Fluent Contextual Image Backgrounds Enhance Mental Imagery and Evaluations of Experience Products

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Abstract

Online shoppers rely on product images to gain information about products. Helpful product images allow a detailed mental imagery of the product and its use. Product images with a fitting contextual background, as opposed to a plain white background, increase such mental imagery and in turn product liking and purchase intent. This effect, however, is preceded by imagery fluency—the ease with which mental images come to mind in the first place. As a result, effective product images need to facilitate fluent perceptions, while also evoking fitting mental imagery. Two experimental studies confirm this pathway which links research on mental imagery with research on imagery fluency. Moreover, the experiments show that this effect of contextual backgrounds works for fitting but not for non-fitting backgrounds, better for ambiguous than unambiguous products, and for experience products, but not for search products. Online retailers could leverage contextual backgrounds in product images to enhance consumers' evaluations of their merchandise as long as the beneficial effects via mental imagery outweigh the added photography costs.

Keywords: Product Images, Contextual Background, Mental Imagery, Imagery Fluency, Experience Products

1. Introduction

In e-commerce, products cannot be directly touched (McCabe & Nowlis, 2003) and remain intangible (Laroche, Yang, McDougall, & Bergeron, 2005), rendering product evaluation more difficult and risky compared with offline settings (Dai, Forsythe, & Wi-Suk Kwon, 2014). Visual information from product images provides important information in this context, because it helps consumers to imagine future use (MacInnis & Price, 1987). While product videos (Orús, Gurrea, & Flavián, 2017) or virtual reality (Huang & Liao, 2015) offer alternatives for overcoming the intangibility of products online, the simplest means for online retailers remain product images. In contrast to products photographed on white background, contextual backgrounds in product photography (Chang, 2013) can not only help to reduce the product ambiguity (Maier & Dost, 2018) but also allow consumers to imagine what a product or service would physically feel like and how they might use it in the future (Lee & Gretzel, 2012). But contextual background images come at a cost to the online retailers: while a professionally produced product image on white background might start at $10, contextual product images in real settings cost a multitude of that amount (e.g., from set construction and product styling, Weilmeier, 2017).

This study, therefore, aims to identify under which conditions contextual background images can improve product imagination and evaluation. Specifically, using product images to foster customers' imagination of future use may not be as straightforward as intuitively expected. The present research addresses three limitations of extant research through an integration of two research streams. First, although research has established the process of *mental imagery*, in which contextual images of the product and its future use in consumers' minds (MacInnis & Price, 1987) create positive emotions and increases purchase intentions (Petrova & Cialdini, 2005), we do not know under which conditions this mechanism arises.

Second, although we know the positive evaluative consequences of *imagery fluency*

from contextual images (Maier & Dost, 2018), that is, the ease with which mental images come to mind and its positive affective consequences (Chang, 2013; Petrova & Cialdini, 2005), fluency has not been investigated as input in other perception processes (e.g., mental imagery, where its effect needs to be explored: Yoo & Kim, 2014). This research makes the novel suggestion that both research streams should be combined, as imagery fluency serves as prerequisite for mental imagery. This is managerially relevant, because if both streams are taken separately, conflicting advice for product image selection might arise. For instance, the image of a bottle of wine in the contextual setting of a wine cellar requires more processing effort than the processing of the same bottle on white background. The literature on imagery fluency would recommend using the white background to lower processing effort; the literature on mental imagery would recommend the wine cellar background to stimulate imagery of future use. As a result, different recommendations would emerge if the background effect on fluency is independent from, or related to the effect on mental imagery. If they are related, then product pictures with contextual backgrounds need to strike a balance that satisfies both mechanisms, allowing imagery fluency as well as eliciting mental imagery.

Third, extant research on mental imagery has widely disregarded the moderating role of product category (focusing instead on interpersonal moderators, e.g., non- vs. visualizers: Yoo & Kim, 2014) and calls for an investigation of product-related boundary conditions of the effect (Yoo & Kim, 2014). Because mental imagery in an online context is particularly important for products which have to be experienced in use, we make the novel suggestion that experience (vs. search) products benefit more strongly from mental imagery. This distinction matters for online retailers, because products cannot be touched in e-commerce, hence retailers have to rely more on mental imagery (McCabe & Nowlis, 2003). As contextual product images are more expensive to create, online retailers may need to decide upfront for which product categories they want to make that investment.

The present article contributes to these gaps and the wider related literature by, linking research on mental imagery and imagery fluency, establishing imagery fluency as a prerequisite for mental imagery. This disentangles the effects of fluency and mental imagery on consumers' evaluations and answers calls for research on the antecedents of mental imagery (Orús et al., 2017). The present article replicates existing (product ambiguity) and introduces novel moderating effects (search vs. experience goods) as boundary conditions, which help strike the balance between imagery fluency and mental imagery. Finally, we utilize realistic stimuli and settings close to the actual e-commerce environment (e.g., a webstore with purchase funnel and shopping cart), following calls for fluency research with nonartificial, realistic stimuli (Lee & Labroo, 2004) such as images (Albrecht & Carbon, 2014), the understanding of which is still "incomplete and fragmented" (Larsen, Luna, & Peracchio, 2004, p. 102) to date.

2. Literature review, theoretical background and hypotheses development

Extant literature has investigated the evaluative and behavioural consequences of two mediators related to imagery: mental imagery and imagery fluency, which so far have been assessed in two separate streams of literature (see *Tab. 1*). Our core proposition is that both need to be integrated to develop a comprehensive understanding of mental imagery and to identify novel moderators.

2.1. Extant research on mental imagery from contextual images

MacInnis and Price (1987) were the first to propose that "mental imagery" (p. 487) can evoke perceptual and sensory product representations in consumers' memories that are used similarly to actual stimulus perception. That is, although consumers cannot directly touch a product as in a brick-and-mortar store, they can imagine the actual stimulus "in their mind's eye" (Lee & Gretzel, 2012, p. 1270). Moreover, consumers mentally simulate usage experiences in enactive imagery (Goossens, 2003, p. 134). For instance, consumers envision themselves at a vacation destination (Walters, Sparks, & Herington, 2007), such as a

Caribbean beach (Miller & Stoica, 2003), or how comfortable they feel walking in their new travelling shoes (Chang, 2013). Extant research finds a dominance of visual over verbal cues as antecedents of mental imagery (White, Sheehan, & Ashton, 1977), termed the "picture superiority effect" (Unnava & Burnkrant, 1991, p. 226). This dominance rests on the greater experiential value of visual versus verbal information (Jeon, Fiore, Niehm, & Lorenz, 2009).

The two most common product image types in e-commerce differ in the degree to which they elicit mental imagery. Products can either be shown as stills on a plain white background or set in a concrete contextual background (Yoo & Kim, 2014)—for instance, a living room for furniture or a sunset-lit beach for a surfboard. A contextual background carries semantic meaning (Scott & Vargas, 2007), which fosters mental imagination and "provide[s] the materials necessary to facilitate the formation of more complete conceptions of the future consumption scenarios" (Krishnamurthy & Sujan, 1999, p. 57).

Research has already established that contextual images can induce mental imagery (see *Tab. 1*), but two gaps remain, which we aim to close: First, conditions for mental imagery are not comprehensively assessed. Specifically, characteristics of contextual images might interfere with mental imagery. For instance, contextual images are more complex and might be perceived less fluently (Reber, Schwarz, & Winkielman, 2004). Similarly, imagery fluency (discussed below) varies over different product images. We, therefore, need to test if imagery fluency acts as prerequisite for mental imagery. Second, although the mental imagery effect has been shown for different products (e.g., cars [Babin & Burns, 1997], fashion items [Yoo & Kim, 2014]), the product category has, to the best of our knowledge, never been varied systematically. Instead, product categories for which mental imagery was deemed particularly important were investigated (e.g., travel: Walters et al., 2007). Therefore, we need to identify product category-related boundary conditions for the mental imagery effect (Yoo & Kim, 2014).

	Relationships examined			Dependent variables		Moderators unrelated to the image or text	Stimuli
	Stimuli → Imagery fluency	Stimuli → Mental imagery	Imagery fluency → mental imagery	Evaluations (e.g., liking)	Behaviour (e.g., purchase intent)		
Bone & Ellen, 1992		✓		✓	✓	n/a	Radio ads
Babin & Burns, 1997		✓		✓		n/a	Print ads
Miller & Marks, 1997		✓		✓		n/a	Radio ads
Bolls & Muehling, 2007		✓		✓	✓	n/a	Radio ads
Walters et al., 2007		✓		✓		n/a	Images and text
Lee & Gretzel, 2012		✓		✓		n/a	Images and text
Krishna, Morrin, & Sayin, 2014		✓			✓	n/a	Imagined (vs. real) food scent
Yoo & Kim, 2014		✓		✓	✓	Interpersonal (non- vs. visualizers)	Images and text
Lowe & Haws, 2017		✓		✓		n/a	Acoustic pitch in voice/music
Petrova & Cialdini, 2005	✓			✓		Interpersonal (self-consciousness)	Images and text
Chang, 2013	✓			✓		n/a	Images and text
Roy & Phau, 2014	✓			✓		Interpersonal (regulatory focus)	Print ads
Orús et al., 2017	✓			✓	✓	n/a	Product videos
Maier & Dost, 2018	✓			✓		Product ambiguity	Contextual product images
This research	✓	✓	✓	✓	✓	Product ambiguity; product category	Product images

Tab. 1: Overview of extant research with empirical investigations on imagery fluency and mental imagery: relationships examined, dependent variables and moderators investigated

2.2. Extant research on imagery fluency

A second, independent research stream focuses on the imagery fluency effects of different visual stimuli. The metacognitive process most commonly used to describe the ease of information processing is fluency, defined as "the ease or difficulty with which new, external information can be processed" (Schwarz, 2004, p. 338). Imagery fluency, as one

dimension of fluency, describes the ease with which mental imagery is formed (Chang, 2013). A visual stimulus provides a hypothetical scenario that is more or less easily imaginable to consumers (Alter & Oppenheimer, 2009). For example, the more vivid the picture in an ad, the more easily and fluently the consumer can imagine the related product or service (Petrova & Cialdini, 2005). In contrast, the less vivid the perceptual characteristics of an image (e.g., lack of contrast or vividness: Petrova & Cialdini, 2005), the more disfluently it is perceived. Similarly, disfluency could also arise when the image meaning contrasts with existing representations in consumers' memories (e.g., conflict with existing product associations: Unnava & Burnkrant, 1991; Zhao, Dahl, & Hoeffler, 2014) or when a suggested hypothetical scenario seems implausible. For example, implausible claims decrease imagery fluency and preference for a luxury product (Mandel, Petrova, & Cialdini, 2006).

Two main gaps in research on imagery fluency exist, which our research aims to close. First, extant research has only focused on the downstream attitudinal consequences of imagery fluency, rather than the mediation through mental imagery (see *Tab. 1*: Chang, 2013; Maier & Dost, 2018; Mandel et al., 2006; Orús et al., 2017; Roy & Phau, 2014). This is surprising, because it is not yet clear how the attitudinal consequences of fluency arise. For instance, the attitudinal consequences might arise directly from consumers' feelings of fluency. Extant research widely agrees on the positive affective consequences of fluency (hedonic fluency view; see the following literature reviews: Reber et al., 2004; Schwarz, 2004; Winkielman, Schwarz, Fazendeiro, & Reber, 2003; and empirical investigations: Fang, Singh, & Ahluwalia, 2007; Landwehr, Golla, & Reber, 2017; Winkielman & Cacioppo, 2001). However, the effect might also arise from the actual mental imagery – thus, focusing only on the affective and evaluative consequences of imagery fluency is insufficient to theoretically establish the complete causal chain.

Second, product-related moderators of the effect of contextual images have been

insufficiently assessed. Although product ambiguity has been shown to exacerbate the positive effect of contextual product images on evaluations (Maier & Dost, 2018), we have no information whether contextual images show comparable effects in all product categories. We therefore need to understand whether the fluency effect does not hold for some categories.

2.3 Moderators of the effect of contextual images

As investment in the visuals in e-commerce (e.g., through images) is only warranted when product categories actually require it (e.g., for risk reduction, Schlosser, White, & Lloyd, 2006), retailers should consider the moderating role of product category. The category of a product has been established as influential moderator in e-commerce (Sohn, 2017b). In our context, the product category could influence whether consumers form mental images of a product and therefore moderate the influence of contextual background on imagery fluency.

The question is whether contextual image backgrounds can help evoke that mental imagery, or whether the added complexity of the image hinders a fluent perception (Krishnamurthy & Sujan, 1999; Larsen et al., 2004; Orth & Crouch, 2014), and thus the formation of mental imagery. The answer depends on consumers' processing motivation, which moderates fluency (Graf & Landwehr, 2015) as well as mental imagery, in that mental imagery only occurs when the motivation to process the imagery-inducing stimulus is sufficiently high (Orús et al., 2017). Similarly, Goossens (2003) proposes that enactive imagery, a related form of imagery which combines visual and experiential components, only occurs under high processing levels, and these processing levels are only likely to occur for products for which consumers actually require additional experiential information.

We suggest that processing motivation is only high in the online purchase of experience (vs. search) products, because these require additional (imagery) information. Specifically, products with high sensory requirements, such as experience products, are particularly difficult to purchase online (McCabe & Nowlis, 2003) and could thus benefit

proportionally more from mental imagery. Indeed, Yoo and Kim (2014) suggest systematically extending their analysis on the impact of fashion product imagery to search and experience goods in general. The distinction between search and experience goods has long been established (Nelson, 1974), and although the classification criteria have been debated (Ekelund, Mixon, & Ressler, 1995; Laband, 1991), basic characteristics prevail: search products are those about which information can be researched prior to purchase (e.g., a washing machine), while the characteristics of experience goods can only be recognized after purchase (e.g., sport shoes; Jourdan, 2001). Online retail, therefore, is particularly hampered in its presentation of experience products, because these are predominantly evaluated on sensory criteria, but not all senses can be stimulated in an online environment. Evoking mental imagery could help alleviate this shortcoming in online stores, as mental imagery incorporates not only the mental image itself, but also the sensory experience associated with it (MacInnis & Price, 1987).

In summary, for experience products, the additional visual information from a contextual image background fits with consumers' need for such information, rendering the image more easily accessible and fluent. In contrast, the additional visual information may be not needed for a search good, for which mere product description suffices. Here, the added visual information might even contrast with the easily formed or preconceived mental images from the verbal product information alone, lowering processing ease (Wyer, Hung, & Jiang, 2008). Taken together, we expect a differently fluent perception of contextual backgrounds, given the different need for experiential or sensory information in experience and search goods.

H1: Product category (experience vs. search) moderates the relationship between contextual background and consumer fluency perceptions, in that contextual background (increases) decreases fluency perceptions for search (experience) products.

Additionally, extant research has already shown that consumers perceive ambiguous products more fluently if these products are presented in contextual backgrounds, which facilitate recognition. For instance, a glass vase is ambiguous, because it could be seen as a device for drinking or for storing flowers; adding a beverage or flowers to the image clarifies this ambiguity and increases perceived fluency (Maier & Dost, 2018). To offer a comprehensive assessment on the effects of contextual images, we aim to replicate these findings:

H2: Product ambiguity moderates the relationship between contextual background and consumer fluency perceptions, in that contextual background increases fluency perceptions only for ambiguous products.

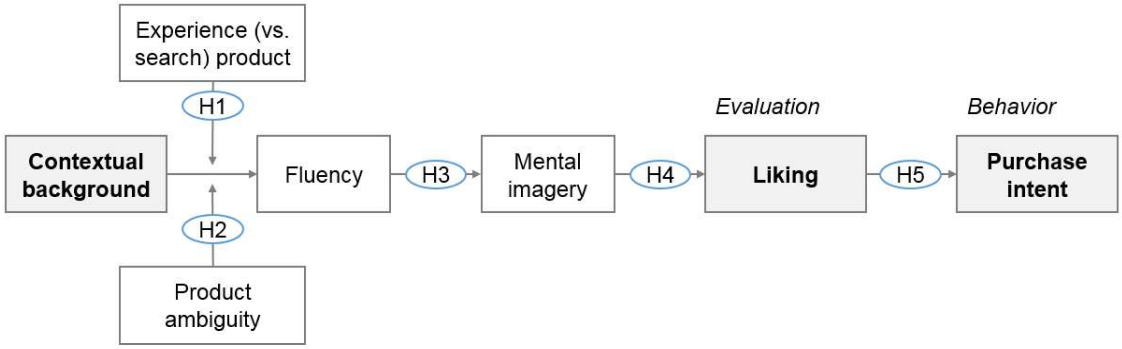

Fig. 1: The conceptual model and related hypotheses

2.4. Imagery fluency as antecedent of mental imagery

We suggest that the effect of imagery fluency on evaluations is mediated through mental imagery. Only if an image can be visually perceived fluently, it is more likely to generate mental images; in contrast, if a visual stimulus is difficult to perceive (e.g., low resolution) or contrasts with expectations (e.g., uncommon usage scenario), it might inhibit mental imagery. In an extreme case, if visual information cannot be decoded (e.g., image is blurred) or is in stark contrast to expectations, its information cannot be used at all. If a stimulus is perceived only slightly disfluently, its information is still likely to be devalued (Orús et al., 2017) or judged more improbable (Petrova & Cialdini, 2005) and is thus less valuable for the generation of mental images.

An image can also be semantically disfluent. For instance, only a fitting product context (e.g., a beach for a surf board) can be fluently perceived, while a non-fitting context (e.g., a beach for an ice-skate) is likely to be semantically disfluent. In support of this proposition, Shapiro (1999) finds that recall of a product is only improved when consumers are previously exposed to it in a fitting context (e.g. a living room for a sofa), but to lesser degree when the context is semantically inconsistent (e.g., a street for a sofa). Therefore, fluency should be highest when a contextual product image is both visually and semantically easy to perceive, and when the image is easily perceived, it can provide additional information to evoke mental imagery.

The present research is the first to disentangle whether and how imagery fluency and mental imagery interact to influence consumers' product evaluations. As shown in the conceptual model in *Fig. 1*, we propose that fluency is a prerequisite of mental imagery and that a significant share of the attitudinal consequences of imagery fluency are mediated through mental imagery. Formally:

H3: Higher fluency increases mental imagery.

2.5. The attitudinal and behavioural consequences of mental imagery

Mental imagery affects product memory and purchase intention (MacInnis & Price, 1987) and elicits experiential consequences, such as "olfactory images" (Krishna et al., 2014). Extant research agrees that the consequences of mental imagery are positive in valence (Bolls & Muehling, 2007; MacInnis & Price, 1987; Yoo & Kim, 2014), as long as no negatively valenced images are evoked (e.g., ailments caused by cigarette smoking; Veer & Rank, 2012). Such negative images are unlikely to be present in advertising (Babin & Burns, 1997) or e-commerce product presentation and can be disregarded here. Therefore, we expect mental imagery from contextual product images to elicit a positive affective response and improve the evaluations of products. Formally:

H4: Greater mental imagery improves product evaluations (e.g., liking).

As evaluations of the products under investigation improve, positive behavioural consequences (e.g., purchase intent) should also arise. Our conceptual model in *Fig. 1*, therefore, also contains these behavioural consequences. Formally, we propose:

H5: Better evaluations (e.g., greater liking) increase behavioural response (e.g., purchase intent).

We test the hypotheses in two independent experiments, which manipulate the context of product images. Study 1 establishes the positive effect of contextual background on liking through fluency and mental imagery in a between-subjects experiment. We replicate the moderating effect of product ambiguity on consumers' fluency perceptions (H1) and in addition show our novel proposition that fluency acts as antecedent of mental imagery (H3) and, in turn, improved product evaluations (H4). Study 2 focuses on all theoretical contributions novel to literature by assessing the effect of the second moderator (H2: search vs. experiential goods) and confirming the role of fluency as antecedent to mental imagery (H3) in a within-subjects experiment. Additionally study 2 tests for further downstream consequences to product evaluations (H4), namely purchase intent (H5). The design of both studies varies, to allow for conceptual replications as an integral part of any research design to increase the external validity and generalizability of the results (Lynch, Bradlow, Huber, & Lehmann, 2015; Uncles & Kwok, 2013).

3. Study 1

3.1. Design

Two-hundred fifty-one participants recruited via Amazon MTurk (45% female, mean age = 37.4 years) viewed product images of two grocery products commonly categorized as nondurable experience products (Nelson, 1974). To test the moderating effect of product ambiguity on fluency, which in turn acts as potential antecedent for imagery processing, we

selected two grocery products that differ in ambiguity: wine and detergent. While a bottle of wine is easy to recognize and, thus, can be fluently perceived even without contextual background, a bottle of detergent could have multiple uses (e.g., cleaning detergent for the bathroom or the kitchen, liquid washing detergent) and thus allow for multiple interpretations (Faier & Unger, 1987; Krishnamurthy & Sujan, 1999). Contextual background might facilitate the access to the meaning of the stimulus (Reber et al., 2004) and could, therefore, increase the fluency with which consumers perceive a stimulus. Conversely, if consumers cannot recognize the stimulus, they might not be able to form mental images of the product and its use.

In addition to showing the products in a no-context condition, we counterbalanced the backgrounds on which the products were displayed to control for the effect of background. We propose, however, that only semantically fitting contexts create a fluency effect, because they can be visually and verbally easily encoded; non-fitting contexts do not. Consequently, the products were displayed in front of either a decanter and wine glasses (fit: wine; no fit: detergent) or a bucket with cleaning equipment (fit: detergent; no fit: wine; see *Fig. 2*). In summary, consumers were randomly assigned to a 3 (background: white vs. fitting contextual vs. non-fitting contextual) × 2 (ambiguity: low [wine] vs. high [detergent]) between-subjects design.

After viewing the stimulus, participants stated their liking, fluency perceptions, and degree of visualization. We measured fluency with items suggested by Wu and colleagues (2016; F1: “The product information presented in the product picture is easy to view”; F2: “It is easy to identify information pieces presented in the product picture”; F3: “I can effortlessly comprehend the information in the picture”; and F4: “It is easy to understand the product and its use from the product picture.”). We used a multi-item measure of fluency but only calculated an overall index, similar to Roy and Phau (2014). We use this approach because

fluency is a meta-cognitive experience of "ease" (Winkielman et al., 2003), which is difficult for participants to differentiate by dimensions (Kahn, 2017). Therefore, we calculated an index from the four items (α = .85). As a result, our investigation does not allow us to differentiate between different types of fluency as antecedent of mental imagery but rather provides robust information on an overall feeling of ease in the perception of the stimulus.

We also included measures of the mental imagery (I1: "I can visualize what it is like to use this product at home" and I2: "I can visualize what it is like to use this product" from Petrova and Cialdini (2005); α = .85). At the end of the experiment, we asked participants to guess the purpose of the study. Six participants correctly guessed that we were interested in the fit of image background and product category and one that we were investigating the effect of image backgrounds; we subsequently excluded these participants from our analysis. No other data cleaning was performed. We used all data collected in the experiment (i.e., no experimental groups or late participants were dropped).

3.2. Prestudy

A prestudy assessed consumers' perceptions of the sample products and backgrounds used. First, consumers evaluated the ambiguity of the two nondurables (wine and detergent) in a repeated-measure design (seven-point Likert scale: "How easy is it for you to recognize this product as detergent/wine?" ranging from "Very difficult" [1] to "Very easy" [7]). We also included an ambiguous durable product (a shelf for wine bottles) as measure of comparison. Participants (MTurk, n = 20) evaluated the detergent as significantly more ambiguous than the wine (within-subject t-test, wine [M = 6.30] vs. detergent [M = 5.35]: t = 2.37, $p < .05$), but equally ambiguous as the durable comparison product (detergent vs. wine shelf [M = 5.70]: t = .80, p = .43; wine vs. wine shelf: t = 3.04, $p < .01$). Second, we tested the fit of the background. As expected, the wine background was more strongly associated with wine as a product ("How strongly do you associate the following product categories with this

image?": Wine vs. detergent, detergent background: $t = -8.27$, $p < .001$; wine background: $t = 12.78$, $p < .001$). In summary, the manipulation checks of the prestudy confirm our experimental design. In line with recent experimental procedures (Herr, Page, Pfeiffer, & Davis, 2012), we do not include manipulation checks in our main study to avoid biasing the dependent variables (e.g., from contamination or raised doubt of the participants; Sigall & Mills, 1998). The downside of this approach is that we cannot provide evidence that the manipulation actually worked in the experiment, should it somehow fail to work as in the prestudy (see Section 6 on limitations).

3.3. Results

To investigate the effect of contextual product backgrounds on consumers' fluency perceptions and, in turn, mental imagery and evaluation, we first compared only the no-context condition with the fitting-context condition in a set of regressions (see *Tab. 2* and *Fig. 2*). Note that we do not report results of analyses of variance (ANOVA) here, because we subsequently include metric variables as key independent variables, for which regressions are more appropriate. If only factorial independent variables are included, the results are identical. All results are reported as standardized betas, comparable to the effect sizes in an ANOVA.

	No vs. fitting context					**No vs. non-fitting context**		
DV:	**Fluency**	**Mental imagery**		**Liking**		**Fluency**	**Mental imagery**	**Liking**
Model:	1a	1b	1c	1d	1e	1f	1g	1h
Contextual background *(0 = without, 1 = with)*	–.01	—	.06	—	.02	–.06	–.01	.04
Ambiguity *(0 = low, 1 = high)*	–.27**	—	–.11	—	.11	–.27*	–.09	.15
Ambiguity × contextual background	.63*	—	.03	—	.18	.12	.10	–.02
Fluency	—	.59***	.56***	—	–.05	—	.63***	.15
Mental imagery	—	—	—	.28***	.31***	—	—	.25**
Hypotheses:	H2: ✓	H3: ✓		H4: ✓				

Notes: Coefficients are standardized betas. *** $p < .001$; ** $p < .01$; * $p < .05$; † $p < .10$.

Tab. 2: Study 1 model specifications and results

As H2 hypothesizes, the effect of contextual background on fluency was moderated by product ambiguity: as intended, the more ambiguous products were perceived generally less

fluently (model 1a: $\beta = -.27$, $p < .01$), but the effect reversed if they were presented in context ($\beta = .63$, $p < .05$). However, contextual images also had a positive main effect on fluency perceptions (not reported in Table 2: $\beta = .14$, $p < .05$). Fluency, in turn, increased mental imagery (model 1b: $\beta = .59$, $p < .001$), in support of H3. We added control variables for the direct effect of contextual background, ambiguity, and their interaction (model 1c), and the effect of fluency on mental imagery persisted ($\beta = .56$, $p < .001$). Contextual background had no significant direct (model 1c: $\beta = .06$, $p > .10$) or interaction ($\beta = .03$, $p > .10$) effect on mental imagery. The effect of contextual background on mental imagery also remained insignificant when fluency was removed from the model (not reported in Table 2: $\beta = .06$, $p > .10$), indicating that mental imagery requires imagery fluency.

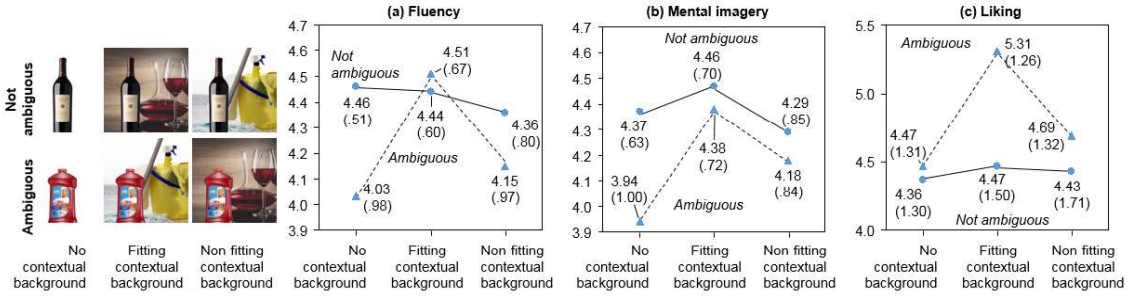

Fig. 2: fluency, mental imagery, and product liking in study 1

A mediation analysis subsequently details the question whether fluency is necessary for mental imagery. In support of H4, mental imagery increased liking, in both the stand-alone (model 1d: $\beta = .28$, $p < .001$) and full (model 1e: $\beta = .31$, $p < .001$) models. We ran a bootstrapping analysis ($n = 5{,}000$) to assess the significance of the moderated mediation (type 2) of fluency on mental imagery (Hayes, 2013; Preacher, Rucker, & Hayes, 2007). The mediation path from contextual background to fluency, mental imagery, and liking was significant for ambiguous products ($n = 5{,}000$, bias-corrected CI95%: .043, .340), but not for non-ambiguous (CI95%: –.094, .071). This confirms fluency as an antecedent of mental imagery, in that the mediation was only significant when context enabled a fluency increase

(i.e., for ambiguous products). As a robustness check for this proposition, we ran a direct mediation from context to mental imagery to evaluation (i.e., without the mediation through fluency). The mediation remained insignificant in both cases (not ambiguous: CI95%: –.068, .269; ambiguous: –.025, .152), pointing to a mediation only through imagery fluency. In summary, these results support our proposition that imagery fluency acts as prerequisite for mental imagery in line with our conceptual model.

To further assess our proposition that mental imagery depends on imagery fluency, we compared the condition on white background with the one with non-fitting contextual background (models 1f-h). The results indicate that the non-fitting context stimuli were not perceived differently in terms of fluency, as the standardized beta coefficients of the direct (β = –.06, p = .61) and moderated effect (β = –.13, p = .41) remained insignificantly different from the condition without context. We conclude that disfluent contexts (e.g., from illogical product-context combinations) do not enable mental imagery. In summary, Study 1 establishes the base effect of contextual background on fluency, imagery processing (H3), and liking (H4) and its moderation through ambiguity (H2).

4. Study 2

Study 2 extends Study 1 twofold: First, it tests the novel proposition of the moderating role of product category (search vs. experience goods, H1). Second, it extends the chain of dependent variables to behavioural measures (purchase intent, H5). Further, we change the investigated category to furniture and appliances to ensure that the effects of Study 1 can be generalized beyond the category of groceries. We thus answer calls for a more diverse set of product categories in the investigation of images (e.g., Yoo & Kim, 2014, who only assess fashion).

4.1. Design

Participants recruited through Amazon MTurk in exchange for a small payment (n =

157, mean age = 36 years, 44% female) conducted test purchases in the setting of an artificial e-commerce store for furniture and home improvement products. They first picked a product from a randomly generated product overview page that contained images of three products of the same category, their name and price, and category information. Participants then viewed the selected product in detail. We systematically varied the picture type on the product detail page by displaying the product in a contextual or white background. The detail page also contained a short description of the product and a hypothetical price, which were identical for all products of a category, irrespective of choice and image type. Participants could add the product to a hypothetical shopping cart, which we used as a measure for purchase intent.

Participants then proceeded to a short survey including single-item measures for fluency (five-point Likert scale: "How easy was the perception of the product?"), product liking ("How do you like the product?"; both from Forster, Leder, & Ansorge, 2013) and mental imagery ("I can visualize what it is like to use this [product] at home", based on Zhao et al., 2014). We acknowledge validity concerns regarding single-item measures (Sarstedt, Diamantopoulos, Salzberger, & Baumgartner, 2016), but wanted to use different scales from Study 1 to avoid common method bias and to shorten the survey in light of the repeated measures design (every participant evaluated four products). In addition, we apply scales commonly used in fluency research (e.g., Labroo & Lee, 2006; Landwehr et al., 2017).

We repeated the procedure in random order for four product categories that were either search or experience products, resulting in a 2 (contextual background: without vs. with) × 2 (product category: search vs. experience) within-subject design. We selected two furniture pieces as experience products (a sofa and a bed) because they strongly relate to multisensory (e.g., the design, the material/fabric) and experiential aspects of consumption. We selected a washing machine and an electric kettle as search products because their purchase is likely more strongly driven by functional product aspects (Dhar & Wertenbroch,

2000), which can be researched remotely, and previous research classifies household electronics as search goods (Jourdan, 2001). This choice is also in line with established classifications of search and experience goods (e.g., Huang, Lurie, & Mitra, 2009).

Finally, we asked for participants' demographic details and administered quality checks through two questions ("Which product was NOT under evaluation?" and "What was the price range of the beds?"), which resulted in the exclusion of 9 participants who incorrectly answered the question, leaving 148 in the sample. We applied no other data cleaning measures and used all collected data (i.e., no experimental conditions dropped).

4.2. Prestudy

A prestudy with 25 MTurk participants assessed consumers' perceptions of the four product categories in a within-subjects design (seven-point Likert scales: "How well can you assess the quality of this product before you purchase it?" and "How well can you assess the quality of this product after using it?" ranging from "Not at all" [1] to "Very well" [7]; Huang et al., 2009). Search products could be better assessed before purchase than experience products (paired-sample t test; $M_{search} = 5.02$ versus $M_{experience} = 3.28$; $t = 6.09$, $p < .001$).[1] The search products also scored higher than the scale midpoint of 4 ($t = 3.29$, $p < .01$), whereas the experience products scored lower than the scale midpoint ($t = –2.45$, $p < .05$). In summary, the prestudy confirms our chosen products. We also tested for the product's ambiguity, because contextual information might help to reduce ambiguity through providing additional information. We showed consumers in randomized order images of the products from the four categories and asked them to categorize the product in the image among seven product categories. This categorization time serves as proxy for ambiguity. The product categories did not differ in ambiguity as measured by the average categorization times (M_{search} = 2699ms

[1] Detailed statistics for search characteristics: $M_{Bed} = 3.40$ (1.53),$M_{Sofa} = 3.16$ (1.68),$M_{Kettle} = 4.88$ (1.72),$M_{Washing} = 5.16$ (1.55); ambiguity measured by recognition time: $M_{Bed} = 2264$ (1062),$M_{Sofa} = 3134$ (4278),$M_{Kettle} = 3289$ (1355), $M_{Washing} = 1802$ (1082).

versus $M_{experience}$ = 2545ms, t = .35, p = .72) from each other, but were significantly less ambiguous than the ambiguous test product already used in the prestudy to Study 1 (a wine shelf without bottles: M_{all} = 2622 versus $M_{ambiguous}$ = 6166, t = -5.37, p < .001).[1]

4.3. Results

We first ran a repeated-measure regression of participants' degree of mental imagery on the image type (context vs. none), product type (search vs. experience), and their interaction. The main effect of context on fluency was not significant (*Tab.3*, model 2a: β = –.05, p = .17), as the effect of context on mental imagery strongly depends on the product type (see *Fig. 3*, panel a). Consequently, contextual background had a positive effect on imagery fluency only for experience products (β = .16, p < .05), in support of H1. As expected there was no stand-alone effect of contextual background (not reported in table 2: β = .01, p = .62).

DV:	–Fluency–	—Mental imagery—		—Liking—		—Purchase intent[a]—	
Model:	2a	2b	2c	2d	2e	2f	2g
Contextual background *(0 = without, 1 = with)*	–.05	—	–.09	—	–.00	—	–1.21
Product category *(0 = search, 1 = experience)*	–.05	—	–.13 *	—	–.09	—	–.15
Context × category	.10 *	—	.13 *	—	.06	—	.64
Fluency	—	.49 ***	.50 ***	—	.25 ***	—	–.77
Mental imagery	—	—	—	.56 ***	.48 ***	—	.57
Liking	—	—	—	—	—	6.41 ***	6.20 ***
Hypotheses:	H1: ✓	H3: ✓		H4: ✓		H5: ✓	

Notes: Coefficients are standardized betas. *** p < .001; ** p < .01; * p < .05; † p < .10; [a] logit model, non-standardized β

Tab. 3: Study 2 model specifications and results

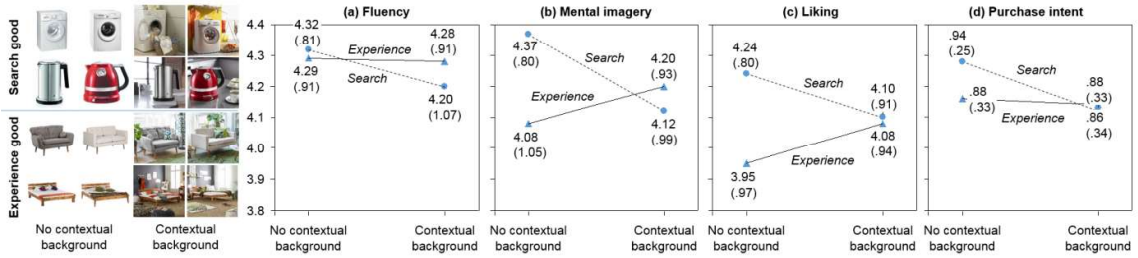

Fig. 3: fluency, mental imagery and product liking in study 1

To test whether fluency acted as antecedent to imagery mental imagery, we first regressed mental imagery on fluency (see *Tab. 3*, model 2b) and found that fluency

significantly increased mental imagery (β = .49, p < .001). We then also included variables for contextual background, experience (vs. search) products, and their interaction (model 2c) and found that the significant positive effect of fluency persisted (β = .50, p < .001), in support of H3. To investigate H4, we then assessed the attitudinal consequences of mental imagery, regressing liking on mental imagery (model 2d: β = .56, p < .001). The effect again persisted when controlling for the direct effects of image and product characteristics (model 2e: β = .48, p < .001), although fluency also had a significant, although smaller, direct influence on liking (β = .25, p < .001), in line with the previously discussed hedonic fluency view. Finally, the data also support H5, in that liking increases purchase intent (model 1f: β = 6.41, p < .001), also when controlling for the image and product characteristics (model 1g: β = 6.20, p < .001).

We then ran a bootstrapping analysis (n = 5,000) to assess the significance of the moderated mediation (type 2: by product category) of fluency and its influence on mental imagery and liking: search goods significantly suffered from contextual backgrounds (CI95%: –.058, –.001), as the bootstrapped confidence interval did not include zero. In contrast, experience products significantly profited from context (CI95%: .006, .052). In summary, the mediation paths support the novel hypothesis that the effect of contextual images is moderated by the product category (H2) through an exacerbation (mitigation) of the context effect for experience (search) products. Furthermore, study 2 indicates that fluency is an antecedent to mental imagery (H3), whose downstream consequences (H4: liking; H5: purchase intent) are positive.

5. Discussion and implications

In two experiments in an e-commerce environment, we explained the relationship between contextual (vs. white) backgrounds in product images, imagery fluency, mental imagery and product evaluations. We show that if contextual product images can be fluently perceived, consumers' mental imagery increases, improving liking, and purchase intent.

Therefore, mental imagery can help to mitigate one of the core challenges in e-commerce: products cannot be touched when shopping online, but they can be imagined. This effect is particularly strong for experience products, while search products do not benefit from contextual product backgrounds.

5.1. Theoretical implications

We extend extant literature in two dimensions that are particularly important for e-commerce. First, we establish fluency in the perception of product images as a prerequisite for mental imagery, which increases our understanding of consumer reactions to images (Larsen et al., 2004). Research thus far has only focused on the hedonic consequences of imagery fluency, linking the positive evaluation effects to the positive perception of fluent processing (Roy & Phau, 2014) or to misattribution of fluency to liking (Chang, 2013). Both our studies show not only that fluency influences evaluation through mental imagery but also that mental imagery requires fluency. Specifically, study 1 shows that the effect of contextual background arises only if the background can be perceived fluently, that is when it fits the viewers' imagery expectations. This finding also helps to explain why not all contextual product images in extant research generate mental imagery (Maier & Dost, 2018): images need to be visually and semantically fluent to be able to create mental imagery.

The second novel contribution is that the effect of contextual backgrounds on mental imagery is stronger for experience than for search products. Specifically, study 2 shows that contextual images have a negative effect on the mental imagery of search products. This negative effect of context for search products could be explained through consumers' focus on search characteristics of the product, while mental images of the product or its use (e.g., of a new washing machine in the own basement) are less important. If retailers then elicit mental images for search products through product images in contextual backgrounds, the mental images might be discounted because consumers perceive that a more objective, search-

characteristic-driven evaluation should take precedence. This could also explain why extant research on the effects of visual stimuli on mental imagery has to date focused on experience products or services, such as tourism (Lee & Gretzel, 2012; Miller & Marks, 1997) or fashion items (Yoo & Kim, 2014): sellers of these categories can hope to profit from eliciting mental imagery through contextual images. This finding extends a body of research that shows the continuing relevance of a search versus experience product distinction in e-commerce, despite the much-reduced search cost in online settings (e.g., Huang et al., 2009). Thus, online retailers of experience categories (e.g., furniture, fashion; also nondurables such as groceries) may find contextual product presentations more useful than online retailers focused on search products (e.g., household electronics).

5.2. Managerial implications

Managerially, contextual background might be a means of facilitating consumer understanding of complex assortments (Kahn, 2017), although retailers face multiple trade-offs. First, fluent imagery processing might contrast with other visual aims. Specifically, retailers can only hope to profit from mental imagery in their product presentation if the contextual images can be fluently perceived. They should be cautious when using novel or uncommon contexts in their product presentation, for instance, to appear novel or to catch consumers' attention (e.g., sports shoe worn at a festive ball) or to showcase product characteristics (e.g., sofa placed on a beach to illustrate that the fabrics are waterproof). Such non-fitting presentation contexts can lower fluency, inhibiting the desired effect on mental imagery and, in turn, liking and purchase intent. Furthermore, the overall store design affects fluency perceptions (Sohn, 2017a), which might, in turn, affect imagery fluency.

Second, finding fitting contexts is difficult for products for which consumer imagination of usage scenarios differs, increasing the effectiveness of contextual backgrounds for some but lowering it for others. For example, while the beach as context for presenting a

surfboard is evident, context choice for other products—such as a tablet computer—is more difficult, as consumers might differ in their preconceptions as to the imagined product use (e.g., on their sofa in their free time vs. in a meeting room for work). Additionally, providing context backgrounds in product images is costly, because realistic settings are required. Therefore, retailers must evaluate whether contexts in their focus category can be effectively provided and outweigh the associated costs—both monetarily and in terms of disfluency for some consumers. As a result, when not correctly selecting image type on a product by product basis, using only images with contextual backgrounds seems a more costly and riskier choice than using only images with white backgrounds. Third, retailers need to be consistent in their product presentation, particularly if multiple products are presented in a row (e.g., search overviews); research on the repeated exposure effect shows that only similar stimuli are perceived fluently (Forster et al., 2013). Therefore, mixing product image types (context vs. none) can cause disfluency, which hampers the intended mental imagery. This uniformity is particularly difficult to achieve if the retailer offers different product categories: study 2 shows that positioning search products in contextual backgrounds lowers fluency, mental imagery, and liking. Many retailers, however, offer both experience and search products (e.g., Amazon); offering contextual backgrounds for the former but not the latter would create inconsistencies that might harm the consumer evaluation they were targeted to increase. One resolution would be to differentiate image types by product category while ensuring similarity in image type if multiple categories are shown.

For professional photo services, our findings suggest that contextual backgrounds would further improve perceptions of their high-quality product images and, as such, the value to their (retail) customers. However, this improvement comes at a cost, because only fitting backgrounds promise mental imagery, which requires the use of many different digital or physical background settings; more complex scene lighting, especially for larger products

such as furniture; and increased postproduction efforts. Therefore, online retailers' adoption of a "contextual-background image standard" is ultimately a managerial decision based on assessment of multiple trade-offs (mental imagery vs. other aims; costs vs. benefits with which contexts can be generated; consistency vs. inconsistency across and within categories).

6. Limitations, critical discussion and further research

The present findings are limited in five domains, which generate need for future research. First, additional unobserved variables could influence the interactions between contextual background, product type, and mental imagery. For example, consumers' product familiarity (Zhao et al., 2014), expert knowledge (Reber et al., 2004), or involvement (Haans, Raassens, & van Hout, 2013) might moderate the appeal of images with or without contextual background. Other consumer characteristics might influence their tendency to form mental images, such as being a visualizer (vs. a verbaliser; Yoo & Kim, 2014) or having high (vs. low) imagery processing abilities (Petrova & Cialdini, 2005). Without accounting for these covariates, the explanatory power of our results may be restricted to the characteristics of our samples.

Second, the product category (kettle and washing machine as search vs. bed and sofa as experience products) and ambiguity manipulation (wine as less and detergent as more ambiguous) coincides with alternative explanations. For instance, for most consumers wine holds more hedonic characteristics than a bottle of cleaning detergent. Similarly, a washing machine might create negative feelings of work, while the bed engenders happy memories of sleep. The more vivid the product images of such potentially negative stimuli (i.e., contextual image increasing mental imagery about cleaning or washing), the more negative evaluations should be. Although we did not explicitly control for these effects, which is a clear limitation of this research, our studies' actual empirical results and study designs rule out these alternative explanations. In Study 1, our empirical results run completely opposite to this

seemingly intuitive explanation, as the effect of contextual background was stronger for the ambiguous utilitarian product detergent. Therefore, we deem it unlikely that the hedonic nature of the wine obscures the hypothesized result. Additionally, the search products in Study 2 carry not only potentially negative associations of work (washing machine) but also positive associations (e.g., tea from a kettle). We can, therefore, rule out the alternative account that contextual background is only beneficial for hedonic or positively associated products. Future research, however, should more explicitly control for these alternative accounts.

Third, the present research predominantly used visual stimuli to generate mental imagery; however, verbal stimuli are alternative, managerially relevant, and cost-effective means of eliciting mental images (Lutz & Lutz, 1978). Although our studies did provide verbal information on the products to increase the reality of the product presentation, we did not manipulate them to induce mental imagery (e.g., “Imagine palm fringed beaches”; Walters et al., 2007). Future research should determine whether the mediation through fluency and the moderation through product type also apply for verbal stimuli that are targeted at eliciting mental images (e.g., “Imagine how the new sofa might improve your living room”).

Fourth, this research shows imagery fluency as an antecedent of mental imagery; that is, the image elicited through the contextual background needs to fit the expectations of the product category. However, the contextual background might have another, non-imagery fluency impact. Specifically, contextual backgrounds are richer in detail and more complex, which might lower their non-imagery fluency perceptions (Reber et al., 2004). Therefore, a trade-off might arise between positive effects of contextual background on imagery fluency and mental imagery, and negative effects on non-imagery fluency, which future research should explore.

Fifth, the present research relies on pretests rather than manipulation checks in the

design of the experimental conditions; while extant research has advocated this approach (Herr et al., 2012), it cannot be ensured that the manipulation actually worked in the absence of a manipulation check. Future research could replicate our findings using manipulation checks. Study 2 also employs multiple single-item measures; although results are consistent between the single-item measure in Study 2 and the multi-item one in Study 1, the validity of single-item measures should be critically reflected on (Sarstedt et al., 2016).

An interesting route for future research would be to investigate whether the effects of contextual backgrounds persist if multiple dissimilar image types are shown beside each other. For instance, retailers often offer multiple images of the same product (Jia, Shiv, & Rao, 2014), among which some offer contextual background and some do not. We have previously discussed the potential negative consequences of a consistent image type for the presentation of search and experience products. However, even within a category or the detail page of a specific product, inconsistency in the product presentation might lower fluency (Wu et al., 2016). Future research should determine whether the positive effects of contextual backgrounds on imagery processing are outweighed by negative dissimilarity effects.

In conclusion, this paper provides a link between fluency research and the literature on mental imagery, establishing imagery fluency as a precondition for mental imagery in two experiments on the effect of contextual background in online product images. For experience products or ambiguous products, contextual background facilitates a fluent perception, evoking mental imagery, which increases consumers' liking of the product and intention to purchase. If these boundary conditions are met, online retailers and providers of professional product photography may consider using matching contextual backgrounds instead of white backgrounds to help overcome the sensual restrictions of online sales channels and improve consumers' responses to their offerings.

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Appendix to "Fluent Contextual Image Backgrounds Enhance Mental Imagery and Evaluations of Experience Products"

Type	Product	No contextual background	Fitting Contextual background	Non-Fitting Contextual background
Not ambi-guous	Wine			
Am-biguous	Detergent			

Appendix Table 1: Stimuli in Study 1

Type	Product	No contextual background	Contextual background
Expe-rience	Bed		
			
			
	Sofa		

			
			
Search	Washing machine		
			

			
	Kettle		
			
			

Appendix Table 2: Stimuli in Study 2

		Bed		Sofa		Kettle		Washing	
		Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Fluency	No context	4.21	(0.93)	4.36	(0.90)	4.39	(0.67)	4.27	(0.89)
	Context	4.32	(0.93)	4.23	(0.89)	4.21	(1.13)	4.19	(1.03)
Mental imagery	No context	4.03	(1.07)	4.13	(1.03)	4.48	(0.68)	4.29	(0.87)
	Context	4.12	(0.97)	4.29	(0.87)	4.22	(0.91)	4.03	(1.05)
Liking	No context	3.84	(1.11)	4.05	(0.83)	4.58	(0.56)	4.02	(0.86)
	Context	4.02	(0.94)	4.15	(0.95)	4.09	(0.95)	4.10	(0.88)
Purchase intent	No context	0.86	(0.35)	0.90	(0.31)	0.94	(0.25)	0.94	(0.25)
	Context	0.87	(0.34)	0.88	(0.33)	0.83	(0.38)	0.90	(0.31)

Appendix Table 3: Detailed empirical results in Study 2