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## Luxury implications of showcasing a product with its “cast” shadow

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## **Luxury implications of showcasing a product with its 'cast' shadow**

### **Abstract**

**Purpose** – This research investigates the role of showcasing a product with its *cast* shadow (formed in the ad's background by the advertised product) on consumer product perceptions.

**Design/methodology/approach** – Three experimentally designed studies, incorporating two product categories, demonstrate the impact of visual presentation of a product with its shadow on consumer evaluations. A total of 203 participants (MTurkers, and student respondents at a southern university) provided data for these studies through questionnaires (online as well as paper and pencil based formats).

**Findings** – Findings reveal that the presence of a product's cast shadow in the ad frame increases its visual acuity, which in turn enhances its luxury perceptions. Downstream, a product shadow's presence positively impacts its overall evaluations, through enhanced product luxury perceptions. Also, consumers with high CVPA (*Centrality of Visual Product Aesthetics*) demonstrate a stronger liking for such product presentations.

**Research limitations/implications** – The current findings not only demonstrate the positive impact of product shadows on consumer perceptions, but also enrich the luxury and aesthetics literature streams.

**Practical implications** – Advertisers often subjectively use product shadows as stylistic tools in marketing communications. This research offers some practical guidelines to employ shadows in fostering product luxury perceptions, and better target aesthetically-sensitive consumers.

**Originality/value** – Advertising research suggests that visual styling and presentation of products significantly impacts consumer perceptions. However, the role of product shadows has not yet been empirically examined. This paper makes an attempt to test if, and how product shadows impact consumer perceptions.

**Keywords** Product's *cast* shadow, Luxury, Visual acuity, Aesthetics

**Paper type** Research paper

## Introduction

A stream of advertising literature suggests that visual images influence attitudes more than the verbal ad content (Edell and Staelin, 1983; Rossiter and Percy, 1980; Scott, 1994). Product visuals not only capture attention, but are also assimilated and recalled better (Pieters and Wedel, 2004; Pieters *et al.*, 2010; Scott, 1994). Product images are capable of influencing consumer perceptions through stylistic manipulations, such as locating the image on the left versus right in an ad frame, image-cropping, and changing the camera-angles (Chae and Hoegg, 2013; Meyers-Levy and Peracchio, 1992; Peracchio and Meyers-Levy, 1994, 2005). However, the impact of another such stylistic manipulation i.e. presenting the product with its 'cast' shadow (formed by the focal product on an ad's background surface) is yet to be systematically investigated.

Numerous brands showcase their products with shadows in promotional frames e.g. Apple, Omega and Coca-Cola. Sometimes brands incorporate product shadows for the same product in a few ads, but not in others. The current research makes one of the first attempts to systematically investigate the effects of product shadows on consumer perceptions. Visual cognition research evidences the integral role of shadow processing in inferring an object's form, shape, and spatial-placement in a visual frame (Cavanagh and Leclerc, 1989; Mamassian, 2004; Mamassian *et al.*, 1998). Literature in visual art identifies shadows as instrumental tools that add realism, contrast, depth and dimensionality to renderings (Casati, 2004; Mamassian, 2008). Drawing upon an understanding of object shadows from these literature streams, the current research examines the influence of showcasing a product with its shadow on consumer product evaluations.

Research in the luxury domain identifies two broad drivers of consumer luxury perceptions: *a*) the status or prestige-benefits attained through the conspicuous consumption of such products in society (Amaldoss and Jain, 2005; Dubois *et al.*, 2012; Han *et al.*, 2010), and *b*) the hedonic '*potential*' or sensory gratification derived from owning, and using such products (Hagtvedt and Patrick, 2009; Hung *et al.*, 2011; Vigneron and Johnson, 2004). Research on product location in visual contexts reveals a *centrality bias*, where an option placed in the center of the frame is considered more prominent and diagnostic (Atalay *et al.*, 2012; Chandon *et al.*, 2009; Valenzuela and Raghurir, 2009, 2015). Shadows provide a similar effect by contrasting an object from its background and making it more prominent (Dee and Santos, 2011; Mamassian *et al.*, 1998). In this way, a product shadow's presence complements the product's status-conferring luxury appeal by increasing its visual acuity, i.e. vividness, prominence and noticeability in the ad frame (Han *et al.*, 2010). Additionally, in line with *Gestalt psychology*, shadows accentuate an object's gestalt-based aesthetics, hence they also boost the product's hedonic luxury appeal (Dee and Santos, 2011; Holbrook, 1986; Mamassian, 2008). Therefore, in this research, presence of a product's shadow in a promotional frame is proposed to enhance both these dimensions of luxury (i.e. status and hedonic), and thus the overall product luxury perceptions, which in turn positively impact the overall product assessments.

Also, since appreciation for visual aesthetics varies among consumers, this research also gauges heterogeneity in consumers' *Centrality of Visual Product Aesthetics* (CVPA), as a

moderator to the proposed relationships (Bloch *et al.*, 2003; Schnurr and Stokburger-Sauer, 2016). Thus, the current research provides a holistic understanding of the factors (i.e. product's visual acuity, luxury perceptions, as well as individual acumen levels) that influence product evaluations in the presence (vs absence) of its shadow.

There are four major contributions of the current research. First, it establishes that the presence (vs absence) of a product's cast shadow in the ad frame improves the product's visual acuity, which in turn elevates the product's luxury perceptions. Second, it investigates the downstream effects of a shadow's presence on the overall product evaluations. Third, it validates that this increase in the product's overall assessment is mediated by improvement in the product's overall luxury perceptions (including both status-conferring and hedonic aspects). Fourth, it examines the moderating effects of consumers' aesthetic orientations on these relationships (Bloch *et al.*, 2003). Three experimentally designed studies, employing different product categories, and demographic makeups investigate the proposed relationships empirically.

### **Cast shadows and visual acuity**

Cognitive research identifies two broad types of object shadows: a) an '*attached*' shadow, formed when the object obstructs light falling on itself, and b) a '*cast*' shadow, formed when the object occludes another surface (e.g. a background) from a light source (Mamassian *et al.*, 1998). This research focuses on cast shadows that are more frequently, and naturally observed (Dee and Santos, 2011). From a visual cognition perspective, cast shadows act as informative cues towards a) the object's shape, b) the light source, and c) the properties of the background surface on which it is cast (Cavanagh and Leclerc, 1989; Dee and Santos, 2011; Mamassian *et al.*, 1998). For the focal object, they help in determining its form, structure, orientation, and spatial layout (Cavanagh and Leclerc, 1989; Madison *et al.*, 2001).

Shadows also play varied functions in art (depending upon how they are employed by an artist), for instance, to grab a viewer's attention, to spatially anchor objects in the frame, to emphasize the object's shape through imitation, to enhance the background surface, or to create object divergence (Casati, 2004). Shadows have been used to create dramatic and vivid representations in art (Casati, 2004; Mamassian, 2008). In two and three dimensional drawings, they are fundamental in object shape recovery (through shading), in addition to enhancing realism as they are '*con-substantive*' (i.e. natural to any object viewed under a light source) (Casati, 2004; Dee and Santos, 2011; Mamassian, 2004).

Advertising literature highlights the role of product *centrality* in a visual frame, where a central location of the product enhances beliefs regarding its popularity, expensiveness, and quality (Atalay *et al.*, 2012; Chandon *et al.*, 2009; Valenzuela and Raghurir, 2009). Not only do consumers pay more attention to a product that is inward-facing or placed in the middle/center of the visual frame, but this location dominance also elevates a product's aesthetic perceptions (Leonhardt *et al.*, 2015; Tatler, 2007; Tsal and Lavie, 1993). There is a strong preference for pictures located at or near the center of a frame. Parallel to this research, cast shadows are proposed to have a similar impact.

Cast shadows improve an object's salience in the visual field of evaluation as they are usually darker than the surroundings i.e. contrasting (Dee and Santos, 2011; Mamassian, 2008; Mamassian *et al.*, 1998). By spatially anchoring the object to the background surface, they provide depth as well as dimensionality to the focal object, and therefore, enhance its vividness (Cavanagh and Leclerc, 1989; Dee and Santos, 2011; Mamassian *et al.*, 1998). In an advertising context, presence of a product's shadow should thus increase the product's visual acuity in the ad frame (i.e. its prominence, vividness and noticeability) (Schindler, 1986). Following *resource matching paradigm*, which suggests that vivid ad information is more diagnostic, less resource demanding, and more persuasive than non-vivid information; cast shadows should have a positive influence on consumer product perceptions (Keller and Block, 1997; Kisielius and Sternthal, 1984).

### **Product shadows and luxury perceptions**

A wide stream of luxury literature captures the status-seeking, symbolic aspects of product consumption such as societal prominence, and conspicuity signals (Dubois *et al.*, 2012; Han *et al.*, 2010); individual's perceived status, competitiveness, and power-level compared to others in society (Hung *et al.*, 2011; Rucker and Galinsky, 2009; Wang and Griskevicius, 2014); and ideals of getting noticed, gaining success, respect, popularity, and prestige (Amaldoss and Jain, 2005; Mandel *et al.*, 2006; Ordabayeva and Chandon, 2011). Since luxury perceptions are driven by such conspicuity appeals, and the presence of a product's shadow improves its noticeability and conspicuousness in the ad frame; a product's luxury perceptions should be accentuated by the shadow's presence (vs absence) in the ad frame through enhanced product visual acuity.

However, preferences in the luxury domain are driven not only by an individual's need for status, but also by the hedonic or visually pleasurable aspects of a product. A relatively narrow stream of luxury research shows that the promise of '*hedonic potential*' or pleasure drives brand extendibility (Hagtvedt and Patrick, 2009). Hedonic perceptions of brand luxury include a product's exquisiteness, and glamour (Vigneron and Johnson, 2004). Experiential aspects of luxury products such as their preciousness, rareness, uniqueness, and attractiveness have been shown to drive consumer purchase intentions for such products (Hung *et al.*, 2011). Therefore, a luxury product's overall appeal is determined by both status-conferring, conspicuity driven benefits, as well as visually pleasurable, desirable, and aesthetic aspects (Hagtvedt and Patrick, 2009; Han *et al.*, 2010; Vigneron and Johnson, 2004).

As discussed before, literature on product location identifies that central positions are not only prominent, but also considered more aesthetically pleasing (Sammartino and Palmer, 2012). Shadows invoke perceptions of space around the focal object, thereby improving the aesthetics of the artistic frame (Arnheim, 1965). The term '*aesthetics*' has been used to describe object forms in consumer psychology that invoke feelings of pleasure and appreciation (Hagtvedt and Patrick, 2014; Hoegg and Alba, 2008). Aesthetics relates to sensitivity to *beauty*, as well as sense perception, i.e. visual in this case (Veryzer Jr, 1993). Aesthetics communicate with an observer based on the sensory experience, rather than logic or reasoning (Creusen and Schoormans, 2005; Veryzer Jr, 1993). Therefore, aesthetics

correspond to intrinsic affect or feelings of pleasure derived from viewing a stimulus as a whole (Wagner, 1999).

Cast shadows enhance an object's aesthetics not only by improving its visual acuity or vividness, but also by facilitating a coarse (gestalt-based) processing of the entire visual field of evaluation (Casati, 2004; Cavanagh and Leclerc, 1989; Liu *et al.*, 2007; Madison *et al.*, 2001). Mamassian (2008, pp. 2146) mentions that "by default, shadows contribute to the low spatial frequency information in an image". In other words, cast shadows are visually deconstructed using a holistic (or an abstract), visual perspective (Torralba *et al.*, 2006; Ward, 1982). This is consistent with principles of *Gestalt psychology*, where one responds to the perceptions of the overall stimulus rather than to its isolated parts, or the individual features of a composition (Berkowitz, 1987; Bloch, 1995; Veryzer and Hutchinson, 1998). Consumer aesthetics are stimulated through higher-order feature interactions, as a part of a holistic, visual-gestalt, which in turn leads to appreciative mental responses (Holbrook, 1986). Therefore, visual deconstruction of product shadows through a gestalt-based abstraction process should also increase its hedonic appeal (i.e. visual aesthetics and attractiveness).

Together, enhanced visual acuity and aesthetic appraisal (i.e. overall luxury perceptions) of the product in the presence (vs absence) of cast shadow in the ad frame, would further improve a more downstream measure, i.e. the overall product evaluations (Hagtvedt and Patrick, 2008). Therefore, it is hypothesized that,

- H1:* The presence (vs absence) of a product's cast shadow in an ad frame positively influences a product's overall luxury perceptions.
- H2:* The presence (vs absence) of a product's cast shadow in an ad frame positively impacts a product's overall evaluations.
- H3:* The positive influence of the presence of a product's cast shadow in an ad frame on the product's overall evaluations is mediated by an enhancement in the overall luxury perceptions regarding the product in the shadow's presence (vs absence).

### **Individual visual aesthetics**

Heterogeneity in aesthetic judgments of consumers creates challenges for advertisers and marketers from a targeting and segmentation perspective. As a general consumer trait, aesthetic acumen varies among consumers. Bloch, Brunel and Arnold (2003) define *Centrality of Visual Product Aesthetics (CVPA)* as "*the level of significance that visual aesthetics hold for a particular consumer in his/her relationship with products*" (Bloch *et al.*, 2003, pp. 551). As a measured construct, CVPA can be used to classify consumers on the basis of their aesthetic acumen, the extent to which they value visual aesthetics, and the way they respond to superior designs (Bloch *et al.*, 2003). Individuals with high CVPA provide keener aesthetic evaluations for high design products, exhibit more positive attitudes, and greater purchase-intentions towards aesthetic products; they are even willing to pay a price premium for products with superior aesthetic appeal (Bloch *et al.*, 2003).

Aesthetically-inclined consumers are also more sensitive to changes in a brand's visual presentation (Phillips *et al.*, 2014). Such consumers respond more positively to stylistic information regarding a product by inferring greater perceived meaningfulness from its design (Schnurr and Stokburger-Sauer, 2016). It has been discussed above that the presence of a product's cast shadow in the ad frame improves the product's visual acuity or vividness, as well as its gestalt-based aesthetics, as reflected in improved luxury perceptions, and overall product evaluations. Given their aesthetic expertise and sensitivity towards aspects such as visual acuity and aesthetics, such effects should be stronger for individuals with a higher CVPA. Therefore,

*H4:* A consumer's CVPA positively moderates the relationship between presence (vs absence) of a product's cast shadow in the ad frame and luxury perceptions regarding the product, as well as the overall product evaluations.

## **Methodology**

A pilot study followed by two main studies were designed using experimental paradigm to test the hypotheses. In all the studies, a grey-scale product image was used to avoid any color based confounds. Product images were presented with some verbal claims, and a brand name to simulate ad realism. For study 1, a portable music speaker was presented under the guise of a fictitious brand name, *Covi* (an Auckland based insurance firm, unknown to the U.S demographic, see Appendix, Figure A). The speaker was photographed under natural sunlight (against a white background), and cropped for shadow using Photoshop to create two ad versions (with and without shadow). For the pilot study and study 2, an ink-cartridge, fountain pen was used as the product category (under the brand name *Yafa*, which is a relatively less known U.S brand). A grey-scale image of the pen was cropped for shadow to create the two ad versions similar to study 1. The verbal product claims for all the studies were adapted from the actual websites.

The pilot study made a preliminary attempt to explore the effects of a product's cast shadow on its visual acuity, as well as luxury perceptions. The main objective of this pilot study was to establish the effects of cast shadow in the domain of product advertising (as suggested for object shadows in general, by the visual art and cognition literatures). Study 1 tested *H1-H3*, i.e. the impact of shadow's presence (vs absence) on product luxury perceptions (status and hedonic), overall product evaluations, and mediation through changes in the overall luxury perceptions. Finally a study 2 examined the effects of individual CVPA on the proposed relationships (i.e. *H4*).

The pilot study and study 1 were created on Qualtrics for online administration. The pilot study was run on Amazon's Mechanical Turk platform. MTurk provides access to a wider demographic, thus lending greater external validity to the findings, especially for establishing preliminary effects (Goodman and Irmak, 2013). Students at a southern university participated in both the main studies in exchange for extra course credit. While study 1 was administered online, study 2 employed a paper and pencil based format, thus providing an alternative context (similar to print advertising) to test the proposed effects.

## Pilot study

Participants for this study were solicited from MTurk, using United States as a location criteria. Fifty-two workers from MTurk between the ages of 20 and 68 years (54% Males, 46% Females) completed a short survey for compensation (\$0.15). In a single factor (shadow vs no-shadow), between-subjects design, each respondent was randomly presented with an ad version (i.e. an ink-cartridge, fountain pen with or without its cast shadow). Following the ad exposures, participants completed measures on ad evaluation using a 9-point bipolar scale (*poor/excellent*), product luxury perceptions (*quality, luxurious appeal and stylishness* – 1 being very low to 9 being very high,  $r = 0.89$ ), product's visual acuity (*extent to which the product stands out* – 1 being far too little to 7 being to a great extent; *product prominence, vividness and noticeability* – 1 being very low to 9 being very high,  $r = 0.94$ ), brand name familiarity ( $M_{\text{familiarity}} = 2.19$ ,  $SD = 1.70$  on a 7-point scale), gender and age (Hagtvedt and Patrick, 2008; Keller and Block, 1997; Peracchio and Meyers-Levy, 1994, 2005; Schindler, 1986; Valenzuela and Raghurir, 2009).

## Results and discussion

There were no differences among the overall ad ratings across conditions ( $M_{\text{present}} = 6.04$ , vs  $M_{\text{absent}} = 6.50$ ,  $p > 0.05$ ). However, ad rating was a significant covariate across all studies, as the overall ad appraisal was contingent on multiple ad elements such as the product's image, the verbal claims, as well as the brand's name. Therefore, *Analysis of Covariance* (ANCOVA) was used to test all the hypotheses, across these studies. A one-way ANCOVA, using ad rating as a covariate ( $p < 0.01$ ), revealed a main effect of the presence of product's shadow on its visual acuity ( $M_{\text{present}} = 6.02$ ,  $SD = 1.66$  vs  $M_{\text{absent}} = 5.32$ ,  $SD = 1.84$ ,  $F(1, 49) = 5.74$ ,  $p = 0.020$ , partial  $\eta^2 = 0.65$ ), such that the product visual acuity was much higher in the shadow's presence than in its absence ( $M_{\text{difference}} = 0.953$ ,  $p = 0.020$ ).

A same ANCOVA on the product's luxury perceptions showed a strong main effect of shadow's presence (vs absence) ( $M_{\text{present}} = 6.36$ ,  $SD = 1.81$  vs  $M_{\text{absent}} = 5.86$ ,  $SD = 1.46$ ,  $F(1, 49) = 5.23$ ,  $p = 0.027$ , partial  $\eta^2 = 0.61$ ) such that the luxury perceptions were higher in the presence (vs absence) of the product's cast shadow ( $M_{\text{difference}} = 0.780$ ,  $p = 0.027$ ). Lastly, the effect of shadow's presence (vs absence) on product's luxury perceptions was significantly mediated by the change in product's visual acuity (Process Model 4; 1000 draws, Hayes, 2012). There were significant indirect effects of the shadow's presence compared to its absence, on its luxury perceptions through visual acuity ( $\beta = -0.2992$ , 95%  $CI = -0.7404, -0.0349$ ). Moving from the shadow-present to the shadow-absent condition, product luxury perceptions declined due to a decrease in the product's visual acuity, as shown by the negative beta value, and a bootstrap interval that did not straddle zero (Hayes, 2012). Gender and age had no impact in this or any other study, and hence, they are not discussed further.

Findings from this pilot study establish that a product's cast shadow has a similar impact on its visual acuity, as suggested by the work on object shadows in visual cognition and art research streams. Not only do product shadows provide contrast relative to the ad's background, but they also enhance the product's luxury perceptions, through an increase in the product's visual acuity (i.e. vividness, prominence and noticeability) in the ad frame.

## Study 1

Students from a graduate level marketing course at a southern university participated in this study in exchange for extra course credit. They were requested to snowball the online survey link to three other friends or family members, who were not currently enrolled in the course. After a live window of one week for the survey link, a total of 61 subjects (39% Males, 69% Females,  $M_{age} = 32$  years) had participated. Five participants took more than 19 minutes to complete the survey, which was more than three standard deviations away from the average completion time ( $M_{time} = 6.48$  minutes,  $SD = 2.94$ ). Hence, they were excluded from the analysis after being assessed as outliers ( $N = 56$ ) (Stevens, 2012). The experimental procedure employed a single factor (shadow vs no-shadow), between-subjects design.

After encountering a randomly presented ad condition (i.e. a portable music speaker with or without shadow, see Appendix, Figure A1), each participant completed the following measures: overall ad liking, product liking (1 being *Dislike a great deal* to 7 being *Like a great deal*), product's overall luxury perceptions including both status and hedonic items (*product quality - 1 being very low to 7 being very high*, *product seems stylish - 1 being strongly disagree to 7 being strongly agree*, *product is visually aesthetic - 1 being strongly disagree to 7 being strongly agree*, and *product rating on unattractive/attractive 7-point bipolar dimension*,  $r = 0.84$ ), brand name familiarity (1 being *very low* to 7 being *very high*) and general demographics such as gender and age (Chae and Hoegg, 2013; Hagtvedt and Patrick, 2008; Peracchio and Meyers-Levy, 1994, 2005; Priester *et al.*, 2004; Schnurr and Stokburger-Sauer, 2016; Tormala and Petty, 2004).

## Results and discussion

The overall ad ratings were again no different across conditions ( $M_{present} = 3.96$  vs  $M_{absent} = 3.83$ ;  $p > 0.05$ ), and the mean brand name familiarity was low ( $M_{familiarity} = 2.30$ ,  $SD = 1.73$ ). A one-way ANCOVA with the overall ad rating as a significant covariate ( $p < 0.01$ ) on the product's overall luxury perceptions revealed a marginal main effect of the cast shadow's presence compared to its absence ( $M_{present} = 3.52$ ,  $SD = 1.27$  vs  $M_{absent} = 2.97$ ,  $SD = 0.88$ ,  $F(1, 53) = 3.95$ ,  $p = 0.052$ , partial  $\eta^2 = 0.50$ ). Similar to the results in the pilot study, overall product luxury perceptions were higher in the presence of shadow, compared to its absence ( $M_{difference} = 0.510$ ,  $p = 0.052$ ). Thus,  $H1$  was marginally supported.

A similar ANCOVA (with ad rating as a significant covariate,  $p < 0.01$ ) on the overall product evaluations also revealed a positive main effect of the presence (vs absence) of the product's cast shadow in the ad frame ( $M_{present} = 4.27$ ,  $SD = 1.49$  vs  $M_{absent} = 3.47$ ,  $SD = 1.76$ ,  $F(1, 53) = 4.49$ ,  $p = 0.039$ , partial  $\eta^2 = 0.55$ ). The product was evaluated more positively in the presence of its cast shadow, compared to its absence ( $M_{difference} = 0.715$ ,  $p = 0.039$ ). Therefore,  $H2$  was supported. Lastly, as hypothesized in  $H3$ , there was an indirect effect of the cast shadow's presence (vs absence) on the overall product evaluations, through the overall luxury perceptions ( $\beta = -0.1640$ , 90%  $CI = -0.4979, -0.0047$ ) (Process Model 4; 1000 draws, Hayes, 2012). Product evaluations declined from the shadow-present to the shadow-absent condition, as negatively mediated by the overall product luxury perceptions. Hence,  $H3$  was also marginally supported.

Study 1 evidences significant effects of the shadow's presence (vs absence) on a more downstream measure i.e., product evaluation, in addition to replicating the effects on product luxury perceptions from the pilot study. It also validates the mediation effect of product luxury perceptions on the overall product evaluations. However, the effects towards luxury perceptions were marginal in this study (compared to the pilot). This could be due to the product category used in this study (i.e. a portable music speaker), which was chosen to match the interest of student demographic. It is possible that luxury perceptions for such a product are weak to begin with. To resolve this (in addition to testing  $H4$ ), study 2 re-employed the ink-cartridge, fountain pen stimuli, previously tested in the pilot study.

## Study 2

Ninety undergraduate students from a marketing course at a southern university participated in this study for extra course credit (53% Males, 47% Females,  $M_{age} = 22$  years). As mentioned before, this study was administered in a pencil and paper format. Each student was randomly assigned to an ad version (showcased with or without its cast shadow), following a between-subjects design. The individual centrality of visual aesthetics was captured as a measured variable towards the end of the study. One case was excluded based on missing data and hence, the final sample size was 89.

After the ad exposure, participants completed various 7-point scale measures such as the overall ad evaluation (*dislike/like*), the overall product evaluation (*bad/good, dislike/like, and negative/positive*,  $\alpha = 0.91$ ), product luxury perceptions (*luxurious, prestigious, classy, designer and stylish – 1 being not at all to 7 being extremely*,  $\alpha = 0.89$ ), brand name familiarity ( $M = 1.70$ ,  $SD = 1.37$ ), gender, age, and CVPA (“*I enjoy seeing visual displays that have superior design*”, “*I have a pretty good idea of what makes a visual display look better for a product*”, and “*I see things in product displays that others tend to pass over*”, 1 being strongly disagree to 7 being strongly agree,  $\alpha = 0.70$ ) (Bloch *et al.*, 2003; Hagtvedt and Patrick, 2008; Peracchio and Meyers-Levy, 1994, 2005).

## Results and discussion

A full factor ANCOVA with an individual's CVPA as the covariate (including the main effects of shadow and CVPA and the interaction term i.e., shadow X CVPA), did not show any differences across the manipulated conditions for the overall ad liking ( $M_{present} = 4.59$  vs  $M_{absent} = 4.38$ ,  $p > .05$ ). However, a full factor ANCOVA (including ad liking as a significant covariate,  $p < 0.01$ ) on the product's luxury perceptions exhibited a strong main effect of the product's shadow ( $M_{present} = 4.36$ ,  $SD = 1.23$  vs  $M_{absent} = 4.28$ ,  $SD = 1.33$ ,  $F(1, 84) = 7.57$ ,  $p = 0.007$ , partial  $\eta^2 = 0.78$ ), and a significant interaction between product shadow's presence (vs absence) and the individual's CVPA ( $F(1, 84) = 7.80$ ,  $p = 0.006$ , partial  $\eta^2 = 0.79$ ). A similar ANCOVA on the overall product evaluations revealed a main effect of the product's shadow ( $M_{present} = 5.17$ ,  $SD = 1.08$  vs  $M_{absent} = 4.89$ ,  $SD = 1.21$ ,  $F(1, 84) = 5.73$ ,  $p = 0.019$ , partial  $\eta^2 = 0.66$ ), a main effect of individual's CVPA ( $F(1, 84) = 4.91$ ,  $p = 0.029$ , partial  $\eta^2 = 0.59$ ), and a significant interaction between the shadow's presence (vs absence) and an individual's CVPA ( $F(1, 84) = 6.58$ ,  $p = 0.012$ , partial  $\eta^2 = 0.72$ ).

Using the Johnson Neyman technique for floodlight analysis, it was found that as the individual CVPA increased, moving from the shadow to no-shadow condition lowered the product's luxury perceptions ( $\beta = -0.6655$ , 95% CI = -1.1394, -0.1917), as well as the overall product evaluations ( $\beta = -0.4706$ , 95% CI = -0.8353, -0.1059) (see Table 1,  $\beta$  becomes more negative as CVPA increases, going from shadow to no-shadow condition) (Process Model 1; 1000 draws, 95% CIs, Hayes, 2012, Spiller *et al.*, 2013). Therefore, *H4* was fully supported.

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Findings from study 2 show that an individual's centrality of visual product aesthetics does indeed impact the product luxury perceptions and the overall product evaluations, based on the presence (vs absence) of a product's cast shadow in the ad frame. Consumers with higher visual aesthetic centralities are more inclined to appreciate products presented with their cast shadows. Although not formally hypothesized this study also revealed significant effects of shadow's presence (vs absence) for low CVPA individuals on both luxury perceptions and overall product evaluations. A discussion on these findings has been provided in the 'limitations and future research' section.

## General discussion

In advertising, managers seem to rely on their subjective evaluations when it comes to design decisions, such as incorporating a cast shadow in the promotional frame. To this date, there has been no empirical guidance to inform the use of cast shadows in ad frames. The current research follows a systematic approach towards establishing how the presence (vs absence) of a product's shadow in the ad frame influences consumer product perceptions. The presence of a product's cast shadow improves its visual acuity in the ad frame which in turn, improves its luxury perceptions (as shown in the pilot study). Shadows also have a significant impact on downstream measures such as the overall product evaluations, through improvement in product luxury perceptions (as evidenced in study 1). Additionally, consumer visual aesthetics moderate these effects, such that those with a higher CVPA exhibit more positive product perceptions in the presence (vs absence) of product's shadow (as established in study 2).

The effects held consistently across different product categories (music speaker and fountain pen), varied demographic groups (MTurkers, graduate and undergraduate students), as well as different study administration formats (online, pencil and paper). The current findings are not only robust, but are also consistent with the past research on vividness, luxury and aesthetics. In accordance with *resource matching paradigm*, shadows provide contrast to the product's image, thus making it more vivid, prominent and noticeable; and as per *Gestalt psychology*, they enhance a product's aesthetics following a gestalt based appraisal of its form (Holbrook, 1986; Keller and Block, 1997). Overall, shadows improve a product's luxury perceptions by appealing to both status based conspicuity needs, and the hedonic senses i.e. through visual gratification (Hirschman and Holbrook, 1982). A product's shadow makes the product stand-out in the ad frame, and elevates its beauty, which combined improve its overall luxury perceptions. These effects

further translate onto positive consumer product evaluations, and tend to vary according to consumer aesthetic-sensitivities.

### **Theoretical implications**

This research has four major theoretical contributions. First, the current work paves the way for research on product shadows. Research in product styling and presentation has looked at many attributes (including camera-angles, left vs right locations, and top vs down package placements), but product shadows have been largely unexplored (Chae and Hoegg, 2013; Deng and Kahn, 2009; Meyers-Levy and Peracchio, 1992). In fact, researchers have often used ad stimuli enclosing the product cast shadow in the ad backgrounds (see stimuli appendices from Meyers-Levy and Peracchio, 1992; Schnurr and Stokburger-Sauer, 2016). However their role on consumer perceptions has not been documented.

Second, it builds upon luxury research, by rendering the use of product shadows in enhancing a product's luxury appeal through both status-conferring benefits as well as hedonic/aesthetic appraisal of the product in the promotional frames (Berger and Ward, 2010; Hagtvedt and Patrick, 2009; Han *et al.*, 2010; Vigneron and Johnson, 2004). There were consistent, positive effects on product luxury perceptions across all the studies. Where luxury research is disparate in identifying *conspicuity* versus *aesthetic* drivers to luxury perceptions, this research demonstrates that product shadows can improve overall luxury perceptions, including both these dimensions. In luxury research, need for uniqueness and need for conformity tend to work in the opposite directions (Amaldoss and Jain, 2005; Berger and Ward, 2010; Truong *et al.*, 2008). However, regardless of a consumer's motivation to purchase a luxury product (status or hedonic or both), cast shadows seem to complement a product's luxury appeal by their mere presence in the visual frames.

Third, by incorporating findings from varied literature streams such as art, visual cognition, luxury and aesthetics, it augments and extends the prior work in applying *resource matching paradigm* and *Gestalt psychology* in product advertising (Bloch, 1995; Holbrook, 1986; Keller and Block, 1997; Schindler, 1986). Fourth, results from study 2 extend the scarce prior research on individual differences in aesthetics, revealing that consumers with a higher acuity towards aesthetics appraise a product presented with its cast shadow more positively (Bloch *et al.*, 2003; Schnurr and Stokburger-Sauer, 2016).

### **Managerial implications**

In addition to the aforementioned theoretical contributions, the current research provides many insights to marketers. The advertising motives for employing shadows in product visuals are usually subjective. For instance, shadows may be added to highlight the product, or to create a dramatic product representation. This research investigates and evidences that even subtle, peripheral elements like product shadows can have tangible impact on consumer perceptions, more specifically its luxury appeal. Shadows accentuate the product's visual acuity and therefore, their use in product visuals should not be random, but rather strategic. Additionally, advertisers can conveniently add product shadows to almost any visual promotional frame, for e.g. print, online, and even in-store product layouts.

There are direct implications of incorporating product shadows for high-end, luxury brands, since they act as stylistic complements to their product visuals. It is documented that luxury brands use negative (or white) space in product advertising to convey the prestige, quality, and sophistication of their offerings (Ambler and Hollier, 2004; Olsen *et al.*, 2012). However, such designs incur huge costs, given the limited and highly competitive ad space. This research provides an alternative, where cast shadows can be used instead of large amounts of white space to convey similar brand perceptions (especially as shadows enhance space perceptions around a focal object, Arnheim, 1965).

Additionally, marketing managers can specifically target and position promotions with product shadows towards highly aesthetic consumers. Online targeting of such consumer profiles can be done through customized promotions, styled with product shadows, and individually delivered to their mailboxes. Also, while research suggests that highly aesthetic consumers assess incongruent visual changes to a brand's existing image negatively, product shadows can unobtrusively refresh a brand visual i.e., without changing any of the familiar brand elements (Phillips *et al.*, 2014).

### **Limitations and future research**

The current studies have certain limitations, and provide opportunities for further improvements. All the studies were run using experimental paradigm and hence, limited in external validity to the extent that conditions were strictly manipulated between-subjects (Bhattacharjee, 2012). More evidence can be complemented from field studies, as well as different product categories to ensure replicability of these findings.

Study 2 revealed some unexpected, significant effects of shadow's presence (vs absence) for low CVPA individuals on both luxury perceptions and overall product evaluations. Interestingly, these effects were in the opposite direction compared to high CVPA individuals, as shown by the positive beta values in table |. It is possible that product shadows act as visual noise for low CVPA individuals, who are already less confident about their visual acumens (Bloch *et al.*, 2003). In fact, there is evidence in visual cognition research that cast shadows act as optical noise, and reduce performance in visual search, object recognition and shape recovery tasks (Cavanagh and Leclerc, 1989; Rensink and Cavanagh, 2004). Low CVPA individuals lack the visual skills for deciphering superior design aesthetics, compared to high CVPA individuals and hence, may find shadows distracting, rather than helpful. This provides an interesting new line of research for exploration, i.e. scenarios where cast shadows hurt, rather than help perceptions, such as in the case of a novel stimuli, or conditions pertaining to high visual complexity (Pieters *et al.*, 2010).

Given a preliminary attempt, the stimuli was stripped of color to avoid any confounds. The effects of color together with cast shadows provides another fruitful area for exploration (Gorn *et al.*, 1997; Lee *et al.*, 2014). In the current studies, lesser known or fictitious brand names were used, however, brand perceptions may be influenced differentially based on the use of cast shadows in promotional frames. Some artists employ shadows to create perceptions of doom and sadness, others use them to highlight and enhance vividness of a focal object (Casati, 2004; Mamassian, 2008). Therefore, the meaningfulness and nature of

the emotions evoked by product shadows provides another domain for investigation. It is encouraged that researchers explore these plentiful opportunities in the future.

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**Figure A|** Stimuli used in study 1 (Shadow-present vs shadow-absent)

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