Filling an Empty Self: The Impact of Social Exclusion on Consumer Preference for Visual Density

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This research examines the effect of social exclusion on consumers' preferences for visual density. Based on seven experimental studies, we reveal that consumers who perceive themselves as socially excluded evaluate products with dense visual patterns more positively than their nonexcluded peers. This effect occurs because social exclusion triggers a feeling of psychological emptiness and dense patterns can provide a sense of being "filled," which helps to alleviate this feeling of emptiness. This effect is attenuated when consumers physically fill something or experience a feeling of "temporal density" (i.e., imagining a busy schedule with many tasks packed into a short time). These results shed light on consumers' socially grounded product aesthetic preferences and offer practical implications for marketers, designers, and policy makers.

Keywords: social exclusion, visual density, a feeling of emptiness

At the point of sale, the most visible element of a product is often the visual aesthetics of its design. Visual aesthetics play a pivotal role in consumers' decisions (Hoegg, Alba, and Dahl 2010). Even after the product purchase, the consumption experience continues to be influenced by aesthetics because consumers see the product whenever they use it (Hagtvedt and Patrick 2014). Due to the theoretical and practical importance of understanding consumers' aesthetic preferences, the literature on marketing and consumer behavior has attempted to understand how visual design elements such as a product's color, composition, and symmetry affect consumers' perceptions, evaluations, and behavior (Deng and Kahn 2009; Hagtvedt and Patrick 2008, 2014; Hoegg and Alba 2011; Hoegg et al. 2010; Patrick and Hagtvedt 2011; for a review, see Adaval, Saluja, and Jiang 2019).

Although visual density is an essential dimension that defines a visual image, it has largely been overlooked in consumer research. Visual density can be defined as the number of visual elements in a unit area on a visual image (Rosenholtz, Li, and Nakano 2007). Extensive evidence in daily life suggests that visual density strongly influences people's attitudes toward an object and that its valence can be positive or negative. Trypophobia is an extreme sense of revulsion toward visually dense patterns. This term was coined to describe an intense fear of visual patterns closely grouped together, which can appear in objects such as honeycombs or lotus seeds. Nevertheless, some people like

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visual density. The recent popularity of Johanna Basford's "Secret Garden," a coloring book of visually dense and intricate arrangements, is a good example of such a preference.

As visual density is an important dimension of product aesthetics, consumer researchers need to understand how and why consumers react to products with dense visual patterns. In this study, we go beyond the aesthetic perspective and examine the psychological mechanism that drives consumers' attitudes toward dense patterns in aesthetic product design. By taking a novel perspective on socially grounded consumer behavior, we propose that consumers have more favorable attitudes toward densely patterned products when they experience social exclusion—a state of being deprived of social relationships (Williams 2007)—than when they do not feel socially excluded. We posit that this proposed effect occurs because socially excluded consumers feel psychologically empty, and the subsequent motivation to "fill up" this emptiness results in more favorable attitudes toward dense patterns that can metaphorically provide a sense of inner filling and temporarily lessen the negative feeling of emptiness. It is similar to the phenomenon in which people lacking social connections engage in an irrational hoarding behavior, "filling up" their homes. Consistent with the proposed mechanism, we further hypothesize that the effect is attenuated when consumers use other ways to fill this emptiness, such as engaging in the physical act of filling something up and perceiving "temporal density" (e.g., imagining a busy schedule with many tasks packed into a short period).

By documenting the novel effect of social exclusion on consumer response to visual density, this research links the literatures on social relationships and visual aesthetic design, and reveals consumers' socially grounded product aesthetic preferences, paving the way for future research in this emerging research area. This research also contributes to the field of visual marketing by considering consumer preferences for visual density, an aspect of consumer preferences largely overlooked in the literature. In the following sections, we outline the theoretical framework, develop our hypotheses, present our seven empirical studies, and conclude with a discussion of our contributions, directions for future research, and practical implications.

CONCEPTUAL FRAMEWORK

Social Exclusion and the Feeling of Emptiness

People sometimes feel rejected, ignored, or left behind by other individuals or social groups (Williams 2007). As the desire for social interaction is a universal and fundamental human need, social exclusion significantly affects people's psychological and physiological functioning. Studies have shown that social exclusion leads to aggressive behaviors (Baumeister et al. 2007); encourages people to modify their self-concepts, presumably in pursuit of renewed affiliation (Richman et al. 2015); and leads to outwardly expressive behavior, such as mimicry and ingratiation (Lakin, Chartrand, and Arkin 2008). In the realm of consumer research, researchers have found that excluded people are more likely to tailor their spending preferences to the preferences of an interaction partner (Mead et al. 2011), pursue riskier but potentially more profitable financial opportunities (Duclos, Wan, and Jiang 2013), hold negative attitudes toward probabilistic selling (Fan and Jiang 2018), and exhibit greater preferences for distinctive products (Wan, Xu, and Ding 2014).

Interestingly, people often use the word "empty" to describe their feelings after being socially excluded. For example, in the drama *Silver Linings Playbook* (2012), the main character, Tiffany—having experienced a series of blows, including the loss of her beloved husband and a failure to form new relationships—declares, "I woke up and I am empty. I have nothing." Scholarly research based on qualitative and quantitative data has also illustrated that people often characterize their experiences of social exclusion as a "feeling of emptiness." For example, Roche and Tucker's (2003) interview study revealed that young parents and carers reported experiencing "emptiness" due to the lack of regular peer group contact and their inability to maintain long-term social relationships. Quantitatively, Klonsky (2008) found high correlations (ranging from .69 to .84) between participants' ratings of feeling "isolated" and "lonely" and ratings of "feeling empty inside." In addition, Moore and Schultz's (1983) adolescent survey found that 54% of participants agreed with the statement "loneliness means a sense of emptiness." In our own content analysis of the 41 posts on the topic of "I feel empty" recently posted on Similar Worlds (www.similarworlds.com), an online platform where people from around the world share personal stories, we found that nearly half of the personal stories described in the posts (41.46%) mentioned a lack of social relationships.[1]

Webster (2018b) defines emptiness as a) containing nothing or unoccupied, or b) lacking meaning. Psychological emptiness is a metaphor for the term "empty"—being physically vacant, containing nothing, or being unoccupied. In everyday language, people characterize the feeling of emptiness as a psychological inner void and hollowness, with the opposite state being a psychological perception of being filled. In the social exclusion context, emptiness can be regarded as a symptom of a lack of meaning or belongingness. Research has suggested that social exclusion threatens one's sense of belongingness, which is the perception of being affiliated with other

1 See https://similarworlds.com/7068523-I-Feel-Empty-I-Feel-As-If-Ill-Always-Feel-Empty; https://similarworlds.com/5100281-I-Feel-Like-A-Part-Of-Me-Is-Missing; https://similarworlds.com/6743992-I-Feel-Empty-Inside.

persons, organizations, or communities (Williams 2009). Considering the countless situations related to social interactions and belongingness (e.g., intimate attachments, friendships, collegial relationships, belonging to a coherent community), threats on social belongingness result in a vanishment of a large part of social life, which is symptomized by emptiness—a psychological feeling of "containing nothing" in life or being "unoccupied." Indeed, research has suggested that the loss of important social interactions causes individuals to perceive their world as desolate, barren, or devoid of others (Lunt 1991). As human beings are social creatures and social connections give life meaning, social exclusion also threatens meaningful existence—the perception that one's life is meaningful and valuable (Lee and Shrum 2012; Lee, Shrum, and Yi 2017). Consistent with research in clinical psychology, threats on meaningful existence resulting from social exclusion can also be symptomized as a feeling of emptiness. For example, patients report a sense of emptiness when they feel their lives lack substance and meaning (Fahlman et al. 2009).

Because emptiness is an unpleasant, painful, and sometimes unbearable feeling that can have negative consequences, such as self-injury and even suicide attempts (Schnyder et al. 1999), people are motivated to suppress or remove the feeling of emptiness by metaphorically filling a physical inner void. For example, those who feel empty may be compelled to fill themselves up with food and drink, which can lead to an eating disorder (Meehan 2007). In the current research, we propose that dense patterns in product aesthetic design can metaphorically provide a psychological perception of being "filled" that helps people cope with the feeling of emptiness from social exclusion.

Product Aesthetic Design and Visual Density

Aesthetic design determines how products look at the moment of purchase or consumption—for example, the artwork printed on a soap dispenser container (Hagtvedt and Patrick 2008), or the picture on a wine bottle label (Orth and Malkewitz 2008). Research has examined how visual design elements, such as the color, composition, symmetry, and design style of products, affect consumers' judgments and decision making (Deng and Kahn 2009; Hagtvedt and Patrick 2008; Hoegg and Alba 2011; Hoegg et al. 2010). Although visual density is an essential and basic geometrical characteristic that defines a visual image, however, consumer research has largely overlooked it.

The density of a substance is defined in physics as its mass per unit volume (or how heavy the object looks; Webster 2018a). Density can also describe the compactness or clustering together of elements in different domains. For example, temporal density, or "busyness," denotes a situation in which numerous tasks are planned in a short time (Snyder 2013). Our concern in this research is visual density, which is defined by the number of distinguishable elements in a unit area of a visual design (Donderi 2006; Rosenholtz et al. 2007). For instance, a dense web page means that it contains many distinguishable elements, such as words, graphics, or "areas of interest" (Dynamic Logic 2001). Most research in this area has focused on the downstream effects of visual density, such as increased arousal (Berlyne 1970) and increased difficulty in information processing (Pieters, Wedel, and Batra 2010). In our study, we investigate how social exclusion can act as an antecedent of consumers' attitudes toward densely patterned products. Specifically, we posit that dense patterns on products can provide a visual sense of being filled, which can respond to the feeling of emptiness of the socially excluded.

Research Hypotheses

We propose that experiencing social exclusion increases consumers' positive attitudes toward products with a visually dense design because visual density provides a sense of being filled, which can alleviate the feeling of psychological emptiness caused by social exclusion. This perspective is grounded in research in embodied cognition and suggests that sensory input or bodily sensations can be metaphorically linked to abstract thinking (Krishna and Schwarz 2014; Landau, Meier, and Keefer 2010). For example, research has shown that warm temperatures can increase participants' perception of social closeness to others because of the metaphorical link between bodily warmth and social warmth (Williams and Bargh 2008). Similarly, visual perception is a sensory input that can be perceived in bodily terms and can affect abstract concepts in metaphorical ways. For instance, Crawford et al. (2006) found that participants tended to recall positive images as appearing in higher spatial locations than negative images, due to the metaphorical link between vertical visual position (i.e., high vs. low visual position) and information valence (i.e., positive vs. negative information). In short, the world is understood through "concrete" concepts that feed into more abstract ideas.

More importantly, the metaphorical link between physical/sensory input and psychological/abstract concepts can be bidirectional (Zhong and Leonardelli 2008; Zhong and Liljenquist 2006). Perceptual or sensory experiences can prime abstract concepts, and conceptual thinking involves the perceptual simulation of the senses. For example, Zhong and Liljenquist (2006) found not only that people described moral misdeeds using metaphoric terms related to physical cleanliness (e.g., "he has a *clean* record"; "a pair of *dirty* hands"), but that thinking about their past moral misdeeds actually triggered their need to physically cleanse. More relevant for the current research, Zhong and Leonardelli (2008) showed that people described the experience of social exclusion using metaphoric terms related

to physical coldness (e.g., "feeling icy cold"), and that experiencing social exclusion (vs. social inclusion) increased their desire for hot food and drinks (to counteract the physical coldness). Based on these theories and findings, we propose that people not only describe social exclusion using a metaphor of emptiness, but also use the physical sensation of "being filled" to cope with this psychological emptiness.

A dense pattern has more elements than a sparse pattern, filling a compact space and offering a visual perception of being filled. Following the body of research on embodied cognition (Krishna and Schwarz 2014; Zhong and Leonardelli 2008), we theorize that a similar metaphorical link exists between the physical sensation of being filled triggered by visual patterns and an abstract psychological feeling of being filled. In turn, we surmise that dense patterns can provide the sense of "filling" that helps relieve the psychological emptiness caused by social exclusion, which consequently increases socially excluded consumers' preference for products with visually dense patterns. We formally state the following hypotheses.

H1: Socially excluded consumers have more favorable attitudes toward densely patterned products than socially included consumers.

H2: Socially excluded consumers have a stronger feeling of emptiness than socially included consumers, which mediates the effect of social exclusion on attitudes toward densely patterned products.

If consumers' attitudes toward visually dense patterned products are influenced by the feeling of emptiness resulting from social exclusion, then we expect that this effect will be attenuated when consumers use other embodied ways to address their feeling of emptiness before being exposed to these densely patterned products. First, research on embodiment has suggested that engaging in simple physical or motor actions can activate cognitive metaphor (Gu, Botti, and Faro 2013; Lee and Schwarz 2010). For example, performing acts of closure, such as "turning off the lights" or "closing the door," can activate the abstract concept of "decision closure" and trigger consumers' choice closure in difficult choices (Gu et al. 2013). Similarly, physical acts of cleansing, such as "wiping the slate clean," are associated with the abstract concept of "moral purity," leading to the elimination of the sense of guilt resulting from immoral behavior (Zhong and Liljenquist 2006). Therefore, we expect the motor act of filling something up (e.g., filling a bottle with water) to be metaphorically associated with the cognitive perception of being filled. Thus, we posit that engaging participants in the physical action of filling something up will attenuate the feeling of emptiness sparked by social exclusion and will mitigate their increased preference for dense visual patterns. We formally hypothesize this as follows:

H3: The effect of social exclusion on attitudes toward densely patterned products is attenuated when consumers engage in the physical act of filling something up.

Second, research has shown that people who experience a feeling of emptiness tend to increase the pace of their lives to keep themselves busy (e.g., adopting new hobbies, focusing on work) to "fill" their emptiness with a full schedule (Fogarty 2000). Recent research has suggested that simply describing a busy day in detail can prompt people to perceive themselves as having a busy schedule (Kim, Wadhwa, and Chattopadhyay 2018). In such cases, consumers may perceive a high level of "temporal density" denoted by a large number of tasks packed in a unit of time (Snyder 2013). We expect that the perception of temporal density can also moderate the effect of social exclusion on attitudes toward densely patterned products. We predict that when excluded consumers are primed with a busyness mindset (i.e., temporal density), their feeling of psychological emptiness will be alleviated by the perception of "being filled" by the various tasks in their perceived busy schedule. As a result, we expect socially excluded consumers to rely less on visual cues to metaphorically fill their inner void and have less positive attitudes toward densely patterned products. Formally, we hypothesize this as follows:

H4: The effect of social exclusion on attitudes toward densely patterned products is attenuated when consumers perceive themselves to be in a situation of "temporal density" (i.e., having a busy schedule or handling many tasks at once).

Overview of Studies

We test these hypotheses in seven experimental studies. Studies 1A and 1B reveal that socially excluded consumers compose denser visual patterns than nonexcluded consumers by incorporating more visual elements into the design of the case (study 1A) and the lock screen (study 1B) of their mobile devices. Studies 2A and 2B replicate the effect of social exclusion on consumers' density preference by checking evaluations of densely patterned and sparsely patterned products separately (study 2A) or the relative preference between the two (study 2B), and provide direct support for our proposed emptiness-filling mechanism by examining the mediating role of the feeling of emptiness. Studies 3 and 4 provide additional evidence of the proposed emptiness-filling mechanism by demonstrating the moderating roles of the physical act of filling something (study 3) and temporal density (study 4). Finally, study 5 explores the substantive implications of our findings for consumer well-being and shows that consuming products with visual density can mitigate socially excluded consumers' feelings of emptiness.

The sample size of each study was determined in advance based on the sample size of published studies using similar study methods and procedures. The target cell size for each between-subjects cell was 40–50, with around 10% more collected for online studies. The data were analyzed at the end of the data collection. We present here all data exclusions (if any), all manipulations, and all hypothesis-related measures. Additional measures and related analyses are reported in the web appendix.

STUDY 1

Study 1A

Study 1A tested hypothesis 1, the basic proposition on the effect of social exclusion on consumers' preference for densely patterned products with real behavior measurements. One hundred fifty-four Hong Kong undergraduates (43 males, $M_{age} = 20.60$) registered and participated in the study in exchange for a nominal payment. We eliminated the data from six participants who failed our data screen criteria.[2] Thus, the final valid sample of this study was 148 participants.

Participants were randomly assigned to one of three (social exclusion vs. social inclusion vs. baseline) between-subjects conditions. We first manipulated participants' feeling of social exclusion with a recall task (Duclos et al. 2013; Mead et al. 2011; Su et al. 2017). Participants in the social exclusion condition elaborated on a social experience in which they had felt excluded (e.g., ignored, isolated, rejected), while those in the social inclusion condition elaborated on a social experience in which they had felt included (e.g., accepted, welcomed). Participants in the baseline condition were instructed to recall their activities in a typical evening. Immediately after completing this alleged recall task, participants were asked to rate how "rejected," "left out," and "ignored" they felt on a scale of 1 (not at all) to 7 (very). These results served as a manipulation check on the state of their social exclusion (Duclos et al. 2013).

Next, all of the participants took part in the seemingly unrelated task of designing a phone case. They were told that a smartphone accessory company was looking for new design ideas and were asked to design their own smartphone case. They were told that they would be entered into a lottery to win the phone case they had designed. This information was intended to test our predicted effect on participants' behavior with real consequences. To design the case, each participant was provided with a stamping tool that could produce a black-filled diamond shape and a paper model of a smartphone case (see appendix). Participants were informed that they could use only the stamping tool to design their case, but they could use it as they wished and produce any number of shapes. After the design task, two participants were selected by lottery to receive free smartphone cases.

Manipulation Check. Participants' ratings of how "rejected," "left out," and "ignored" they felt ($\alpha = .96$) were averaged. Participants in the exclusion condition ($M = 3.69$, SD = 1.68) reported feeling more excluded than their counterparts in the inclusion condition ($M = 2.41$, SD = .98; $F(1, 145) = 22.03$; $p < .001$) and the baseline condition ($M = 2.57$, SD = 1.28; $F(1, 145) = 17.25$; $p < .001$), while the last two conditions showed no significant differences ($F < 1$, NS).

Visual Density. Two visual density indices were calculated based on the participants' smartphone case designs. First, we counted the number of visual stamps used in each participant's design as an objective visual density index. Due to its non-normal data distribution (Kolmogorov-Smirnov test: D (148) = .18, $p < .001$), a bootstrapping ANOVA was performed with 5,000 iterations (Mooney and Duval 1993). Consistent with hypothesis 1, participants in the exclusion condition ($M = 33.58$, SD = 36.60) used more visual stamps in their designs than those in the inclusion condition ($M = 23.27$, SD = 13.59; $F(1, 145) = 3.94$; $p = .049$; $\eta^2 = .05$) and in the baseline condition ($M = 22.22$, SD = 16.50; $F(1, 145) = 9.64$; $p = .002$; $\eta^2 = .08$). The number of stamps used in the inclusion and baseline conditions did not differ ($F(1, 145) = 1.18$, NS).

Two independent coders judged the perceived visual density of each participant's design on a seven-point scale (1 = very low density, 7 = very high density). We followed the standard coding procedure used in previous research (Neuendorf 2016), including briefing the coding scheme (see web appendix A for details), training the coders (i.e., having them work on some samples to ensure they understood the instructions and followed the coding procedure), and having the coders code the designs. We averaged their ratings of density ($r = .85$, $p < .001$) to form a perceived visual density index. Similarly, the phone cases designed by participants in the exclusion condition were perceived as denser ($M = 3.38$, SD = 1.08) than those designed by participants in the inclusion ($M = 2.90$, SD = 1.17; $F(1, 145) = 4.12$; $p = .044$; $\eta^2 = .05$) and the baseline conditions ($M = 2.74$, SD = 1.28; $F(1, 145) = 7.36$; $p = .007$; $\eta^2 = .06$). The perceived density in the inclusion and baseline conditions did not differ ($F < 1$, NS).

Discussion. Study 1A tested the effect of social exclusion on consumers' preference for visual density. We found that compared with their included and baseline counterparts, excluded participants created denser visual patterns for their smartphone case designs. The results also

2 For all studies, we preset the data screening criteria. First, we included a writing task in studies 1A, 1B, 2B, 3, and 4. Following previous research (Lee, Shrum, and Yi 2017), we screened out participants who did not follow the instructions for the writing task and wrote irrelevant information. Second, in all studies, we administered a suspicion check question. Participants who figured out the purpose of the research were also screened out.

suggested that the effect was primarily driven by social exclusion and not by social inclusion. Consistent with our theorization, we did not find a similar effect of social exclusion on the visual complexity of the participants' designs.

Several confounding factors involved in the stamping behavior should be noted. First, because stamping involves pressing a special tool against a surface, this motion can be perceived as an effort. Therefore, participants who have just recalled an excluded experience—a kind of "failure" in social interactions—may be more motivated to devote their efforts to the subsequent task (i.e., conducting more stamping acts). The stamping behavior can be viewed as distracting, leading socially excluded participants to perform more stamping motions to help them overcome the painful memory of being excluded. To rule out these alternative explanations, we conducted study 1B, using a behavioral design task involving an equal amount of motions to create both a dense pattern and a sparse pattern.

In addition, study 1A raises the question of whether the effect on visual density can be confounded with an effect on visual complexity. While the construct of visual complexity has previously been considered in conjunction with visual density (Cox and Cox 1988), the two are conceptually different. Visual density is defined as the number of distinguishable elements in a unit area of a visual design (Donderi 2006), while visual complexity is a visual perception that can result from various factors, including details in visual features, irregularity, asymmetry, or variation in design elements and composition (Pieters et al. 2010). Based on our proposed emptiness-filling mechanism, we expect social exclusion to result in an increased preference for denser but not more complex visual designs, as complexity is not always associated with visual fillingness. Empirically, we followed the same standard coding procedure to code participants' designs along the dimension of perceived visual complexity on a seven-point scale (1 = very low complexity, 7 = very high complexity; see web appendix A for details). The ratings of the two coders were averaged to form a perceived visual complexity index (r = .90, $p < .001$). The results showed that the phone cases designed by participants in the three conditions did not differ in terms of visual complexity ($M_{exclusion} = 2.95$, SD = 1.50 vs. $M_{inclusion} = 2.77$, SD = 1.54 vs. $M_{baseline} = 2.95$, SD = 1.59; Fs < 1, ps = NS). In study 1B, we further strictly controlled the perceived complexity of participants' designs. Specifically, we controlled the design element used and its arrangement (except for spacing); thus, the designs generated by participants were prevented from varying in complexity.

Study 1B

Study 1B tested the robustness of the effect documented in study 1A using a similar design task for mobile device (e.g., smartphone, tablet) lock screens. To equalize the number of motions involved to make either a dense or a sparse pattern, we asked participants to perform the design task using the "Patternator," a free smartphone app developed by Bazaart Ltd. In this app, consumers can adjust the visual density of their designed lock screen by dragging a button along an axis to control the spacing between design elements.

One hundred fourteen Hong Kong undergraduates (43 males, $M_{age} = 22.46$) registered and participated in the study in exchange for a nominal payment. We eliminated the data from four participants who failed our data screening criteria. Thus, the final valid sample of this study was 110 participants. They were randomly assigned to one of two (social exclusion vs. social inclusion) between-subjects conditions.

Participants performed the same task manipulating social exclusion and inclusion and answered the same manipulation-check questions as in study 1A. Then, they completed a seemingly unrelated task of designing a lock screen for mobile devices (e.g., smartphone, tablet). They were told that a mobile device company wanted to obtain customer feedback on the optimal layout of design elements in a lock screen design. Participants were also instructed to imagine using their design on their own mobile devices. Each participant was given a tablet with Patternator and instructed to use it to design a lock screen with a repeating pattern. They could make their preferred pattern by dragging a button along an axis to move the design elements closer or farther apart, affecting the number of identical elements contained in their design (i.e., design density). We preselected the design element and controlled other settings, so that the minimum number (at the left anchor of the axis) and the maximum number (at the right anchor of the axis) of design elements were identical for each participant (see appendix).

Manipulation Check. Participants' ratings of how "rejected," "left out," and "ignored" they felt ($\alpha = .85$) were averaged. As expected, participants in the exclusion condition ($M = 3.90$, SD = 1.61) reported feeling more excluded than their counterparts in the inclusion condition ($M = 3.18$, SD = 1.34; $F(1, 108) = 6.48$; $p = .012$).

Visual Density. We used the number of elements contained in each design as an objective visual density index. While each whole design element was counted as 1, an element that was partially visible was counted as 1 if more than half was visible, and 0 otherwise. Consistent with hypothesis 1, participants in the exclusion condition ($M = 81.81$, SD = 64.31) incorporated more visual design elements in their design than their counterparts in the inclusion condition ($M = 57.98$, SD = 36.98; $F(1, 108) = 5.73$; $p = .018$; $\eta^2 = .04$).

Following the same coding procedure and scheme used in study 1A (see web appendix A for details), two independent coders judged the perceived visual density of each participant's design on a seven-point scale (1 = very low density, 7 = very high density). Again, we averaged their ratings ($r = .92$, $p < .001$) to form a perceived visual density index. Similarly, the lock screens designed by

participants in the exclusion condition were perceived as denser ($M = 4.57$, SD = 1.57) than those designed by participants in the inclusion ($M = 3.88$, SD = 1.27; $F(1, 108) = 6.48$; $p = .013$; $\eta^2 = .06$).

Discussion. Study 1B replicated the effect documented in study 1A of social exclusion on consumers' preference for visual density. It demonstrated that socially excluded participants used denser visual patterns in their mobile device lock screen designs than socially included participants. Unlike study 1A, in study 1B, the design task controlled the amount of motor acts involved in creating either a more densely or a more sparsely patterned design. As a result, this effect could not be confounded with efforts or distraction.

STUDY 2

Study 2A

Study 2A had two objectives. First, we tested the proposed underlying mechanism of the feeling of emptiness by directly testing its mediational role (hypothesis 2). By treating visual density as a between-subjects factor (i.e., either densely or sparsely patterned products), we predicted that social exclusion (vs. inclusion) would enhance the participants' preference for products with high visually dense patterns but not when the visual pattern on the product is not dense enough to serve to fill in the feeling of emptiness. We also expected the feeling of emptiness to mediate the observed effect. Second, as social exclusion has been found to lead to negative mood (Warburton, Williams, and Cairns 2006), we also examined mood as an alternative explanation in this study.

One hundred fifty-eight Hong Kong undergraduates (40 males, $M_{age} = 20.52$) participated in this study in exchange for a nominal payment. We excluded the data from one participant who failed our data screening criteria. Thus, we had valid data from 157 participants. This study used a 2 (social relationship: exclusion vs. inclusion; between-subjects) × 2 (product visual density: densely patterned vs. sparsely patterned; between-subjects) × 3 (t-shirt pattern; within-subjects) mixed design. First, participants completed a Cyberball game, an online ball-tossing exercise designed to manipulate the state of social exclusion (Williams, Cheung, and Choi 2000). They were told they would be grouped with two other anonymous players online and the three of them would play a virtual game of catching and throwing a ball. In fact, there were no other players connected and all of the ball tosses from "the other two players" were preprogrammed. Participants in the social exclusion condition received the ball for the first few throws and were then completely excluded as the game progressed. Participants in the social inclusion condition received and tossed the ball frequently. Next, they were asked to respond to the three manipulation-check questions used in the previous studies. Participants then rated their feeling of emptiness along three items (i.e., "I feel empty inside," "I feel as though part of me is missing," and "I feel like there is nothing inside me"; 1 = strongly disagree, 7 = strongly agree; $\alpha = .90$; Hazell 1984; Poreh et al. 2006). They also reported their mood using an eight-item mood scale (e.g., "I feel good," "I feel pleasant," "I feel sad" (reversed); 1 = not at all, 7 = extremely; $\alpha = .82$; Williams et al. 2000).

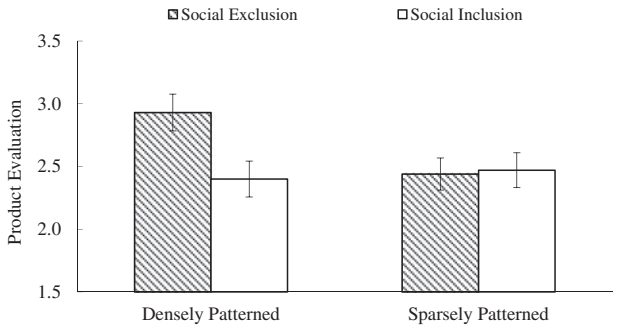
Next, participants completed a seemingly unrelated shopping task. They were instructed to imagine that they were purchasing a t-shirt and were asked to evaluate three t-shirts available in the store. Participants in the densely patterned condition saw three t-shirts with dense visual patterns, while those in the sparsely patterned condition saw three t-shirts with sparse visual patterns (see appendix). In a pretest conducted on a separate group of participants from the same pool ($N = 87$), we asked participants to rate the perceived level of density of the patterns of the three t-shirts in either the densely patterned or the sparsely patterned condition (1= very low density, 7 = very high density). We then averaged the participants' scores on their perceived level of density ($\alpha = .90$). A one-way ANOVA confirmed that participants in the densely patterned condition perceived patterns ($M = 5.06$, SD = .93) as significantly more visually dense than those in the sparsely patterned condition ($M = 2.84$, SD = 1.01; $F(1, 85) = 110.64$; $p < .001$). In the main study, participants saw the three t-shirts sequentially and responded to the questions "How much do you like the t-shirt with this pattern?" and "How attractive do you find a t-shirt with this pattern?" using a seven-point scale (1 = not at all, 7 = very much; $\alpha = .81$).

Manipulation Check. Participants' ratings of how "rejected," "left out," and "ignored" they felt ($\alpha = .93$) were averaged. As expected, participants in the exclusion condition ($M = 5.17$, SD = 1.35) reported feeling more excluded than their counterparts in the inclusion condition ($M = 2.75$, SD = 1.24; $F(1, 155) = 137.13$; $p < .001$).

Product Evaluation. A 2 × 2 × 3 mixed model ANOVA with repeated measures on the t-shirt pattern factor indicated that there was no three-way interaction. The results revealed a significant interaction effect only between social relationship and product visual density ($F(1, 153) = 4.15$; $p = .043$; $\eta^2 = .03$). Planned comparisons showed that participants in the exclusion condition evaluated the densely patterned t-shirts more positively ($M = 2.93$, SD = .85) than those in the inclusion condition ($M = 2.40$, SD = .88; $F(1, 153) = 6.86$; $p = .010$; $\eta^2 = .09$). However, the two groups did not differ in their evaluations of sparsely patterned t-shirts ($M_{exclusion} = 2.44$, SD = .80 vs. $M_{inclusion} = 2.47$, SD = .95; $F < 1$, NS). From another perspective, excluded participants had more favorable attitudes toward densely patterned than sparsely patterned t-shirts ($F(1, 153) = 6.44$; $p = .012$), whereas included participants did not differ in their attitudes toward

FIGURE 1

STUDY 2A: MEAN PRODUCT EVALUATION AS A FUNCTION OF SOCIAL RELATIONSHIP AND PRODUCT VISUAL DENSITY



the two types of patterned t-shirts ($F(1, 153) = .14$; $p = .712$; figure 1).

Feeling of Emptiness. As expected, a one-way (exclusion vs. inclusion) ANOVA showed that socially excluded participants reported a greater feeling of emptiness ($M = 4.02$, SD = 1.46) than their included counterparts ($M = 2.73$, SD = 1.24; $F(1, 155) = 35.20$; $p < .001$; $\eta^2 = .19$).

Moderated Mediation. Our hypothesis predicted that the feeling of emptiness would mediate participants' attitudes only toward densely patterned products and not toward sparsely patterned products. We tested this moderated mediation hypothesis using bootstrapping procedures (PROCESS model 15 with 5,000 bootstrapping samples; Hayes 2018). First, participants' evaluations of the three t-shirts were averaged to form a product evaluation index ($\alpha = .81$), on which the PROCESS model was performed. Consistent with our expectation, the effect of social exclusion on product evaluations was moderated by visual density and mediated by the feeling of emptiness (Index = –.07, SE (boot) = .04; 95% CI: [−.1771, −.0055]). Specifically, the indirect effect of the feeling of emptiness was significant only in the densely patterned condition (95% CI: [.0038, .1546]) and not in the sparsely patterned condition (95% CI: [−.0474, .0201]).

Mood. Consistent with prior research (Baumeister et al. 2007; Twenge et al. 2001), excluded participants were in a more negative mood ($M = 5.53$, SD = .92) than included participants ($M = 5.80$, SD = .82; $F(1, 163) = 3.97$; $p = .048$). However, their mood did not mediate the effect of social exclusion on product evaluations in either the densely patterned (95% CI: [−.0201, .0595]) or the sparsely patterned condition (95% CI: [−.0378, .0224]).

In study 2A, socially excluded participants evaluated densely patterned products more favorably than included participants, although this difference was not observed for sparsely patterned products. This finding revealed that the socially excluded were more favorable toward densely patterned products performing the function of filling the emptiness. Study 2A also confirmed our proposed mechanism by showing that excluded participants felt emptier inside than included participants. This feeling of emptiness mediated the effect of social exclusion on the evaluations of densely patterned products. Study 2A also helped to rule out mood as an alternative explanation for the observed effect. Finally, to rule out complexity, a post-test ($N = 62$) showed that the t-shirts patterns in the dense and sparse conditions did not differ in terms of perceived complexity ($p = .148$) (see web appendix B for details).

Study 2B

Study 2B aims to replicate the effect of social exclusion on visual density preference and the mediation role of the feeling of emptiness, using the measure of relative preference between sparsely and densely patterned products, among a group of participants from a different cultural background. One hundred twelve US participants (40 males, $M_{age} = 35.28$) were recruited from Amazon Mechanical Turk (MTurk) and completed the online study for a small monetary compensation. Data from three participants were excluded from the data analyses because they did not pass the data screening criteria, leaving us with a final sample of 109 participants. Participants were randomly assigned to one of two (social relationship: exclusion vs. inclusion) between-subjects conditions.

Participants first completed the same recall task that manipulated social exclusion and the same manipulation-check questions used in previous studies. The participants also rated their feeling of emptiness ($\alpha = .96$) in the same way as in previous studies. Participants were then asked to imagine that they were shopping for new curtains for their house. They were presented with two curtain patterns simultaneously: one with a sparse pattern that contained only a few design elements (curtain A), and the other with a dense graphic pattern containing many design elements (curtain B). The design element was an abstract curvy shape in black and white and was identical across the two conditions (see appendix). Participants indicated their preference between these two curtains (1 = I prefer curtain A more/I find curtain A more attractive, 7 = I prefer curtain B more/I find curtain B more attractive; $r = .95$, $p < .001$), with higher scores suggesting a greater preference for the densely patterned curtain. A pretest conducted among 34 participants from the same pool confirmed that curtain B ($M = 5.95$, SD = .91) was perceived as visually denser than curtain A ($M = 2.73$, SD = 1.16; $F(1, 32) = 81.78$, $p < .001$). The attractiveness, complexity, and perceived value of these two patterns, however, did not differ from each other ($ps > .131$).

Manipulation Check. Participants' ratings of how "rejected," "left out," and "ignored" they felt ($\alpha = .96$) were averaged. As expected, participants in the exclusion condition ($M = 4.61$, SD = 1.79) reported feeling more excluded than their counterparts in the inclusion condition did ($M = 2.81$, SD = 1.79; $F(1, 107) = 27.34$; $p < .001$).

Product Preference. Consistent with our prediction, results from a one-way (exclusion vs. inclusion) ANOVA showed that socially excluded participants reported a greater relative preference toward the densely patterned curtain over the sparsely patterned one ($M = 4.63$, SD = 1.97) than their included counterparts ($M = 3.69$, SD = 2.07; $F(1, 107) = 5.88$; $p = .017$; $\eta^2 = .05$).

Feeling of Emptiness. A one-way ANOVA showed that socially excluded participants reported a greater feeling of emptiness ($M = 4.11$, SD = 1.98) than their included counterparts ($M = 2.87$, SD = 2.09; $F(1, 107) = 10.12$; $p = .002$; $\eta^2 = .09$).

Mediation Analyses. We ran a mediator model (PROCESS model 4, Hayes 2018) with social exclusion as an independent variable, product preference as a dependent variable, and feeling of emptiness as the mediator. Consistent with hypothesis 2, the results revealed the significant indirect effect of a feeling of emptiness (95% CI: [–.8783, –.1580]).

In study 2B, socially excluded participants preferred more densely patterned products than did socially included participants, and this effect was mediated by a feeling of emptiness. Taken together, the results of studies 2A and 2B document the effect of social exclusion on increased preference for visual density and provide support for our proposed mechanism of a feeling of emptiness.

STUDY 3

Study 3 further tested the proposed emptiness-filling mechanism using a process-by-moderation approach (Spencer, Zanna, and Fong 2005). The physical action of filling was used as the moderator (hypothesis 3). Specifically, after we manipulated social exclusion versus inclusion, participants engaged in the physical action of either filling or emptying water bottles. If the observed effect was indeed driven by the feeling of psychological emptiness, then the effect should have been weakened by the physical action of filling, as it should have fulfilled the excluded participants' need to "fill in" the emptiness. Finally, we aimed to check the robustness of the proposed effect by replicating it using product patterns composed of various design elements.

Method

One hundred sixty-five Hong Kong undergraduates (33 males, $M_{age} = 20.00$) participated in this study for a nominal payment. The data from nine participants were dropped because they did not pass our data screening criteria, leaving a final sample of 156 participants. Participants were randomly assigned to one of four conditions in a 2 (social relationship: exclusion vs. inclusion) × 2 (physical action: filling vs. emptying) between-subjects design.

First, participants performed the same task that manipulated social exclusion and inclusion and responded to the same manipulation-check questions as in studies 1 and 2B. Next, they engaged in the physical act of filling versus emptying water bottles. Participants were told that they had been invited to evaluate two water bottles on their ergonomic user friendliness. Those in the filling condition were instructed to fill one bottle with water and then walk around the room carrying it. They then repeated the same process for the second water bottle. In contrast, participants in the emptying condition were given a full bottle of water and were told to empty it and then walk around the room carrying the empty bottle. They also repeated the same process for the second water bottle.

Next, all of the participants were presented with a photo of the abstract painting "Lady in the Tram Station" (1913) by Kazimir Malevich (1878–1935) and asked for their opinion. This painting was selected because it features various geometric visual elements clustered in the middle, representing a dense pattern (see appendix). A pretest conducted on 25 participants from the same pool validated the painting as highly visually dense ($M = 5.60$ for the item "the perceived level of density or compactness of the painting," where 1 = very low, 7 = very high; the mean was significantly different from the midpoint of 4, $p < .001$). Participants rated the painting on two measures: "How much do you like this painting?" and "How attractive do you find this painting?" (1 = not at all, 7 = very much; $r = .88$, $p < .001$).

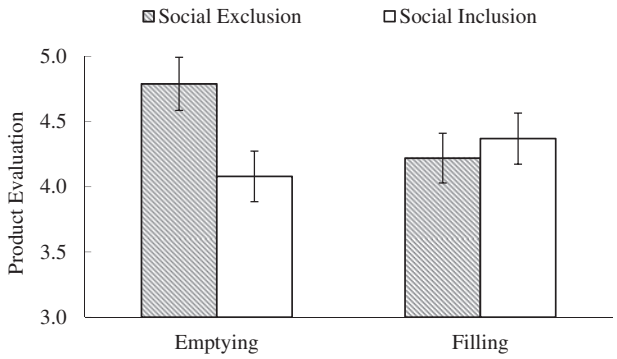
Results

Manipulation Check. Participants' ratings of how "rejected," "left out," and "ignored" they felt ($\alpha = .90$) were averaged. As expected, participants in the exclusion condition ($M = 4.03$, SD = 1.51) reported feeling more excluded than their counterparts in the inclusion condition ($M = 3.37$, SD = 1.37; $F(1, 154) = 8.18$; $p < .01$).

Product Evaluation. A 2 × 2 ANVOA showed only a significant interaction between social relationship and physical action ($F(1, 152) = 4.90$; $p = .028$; $\eta^2 = .03$). In addition, consistent with hypothesis 3, planned contrasts revealed that in the emptying condition, excluded participants evaluated the densely patterned painting more positively ($M = 4.79$, SD = 1.00) than included participants ($M = 4.08$, SD = 1.27; $F(1, 152) = 6.49$; $p = .012$; $\eta^2 = .09$), replicating the effect documented in studies 1 and 2; however, the effect did not occur among participants who

FIGURE 2

STUDY 3: MEAN PRODUCT EVALUATION AS A FUNCTION OF SOCIAL RELATIONSHIP AND PHYSICAL ACTION



filled their bottles with water. In this condition, excluded and included participants evaluated the painting similarly ($M_{exclusion} = 4.22$, SD = 1.21 vs. $M_{inclusion} = 4.37$, SD = 1.37; $F < 1$, NS). From another perspective, socially excluded participants who emptied water bottles evaluated the painting more favorably than those who filled water bottles ($F(1, 152) = 4.19$; $p = .042$). However, socially included participants did not differ in their attitudes toward the painting regardless of whether they emptied or filled water bottles ($F(1, 152) = 1.16$; $p = .283$; see figure 2).

Discussion

In study 3, we found that the physical act of filling water bottles weakened the previously observed effect of social exclusion on participants' preference for visual density, presumably because the physical action of filling something mitigated their feeling of emptiness and subsequently reduced the need for visual density. Therefore, the moderation effect of the physical act of filling water bottles further supported our proposed mechanism of feeling empty.

One may wonder why the act of emptying water bottles in the emptying condition did not increase the desire for the visually dense painting among included participants, given that the motor act of emptying something could possibly be metaphorically associated with psychological emptiness. According to previous studies of embodiment, the activation of a metaphorical link is subjective to "motive-relevancy" (Landau et al. 2010), and is "highly sensitive to perceivers' goals" (Krishna and Schwarz 2014). Therefore, we conjecture that although filling bottles could provide a psychological fillingness among excluded participants who had the motivation to fill the self, emptying bottles did not activate a complementary process of "emptying the self" among included participants, as they had no such motivation. Consequently, we did not observe higher attitudes toward the densely patterned painting when included participants engaged in the motor act of emptying or filling water bottles.

One may also wonder whether filling and carrying around full bottles can be perceived as a more positive experience than emptying bottles and carrying them around, which may alleviate the pain of social exclusion. We conducted a post-test ($N = 62$) to test this alternative explanation. Participants rated their mood using the 20-item PANAS scale (Watson, Clark, and Tellegen 1988) after performing the same motor act involved in the filling or emptying condition as in the main study. Separate ANOVAs on the respondents' overall positive and negative mood state indices revealed no significant effects of the different motor acts ($ps > .805$; see web appendix C for details). Therefore, we concluded that the effect observed in study 3 was unlikely to be influenced by mood under different conditions.

STUDY 4

Study 4 tested another factor that could influence the effect of social exclusion on consumer attitudes toward densely patterned products by providing an opportunity to fill the inner void. As previously argued, the perception of a busy schedule can be seen as density in the temporal dimension and thus potentially alleviate the feeling of emptiness (Fogarty 2000). If the effect of social exclusion on visual density preference is indeed driven by a feeling of psychological emptiness, then the effect should be weakened when participants perceive themselves to be in a situation in which they have many tasks packed in a busy schedule. We denoted this as a situation of temporal density. Therefore, study 4 tested the moderation effect of perceived temporal density, as stated in hypothesis 4.

Method

Two hundred twenty-four UK consumers (74 males, $M_{age} = 38.74$) were recruited from the online crowdsourcing platform Prolific Academic (Peer et al. 2017) and completed the survey in exchange for a nominal payment. The data from nine participants were excluded because they failed our data screening criteria, leaving us with a final sample of 215 participants. Participants were randomly assigned to one of four conditions in a 2 (social relationship: exclusion vs. inclusion) × 2 (temporal density: busy vs. baseline) between-subjects design.

First, participants performed the same recall task that manipulated social exclusion and inclusion, and then answered the same manipulation-check questions previously used. Next, participants rated their feeling of emptiness ($\alpha = .93$) in the same way as in studies 2A and 2B. They then performed a seemingly unrelated "Mental Simulation Task" that manipulated temporal density by reading a scenario depicting a day in the life of a person named Chris and imagining themselves to be in the role of Chris.

Participants in the busy condition were presented with a scenario describing Chris's busy day, in which s/he was busy with lots of mundane household chores, whereas in the baseline condition participants were presented with only general information about Chris (see web appendix D). A pretest conducted on 69 participants from the same pool confirmed that people encountering the scenario describing Chris's busy day reported higher perceived temporal density ($M = 4.60$, SD = 1.44) than those in the baseline condition ($M = 3.18$, SD = 1.20; $F(1, 67) = 19.85$; $p < .001$; 1 = low temporal density, 7 = high temporal density). We also asked participants in the pretest to rate perceived social status and social connections to detect whether the manipulation of temporal density (i.e., having a busy day) raised the perception of having a higher social status or more social interactions. We found no difference between the busy and the baseline conditions along perceived social status ($M_{busy} = 3.49$, SD = 1.16 vs. $M_{baseline} = 3.55$, SD = 1.12; $F < 1$, NS; $\alpha = .81$; Bellezza, Paharia, and Keinan 2017) and perceived level of social interactions ($M_{busy} = 3.20$, SD = 1.74 vs. $M_{baseline} = 2.74$, SD = 1.59; $F(1, 67) = 1.33$; $p = .254$; $\alpha = .91$; Duclos et al. 2013).

Next, participants performed a product evaluation task. They were asked to imagine that they were shopping for new curtains for their house and to evaluate two curtains with different visual patterns. Participants were then presented with two curtain patterns simultaneously: one with a sparse pattern that contained only a few design elements (curtain A), and the other with a dense graphic pattern containing many design elements (curtain B). The design element, a large, wavy figure composed of various abstract shapes (see appendix), was identical across both conditions. A pretest conducted on 38 participants from the same subject pool confirmed that participants perceived curtain B ($M = 6.21$, SD = 1.26) as more visually dense than curtain A ($M = 2.92$, SD = 1.17; $t(37) = 12.22$; $p < .001$). However, the perceived value and attractiveness did not differ for the two patterns ($ps > .176$). Then, participants indicated their relative preference toward the two patterns along the same scale used in study 4 ($r = .96$, $p < .001$), with higher scores suggesting a greater preference for the densely patterned curtain.

Results

Manipulation Check. Participants' ratings of how "rejected," "left out," and "ignored" they felt ($\alpha = .94$) were averaged. As expected, participants in the exclusion condition ($M = 3.70$, SD = 1.71) reported feeling more excluded than their counterparts in the inclusion condition did ($M = 2.57$, SD = 1.69; $F(1, 213) = 23.55$; $p < .001$).

Product Preference. A 2 × 2 ANOVA showed a significant interaction between social relationship and temporal density ($F(1, 211) = 4.11$; $p = .044$; $\eta^2 = .02$). In addition, consistent with hypothesis 4, planned contrasts showed that in the control condition, participants' relative preference for the densely patterned curtain over the sparsely patterned curtain was higher when they felt socially excluded ($M = 4.28$, SD = 1.77) than when they felt included ($M = 3.16$, SD = 1.88; $F(1, 211) = 9.48$; $p = .002$; $\eta^2 = .04$), which replicates the findings of our previous studies; however, the effect did not occur among participants in the busy condition ($M_{exclusion} = 3.23$, SD = 1.85 vs. $M_{inclusion} = 3.14$, SD = 1.97; $F < 1$, NS). From another perspective, the excluded participants preferred the densely patterned curtain over the sparsely patterned curtain more if they were in the baseline condition than if they were in the busy condition ($F(1, 211) = 9.21$, $p = .003$). However, the relative preference of included participants did not differ between the busy and the baseline condition ($F < 1$, NS; see figure 3).

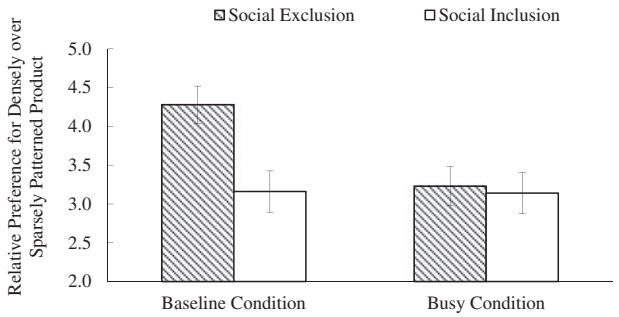
Moderated Mediation. A one-way (exclusion vs. inclusion) ANOVA showed that, as expected, socially excluded participants reported a greater feeling of emptiness ($M = 2.86$, SD = 1.76) than their included counterparts ($M = 2.21$, SD = 1.50; $F(1, 213) = 8.41$; $p = .004$). We predicted that the feeling of emptiness would mediate the participants' preference for the densely patterned curtain over the sparsely patterned curtain in the baseline condition, but not in the busy condition when participants' feeling of emptiness was filled with temporal density (i.e., the perception of a busy schedule). We tested this moderated mediation hypothesis using bootstrapping procedures (multiple-mediator PROCESS model 15 with 5,000 bootstrapping samples; Hayes 2018). Consistent with our expectation, the effect of social exclusion on density preference was moderated by temporal density and mediated by the feeling of emptiness (Index = .29, SE (boot) = .14; 95% CI: [.0795, .6686]). Specifically, the indirect effect of the feeling of emptiness was significant only in the baseline condition (95% CI: [.0367, .4705]), and not in the busy condition (95% CI: [–.2854, .0248]).

Discussion

While the previously observed effect of social exclusion on consumer preference for visual density was replicated in the control condition, this effect disappeared when consumers perceived themselves as having a busy schedule. This moderation effect further supported our proposed emptiness-filling mechanism. The findings suggested that the perception of temporal density (i.e., imagining a busy schedule with many tasks) could also compensate for the excluded participants' feeling of psychological emptiness, which weakens their need for visual density. As previously mentioned, we created both the dense and sparse patterns used in this study by replicating the same design component more (fewer) times in the dense (sparse) pattern. As the design component looked complex and there were

FIGURE 3

STUDY 4: MEAN PRODUCT PREFERENCE AS A FUNCTION OF SOCIAL RELATIONSHIP AND TEMPORAL DENSITY



significant overlaps between design components in the densely patterned curtain image, this could affect the higher perceived complexity of the dense pattern compared with the sparse one. A post-test conducted on a separate group of participants from the same pool ($N = 60$) confirmed that the dense curtain pattern was perceived as more complex than the sparse one ($p = .004$; see web appendix E). We speculate that this result occurred because the design element itself (i.e., a wavy figure) in the curtain looks somewhat complex and there is significant overlapping of design components in the densely patterned curtain image. Given the converging evidence across studies, however, we concluded that the observed effect of social exclusion on the preference for the two patterned curtains was grounded on their distinct levels of density.

STUDY 5

So far, we have presented robust evidence that socially excluded consumers show a higher preference for products with visually dense patterns to cope with the feelings of emptiness triggered by social exclusion. However, one question that we have not answered is whether consuming densely patterned products will really make consumers feel less empty. Prior research has documented that people engage in filling-in activities in various ways to alleviate the feeling of emptiness, such as hoarding (McKinnon, Smith, and Hunt 1985) and overeating or drinking (Fogarty 2000; Meehan 2007). We are curious whether a similar alleviation effect happens when socially excluded people have the opportunity to deeply review and process visually dense patterns—that is, from a consumer well-being perspective, whether we should really encourage socially excluded consumers to consume more products with visually dense patterns. Study 5 tackles this issue by measuring socially excluded consumers' feelings of emptiness before and after they carefully review a series of densely patterned products.

Method

One hundred ninety-eight Hong Kong undergraduates (49 males, $M_{age} = 20.83$) participated in the study in exchange for a nominal payment. We dropped the data from five participants who did not pass the data screening criteria. Thus, the final valid sample for this study had 193 participants. Participants were randomly assigned to one of four conditions of a 2 (social relationship: exclusion vs. inclusion) × 2 (product visual density: densely patterned vs. sparsely patterned) between-subjects design.

To manipulate participants' real experience of social exclusion versus inclusion, we first instructed participants to complete an ostensible "groupmate finding task" (Buckley, Winkel, and Leary 2004; Nezlek et al. 1997). In this task, participants were asked to find groupmates for a group task to be completed later in the study. Each participant needed to introduce themselves online to three potential groupmates by answering a series of questions (e.g., "What are your hobbies?" "How would you describe your personal style?") and each of their potential groupmates would decide whether or not to form a group with the participant. After answering the questions, participants in the exclusion condition received three preprogrammed rejection messages from the three potential groupmates (e.g., "I am not that interested in working with you as a group"); participants in the inclusion condition received three acceptance messages (e.g., "I want to be your groupmate!"). Participants then completed the same manipulation checks ($\alpha = .90$) and evaluations of feelings of emptiness ($\alpha = .92$) used in previous studies.

Next, participants were asked to complete a "filler task" in which they need to review a product catalog from a home decor company. The cover story informed them that they were checking the products from a home decor company to decide which products they would purchase for their houses. This instruction incentivized participants to carefully review the product patterns that they might see every day in their houses. We used carefully reviewing a product catalog containing dense (sparse) patterns as a proxy for consumption of densely (sparsely) patterned products. The catalog contained a series of patterns for cushions, curtains, and carpets, with either dense patterns (the densely patterned condition) or sparse patterns (the sparsely patterned condition). Importantly, the participants were requested to review the patterns carefully for about three minutes and try to remember as many patterns as possible. A pretest conducted on a separate group of participants from the same pool ($N = 38$) confirmed that the perceived level of density of the patterns in the densely patterned condition ($M = 6.00$, SD = .92) was indeed much higher than it was for the patterns in the sparsely patterned condition ($M = 2.83$, SD = 1.10; $F(1, 36) = 93.70$, $p < .001$).

After reviewing the product catalog in detail for around three minutes, we checked whether reviewing product

patterns with visual density alleviated participants' feelings of emptiness by measuring participants' feelings of emptiness again using the same three-item scale ($\alpha = .91$). Afterward, participants were told that the planned group project was cancelled due to a technical problem, and then received their payment.

Results

Manipulation Check. As expected, participants in the social exclusion condition felt more excluded ($M = 4.79$, SD = 1.41) than those in the inclusion condition ($M = 1.56$, SD =.98; $F(1, 191) = 350.57$, $p < .001$).

Emptiness before and after Consuming Products with Different Visual Densities. Replicating our previous findings, excluded participants perceived greater feelings of emptiness ($M = 3.15$, SD = 1.54) than included participants ($M = 1.72$, SD = .98; $F(1, 191) = 62.22$, $p < .001$) before reviewing the product catalog containing visually dense patterns. We then investigated whether reviewing the densely patterned product catalog alleviated socially excluded participants' feelings of emptiness. We conducted a 2 (social relationship: exclusion vs. inclusion) × 2 (visual density: dense vs. sparse) × 2 (time: before vs. after reviewing product catalog) mixed-design ANOVA with time as the within-subjects factor. Results showed significant main effects of social relationship ($F(1, 189) = 46.25$, $p < .001$) and time ($F(1, 189) = 12.19$, $p = .001$), significant interaction effects of time × social relationship ($F(1, 189) = 36.68$, $p < .001$) and time × density ($F(1, 189) = 9.36$, $p = .003$), and a significant three-way interaction ($F(1, 189) = 9.78$, $p = .002$; $\eta^2 = .04$; see figure 4).

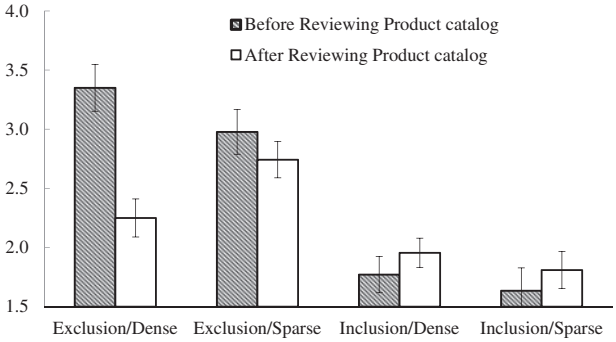
To understand the nature of these effects, we examined the change in the feelings of emptiness across the four between-subjects conditions (social relationship × visual density). As expected, excluded participants reported a significant decrease in perceived emptiness after reading the densely patterned product catalog ($M_{before} = 3.35$, SD = 1.61 vs. $M_{after} = 2.25$, SD = .92; $F(1, 189) = 39.74$, $p < .001$; $\eta^2 = .20$). This effect was not observed among socially excluded participants who read the sparsely patterned product catalog ($M_{before} = 2.98$, SD = 1.47 vs. $M_{after} = 2.74$, SD = 1.14; $F(1, 189) = 2.69$, $p = .103$), socially included participants who read the densely patterned product catalog ($M_{before} = 1.77$, SD = 1.02 vs. $M_{after} = 1.96$, SD = 1.01; $F(1, 189) = 2.51$, $p = .115$), and socially included participants who read the sparsely patterned product catalog ($M_{before} = 1.63$, SD = .92 vs. $M_{after} = 1.81$, SD = .98; $F(1, 189) = 1.42$, $p = .236$).

Discussion

Study 5 confirmed that carefully reviewing a series of densely patterned products could alleviate feelings of emptiness among socially excluded consumers. The excluded participants reported a significantly lower feeling of emptiness after a lengthy reading of the product catalog full of densely patterned products, compared with that before reading the catalog. No such effect was found among included participants. There was also a trend in the exclusion/sparse conditions that the feeling of emptiness was lower after participants reviewed the product catalog than before they reviewed it (*M*s = 2.98 vs. 2.74, $p = .103$), though the difference did not reach significance. We conjecture that the product category reviewing task temporarily diverted the participants' attention from the experience of exclusion and subsequently reduced feelings of emptiness. As such effect should contribute to the decreased feeling of emptiness in exclusion/dense conditions with a similar amount, we performed a post-hoc 2 (visual density: dense vs. sparse) × 2 (time: before vs. after reviewing product catalog) mixed-design ANOVA in the social exclusion conditions only. The results revealed a significant main effect of time ($F(1, 82) = 31.62$, $p < .001$) and a significant interaction effect of time × density ($F(1, 82) = 13.28$, $p < .001$). It indicated that the dense patterns reduced feelings of emptiness to a greater extent than the sparse patterns. Thus, reviewing densely patterned products indeed lessened the feelings of emptiness for socially excluded consumers.

FIGURE 4

STUDY 5: FEELING OF EMPTINESS AS A FUNCTION OF SOCIAL RELATIONSHIP, VISUAL DENSITY, AND MEASURING TIME



GENERAL DISCUSSION

The seven studies reported in the current article offer new perspectives on how and why social exclusion leads to more favorable attitudes toward densely patterned products. Compared with nonexcluded participants, socially excluded participants were more likely to design a case (study 1A) and a lock screen (study 1B) for mobile devices with high-density visual graphics. They were also more likely to provide more favorable evaluations of the t-shirts

with a dense graphic design (study 2A), the curtain and home decor items with a dense visual pattern (studies 2B and 4), and the painting with a dense visual layout (study 3). Furthermore, our studies provided evidence that this effect is driven by a feeling of psychological emptiness among socially excluded people. Specifically, studies 2A and 2B showed the mediating role of the feeling of emptiness with direct mediation tests. Studies 3 and 4 used the moderation approach to provide further evidence for our proposed emptiness mechanism. These two studies revealed that the effect was attenuated when socially excluded consumers were able to alleviate the feeling of emptiness in other ways, such as engaging in a real filling action (study 3) and perceiving themselves to be in a state of temporal density (study 4). Finally, study 5 illustrated an important substantive implication of our findings—that is, the effectiveness of consuming visually dense patterned products at relieving consumers' feelings of emptiness from social exclusion.

This research extends the literature on social exclusion in two directions. First, it adds to the repertoire of behavioral consequences of social exclusion in the consumption context and builds on prior research of social influence on aesthetic preference (Mourey, Olson, and Yoon 2017) by linking social exclusion to visual preference. Following prior research suggesting that the metaphorical link between physical input and abstract concepts can be bidirectional (Zhong and Liljenquist 2006), we predict and document the novel effect of social exclusion on consumer preference for visual density. This finding contributes to research on how social exclusion can affect people's physiological functions and physical reactions (Zhong and Leonardelli 2008). Second, based on consumers' use of "emptiness" to metaphorically describe their feelings after experiencing social exclusion, as well as prior evidence of how social exclusion leads to the loss of social relationships and intensifies the feeling of meaninglessness (Mead et al. 2011), we predicted and showed that socially excluded people experience the feeling of emptiness as a novel symptom of the threatened belongingness and meaning.

This research also contributes to the literature by exploring the effect of aesthetic design on consumer behavior (Deng and Kahn 2009; Hagtvedt and Patrick 2008; 2014; Hoegg and Alba 2011; Hoegg et al. 2010; Patrick and Hagtvedt 2011). Focusing on the understudied area of visual density, it introduces social relationships as a novel psychological antecedent of consumers' visual density preference. Although the effect of visual density on consumer perception is an important dimension of visual marketing, little research has investigated it. Our work fills this gap by focusing on the effect of visual density in the context of product aesthetic design. It reveals that consumers may develop a preference for products with dense visual patterns because social exclusion triggers a psychological need that goes beyond their taste or aesthetic preference.

Finally, the current findings enrich our understanding of the feeling of emptiness, which has been investigated in clinical psychology (Cushman 1990; Hazell 1984). Research in this area has documented how people fill themselves up to alleviate their psychological emptiness—for instance, by overconsuming food, shopping, maintaining a busy daily life, abusing drugs, and hoarding material objects (Fogarty 2000; Meehan 2007). Our research suggests a new means for consumers to address the feeling of emptiness: they can use the density of visual images in product aesthetics to lessen their feeling of emptiness, the effectiveness of which was supported in study 5. The demonstration is in line with past findings that when people are not able to acquire social connections, some of them may fill their homes with tangible comforting objects—known as "hoarding behavior" (McKinnon et al. 1985)—or turn to physiological fillingness through overeating or drinking (Fogarty 2000).

Our findings also suggest several directions for future research. First, examining whether the feeling of emptiness is always followed by the motivation to fill the inner void is a valuable area of study. Are there situations when the feeling of emptiness is not threatening, or may even be pleasant? Buddhism and Daoism posit that "all things under heaven are born from being and being is born from emptiness" (Cheng 2011). Similarly, absolutists construe emptiness as the ultimate reality or the absolute *noumena* (Li 2016). In short, they assume that emptiness is not a negative state but an affirmation of existence. Can the effect diminish or even be reversed, then, among Buddhists, Daoists, and absolutists? This intriguing research question merits further investigation. Second, the products used in our studies were chosen because their appearance is an important factor in purchase decisions. Therefore, it would be worth exploring whether the effect persists for products that are judged more on their functional (e.g., ergonomics, durability, recyclability; Bloch 1995) than their aesthetic attributes. Finally, while we study the effect of social exclusion on visual density preference in the domain of product aesthetic design, future research could explore whether the effect can be generalized to other visual marketing stimuli, such as brand logos, print advertisements, or store decorations.

Our findings also have practical implications. While the graphic design of patterns on products and packaging is usually based on aesthetic considerations, such as how visually appealing these patterns are, our findings suggest that marketers should also consider consumers' psychological state. For example, packaging can be developed with dense patterns or designs for products that target consumers who are more likely to experience loneliness, such as senior citizens and new immigrants. This may help them to feel that they have "filled" their inner void by using a product with a dense visual design. Based on the results from study 5, our findings can also be used by art therapists, for example, to offer dense visual forms of art therapy to patients who have suffered a significant social loss (e.g., divorcées, widows, and victims of discrimination). Working on dense art designs may provide them with a

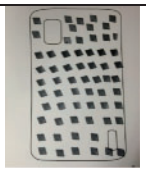
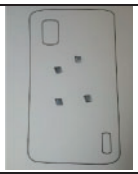
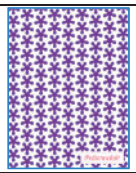
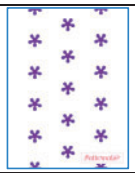
better way to cope and be a more effective therapeutic activity than working on simpler designs.

DATA COLLECTION INFORMATION

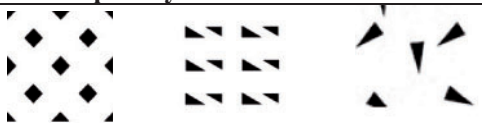
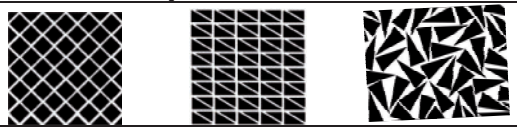
The authors jointly supervised the data collection and analyzed the data for the seven studies reported. Study 1A was conducted in April 2016 and study 1B in July 2017 by research assistants at Hong Kong Baptist University. Study 2A was conducted in November 2015 by research assistants at The University of Hong Kong. Study 2B was conducted in September 2018, through Amazon Mechanical Turk. Study 3 was conducted in March 2016 by research assistants at The University of Hong Kong. Study 4 was conducted in August 2017 through the Prolific Academic website. Study 5 was conducted in October 2018 by research assistants at Hong Kong Polytechnic University.

APPENDIX
STUDY STIMULI

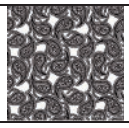
SAMPLE DESIGNS IN STUDY 1

Study 1A			Study 1B	
Exclusion	Inclusion	Neutral	Exclusion	Inclusion
				

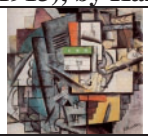
PATTERNS USED IN STUDY 2A

Sparsely Patterned Condition	Densely Patterned Condition
	

PATTERNS USED IN STUDY 2B

Sparsely Patterned Condition (Curtain A)	Densely Patterned Condition (Curtain B)
	

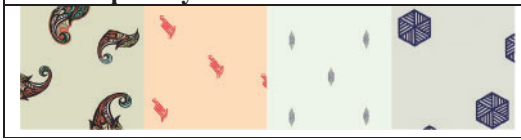
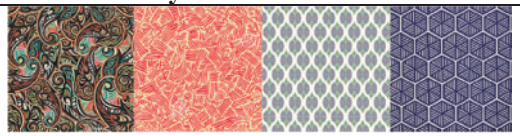
PAINTING USED IN STUDY 3

Lady in the Tram Station (1913), by Kazimir Malevich (1878-1935)


PATTERNS USED IN STUDY 4

Sparsely Patterned Condition (Curtain A)	Densely Patterned Condition (Curtain B)
	

SAMPLE PATTERNS USED IN STUDY 5

Sparsely Patterned Condition	Densely Patterned Condition
	

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