

PRODUCT EXPRESSION AND SELF-CONSTRUAL: DOWNSTREAM EFFECTS OF CONNECTED SHAPES ON SOCIAL CONNECTEDNESS

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1. Introduction

The visual form of a product plays a critical role in determining consumer responses and product success. Product appearance is important especially when consumers assess functionality, semantics, ergonomics, production feasibility, and social factors related to the product [Postrel 2003]. To attract, inform and influence consumers, designers use a variety of approaches during activities involving form generation [Baxter 1995]. Empirical research has been devoted to examining how consumers respond to product appearance and derive meaning from formal product features. However, these efforts have been limited to eliciting product-specific responses for the purpose of satisfying consumers and promoting product success. Given this focus on consumers' responses to various aspects of the product, relatively little attention has been devoted to understanding how product expression influences more downstream judgments and behaviors that are ostensibly unrelated to the product.

In the present research, we apply a priming paradigm from the psychology literature to explore how product expression influences thoughts and behaviors in the social domain. In particular, we investigate the potential for physical design features of products to influence an individual's perception of the self (i.e., self-construal), which is an important determinant of various social behaviors. In the next section, we briefly review the priming literature and discuss how the design features of everyday products can nonconsciously influence social behavior. In so doing, we propose a novel hypothesis regarding the downstream effect of product expression.

2. Conceptual background

2.1 Nonconscious influence of products in daily life

Priming research in marketing and psychology has demonstrated that environmental artifacts become nonconscious sources of influence on social interaction: the mere presence of artifacts can activate associations and mental representations, as well as influence subsequent behaviors in line with these mental representations. For instance, mere exposure to a gun increased aggression among college students [Berkowitz and Lepage 1967] and exposure to objects relevant to a business context (e.g., fountain pens and briefcases) elicited the concept of competition and made subjects perceive ambiguous social interaction as less cooperative [Kay et al. 2004]. Likewise, green products can stimulate people to behave altruistically [Mazar and Zhong 2010], and exposure to the Apple logo results in increased creativity [Fitzsimons et al. 2008]. This research has focused on psychological

meanings of the target object, but relatively little attention has been given to the potential impact of the physical features of objects on nonconscious or implicit processes.

A growing body of research on embodied cognition has revealed interesting interactions between people's understanding of abstract social concepts and their experiences with the physical world. Subtle manipulation of perceptions or sensations of concrete concepts could produce a metaphoric transfer effect on social perceptions. People who simply held a warm beverage described a target individual as having a warmer personality [Williams and Bargh 2008]. Similarly, Ackermam, Nocera and Bargh [2010] showed that tactile features of products such as hardness, weight and texture can influence impressions during social interaction. For example, people sitting on hard chairs are more likely to be rigid in negotiating the sale price of a new car, and people evaluate job candidates more seriously when they review their resumes on a heavy clipboard rather than a light one. People who have completed a difficult puzzle tend to view a subsequent social interaction as being more difficult, harsh and argumentative. These findings illustrate the significant role played by physical features of objects in activating mental associations across multiple domains.

2.2 Downstream effects of product expression

Formal product features reflect meanings that designers intend to communicate [Krippendorff 1989]; thus particular design features communicate specific constructs and associations to consumers. For example, angular shapes represent confrontation between a focal stimulus and its surroundings, thus creating an *aggressive* connotation, whereas rounded shapes present no such clash between stimulus and surroundings, hence a *harmonious* connotation. People also generally perceive rounded logos as more *harmonious* and less *aggressive* than angular logos [Zhang et al. 2006]. Can these design-related meanings have downstream consequences for our daily lives?

Given that a) particular design features hold representation and meaning, and b) judgments and perceptions are affected by environmental cues that trigger cognitive accessibility, it is reasonable to predict design-generated priming effects. Exposure to specific design features may communicate specific constructs, which in turn influences subsequent responses. Our pilot data show that people perceive an image of a person in a *rounded* picture frame as having a more *flexible, cooperative* and *sympathetic* personality than the identical image in an *angular* picture frame (see Figure 1), suggesting that design meanings could have downstream effects on social perception in a metaphor-consistent way.

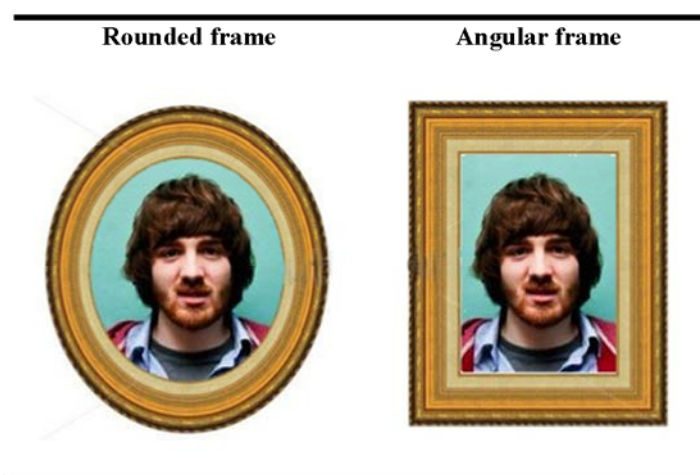


Figure 1. The impact of rounded vs. angular shapes on personality judgment: A person in a rounded photo frame (left) was perceived as being more flexible and cooperative than the person in an angular photo frame (right)

In the present research, we investigate the effects of product expression on perceptions of the self (i.e., self-construal) for two reasons. First, how individuals define themselves influence how they think, feel, and interact with others; self-construal has been shown to affect social interactions [Van Baaren

et al. 2004] and many other behaviors. Second, self-construal is sensitive to the context or environment and is therefore likely to be susceptible to the implicit effects of design elements in products. In the next section, we review self-construal in more detail.

2.3 Self-construal

Self-construal is a social psychological term that refers to the way that individuals conceptualize themselves in relation to others. Two primary types of self-construal have been identified: independent and interdependent [Markus and Kitayama 1991]. Individuals with an independent self-construal tend to see the self as stable and detached from their social context, and value self-promotion, autonomy, and uniqueness. Those with an interdependent self-construal, on the other hand, see the self as more flexible and intertwined with the social context, and value maintaining group harmony and fitting in. This concept of self has been shown to influence cognitive styles, aesthetic preference [Zhang et al. 2006], motivation and social behaviors [Van Baaren et al. 2004]. It is perhaps not surprising, therefore, that individuals with an interdependent self-construal exhibit a stronger preference for closeness with others, both emotionally, psychologically, and physically compared to individuals with an independent self-construal. Interdependent self-construal is thus associated with a more other-focused and, hence, pro-social orientation [Ashton-James et al. 2007].

Although self-construal seems to vary across individuals and cultures, self-construal can be manipulated by nonconscious priming manipulations such as through family anecdotes, national icons, and collective pronouns. For example, people's self-construal becomes more interdependent after being asked to circle all pronouns in a passage that includes instances of "we" and "us" compared with that of people who search for pronouns in a passage containing instances of "I" and "me".

Against this theoretical backdrop, we speculate that perceiving design elements as being physically connected would influence the extent to which individuals perceive themselves as being connected to others. In other words, exposure to a product expression of "connectedness," once the viewer makes sense of such product expression through its specific design elements and characteristics, may lead to greater interdependent self-construal. Based on the 'design as communication' perspective, we reasoned that connectedness is conveyed via particular design features. In Study 1, we seek to define design features that can visually express connectedness. In Study 2, we aim to demonstrate the impact of those connectedness cues on self-construal.

3. Study 1

The goal of this study was to identify the design features that represent connectedness. The meaning of connectedness can be represented in various ways, but we were most interested in how the theme of connectedness is physically embedded in product forms through design features, especially in terms of joint relationships between design elements. We sought to identify design dimensions contributing to the meaning of connectedness and to understand the design characteristics of each dimension.

3.1 Method

Study 1 involved a task where subjects were asked to design visual images expressive of connectedness. A total of 39 student participants (29 females, mean age=19) from the University of Michigan were recruited. They were informed of a company that was about to launch a new product and wanted to have a logo/trademark that visually communicated the new brand slogan, *connectedness*. They were told to imagine that they were designers who had to create a brand logo and to design a logo/trademark that visually communicated the concept of connectedness by drawing visual images on the provided sheets. They were asked not to communicate the concept through words (e.g., the word 'connectedness') but rather to communicate the concept abstractly through geometric or organic shapes. They were asked to generate as many design ideas as they could for 15 minutes and to indicate the final design (or designs) that they wished to present to the company.

Table 1. Coding scheme and results

Dimensions	Frequency results	
The number of elements	Singular (0%) / Multiple (100%)	
Similarity	Heterogeneous (22%) / Homogeneous (78%)	
Repetition	Not repetitive (13%) / Repetitive (87%)	
Proximity	Distant (4%) / Close (96%)	
Overall symmetry	Asymmetrical (35%) / Symmetrical (65%)	
Overall shape	Angular (39%) / Rounded (61%)	
Overall balance	Instable (0%) / Balanced (100%)	
A type of joint relationship		Examples
	No joint (4%)	
	Joint on a common edge (9%)	
	Intertwined (9%)	
	Linked (17%)	
	Superimposed/overlapped (22%)	
	Complementarity/ concavity & convexity (39%)	

Among all 49 logos that participants indicated as final designs, we removed 26 logos that had typographies (e.g., the word ‘connectedness’) and symbolic meanings that were external to formal styles (e.g., images of people holding hands, people talking on the phone, globes, and power buttons).

We reasoned that such typographic or symbolic logos do not provide any information about visual characteristics of the logo designs. After excluding 26 logos, a total of 23 logos were used in analysis. We recruited two independent coders with industrial design background to rate each logo on a number of dimensions using bipolar adjectives in a dichotomous format. The dimensions included the number of and similarity between shape elements, spatial relationship (i.e., proximity), synthesizing principles such as balance and symmetry, and types of joint relationship (see Table 1). We also asked the coders to evaluate each logo on a 5-point scale as to how well it represented the theme of connectedness.

3.2 Results and discussion

Inter-coder agreement was relatively high (80%). When disagreements between the coders arose, a third coder reconciled them. We used frequencies to identify common characteristics in each dimension. The majority of the logos were perceived as having *multiple* and *homogenous* shape elements: they used the same elements *repetitively* arranged in *close* proximity. The overall shapes of the logos were generally perceived as *symmetrical*, *rounded* and *balanced*. In terms of joint relationships between the individual elements, most logos had shape elements that were locked in complementary relationships (e.g., concavity and convexity) (39%) or superimposed/overlapped on each other (22%) or linked (17%). Figure 2 shows four logos that had the highest ratings (mean = 4.5) on effective representation.

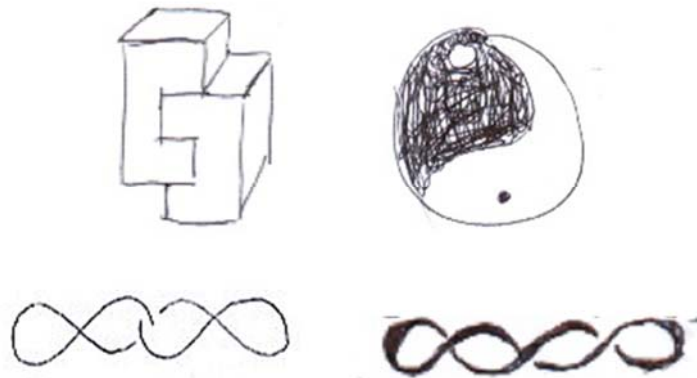


Figure 2. Logos perceived as effectively representing connectedness

We found that most participants visually expressed the concept of connectedness through specific types of physical continuity or joints between multiple, similar shape elements. The types of joint relationships included complementarity, link, and intertwinement; we believe that these joint relationships in design features factor significantly in visually communicating the concept of connectedness. In other words, manipulating joint relationships could be a key dimension in priming connectedness.

4. Study 2

Study 2 examined the effect of connectedness cues on self-construal. This study provides evidence that particular design features (i.e., connectedness) as implemented in common products can prime self-construal such that connectedness cues (compared to control cues) will activate more interdependent self-construal.

4.1 Method

4.1.1 Stimuli (connectedness cues)

Based on design characteristics of connectedness that were identified in Study 1, we adopted images of real products with design characteristics of connectedness: three “connected” objects and three counterpart objects (i.e., control) as shown in Figure 3. The connected objects were a set of products having a complementary relationship to complete a form or function, whereas the control objects

lacked the cues for complementarity but were otherwise matched to the connected objects in terms of standard design features such as the number of elements, function, similarity and proximity. These objects were pretested to ensure that they were perceived as different in the design dimensions of interest. A total of 157 subjects (60% female, mean age=30), who did not participate in the main study, participated in the pretest. Each object was evaluated on 7-point measures of design principles, familiarity and liking. The connected objects ($M=5.52$, $SD=0.95$) were perceived as more interlocking, fitting together, and complementary than the control objects ($M=4.90$, $SD=1.08$, $t(150)=3.82$, $p<0.001$). The connected images ($M=5.15$, $SD=0.92$) were perceived as more novel than the non-connected images ($M=3.14$, $t(152)=14.87$, $p<0.001$), and there was no difference in liking between the groups ($p=.37$).

4.1.2 Procedure

A total of 213 subjects (55% female, mean age=30) participated in the main study. They were told that the purpose of the experiment is to study the relation between different kinds of cognitive processes and that they would be participating in two simple tasks intended to assess different kinds of thinking, the first involving the assessment of product design and the second involving a sentence completion task. The participants were randomly assigned to either an experimental or control condition. In the experimental condition, participants were exposed to images of “connected” objects, whereas in the control condition, participants were exposed to images of control objects. All participants were presented with a set of three images on the computer screen in counterbalanced order and asked to describe each image with three adjectives. After participants viewed the objects, they completed a modified Twenty Statement Test (TST) [Kuhn and McPartland 1954] in which they completed ten statements that begin with “I am.”

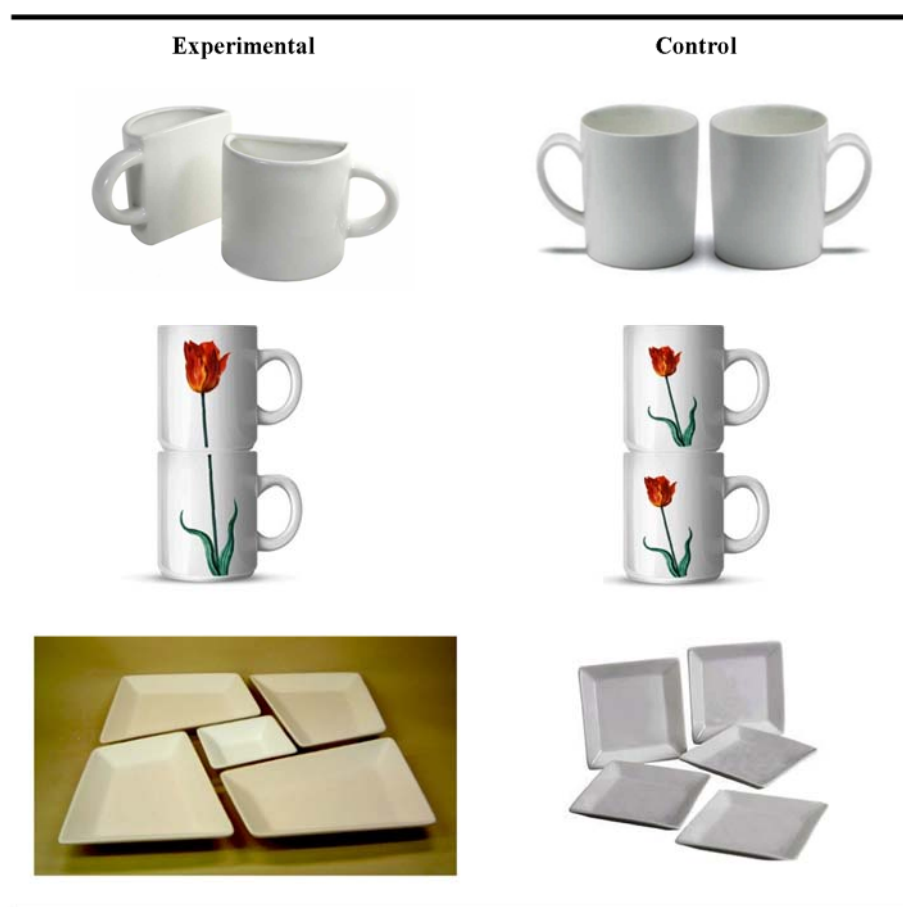


Figure 3. Connectedness manipulation: experimental (left) and control (right) objects

4.1.3 Coding scheme

TST, a standard self-construal scale widely used in the literature, is a projective technique that allows participants to define themselves or construe their identity with reference to their social roles, groups, status, and relationships. To analyze the content of self-description in the TST, two independent coders, who were blind to the experimental conditions, coded the top five statements among ten statements each subject made as independent, interdependent, or not relevant, following the TST coding scheme [Gardner et al. 1999]. Descriptions about personal traits, ability and attitudes (e.g., “I am smart,” “I am tall”) were coded as independent self-description, whereas descriptions about social roles or membership (e.g., “I am a mother,” “I am a student of the University of Michigan”) were coded as interdependent self-descriptions. Descriptions that referred to neither personal attributes nor social membership, such as statements regarding the immediate or peripheral situation (e.g., “I am doing this survey”) and nonsense statements (e.g., “I am a penguin,”), were coded as ‘not relevant.’

4.2 Results and discussion

Inter-coder reliability was 0.70. The primary dependent variable of interest was the number of interdependent and independent self-descriptions among the top five statements. The results show that participants in the experimental condition expressed more interdependent descriptions ($M=0.87$, $SD=1.22$) than did those in the control condition ($M=0.55$, $SD=1.01$), $t(202)=2.09$, $p<.05$ (Welch’s t-test), whereas those in the experimental condition produced less independent descriptions ($M= 4.07$, $SD= 1.26$) than did those in the control condition ($M=4.35$, $SD=1.11$) $t(206)=1.75$, $p=0.08$ (Welch’s t-test) (see Figure 4).

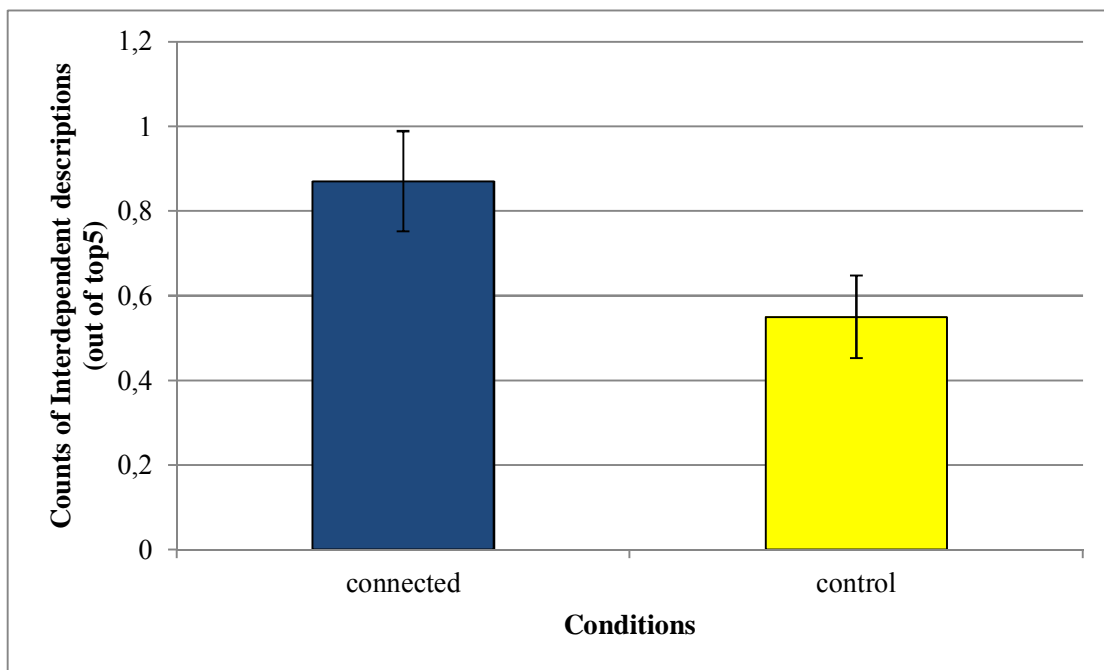


Figure 4. Counts of interdependent descriptions

The results show that connectedness cues (i.e., connected objects) help shift one’s self-construal to be more interdependent (compared to control objects), demonstrating that connectedness cues delivered by design features (i.e., interlocking/fitting together/complementary design characteristics) influence the extent to which one perceives oneself as being more connected to others. We used the top five TST statements in the analysis, because we reasoned that the subtle and momentary priming effect of connectedness cues would be more likely to be captured in those statements. However, similar trends (but with slightly weaker significance) were identified even when we considered all ten statements in the calculation of the respective proportion of interdependent and independent descriptions.

5. Overall discussion

The present studies focused on identifying design features that expressed the theme of connectedness and their influence on how one views oneself in relation to others. In Study 1, we examined which design features expressed the theme of connectedness. This was done by conducting a logo design task, in which we found particular design characteristics representing connectedness (i.e., connectedness cues). In Study 2, we examined the effect of connectedness cues on social connectedness, measured by the extent to which individuals defined themselves with reference to their social roles, groups, status, and relationships. We found that exposure to connected objects resulted in more interdependent descriptions than was found with control objects. We, therefore, obtained evidence consistent with the notion that connectedness features in design influences self-construal.

5.1 Theoretical and practical implications

The present research demonstrates the power of designs to activate nonconscious processes that influence judgment and behavior. Our findings help us to elucidate the role of design in subtly shaping our mindset and behavior. An awareness of this influence allows designers to consider potential downstream effects of design meanings during form generation as well as to expand their sphere of design and influence. Furthermore, our results point to a new source of priming, which broadens the range of priming methods available in psychology and marketing studies. This new priming source provides a tool for both academic researchers seeking to use common products and to practitioners seeking to implement priming techniques in their studies or designs.

The findings from our studies specifically illustrate how nonconscious and implicit design-generated effects can lead to meaningful variations in behavior. We expect that the influence of connectedness cues would go beyond the self-concept and have downstream behavioral consequences, particularly providing implications for promoting healthy, pro-social behaviors (e.g., helping, cooperating, giving, and sustainable behaviors). This is consistent with previous studies that have shown that an interdependent self-construal leads to more pro-social behaviour [Ashton-James et al. 2007]. Drawing on this prior evidence, we expect that design features that prime connectedness will result in more pro-social behaviors, potentially mediated by interdependent self-construal.

Extensive research across different academic disciplines has revealed diverse influences that promote pro-social behavior. Pro-social behavior has been found to be important for individuals while in a group and important for a society in order to function. Whereas most product interventions have been designed explicitly to orient people to be pro-social (e.g., “save the planet” posters), the present research uniquely contributes to those efforts by adding a tool for designing products or environment that implicitly shapes a pro-social orientation or mind set, which may increase the likelihood of pro-social behavior. For example, marketers could employ connectedness cues in their design of products in order to render more pro-social choices (sustainable consumption, charitable giving), or event managers could employ a connected set of coffee mugs to increase the amount of donation at a charity banquet. These hypotheses about the relation between connectedness cues, products, self-construal, and behavior will be tested in our future research.

5.2 Limitations and unanswered questions

The present research raises a number of questions. First, the present studies primarily focused on one particular incident of downstream effect: the impact of connectedness cues on self-construal. It remains open whether contextually relevant, meaningful downstream effects can be demonstrated in other types of contexts or domains. Future studies will have to demonstrate the range and domain of the present phenomena.

Second, the findings from Study 1 could be specific to types of participants. Given that all participants were non-design students, their visualization skill might have been an obstacle to articulating their ideas. Indeed, observation of their comments and sketches suggests that they could have struggled with visualizing their ideas to some extent. Accordingly, recruiting design students or professional designers for the design task could introduce more variety in design characteristics. In addition, it is worth investigating the relation between meaning and representation cross-culturally. How meaning is represented (and how the product expression is perceived) could be culturally different. Although we

expect particular universals to hold across cultures, it may be the case that the same representation communicates distinct meanings in different cultures, suggesting a need for culture-specific design cues that represent connectedness.

Third, although we developed and tested our hypothesis based on what is known about the metaphoric concept transfer effect and priming, the mechanism of how product expression influences one's self-construal is still unknown. Our data indicated that the connected objects were described by independent judges with connectedness-relevant words (e.g., complementary, connected, unbreakable, interlocking, family) significantly more often than the control objects. We, therefore, reasoned that the connected objects led to greater cognitive accessibility of particular constructs associated with the sense of connectedness (e.g., togetherness, group, interdependence), which primed one's self-construal to be more interdependent, as manifested in TST descriptions. However, our assertion regarding this simplistic pathway is speculative. We also observed that the connected objects were described with separation-relevant words (e.g., split, incomplete, separated, fragmented) more frequently than the control objects. The incidence of these conflicting meanings might be attributable to particular stimuli used in the study. Unlike graphic designs such as logos, the appearance of tangible products additionally communicates downstream, functional meanings, that is, the meaning of 'what we can do' with objects [Krippendorff 1989]. The perception of functional products can also evoke the mental simulation of physical interaction with the products. Therefore, it may be the case that perceiving the visually attached objects affords an action possibility of disconnecting or detaching them in the context of use. It is still ambiguous whether these opposite meanings work for or against priming interdependent self-construal (e.g., the cues might have activated mindsets associated with independence or individualism). Future research is needed to control the multilayered meanings in order to shed light on exact mechanisms of the downstream effect observed in the present research. In conclusion, the present research demonstrates the value of attending to the design properties of objects and the messages they convey in delivering subtle cues to influence perceptions and judgments. Our findings could encourage a healthier dialogue and collaboration between disciplines, especially between behavioral scientists who concentrate on the effect of environmental cues on judgment and behavior and designers who are interested in behavior change.

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