other types of threats as well. Study 1B (and subsequent studies) sought to validate the unique nature of a disease threat by comparing it to a disease-unrelated threat.

3 All studies reported here were conducted before the ongoing pandemic. The manipulations we used may well be affected in a variety of ways by the intensity and immediacy of this severe current threat (as one example, infection salience might currently be high even in the non-disease "control" conditions).

TABLE 1

PERCENTAGE OF CHOOSING TYPICAL OPTIONS ACROSS PRODUCT CATEGORIES (STUDY 1A)

	Disease (N = 139) (%)	Control (N = 142) (%)
Juice	52.5	62.7
Toy	46.8	56.3
Mouse	72.7	81.7
Average	57.3	66.9

STUDY 1B: DISEASE VERSUS ACCIDENT THREATS

Study 1B sought to generalize our focal effect along the following dimensions: (a) it used a student sample as opposed to MTurk; (b) it employed another standard manipulation of disease salience taken from the BIS literature; and (c) it included a control condition featuring a non-disease threat. Thus, participants were exposed to slideshows of either infectious pathogens or accidents that might occur in everyday life (see web appendix A for details). The latter has been frequently used in the BIS literature as a threat control, to show that the obtained effects are specific to disease threat, not to threats in general (Faulkner et al. 2004; Murray and Schaller 2012). The two slideshows were pretested to make sure that the threatening situations depicted in two slideshows did not differ in perceived severity and likelihood of occurrence.[4] Participants were then asked to indicate their relative preference for typical versus atypical product options across two product-category replicates: stuffed toys and plate sets. As before, we predicted that exposure to disease (vs. accident) cues would induce a preference shift away from the typical option in each category.

Method

A total of 124 undergraduate students in Hong Kong were randomly assigned across a 2 (slideshow: disease vs. accident, between subjects) × 2 (product category: stuffed toys vs. plate sets, within subjects) × 2 (product category order, counterbalanced factor) mixed design.

Participants were told that they would complete a series of independent tasks. Disease salience was manipulated in the first task through the slideshow presentation described earlier. Pretesting confirmed the efficacy of this manipulation: exposure to the disease (vs. accident) slideshow led to greater concerns about the threat of infections ($F(1, 232) = 42.61$, $p < .001$). After viewing the slideshow to which they were assigned, participants answered two filler questions about the slideshow ("How informative is the slideshow?," "How much do you like the slideshow?"). Next, they proceeded to the second task in which they were presented with two pairs of products—stuffed toys and plate sets (order counterbalanced). As in study 1A, options in each pair were described as comparable in terms of functionality and price. In each pair, however, one of the options was relatively category typical and the other category atypical.

Participants then indicated their preference for and their purchase intention toward the stuffed toys and the plate sets on two 7-point scales (which one of the two options above would you prefer/buy?), with option A (B) representing the typical (atypical) option (1/7 = definitely option A/definitely option B). Next, participants answered an attention check question ("How are you feeling right now? Although we would like to know how you are feeling, please select 'Fair' so we know you are paying attention"; Oppenheimer, Meyvis, and Davidenko 2009). Finally, participants provided demographic information.

Results

Thirteen participants were excluded via the filtering criteria. Analyses were run with the remaining 111 participants ($M_{age} = 19.50$, 63.1% females).

Preference. We averaged and reverse-coded participants' preference and purchase intention scores to form a single measure (toy: $r = 0.91$; plates: $r = 0.89$); a higher number indicated greater preference for typicality. A repeated-measure ANOVA with slideshow type and product order as between-subject factors and product category as a within-subject factor yielded only the predicted effect of disease priming on this index: participants in the disease condition indicated lower relative preference for the typical option ($M = 4.37$, SD = 1.70) than participants in the accident condition ($M = 5.04$, SD = 1.12; $F(1, 107) = 5.99$, $p = .016$; $d = 0.46$; see table 2 for means across product categories). Neither product order nor the interaction between disease manipulation and product order was significant ($ps > .64$). In other words, as in study 1A, disease salience reduced relative preference for the typical versus the atypical option in each of the preference sets.

Discussion

Using a different induction of disease threat, study 1B provided additional support for our prediction that disease salience reduced relative preference for typical versus atypical product options. Unlike study 1A, the control condition in this study also featured a negative, threatening

4 Participants ($N = 150$) answered four 7-point items after watching either the disease or the accident slideshow. Two questions pertained to perceived severity (how serious/severe is the consequence of encountering the accidents/diseases described in the slideshow; $r = 0.82$). The remaining two pertained to the perceived likelihood of occurrence (how likely/probable is it for people to encounter the accidents/diseases described in the slideshow; $r = 0.75$). No significant difference was observed for either of these two measures for disease versus accident condition (severity: 6.05 vs. 6.05; $p > .90$; likelihood: 5.74 vs. 5.42; $p = .11$).

TABLE 2

MEAN PREFERENCE FOR TYPICALITY ACROSS PRODUCT CATEGORIES (STUDY 1B)

	Disease ($N = 54$)	Control ($N = 57$)
Toy	4.56 (2.05)	5.03 (1.63)
Plate	4.17 (2.23)	5.04 (1.66)
Average	4.37 (1.70)	5.04 (1.12)

stimulus (accidents and related hazards). Our predicted effect nevertheless obtained, indicating that the preference shift has to do with disease threat in particular, not threats in general. This is consistent with disease threats being linked to a unique set of psychological responses, as posited by the BIS (Murray and Schaller 2016).

We also ran other replication studies, which are reported in the web appendix for space reasons. One of these (web appendix J) included both an accident control and a no-threat control, in addition to the disease-salient condition. That study found that disease salience reduced preference for the typical option compared to both of these controls, ruling out the possibility that the effect in study 1B is driven by increased preference for the typical option in the accident-threat condition (rather than, as we predict, a reduced preference for the typical option in the disease-threat condition). A final replication study generalized the effect to a different consumer online panel (see web appendix I). Having established the basic effect, the subsequent studies sought to provide insights into the underlying process.

STUDY 2: INFECTIOUS VERSUS NONINFECTIOUS DISEASES

Study 2 had two objectives. First, following from our conceptualization, this study sought to show that the effect of disease salience on product preference is less likely to obtain if the disease being made salient is explicitly described as noncontagious. In such an event, the intuitive other-avoidance motive that is held to underlie participants' shift away from the typical option should be at least partly suppressed by the explicit knowledge that the disease is not infectious, and consequently the disease-induced preference shift will be attenuated. Note that given the over-defensive nature of the BIS, we do not anticipate that the other-avoidance motive caused by disease salience will be completely suppressed. Our contention is simply that the *extent* of other avoidance, and therefore the magnitude of the preference shift, should be stronger when the disease is believed to be contagious.

In addition to identifying a moderator for the effect, a second objective of this study was to provide mediational evidence for the process: namely, disease cues evoke fear of infection, which, in turn, increases consumers' motivation to avoid others and consequently reduces preference for the typical versus atypical product option. To that end, participants reported their fear level and other-avoidance tendency after reporting preferences. Our theorizing predicts a serial mediation, with disease salience affecting product preference through the fear of infection (distal mediator) followed by the intent to avoid people (proximal mediator).

Method

Two hundred sixty-six MTurkers took part in the study, which featured a 3 (threat type: infectious disease vs. noninfectious disease vs. accident) $\times$ 2 (position: atypical mouse on the right vs. left) between-subject design.

Threat type was manipulated first through a slideshow about the disease lupus erythematosus. A relatively unfamiliar disease was deliberately chosen so that we could manipulate its perceived infectiousness. Thus, although participants in both infectious and noninfectious conditions watched the same set of eight slides that displayed aversive-looking consequences of lupus (e.g., rash on the cheek and nose, swollen joints; see web appendix A), those in the infectious condition read, after the slideshow, that "this disease is caused by viral infection. Importantly, the disease is HIGHLY contagious," whereas those in the noninfectious condition read that "this disease is caused by a number of genetic factors. Importantly, the disease is NOT contagious. People cannot catch the disease from another person who has the disease." The remaining one-third of the participants watched the accident slideshow used in study 1B. We predicted that the infectious-disease condition would display a relative shift in preference from the typical option to the atypical option, compared to the other two conditions.

Following the slideshow, participants completed the product preference task. Studies 1A and 1B, which focused on obtaining the basic effect, had examined preference in the context of multiple product pairs to establish the robustness of the effect. Study 2 (and subsequent studies), which focused on obtaining evidence for the underlying process, featured one product pair each. Thus, participants in this study were presented with the same pair of portable mice used in study 1A, with the atypical mouse placed either on the right as option B or on the left as option A, depending on the position condition. They then reported their preference for and purchase intention toward the portable mice on two 9-point scales (which one of the above two options would you prefer/buy; 1/9 = definitely option A/definitely option B; $r = 0.97$). Next, to measure the distal mediator of fear of infection, participants reported how fearful/anxious about getting infected (1/9 = not at all/very much; $r = 0.85$) they felt after watching the slideshow and reading the information about lupus. To examine whether another emotion related to disease—that of disgust—drove the effect, participants also reported how disgusted/

nauseated (1/9 = not at all/very much; $r = 0.76$) they felt after watching the slideshow. We expected that both disease conditions should induce disgust, since the symptoms were shown in detail in both conditions. However, fear should be higher in the infectious-disease condition than in the noninfectious-disease condition because of the contagious nature of the former.

Next, to assess the proximal mediator of people avoidance, participants indicated the extent to which they wanted to stay away from crowds (1/9 = not at all/very much) after watching the slideshow and reading the information. Participants then completed the same attention check used in study 1B. As a manipulation check, those in the two disease conditions indicated how contagious they thought the disease in the slideshow was (1/9 = not at all/extremely contagious). They also indicated their liking for unique versus popular products as in study 1A, and whether someone they knew had lupus. Finally, they provided demographic information and expressed their thoughts about the experiment in an open-ended question.

Results

Twenty-three participants were excluded due to the three common filtering criteria. Another 12 were dropped because they indicated that someone they knew had lupus, or because their open-ended comments revealed that they knew for sure that lupus was actually not contagious. Analyses were run with the remaining 231 participants ($M_{age} = 34.62$, 59.7% females).

A 2 (threat type) × 2 (left-right position) ANOVA confirmed that participants perceived lupus as more contagious in the infectious condition ($M = 7.54$; SD = 2.05) than in the noninfectious condition ($M = 1.58$, SD = 1.50; $F(1, 149) = 417.78$, $p < .001$); no other effects were significant ($ps > .31$). Next, the ANOVA on the key product preference measure yielded only a significant main effect of threat type ($F(2, 225) = 3.45$, $p = .033$; $\eta^2 = 0.030$). Further analyses revealed that, as predicted, this effect was driven by a preference shift in the infectious-disease condition rather than in the noninfectious-disease condition. Thus, participants in the infectious-disease condition ($N = 74$) indicated lower preference for the typical versus atypical mouse ($M = 6.40$; SD = 3.05) not only compared to those in the accident condition ($N = 78$; $M = 7.54$, SD = 2.55; $t(225) = 2.55$, $p = .011$; $d = 0.41$) but also compared to those in the noninfectious-disease condition ($N = 79$; $M = 7.23$, SD = 2.62; $t(225) = 1.86$, $p = .064$; $d = 0.29$). The latter two did not differ significantly from each other ($t < 1$). No other effect was significant ($ps > .61$).

Serial Mediation through Fear of Infection and People Avoidance. Our rationale is that the threat of contagious diseases evokes fear of infection, inducing a people-avoidance motive, which, in turn, leads to lower preference for typical versus atypical products. We first looked at how disease salience influenced fear of infection and the intention to stay away from people. The two-way ANOVA on the fear measure yielded only a significant main effect of threat type ($F(2, 225) = 12.36$, $p < .001$; $\eta^2 = 0.10$) such that participants in the accident condition felt less fearful about being infected ($M = 1.57$, SD = 1.19) than those in the infectious condition ($M = 3.31$, SD = 2.68; $t(225) = 4.97$, $p < .001$; $d = 0.84$) and those in the noninfectious condition ($M = 2.41$, SD = 2.30; $t(225) = 2.45$, $p = .015$; $d = 0.46$). The latter two conditions also differed significantly from each other ($t(225) = 2.57$, $p = .011$; $d = 0.36$). The people-avoidance tendency showed a very similar pattern: a main effect of threat type ($F(2, 225) = 18.77$, $p < .001$; $\eta^2 = 0.14$) was observed such that participants in the infectious condition indicated the greatest desire to stay away from crowds ($M = 3.66$; SD = 2.63), as compared to those in the noninfectious condition ($M = 2.32$, SD = 2.10; $t(225) = 3.98$, $p < .001$; $d = 0.56$), and those in the accident condition ($M = 1.62$, SD = 1.31; $t(225) = 6.04$, $p < .001$; $d = 0.98$). The latter two also differed significantly from each other ($t(225) = 2.11$, $p = .036$; $d = 0.40$).

To examine the mediating roles of fear of infection and people avoidance, we then conducted a serial mediation analysis using a bootstrapping procedure (model 6; Preacher and Hayes 2004). Since there was no interaction effect between disease manipulation and position on any of the mediators or the main dependent variable, we collapsed the data across the two position conditions. Because there are three levels on the IV side, we contrast-coded infectious-disease condition against each of the other two conditions separately. When comparing the infectious-disease condition with the noninfectious-disease condition, bootstrapping analyses (Hayes and Preacher 2014) yielded a significant serial mediation through fear of infection and people avoidance ($B = -0.15$, SE = 0.12; 95% CI: −0.541 to −0.006), whereas the direct effect of disease now reduced to nonsignificance ($B = 0.63$, SE = 0.46; $t(225) = 1.37$; $p = .17$). A significant serial mediation also obtained when we compared the infectious condition with accident condition ($B = -0.29$, SE = 0.18; 95% CI: −0.721 to −0.007), with the direct effect of disease being marginally significant ($B = 0.89$, SE = 0.48; $t(225) = 1.87$; $p = .06$).

Disgust. The same two-way ANOVA performed on the disgust measure also yielded a main effect of threat type ($F(2, 225) = 32.10$, $p < .001$; $\eta^2 = 0.22$) such that participants in the accident condition felt less disgusted ($M = 1.59$, SD = 1.18) than those in the infectious condition ($M = 3.91$, SD = 2.39; $t(225) = 6.93$, $p < .001$; $d = 1.23$) and those in the noninfectious condition ($M = 3.87$, SD = 2.39; $t(225) = 6.93$, $p < .001$; $d = 1.21$). However, the latter two did not differ ($F < 1$). The same serial mediation analyses with disgust instead of fear as the distal mediator did not yield any significant patterns (95%

CIs: −0.110 to 0.044 for infectious vs. noninfectious; −0.448 to 0.011 for infectious vs. accident). These results suggest that the disgust emotion does not play a role in the observed preference shift.

Discussion

In support of our conceptualization, study 2 found that exposure to infectious disease cues reduced relative preference for the typical versus atypical product, not only compared to accident cues, but also compared to the same disease framed as noncontagious, indicating that the proposed effect is at least partly driven by the contagious nature of infectious diseases. Further, study 2 also provided mediation-based insight into the mechanism by obtaining good evidence for our proposed serial mediation path from disease threat to product preference, with fear of infection being the distal mediator and people-avoidance being the proximal mediator.

It is worth noting that alongside this significant mediation effect, the direct effect of disease threat on the preference shift between infectious and accident conditions remained marginally significant, suggesting that the effect might be multiply determined (as is true for many phenomena). We leave to future research the task of identifying other drivers of the effect. The remaining studies used a moderator-based approach to provide further insight into the focal mechanism examined in the current research, showing that the proposed effect should obtain only under specific conditions dictated by this mechanism.

STUDY 3: HAND CLEANING MODERATES THE EFFECT

Because the physical threat of contagion can often be eliminated with actions such as hand cleansing (Curtis and Cairncross 2003), such interventions should also deactivate the BIS, so that the mental responses otherwise induced by disease-related threats are no longer observed. In support, Huang et al. (2011) showed that a hand cleansing intervention can lower the interpersonal prejudice that is otherwise induced when chronic aversion to germs activates the BIS.

Similarly, if the preference shift away from typical versus atypical products is caused by an activation of the BIS, as we argue, this effect should be mitigated by the use of a germ-killing hand wipe. Indeed, as a stronger test of this prediction, we drew on research showing that simply imagining an act can reproduce the mental consequences of this act (e.g., imagining eating can produce satiation; Morewedge, Huh, and Vosgerau 2010). Thus, half of the participants in study 3 were asked to evaluate and visualize using a hand wipe after the disease-slideshow manipulation. We predicted an attenuation of the preference shift in this condition, as compared to those in a default condition, who did not engage in such visualization.

Method

A total of 221 MTurkers were randomly assigned across the conditions of a 2 (slideshow: disease vs. accident) × 2 (hand wipe: absent vs. present) between-subject design.

Disease salience was manipulated the same way as in study 1B, using disease versus accident slideshows. Afterward, participants in the hand wipe-absent condition—that is, the default case—proceeded directly to the product choice task in which they were asked to indicate their relative preference between two bottles of juice, the same pair used in study 1A. Participants in the hand wipe-present condition were presented with a picture of a branded hand wipe. Note that given the MTurk setting, the current study (unlike Huang et al. 2011) could not evoke hand wipe protection via actual usage. To create an equally strong manipulation even without usage, the protective cleansing properties of the hand wipe were made salient in this condition through a two-step induction. First, the hand wipe picture in this condition was accompanied by a bulleted description stating that the hand wipe used an "antibacterial formula" and "killed 99.99% of germs." Second, participants were asked, under the pretense of evaluating the product, to imagine as vividly as possible using the hand wipe to clean their hands and the keyboard. Then, they proceeded to the same juice choice task as those in the default condition.

As the main dependent measure, participants reported their relative preference for and their purchase intention ($r = 0.96$) toward the juice options on the same items used in study 2 (1/9 = definitely option A/definitely option B), with higher scores in each case representing greater preference for the atypical pomegranate (vs. typical orange) juice. Participants then answered the same attention check and demographics questions as in study 2.

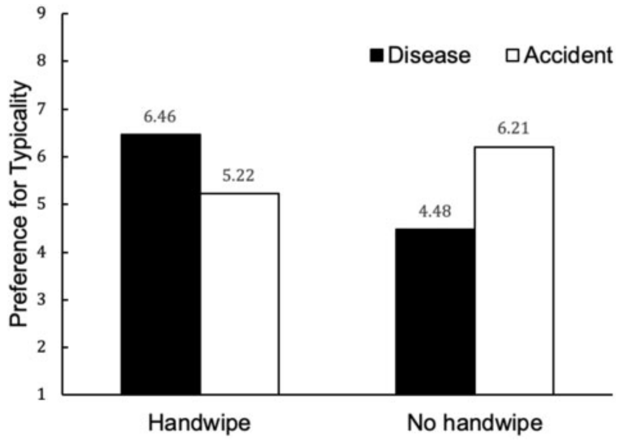
Results

Thirty-eight participants were excluded using the common filtering criteria. Accordingly, analyses were run with the remaining 183 participants (M_{age} = 32.75, 55.2% females).

Preference. The preference index was first reverse-coded such that higher numbers reflected greater preference for the typical juice. A 2 (slideshow) × 2 (hand wipe) ANOVA on this index yielded only a significant interaction ($F(1, 179) = 10.09$, $p = .002$; $\eta^2 = 0.053$; see figure 1). Follow-up contrasts showed that, when no hand wipe was involved, disease salience led to reduced preference for the typical juice ($N = 51$; $M = 4.48$, SD = 2.98) as compared to accident salience ($N = 43$; $M = 6.21$, SD = 3.19; $t(179) = -2.66$, $p = .009$; $d = 0.56$), replicating prior results. In contrast, when participants evaluated and imagined using the hand wipe, the effect disappeared—indeed, it almost reversed: participants in the disease condition

FIGURE 1

TYPICALITY PREFERENCE AS A FUNCTION OF DISEASE SALIENCE AND CLEANSING INTERVENTION (STUDY 3)



preferred the typical juice to a greater extent ($N = 40$; $M = 6.46$, SD $= 3.06$) versus the accident condition ($N = 49$; $M = 5.22$, SD $= 3.33$; $t(179) = 1.85$, $p = .066$; $d = 0.39$). Examining the results within threat type provided convergent support for our predictions. Thus, within the disease condition, imagining using the hand wipe increased preference for the typical juice ($t(179) = 2.99$, $p = .003$; $d = 0.66$), whereas the hand wipe manipulation did not have an effect within the accident condition ($t(179) = -1.50$, $p = .136$).

Discussion

Study 3 not only replicated our prior findings but also provided evidence consistent with a theoretically derived moderator. Thus, in the default condition, making salient the threat of a disease reduced preference for the typical versus atypical product, as compared to a non-disease threat. However, consistent with the premise that this preference shift obtains because the disease threat activates a psychological immune system (which then prompts defensive reactions), this effect no longer manifested when participants visualized cleaning their hands after exposure to the disease slides. Presumably, such visualization itself wards off the threat and thereby serves to satisfy the psychological immune system, reducing the need to do so via product choice. We do not have an explanation for the marginal reversal in the hand wipe condition, but we believe that it is tangential to and does not detract from the focal effect.

Collectively, studies 2 and 3 clarified the nature of the preference shift by showing that the effect is no longer observed if: (a) the disease being made salient is noninfectious and (b) participants get an opportunity to deal with the infection threat before exposure to product choice. Another boundary condition worth mentioning involves lay beliefs regarding disease prevention. Our theorizing suggests that disease threat changes product preferences as a manifestation of the tendency to avoid other people—a tendency that itself is driven by the belief that such avoidance will help to minimize the threat of infection. If so, diluting this belief (e.g., by convincing individuals that "following the crowd" is the way to prevent infections) should attenuate the effect. A study that was run to test this logic also provided supportive results. While it was not included in the main text due to space constraints, full details are in web appendix J.

STUDY 4: DECISION CONTEXT MODERATES THE EFFECT

Study 4 assessed two other important aspects of our theorizing. First, it sought to provide insight into the decision contexts in which the basic effect is more likely to hold. According to our theorizing, the aversion to products associated with many consumers stems from the underlying wish to minimize disease threat. It follows, therefore, that such a preference effect is likely to manifest for product categories whose use does carry some risk of infection—whether via touch (portable mouse) or consumption (juices). In contrast, when the product category is not associated with any such risk, the other-avoidance motive triggered by disease salience is unlikely to be manifested in product preference. Study 4 assessed this argument by describing the focal product—plate sets—as being either for dinnerware or for a wall decoration. Because of its use in consuming edibles, we expected the former positioning to carry a higher infection-risk connotation than the latter, an expectation that was confirmed in a posttest.[5]

Second, study 4 sought to provide convergent evidence for a key part of our rationale. We have argued that the other-avoidance motive activated by exposure to disease cues reduces preference for typical versus atypical products—because typical (atypical) products are associated with many (few) consumers. If this logic is correct, then other manipulations that create a many versus few association with the two products in the choice set should result in a similar effect of disease salience (i.e., a reduced preference for the option associated with the many vs. that associated with the few)—even if the two products do not differ in typicality.

5 A posttest with 236 MTurk participants confirmed that framing the plate set as dinnerware carried higher infection connotation than framing the same set as a wall decoration ("Which of these two uses of the plates do you think would involve higher risk of infection/higher chance of contamination?"; $1 =$ plate set as dinnerware, $7 =$ plate set for decoration; $M = 2.36$, significantly smaller than scale mid-point 4; $t(235) = -14.78$, $p < .001$).

Study 4 examined this thesis in the context of preference between two plate sets featuring different patterns, which had been pretested to be equally typical of the category.[6] One of the plate sets was described as being popular (i.e., associated with a lot of people) and the other unique (i.e., associated with very few people). Note also that, while this manipulation explicitly induced a many/few association, it preserved an important aspect of our typicality inductions: namely, there is no strong reason to believe that either of the two descriptions reflects an objectively superior product; rather, both *popular* and *unique* can be viewed positively.

To summarize our arguments therefore, we expected to replicate our basic effect when the plate sets were described as dinnerware: exposure to disease cues should shift preferences away from the popular option to the unique option. However, this effect should be attenuated when the plate sets were described as being wall decorations.

Method

Two hundred eight undergraduate students in Hong Kong participated in the study in exchange for course credit. They were randomly assigned across a 2 (slideshow: disease vs. accident) × 2 (purpose: dinnerware vs. decoration) between-subjects design.

Disease versus accident salience was manipulated through the same slideshow presentations employed in study 3. Participants then proceeded to a product preference task in which they were asked to indicate their relative preference between two plate sets. In the dinnerware (decoration) condition, participants read that the plate set was to be purchased as dinnerware for a Christmas party (as a Christmas wall decoration). While the two sets were described as equally priced and having the same features (e.g., US made, 1-year warranty, scratch-resistant materials), they varied along the uniqueness/popularity dimension. A tagline saying "A unique option: you won't find them in every home" was attached to one plate set, whereas a tagline saying "A popular option: you may find them in many homes" was attached to the other. As the main dependent measure, participants reported their relative preference for and purchase intention toward the two plate sets (r = 0.88) on two 9-point scales ("Which one of the two plate sets do you prefer"; 1/9 = definitely option A/ option B. "Assume these plates fit your price range. Please indicate how likely it is that you will buy one of the plate sets"; 1/9 = will consider purchasing option A/option B), with option A (B) representing the popular (unique) option. Afterward, they completed the Perceived Vulnerability to Disease (PVD) scale (Duncan, Schaller, and Park 2009; α = 0.74), which consists of 15 items assessing individuals' dispositional concerns with disease susceptibility. Past research on the BIS has obtained mixed evidence as to whether this individual difference influences the effects of disease salience (Hill, Prokosch, and DelPriore 2015; Mortensen et al. 2010). We thus included it in this one study for exploratory purposes, but no effects of PVD were obtained. Accordingly, we pooled the data across PVD. Finally, all participants reported demographic information. The same attention check used in previous studies was embedded in these final questions.

Results

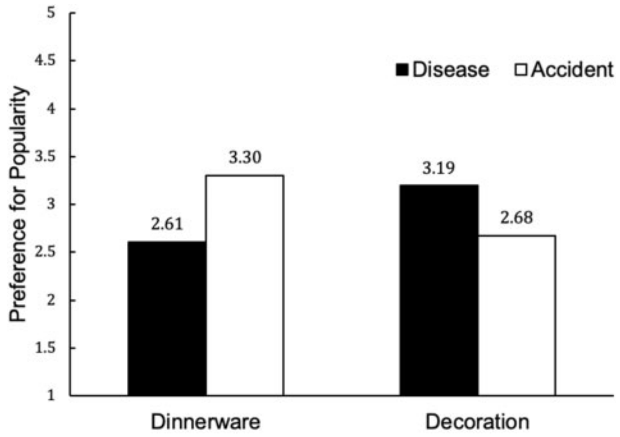
Nineteen participants were excluded due to the common filtering criteria. Analyses were run with the remaining 189 participants (M_{age} = 20.06, 59.3% females). Note that we did not use the attention check as a filtering criterion in this study because the attention check question (only in this study) was embedded in the demographic questions placed at the end of the study. Likely as a result of fatigue as well as a falloff in attention triggered by demographic questions that typically signal the end of a survey, an unusually higher number of participants (N = 50; around 25% of the initial sample) failed the attention check. Reassuringly, even if this filter was to be used and these additional participants excluded, our results would not be altered: the key preference interaction effect remains significant ($F(1, 135) = 5.05$, $p = .026$).

Preference. A 2 (slideshow) × 2 (purpose) ANOVA on the preference index (reverse coded so that higher scores indicate greater preference for the popular option) yielded only a significant interaction ($F(1, 185) = 4.95$, $p = .027$; $\eta^2 = 0.026$; figure 2). Follow-up contrasts showed that when the plate set was positioned as dinnerware, participants in the disease condition reported directionally lower preference for the popular (vs. unique) set (N = 46; M = 2.61, SD = 1.78) as compared to those in the accident condition (N = 48; M = 3.30, SD = 2.07; $t(185) = 1.80$, $p = .073$; d = 0.36), replicating prior results. In contrast, but aligned with predictions, when the plate set was positioned as a decoration, the effect was eliminated such that preference did not differ for the disease (N = 44; M = 3.19, SD = 2.06) versus the accident slideshow (N = 51; M = 2.68, SD = 1.55; $t(185) = 1.35$, $p = .180$); if anything, the pattern indicated a reversal of the usual effect, albeit nonsignificantly so.

6 A within-subject posttest with 57 MTurk participants confirmed that the two plate sets were perceived as being equal in category typicality (1 = conventional/normal for a Christmas plate, 7 = unconventional/unusual for a Christmas plate; rs = 0.77 and 0.83; means: 3.80 vs. 3.69; $F(1, 56) < 1$, $p = .35$), quality (1 = very low quality, 7 = very high quality; means: 4.75 vs. 4.91; $F(1, 56) = 1.53$, $p = .22$), and likeability (1 = dislike very much, 7 = like very much; means: 4.93 vs. 5.09; $F(1, 56) < 1$, $p = .34$).

FIGURE 2

POPULARITY PREFERENCE AS A FUNCTION OF DISEASE SALIENCE AND DECISION CONTEXT (STUDY 4)



Discussion

Study 4 accomplished two objectives. First, it provided evidence consistent with a key aspect of the underlying rationale: namely that the disease-induced reduction in preference for typical versus atypical product options is due to typical (atypical) options being associated with many (few) consumers. In accordance with this logic, a different manipulation of the many versus few association (based on popularity vs. uniqueness, with typicality held constant) yielded results convergent with the basic effect: exposure to disease cues decreased relative preference for the popular option relative to the unique option.

Notably, and in fulfillment of a second major objective, these results were only obtained when the plate sets were described as dinnerware, not when they were positioned as wall decorations. This result depicts another important boundary condition for the basic effect, which helps to delineate its domain: disease threat is more likely to influence preference when product use is itself associated with infection risk, but not when such infection risk is relatively low.

Interestingly, in this noninfectious context, the results were suggestive of a reversal of our usual effect, with disease threat enhancing preference for the popular option. Although this finding did not reach significance, it is reminiscent of some past research depicting disease-induced conformity effects (Murray and Schaller 2012). Student participants were asked to express their agreement or disagreement with a proposed change in grade-reporting method, after seeing that a majority of their peers (25 out of 28) had voted one way—either for or against the change—and a minority (3 out of 28) had voted the other. Those exposed to disease threat (vs. a non-disease threat) displayed greater opinion conformity, choosing the option endorsed by the majority. However, these past conformity effects (see also Wu and Chang 2012) have been obtained in purely noninfectious contexts, such as expressing opinions regarding grading schemes. In light of the findings in study 4, it is therefore understandable why the basic effect documented in our work—a relative decrease in preference for options associated with many people (such as typical products, popular products) —was not observed in that earlier research. The General Discussion provides additional insight into the conformity effect of disease threat, and a supplementary study (web appendix K) builds on that discussion to show when disease threat in a noninfectious decision context might actually induce conformity and thereby actually reverse our basic effect, instead of simply attenuating it.

STUDY 5: INCLUDING A NO-CHOICE OPTION

As noted earlier, this research focuses on examining the shift in preference away from typicality in contexts where consumers are choosing between a typical and atypical product, and choosing neither is not an option (e.g., when one has a budget constraint and only those two products are on sale). However, while the no-choice option is not always feasible or attractive, there are many situations in which it is—for instance, when consumers cannot make up their minds between options and elect to defer choice (Dhar 1997). Our final study, therefore, examined a preference context that included a no-choice option, along with a typical and atypical option. Doing so served two purposes. First, the mere presence of a no-choice option can alter preferences (Parker and Schrift 2011). It is therefore important to assess whether the preference effect observed thus far—reduced preference for typical versus atypical options in the disease condition—generalizes to a no-choice context. Second, as described subsequently, including a no-choice option provides exploratory insight into an issue on which our theorizing is agnostic: namely whether the observed preference shift is driven by a decreased preference for the typical option, an increased preference for the atypical option, or both.

Note that inclusion of the no-choice option also allows us to examine another novel effect of disease salience. It seems likely that exposure to disease cues (which usually trigger disgust; Schaller et al. 2010) will cause consumers to increase their preference for the no-choice option, since disgust creates an aversion toward acquiring products in general (Lerner, Small, and Loewenstein 2004). However, while this is an interesting possibility, it is unrelated to our focal prediction: disease salience should reduce preference for the typical versus atypical option.

Method

Four hundred four MTurkers were randomly assigned across a one-factor (article type: disease related vs. disease unrelated) between-subjects design. Participants were told that they would complete two independent tasks. Disease salience was manipulated first through a news reading task. Participants were asked to read a news article either about a flu outbreak (disease condition) or the necessity of fact checking when reading news (control condition; see web appendix B for details) and were asked to summarize the main content of the news article.

Next, participants proceeded to the second task in which they were presented with the same pair of stuffed toys used in studies 1A and 1B: the gray bunny (typical) and the red dragon (atypical). Participants were told that they could choose one of the two options provided, or alternatively, a 2-dollar coupon to be used later for other stuffed toys produced by the same brand (note that this no-choice option featured a cash reward of lower value than the toys because of the greater fungibility of money, which increases its perceived value; Simmel 1978).

To make their choice consequential, we also informed all participants that they would receive their chosen options at the end of the study. Eventually, for logistical reasons, all the participants who had passed the filtering criteria were instead rewarded with a 2 USD bonus through the MTurk platform (35 participants failed the filtering criteria; analyses were run with the remaining 369 participants; M_{age} = 37.32, 55.3% females). Finally, participants reported the extent to which they generally prefer unique versus popular products, followed by demographic information.

Results

Choice. Chi-square analyses were conducted to analyze how disease salience affected the choice share of each option, with the choice of atypical option coded as 1, the typical option coded as 0, and the 2-dollar coupon option coded as 2. Results revealed that disease salience increased the share of participants who selected the no-choice option, as compared to the control condition (32.8 vs. 23.5%: Wald = 3.94, p = .047; odds ratio = 1.59). This suggests that, in line with our speculation, disease salience does discourage consumers from purchasing in general.

However, this raised preference for the no-choice option is tangential to our central prediction, which argues for a reduced preference for the typical versus atypical product in the disease condition, as compared to the control condition. This prediction was examined via a difference score, computed by subtracting the choice share of the atypical product from the choice share of the typical product. Supporting our prediction, this difference score was lower in the disease versus control condition. Specifically, 21.9% more participants in the control condition selected the typical option versus the atypical option, whereas this difference decreased to 7.0% in the disease condition (Wald = 16.58, $p < .001$; odds ratio = 3.62).

The difference-score analysis above is the appropriate way to test our focal prediction, which deals with the change in preference from the typical option to the atypical option. While we do not have an a priori expectation for whether this disease-induced preference shift arises more from a lowered preference for the typical option or an increased preference for the atypical option, the experimental paradigm in this study provides exploratory insight into this issue by examining the *absolute* choice shares of each option in the disease versus control conditions (note that this was not possible in earlier studies, which featured only the typical option and the atypical option, because a greater preference for one automatically meant lowered preference for the other).

The analysis of absolute choice shares revealed that the share of the typical option decreased significantly for participants in the disease (vs. neutral) condition (37.1 vs. 49.2%; Wald = 5.49, p = .019; odds ratio = 0.61), whereas the share of the atypical option increased slightly but nonsignificantly for participants in the disease (vs. neutral) condition (30.1 vs. 27.3%; Wald < 1, p = .554; see table 3 for more details). At least in this study, therefore, the results indicate that the disease-induced preference shift is based more on lowered preference for the typical option rather than increased preference for the atypical option. However, while this is useful insight, we would be cautious in overgeneralizing this result until additional evidence is collected, a task we leave for future research (for instance, it might be that the results are dependent on the specific nature of the no-choice option included in the choice set).

Discussion

Study 5 generalized support for our focal prediction to a context that included a no-choice option, finding once again that exposure to disease cues reduced preference for the typical option versus the atypical option. In addition, inclusion of the no-choice option provided insight on two further aspects. First, the disease-induced change in preference was driven more by a reduced preference for the

TABLE 3

CHOICE SHARE OF EACH OPTION UNDER DISEASE THREAT VERSUS CONTROL (STUDY 5)

	Disease (N = 186)	Control (N = 183)	p
Atypical option	56 (30.1%)	50 (27.3%)	.554
Typical option	69 (37.1%)	90 (49.2%)	.019
Coupon option	61 (32.8%)	43 (23.5%)	.047

typical option than a heightened preference for the atypical option. This finding adds to the extant literature on the BIS, which has thus far not explored whether the effects of disease salience are driven more by an avoidance of the many, or a preference for the few. The results from study 5 suggest the former, although we reiterate that caution should be exercised against overgeneralizing this finding.

Second, disease salience increased preference for the no-choice option, suggesting that exposure to disease cues induces a tendency to delay purchasing, perhaps because of a disgust-related aversion to acquisition. Again, this is a novel finding in the context of the literature on disease salience, and future research could delve deeper into it. It is worth noting, however, that the aversion to acquiring was not a generalized tendency. Rather, consistent with our theorizing, disease salience did lower the inclination to choose the typical product but not the atypical product. If anything, choice share of the latter increased slightly in the disease condition.

GENERAL DISCUSSION

Drawing on recent perspectives positing that evolutionary adaptive mechanisms have led human beings to develop a psychological system (BIS) that is activated upon exposure to disease threats, this research examines how disease cues influence product preference. We argue that disease threat should reduce consumers' relative preference for category-typical, mass products, as compared to category-atypical, niche products. This prediction is based on three tenets: (a) typical products are implicitly associated with more people than are atypical products; (b) the desire to avoid others is an integral part of the BIS; and (c) the smoke-detector aspect of the BIS causes people to avoid superficially threatening stimuli even when they do not actually pose an infection threat. Consequently, the disease-induced wish to avoid others should decrease relative preference for typical versus atypical products, even when the typical product is not actually more contaminated than the atypical product.

A set of six studies provided support for this thesis as well as the underlying mechanism. Studies 1A and 1B demonstrated the basic effect that exposure to disease threat—but not other threats, such as those related to accidents and hazards—resulted in reduced preference for typical versus atypical product options, using different manipulations of disease salience and different decision targets. Study 2 provided support for the mediating role played by the fear of infection (distal mediator) and the interpersonal avoidance motive (proximal mediator). Support was then obtained for a set of theoretically derived boundary conditions that illuminated important aspects of the posited process. Thus, the effect was mitigated when the salient disease was not contagious in nature (study 2), when participants had a chance to visualize cleaning their hands before product choice (study 3), and when they were led to believe that product usage involved minimal infection risk (study 4). Finally, although this research primarily focuses on contexts that comprise only the typical and atypical options (such that decreased preference for typicality is equivalent to increased preference for atypicality), study 5 included a no-choice option and obtained initial results suggesting that the disease effect on product preference was driven mainly by a decrease in the absolute choice share of the typical product.

Implications and Contributions

In contrast to past work on the BIS, which has shown how this disease-triggered motivational system affects a variety of interpersonal processes (Ackerman et al. 2009; Murray and Schaller 2016), the current research uses the consumption context to show how and why exposure to disease cues can influence behavior in nonsocial settings as well. This research thus demonstrates not only that the impact of disease avoidance motivations is far more wide ranging than previously thought (i.e., including nonsocial behaviors), but also more broadly that being exposed to disease cues can influence decisions that have no obvious relation to health. Given the ubiquity of disease-related cues around us, these findings point to an important and novel influence on consumer preferences. That the other-avoidance motive evoked by disease salience can even affect preference for products that do not differ in actual level of contamination also speaks to the powerful nature of the underlying motive (Huang et al. 2017).

In addition, the boundary conditions documented in this research provide insight into fundamental aspects of extant research on the BIS. For example, that the effect was only obtained for diseases thought to be infectious (study 2) provided evidence for an important yet untested theoretical tenet: that the BIS exerts an influence precisely because it is a reflexive means of coping with infection-related threats; the effect is attenuated when people are made explicitly aware of the noncontagious nature of the disease. Also, going beyond past BIS research, this work articulated the important role of decision context: disease threat was found to impact product preference only when the decision target carried some risk of infection (study 4).

Although the major contribution of this research lies in advancing knowledge relating to the effects of disease threat, we also contribute to the existing literature on product typicality. At a conceptual level, this research is the first, we believe, to demonstrate that an implicit association exists between typicality/atypicality, on the one hand, and many/few people, on the other hand. Empirically, while past work in the area has robustly identified a preference advantage for typical versus atypical options, the current investigation identifies a novel condition for the attenuation of such typicality preference: exposure to disease cues.

Finally, the current results also carry practical implications. They suggest, for instance, that managers should consider marketing novel, atypical product offerings, rather than typical offerings, during disease-prone environments. Moreover, given that sales of typical products are reduced by disease cues, managers might want to include natural fluctuations of pathogen load across time and geographic locations in their forecasting models for typical/mass product offerings. These applied implications are of particular importance at the present moment, given the ongoing pandemic threat. At the same time, and as we discuss subsequently, the severity and immediacy of the Covid-19 threat could conceivably influence product preference in unique ways that are different from those uncovered in this research.

Relationship with Past Research: The Conformity Effect

As discussed earlier, past research on interpersonal influence shows that disease threat can yield greater opinion conformity, enhancing preference for the majority-endorsed option (Murray and Schaller 2012). This finding seems discrepant from our predictions regarding disease-induced aversion to typical (vs. atypical) products. Thus, while we argue that disease threat reduces relative preference for the option associated with more people (in our context, the typical option rather than the atypical option), conformity research finds that disease threat enhances preference for the option endorsed by the majority—namely that associated with more people.

The seeming discrepancy between the two effects is misleading, however, because they pertain to different contexts. In particular, while a fundamental tenet of the BIS is that disease threat evokes a desire for safety (Griskevicius and Kenrick 2013), we argue that this safety motive should manifest itself in different ways depending on the decision context. In the infection-related contexts we study, the disease-induced safety motive naturally involves a specific goal to minimize the infection risk. Given this goal, an association with *many others* carries a negative connotation, thus resulting in our typicality-aversion effect.

Such infection-specific goals are unlikely to be salient in contexts unrelated to infection, which is why—as study 4 showed—the typicality-aversion effect will not obtain there. This does not mean that disease salience will not induce safety seeking. Rather than trying to reduce infection risk, however, safety seeking here can take the form of minimizing risk in general by choosing the option that seems intrinsically superior (e.g., a higher-quality product). If a signal does exist as to the clear superiority of one of the target options, therefore, the basic safety motive induced by disease threat should result in enhanced preference for that option. Viewed in this light, the conformity effect in past research makes sense because not only did it involve noninfectious contexts (e.g., opinions of grading schemes; Murray and Schaller 2012), but it also featured an explicit majority versus minority endorsement—which has been shown to provide an unambiguous indicator of superiority versus inferiority (Bikhchandani et al. 1998).

Both our theorizing and the empirical context of prior conformity research thus suggest that two conditions are required to observe the conformity effect of disease salience: (a) the decision context has to be infection unrelated and (b) an unambiguous signal is provided regarding quality differences between the options (e.g., majority vs. minority endorsement).[7] Although the focus of this research was on infectious contexts, which is where we expect the typicality-aversion effect to obtain, we conducted a supplementary study that replicated the conformity effect in a product context by satisfying the two conditions above (see web appendix K).

Future Research

Since disease-related cues, despite their prevalence, have been relatively understudied in consumer research, our work opens up several other avenues for future exploration. First, just as disease threat was found to decrease relative preference for typical (vs. atypical) products because such products are implicitly associated with more people, other product-related aspects that convey a *many* versus *few* people distinction should also be susceptible to the influence of disease. Indeed, some supportive evidence for this idea has already been obtained. Unpublished data from another laboratory showed that disease threat decreased liking for a brand of potato chips reviewed by 500 versus 100 consumers, with the average review rating held constant (Galoni, Carpenter, and Rao 2019, *unpublished data*). This finding not only offers a reassuring conceptual replication of the current findings, but also suggests that our theoretical platform can be fruitfully used to identify other ways in which disease threat can affect product preference.

Second, the Covid-19 pandemic offers a naturalistic context to examine the influence of disease cues. One possibility, in line with the current findings, is that the high current salience of disease threat will exacerbate consumer aversion to typicality, inclining them toward less typical products. Indeed, a recent Bloomberg article[8] reported that the

7 Pertinently, the only study in which we have investigated a noninfectious context (study 4: plates as wall decoration) did not feature a clear difference in quality between the options. Rather, as validated in pretesting, the "popular" and "unique" plates were deemed similarly high in quality. We believe that is the reason why this study, while it eliminated the typicality-aversion effect, did not find significant support for the conformity effect either.

lockdown in the UK has significantly increased purchases of relatively unusual ingredients for both food (e.g., kimchi) and home-made cocktails (e.g., tequila; market research conducted by OnePoll and John Lewis Partnership 2020).

However, another intriguing possibility derives from important differences between the pandemic (an intense, ongoing threat) and the type of infection reminders studied in our research, which were relatively less threatening with regard both to the severity and the immediacy of the danger. For these less immediate threats, the people-avoidance propensity induced by disease salience stems from evolutionary adaptation rather than being a rational threat-mitigating strategy. With the pandemic, in contrast, social distancing has been externally mandated in many countries across the world as a rational defense against infection. Such imposed, long-lasting isolation might well produce a compensatory backlash, with the continued salience of Covid-19 making people crave rather than avoid the company of others. In turn, this could well lead to an increase in relative preference for products associated with the many versus the few: in other words, a heightened preference for typical versus atypical products. Testing these ideas could serve to both extend and complement the current research.

Perhaps the broadest avenue for future research lies in exploring other ramifications of the other-avoidance motive induced by disease threat. For example, since social connections and monetary resources are often interchangeable (Lasaleta, Sedikides, and Vohs 2014), disease threat, because it leads to people avoidance, should conversely enhance the value of money (and thereby lead to lower spending). Another interesting implication of the other-avoidance motive is that disease threat should lower liking for anthropomorphized products (because of their resemblance to humans). Indeed, early results from our laboratory support both of these ideas.

In sum, disease cues have the potential to affect consumer behavior in a variety of ways, including nonobvious ones. Despite the prevalence of disease cues in our environment, and their tremendous potential impact on all aspects of human life, their influence on consumption has been understudied. This research represents a step in this direction, and we hope it sparks further work in this area.

DATA COLLECTION INFORMATION

All the data reported in our studies were collected by the first author or by research assistants from Hong Kong University of Science and Technology (HKUST) under the first author's supervision. Data for studies 1B (March 2019) and 4 (March 2016) were collected using the student subject pool at HKUST. Data for web appendix I study were collected in December 2019 from online samples of Chinese adults (Credamo). Data for all other studies were collected on Amazon's Mechanical Turk (study 1A: May 2018; study 2: September 2016; study 3: March 2016; study 5: September 2019; web appendix H study: April 2018; web appendix J study: January 2016; web appendix K study: September 2018). The first author conducted all the data analyses.

8 https://www.scmp.com/news/world/europe/article/3083322/britons-beat-coronavirus-lockdown-blues-sewing-tequila-and-kimchi. Accessed July 14, 2020.

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