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The Mirror Effect in Online Survey Data: Evidence and Implications for Marketing Theory and Strategy

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The Mirror Effect in Online Survey Data:

Evidence and Implications for Marketing Theory and Strategy

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ABSTRACT

This research reveals the presence, in online survey data, of a key pattern documented in psychology lab research: the *Mirror Effect*. The Mirror Effect occurs when unfamiliar stimuli are unexpectedly recognized as accurately as familiar stimuli, or more accurately. Using a set of familiar and unfamiliar words (as determined by lexical frequency), we first report that we can robustly replicate psychology lab research in an online survey, detecting the Mirror Effect. We then apply the same analytical approach to surveying consumer recognition of everyday brands (supermarkets, banks, and car brands). We find that unfamiliar brands can be recognized with the same level of accuracy as familiar brands, and this effect is stronger than age and gender memory biases present in the data. However, we detect a boundary condition for branded apps, which are extremely unfamiliar brands competing in highly fragmented marketplaces, so very few get downloaded or used. For these digital brands, we find a *Concordant Effect*, as most respondents find it difficult to recognize highly unfamiliar branded apps (i.e., those with fewer than 5,000 downloads). The Mirror Effect re-emerges for highly experienced app users. These results demonstrate the implications of a generalizable empirical pattern from cognitive psychology for branding and advertising theory. The outcomes of this research also translate into practical guidelines for brand performance measurement via online surveys, mitigating recognition memory bias for the development of marketing strategies based on more accurate interpretation of empirical evidence.

Keywords: *Mirror Effect; Recognition Memory; Branding Theory; Advertising Theory; Online Surveys; Brand Performance Measurement; Marketing Strategies.*

1. Introduction

The *Mirror Effect* describes symmetrical (i.e., mirrored) results for recognition of familiar (frequently encountered) versus unfamiliar (infrequently encountered) stimuli (Glanzer, Kim, & Adams, 1998). It is an empirical pattern arising due to confusion in the activation of episodic versus semantic memory traces (Hintzman, 1994). The aim of the present research is to significantly expand marketing literature on this well-established phenomenon, given its importance for understanding how individuals process and recognize information (Glanzer, Adams, & Iverson, 1991; Glanzer et al., 1993; Greene, 1996; Hilford, Glanzer, & Kim, 1997; Hintzman, 1994; Glanzer et al., 1998). In more detail, this research investigates the Mirror Effect's implications for marketing theory and strategy by documenting: i) replicability of research approaches from psychology (laboratory experiments) to online surveys; ii) existence and strength of the Mirror Effect underpinning the performance of day-to-day brands; and iii) likely boundary conditions that may arise (e.g., for highly unfamiliar brands competing in fragmented markets with very low entry barriers).

Within the literature, there is a consensus that embracing a memory perspective through a psychological lens forms a strong basis for the theory and practice of marketing. For decades, past studies have drawn upon psychology principles to explain the cognitive mechanisms underlying consumer knowledge of products and brands (Nedungadi, 1990; Keller, 1993; Krishnan, 1996). For example, branding research draws on *associative network theories of memory* (Anderson, 1983; Anderson, 1993; Anderson, 1996; Anderson & Bower, 1973; Anderson & Bower, 1974; Anderson & Bower, 2014; Anderson & Milson, 1989) to explain how consumers process brand information (Keller, 1993; 2003), including in the context of decision-making (Bettman, Luce, & Payne, 1998). More contemporary views also see marketing activities as prominent sources of semantic and episodic cues (Herz & Brunk, 2017) that, when evoked, impact buying behavior and brand performance (Romaniuk, 2013;

2023; Romaniuk & Nenycz-Thiel, 2013; Romaniuk & Sharp, 2016). Similarly, advertising research relies upon psychological and cognitive measures to infer the effects of promotional activities – e.g., for the measurement of advertising recognition, brand recognition and shifts in purchase intention (see Shapiro & Krishnan, 2001; Braun-LaTour et al., 2004).

As we show in the present research, the Mirror Effect offers a fresh perspective for understanding the factors shaping consumer processing of marketing cues (Heath & Nairn, 2005). Above all, the Mirror Effect challenges and updates existing theorizations and analytical approaches entailing appraisals of recognition memory performance. In particular, it concurrently accurately delineates between complementary yet competing memory processes (familiarity and recollection), and between different types of memory structures (semantic and episodic memory) (Yonelinas, 1994; 1997). It also generates empirical benchmarks and expectations for stimuli differing in the level of familiarity (Kent & Allen, 1994; Vaughan et al., 2016) to be expected in marketing settings (Romaniuk, Bogomolova & Dall'Olmo-Riley, 2012). Hence, the primary contribution of this research lies in simultaneously ascertaining the presence of the Mirror Effect in marketing settings and clarifying the resulting implications for marketing theory and strategy. As a secondary contribution, this study complements prior research that has advocated for a better delineation between different memory processes and memory types to better understand consumer knowledge of product categories and brands, improving accuracy in brand performance measurement (e.g., Stocchi et al. 2016; Konopka et al., 2019). More broadly, the present study reinvigorates and expands the scholarly discourse on the impact of recognition memory performance on brand purchase decisions (e.g., Coates, Butler, & Berry, 2006; Konopka, Wright, Avis, & Feetham, 2019; Lee & Labroo, 2004; Romaniuk, 2013; Stocchi, Wright, & Driesener, 2016; Teichert & Schöntag, 2010; Van Osselaer & Janiszewski, 2001). Finally, by

examining the Mirror Effect in consumer surveys, we reinforce vital cross-disciplinary ties between psychology and marketing, paving the way to new knowledge creation.

From a managerial viewpoint, the present research lends itself to outlining a series of practical implications to be taken into consideration when designing online consumer surveys that require consumers to recognize brands or other marketing artefact, including: i) pre-testing stimuli familiarity and, accordingly, ascertaining whether the stimuli are likely to generate a Mirror Effect; and ii) using episodic cues rather than semantic cues to level the playing field between familiar and unfamiliar stimuli. It is also possible to draw on the Mirror Effect to more accurately ascertain if results of measures involving recognition memory are likely to be biased by brand usage (*post hoc*). As we explain, these practical solutions can mitigate the risk of misinterpretation of online survey data to derive marketing strategies, thanks to establishing guidelines for developing, tracking, and interpreting memory-based measures of brand performance underpinning consumer purchase decisions.

2. Conceptual Background

2.1 The Mirror Effect in Psychology

The *Mirror Effect* (Glanzer, Adams, & Iverson, 1991; Glanzer, Kim, & Adams, 1998; Glanzer et al., 1993; Greene, 1996; Hilford, Glanzer, & Kim, 1997; Hintzman, 1994) is an empirical pattern seen in *recognition memory performance*, which concerns the ability to correctly distinguish between 'new' versus 'old' information. The importance of the Mirror Effect in psychology research derives from the possibility of explaining when and why unfamiliar concepts are, at times, recognized as easily as familiar concepts.

The Mirror Effect is best understood through the theoretical lens of the *Source Activation Confusion* (SAC) model, which proposes that highly familiar information has two sources of memory activation: i) *semantic associations* established in long term memory; and ii) *episodic memory* enriched by autobiographical details (Reder et al., 2000; 2002). Semantic

and episodic memories are associated with *familiarity* and *recollection*, respectively (Yonelinas, 1994; Yonelinas, 1997; Reder et al., 2007). Familiarity measures the strength of semantic associations (Buchler, Light, & Reder, 2008) developed over time (Anderson et al., 1998; Cary & Reder, 2003; Mantonakis, Whittlesea, & Yoon, 2018). Recollection involves retrieving episodic information and the details that characterize it, as it is formed (Cary & Reder, 2003; Diana et al., 2004; 2006; Tulving, 2002). While both processes can feasibly underpin recognition memory performance, one will typically prevail over the other, depending on properties of the stimulus that prompts recognition, such as its familiarity. In more detail, within this framework, the Mirror Effect occurs when recognition memory is prompted by an episodic cue and: i) memory activation of a *familiar* stimulus is *hampered* due to confusion triggered by salience of the episodic cue and of the details it carries (i.e., recollecting time and place of exposure), rather than familiarity (i.e., ease of processing resulting from prior exposures and strengthened semantic associations); while ii) memory activation of an *unfamiliar* stimulus is *facilitated*, given that the primary source of salience will be episodic memory (and recollection) formed during exposure overriding the deficit in familiarity (i.e., weak or non-existing semantic associations).

In psychology research, the Mirror Effect is typically investigated using a two-stage investigation process (Reder et al., 1996; Reder et al., 2000; Cary & Reder, 2003; Buchler et al., 2008). In the first stage of the experiment, participants are provided with a list of stimuli differing in familiarity (e.g., high vs low lexical frequency words) and tasked to memorize the list (*study phase*). The time and place of this stage of the experiment create an episodic memory. In the second stage (*experiment phase*), participants view a second list including several stimuli from the original list and distractors to allow measurement of correct (hits) vs. incorrect recognition (false alarms). Participants then answer questions such as: "*Is stimuli X new or old to the experiment?*" Recognition memory performance is inferred from comparing

the proportion of hits (correctly identifying 'old' stimuli as 'old') against the proportion of false alarms (incorrectly identifying 'new' as 'old'). A classic Mirror Effect implies hits for unfamiliar words will be equal to, or greater than, hits for familiar words.

2.2 The Mirror Effect in Marketing

The Mirror Effect in marketing research is somewhat overlooked, which is surprising given that empirical appraisals of consumer recognition of commercial artefacts such as brands, advertisements and product quality cues are widely established. Moreover, the Mirror Effect has the potential to challenge typical expectations in branding and advertising theory that brand users, who are more familiar with brands, will be always more likely to recognize the brands they use – a phenomenon known as the *brand usage bias* (Bird et al., 1970; Barwise & Ehrenberg, 1985; 1987; Barnard & Ehrenberg, 1990).

Upon choosing as research discipline 'marketing', a bibliometric search across leading scholarly databases based on the keyword 'Mirror Effect' returned a very limited number of studies affected by noteworthy limitations. Above all, there seems to be no marketing study in peer reviewed journals providing an account of the Mirror Effect tested with the same methods used in psychology research. For example, Stocchi et al. (2016) detected activation confusion for highly familiar brands arising from product category knowledge through a manipulation of brand image data (i.e., a comparison of brand-to-attribute associations rates resembling hit and false alarm rates). There are also conflicting results, especially for studies conflating recognition and other memory processes such as information recall or deliberation. Chandon et al. (2002) reported no Mirror Effect, concluding that brand familiarity increases both hit and false alarm rates in brand recall. Similarly, Jin et al. (2008) found that pre-exposure to publicity inhibits recall of non-publicized brands, suggesting no evidence of activation confusion or Mirror Effect. However, Konopka et al. (2019) found that deliberation is *not* greater for familiar brand logos than for

unfamiliar brand logos, enhancing consumer preference for unfamiliar offerings in low-involvement product categories, a result consistent with the Mirror Effect.

At the same time, hardly any psychology studies on the Mirror Effect have utilized marketing stimuli (e.g., brands and products as stimuli for word recognition experiments). A partial exception is Kronlund's (2006) doctoral dissertation, which reports a stronger Mirror Effect for brands than for words, even though brands were rated as more abstract than words. Nonetheless, Kronlund's studies were not set up as a classic recognition test, and brands were compared versus words within the same study.

In the absence of unambiguous empirical evidence of the Mirror Effect in marketing, a first crucial step is determining whether the same effect documented through psychology lab research can be robustly replicated in a marketing setting. Consumer surveys, nowadays primarily conducted online, are a marketing setting where it is theoretically and practically relevant to ascertain whether the Mirror Effect is present. Online consumer surveys often entail completion of a series of questions or tasks, which are turned into measures or approximation of relevant parameters. For example, in branding research, online surveys gauge consumers' ability to recognize brands (with and without prompts) and to score brands' associations with specific attributes (or images), along with standard measures holding a certain degree of relevance and/or correspondence with real-world behaviors (e.g., purchase intention, willingness to pay, customer satisfactions etc.) (Jin, Yoon & Lee, 2019; Erjansola et al., 2021). Similarly, in advertising research online surveys represent a widely used method to test the effectiveness of marketing communications, evaluating consumers' ability to remember (recognize) exposure to said communications, and to correctly determine the brand or business behind those activities (Yoo, 2014; Aribarg & Schwartz, 2020).

In line with this reasoning, in Study 1, we set up an online survey mimicking recognition tests from psychology using words varying in lexical frequency in an online

survey. We do so to determine the replicability of psychology research protocol from lab-settings to online consumer surveys. The underlying research question that we address is:

RQ_1*: To what extent do we observe a Mirror effect in online survey data?*

Answering this question is fundamental to the advancement of marketing theory and practice, as if the Mirror Effect were to be observable in an online survey setting, then precautions need to be in place during research design and when interpreting data quality and results. Above all, conclusions based on any survey-derived measure that originate from recognition memory (as it is the case in mainstream branding and advertising research), would need to be benchmarked against the Mirror Effect.

Based on the outcome of RQ_1, we then evaluate in Study 2 whether market performance measures derived from surveys about brands likely to vary in familiarity (e.g., based on their market share) for popular consumer categories (e.g., supermarkets, banks, and cars) are likely to be affected by the Mirror Effect, as per the following question:

RQ_2*: To what extent does recognition of day-to-day brands reveal a Mirror Effect?*

Finally, in Study 3 we determine whether there is a boundary condition for the Mirror Effect for brands that have extremely low familiarity and compete under highly unfavorable market conditions, such as heightened fragmentation, low entry barriers and limits to price differentiation. A prominent example of such conditions can be seen for *branded mobile apps* (branded apps in short) – i.e., apps showing a clear brand identity (Bellman et al., 2011). A mobile app is a 'brand in the hand' (Sultan & Rohm, 2005), generating value for firms and consumers (Al-Nabhani, Wilson & McLean, 2022; Stocchi et al., 2020; Stocchi, Guerini, & Michaelidou, 2017; Tran, Mai, & Taylor, 2021; van Noort & van Reijmersdal, 2019), allowing firms to gain a competitive advantage (Boyd, Kannan, & Slotegraaf, 2019; Gill, Sridhar, & Grewal, 2017; Stocchi et al., 2022; Zhao & Balagué, 2015). Despite their significant potential as marketing tools, unlike other day-to-day brands, branded apps

compete for attention, downloads, and ongoing use with thousands of free alternatives, which seldom differ in functionality due to extremely low entry barriers and the ease-of-access for the technology that underpins apps. These conditions make branded apps *extremely unfamiliar brands*, and reduce the opportunities for consumers to have exposure, let alone any deeper interaction with branded apps, including the ones they download (often used once and then quickly abandoned). Yet, recognition of branded apps is vital to ensure continued use (Stocchi, Pourazad, & Michaelidou, 2020) and to impact consumer behavior (Fang, 2017), thus improving brand performance (Stocchi et al., 2017; 2021). Moreover, the recognition of branded apps is virtually the only feasible strategy for market survival, due to limits to differentiation superimposed by app stores' business model, which implies profit-sharing and hinders price differentiation (Stocchi et al., 2021). The unique features of branded apps make them a suitable context for testing whether the Mirror Effect potentially has a boundary condition, leading to the following final research question:

> **RQ$_3$***: Does the Mirror Effect break down for extremely unfamiliar brands, such as branded apps?*

Figure 1 summarizes the anticipated contributions resulting from these three research questions and the aims of the three studies linked to each question.

****Figure 1 about here*

3. Study 1

3.1 Data and Survey Structure

Study 1 tested whether the Mirror Effect found in psychology laboratory experiments can be robustly replicated using an online survey of United States panelists from PureSpectrum. We used a sample representative of the US population in terms of age (range 21 to 86 years; M = 47, SD = 17), gender (53% females, 45% males, 2% other) and location (Midwest 18%, Northeast 24%, South 36%, West 22%). After deleting participants who failed three attention checks, IP checks (e.g., removing one participant from India), and checking for straight liners (SD < .6), speeders and dawdlers (more than one hour to complete) (Ford, 2017), the final usable sample included N = 108 participants.

The survey instructions told participants they would be asked about perceptions of brands and words, to test ideas for branding strategies. At no point of the survey were participants told their memory would be tested. Participants were asked to rate the familiarity of an equal number of familiar and unfamiliar words, replicating the study phase of a classic recognition experiment (Buchler et al., 2008; Cary & Reder, 2003; Reder et al., 1996; Reder et al., 2000). In line with previous Mirror Effect research in psychology (Glanzer & Adams, 1985), we used 36 words (five to ten characters in length each) randomly selected from a contemporary list of English words (Brysbaert & New, 2009), rather than the lists used in seminal psychology studies (e.g., Kučera & Francis, 1967). We replicated the average frequencies for the 18 familiar words (142 per million) and the 18 unfamiliar words (1.6 per million) from previous studies (Gardiner & Java, 1990; Reder et al., 2000).

We randomly allocated participants to one of six Latin-square groups, so that each group saw a different set of 18 words (9 familiar, 9 unfamiliar), in a randomized order, during the study phase. Participants rated the familiarity of each word, displayed one word at a time, on a single-item 7-point *familiarity* scale (1 = "very unfamiliar" to 7 = "very familiar";

Woltman Elpers et al., 2003). After the study phase ended, we included a short memory clearance task measuring the consumer life cycle stage using two questions (household composition and size, as per Frey et al., 2017). Then, in the experiment phase, we presented all 36 words in a random order and asked participants to recognize each word as 'new' or 'old', and to indicate their *recognition confidence* on a single-item 6-point scale (1 = "very sure new" to 6 = "very sure old"; Light et al., 1979). Responses of 4, 5, or 6 on this scale were classified as "yes, recognized as old" = 1, otherwise 0. Finally, we measured the familiarity of the remaining words not shown earlier in the survey (study phase), presented in a random order from the appropriate word list for each participants' group. As a result, from the survey answers we could calculate familiarity scores for all 36 words, as well as hit and false alarm rates, which we examined as follows.

3.2 Empirical Tests

The manipulation of familiarity was successful ($M_{\text{familiar}} = 6.4$ on the 7-point familiarity scale, $SD = 1.0$, vs $M_{\text{unfamiliar}} = 4.7$, $SD = 1.0$, $t(107) = -18.0$, $p < .001$, $d = -1.7$). After a natural-log transformation to normalize the data, this difference was even more significant ($t(107) = -19.8$, $p < .001$, $d = -2.2$). A multivariate analysis of variance (MANOVA) confirmed there were no significant differences between the six word-list groups on any potential covariates (e.g., age, gender, household type).

Based on these premises, replicating protocols from prior Mirror Effect research (Buchler et al., 2008; Diana et al., 2004; 2006), we calculated hits and false alarms. Hits were correct identifications of 'old' words as 'old' (seen in the study phase) and false alarms were incorrect identifications of 'new' words as 'old.' In a classic Mirror Effect, hit rates should be higher for unfamiliar than familiar stimuli (a negative slope), while false alarm rates should be higher for familiar than unfamiliar stimuli (a positive slope). However, 'flat slopes', or the lack of statistically significant differences between hit and false alarm rates for familiar and

unfamiliar stimuli, have also been accepted as evidence of the Mirror Effect in previous research (Reder et al., 2002).

We analyzed our data using a repeated-measures MANOVA based on a two (unfamiliar vs familiar) × six (word list groups) design, with the three dependent variables: hit rates, false alarm rates, and hit rate corrected for false alarm rate (i.e., recognition sensitivity/discrimination, measured by *d'*) (Hautus, Macmillan, & Creelman, 2021).

3.3 Results

Figure 2 shows the expected Mirror Effect in the hit (old words rated 4, 5, or 6) and false alarm (new words rated 4, 5, or 6) rates for familiar and unfamiliar words. Additionally, the only significant multivariate effect was for familiarity (Wilks' $\Lambda = .8$, $F(3, 100) = 5.8$, $p = .001$, $\eta_p^2 = .15$). There was no significant difference in hit rate between familiar and unfamiliar words ($M_{familiar} = .77$, $SE = .03$, 95% confidence interval [CI] = [.72, .83] vs $M_{unfamiliar} = .74$, $SE = .02$, 95% CI = [.69, .79], $p = .21$). Moreover, familiar words had a significantly higher false alarm rate ($M_{familiar} = .44$, $SE = .04$, 95% CI = [.36, .52] vs $M_{unfamiliar} = .33$, $SE = .03$, 95% CI = [.27, .40] $p < .001$). For this reason, *d'* was higher for unfamiliar words ($M_{familiar} = 1.4$, $SE = .18$, 95% CI = [1.1, 1.8] vs $M_{unfamiliar} = 1.7$, $SE = .20$, 95% CI = [1.3, .2.1], $p = .002$).

****Figure 2 about here*

3.4 Discussion

Study 1 results confirm that we can successfully replicate the Mirror Effect in an online survey. As explained by the SAC model, familiar words have two sources of memory activation: recollection based on recently established episodic memory (incidental learning

during the study phase) and familiarity as determined by semantic memory associations pre-dating the study (Reder et al., 2000). Hence, familiar words are more prone to activation confusion and have higher false alarm rates, as participants are *less* able to distinguish between old words (seen in the study phase) and new words (not seen in the study phase). In contrast, unfamiliar words have lower chances of memory activation, due to the main source of memory activation being recollection from the study phase. This occurrence, aided by the contextual richness and recency of episodic memory, allows participants to discriminate between old and new unfamiliar words more accurately in an online survey.

4. Study 2

In Study 2, we replaced the 36 familiar and unfamiliar words used in Study 1 with 18 familiar and 18 unfamiliar everyday brands from three popular product categories: supermarkets, banks, and cars. We selected the 12 brands in each category, six familiar and six unfamiliar, based on market share (see the Appendix). As in Study 1, participants rated the familiarity of 18 stimuli in the study phase (three familiar and three unfamiliar brands per category) using the same 7-point familiarity scale. Importantly, participants were asked to consider usage as a source of familiarity (e.g., "If you are familiar with the brand, because you used it/have heard of it many times, please select 'Very familiar'") (see e.g., Alba & Hutchinson, 1987).

Study 2 also explored the effects of age and gender recognition biases. Age can increase brand familiarity (Guest, 1942), but is also associated with deterioration of memory (Craik & Schloerscheidt, 2011; Ward et al., 2017). To capture the implied inverse U-shaped effect of age, we compared three age groups: middle-aged (35 to 54 years) younger (18 to 34 years) and older (55 years or older). At the same time, gender has been associated with variations in brand familiarity (McDaniel & Kinney, 1998) and recognition memory performance (Lovén, Herlitz, & Rehnman, 2011; McGivern et al., 1998; McKelvie et al.,

1993; Vuilleumier et al., 2005; Wang, 2013); hence, we compared results for female and male respondents to ascertain any potential gender bias.

4.1 Data and Survey Structure

We used the same consumer panel (PureSpectrum) as in Study 1 to recruit a different sample of US participants representative of the population in terms of age (range 21 to 96 years, M = 48, SD = 17) and location (Midwest 28%, Northeast 21%, South 28%, West 23%). Some gender skew emerged (63% females, 37% males). After deleting participants who failed attention and other checks, the final sample consisted of N = 105 participants.

The survey structure and procedure replicated Study 1, with the words in the six word-list groups replaced by brand names. After the study phase, participants completed the same memory clearance task. In the experiment phase, participants determined whether each brand was 'old' or 'new' using the same 6-point confidence scale. Finally, participants rated the remaining brands not shown in the study phase.

4.2 Empirical Tests

A manipulation check confirmed a significant difference in brand familiarity (M_{familiar} = 5.5, SD = 0.9, vs $M_{\text{unfamiliar}}$ = 3.6, SD = 1.1, $t(104) = -24.1$, $p < .001$, $d = -2.4$). However, the familiar brands were less familiar than the familiar words used in Study 1 ($M_{\text{familiar brands}}$ = 5.5 vs $M_{\text{familiar words}}$ 95% confidence interval [6.2, 6.6]). Similarly, the unfamiliar brands were less familiar than the unfamiliar words used in Study 1 ($M_{\text{unfamiliar brands}}$ = 3.6 vs $M_{\text{unfamiliar words}}$ 95% confidence interval [4.5, 4.9]). The manipulation check results were replicated in all categories, with lower levels of familiarity than Study 1 (supermarkets M_{familiar} = 5.8 vs $M_{\text{unfamiliar}}$ = 3.5; banks M_{familiar} = 4.8 vs $M_{\text{unfamiliar}}$ = 3.5; cars M_{familiar} = 5.8 vs $M_{\text{unfamiliar}}$ = 3.9).

Accordingly, we concentrated on analyzing the three dependent variables (hits, false alarms and d') using the same two (unfamiliar vs familiar) × six (brand-list groups) repeated

measures design as Study 1, with the addition of age (three levels) and gender (two levels). Statistical checks revealed no need for covariates to control for differences between groups.

4.3 Results

Table 1 lists the means and standard deviations for familiarity, hits, false alarms and *d'*. Together with Figure 3, the scores of these measures suggest the Mirror Effect can also be found using day-to-day brands instead of words.

****Table 1 about here*

Nonetheless, the results for brands were slightly different to what emerged in Study 1 for words. In more detail, the multivariate effect of familiarity was significant for false alarms (Wilks' $\Lambda = .7$, $F(1, 73) = 26.6$, $p < .001$, $\eta_p^2 = .27$) and hits (Wilks' $\Lambda = .8$, $F(1, 73) = 18.1$, $p < .001$, $\eta_p^2 = .20$), but not for *d'* (Wilks' $\Lambda = 1.0$, $F(1, 73) = 2.2$, $p = .14$, $\eta_p^2 = .03$) (*note*: we examined the three dependent variables separately, because the overall MANOVA failed Box's equal covariances test). As in Study 1, familiar brands returned more false alarms ($M_{familiar} = .55$, $SE = .04$, 95% CI = [.46, .64] vs $M_{unfamiliar} = .41$, $SE = .04$, 95% CI = [.33, .48] $p < .001$). Unfamiliar brands had a higher *d'* than familiar brands, but unlike Study 1, this difference was not significant ($M_{familiar} = 1.1$, $SE = .22$, 95% CI = [0.7, 1.6] vs $M_{unfamiliar} = 1.3$, $SE = .23$, 95% CI = [0.9, 1.8], $p = .14$). There was also a significant difference in hits, greater for familiar brands ($M_{familiar} = .80$, $SE = .03$, 95% CI = [.75, .85] vs $M_{unfamiliar} = .69$, $SE = .03$, 95% CI = [.63, .75], $p < .001$).

****Figure 2 about here*

Similar results emerged across all three product categories considered with no significant difference between familiar and unfamiliar brands in d' (supermarkets $p = .11$, banks $p = .32$, cars $p = .89$), although for supermarket brands the hit rate difference was also not significant at the .05 level ($p = .06$). Familiar brands had significantly more false alarms in all three categories (supermarkets $p < .001$, banks $p = .017$, cars $p < .001$), and significantly higher hit rates in the banks and cars categories (banks $p = .039$, cars $p < .001$).

The brands used in Study 2 were more familiar to males than females ($M_{females} = 4.28$, $SE = .11$, 95% CI = [4.05, 4.50] vs $M_{males} = 5.09$, $SE = .16$, 95% CI = [4.77, 5.40], $F(1, 73) = 17.14$, $p < .001$, $\eta_p^2 = .19$). Yet, there were no significant gender differences in hits ($p = .27$), false alarms ($p = .38$), or d' ($p = .19$), and no significant interaction between gender and familiarity (hits $p = .42$, false alarms $p = .89$, d' $p = .35$). Despite a slight decline in the oldest age group, there were also no significant differences in brand familiarity between the three age groups ($M_{18–34} = 4.66$, $SE = .20$, 95% CI = [4.26, 5.06], $M_{35–54} = 4.90$, $SE = .15$, 95% CI = [4.60, 5.21], $M_{55+} = 4.39$, $SE = .15$, 95% CI = [4.09, 4.69], $F(2, 73) = 2.84$, $p = .06$, $\eta_p^2 = .07$), and no significant effects of age on any of the three dependent variables.

4.4 Discussion

Study 2 used everyday brands varying in familiarity and revealed a Mirror Effect due to the lack of statistically significant differences in hit and false alarm rates between familiar and unfamiliar stimuli. In more detail, Figure 3 shows parallel slopes for hits and false alarms, signaling a reduced ability to discriminate between new and old unfamiliar brands; and the effect of familiarity on d' was small ($\eta_p^2 = .03$) and not significant ($p = .14$). The most likely explanation is that everyday brands' familiarity in Study 2 was lower than words' familiarity in Study 1, weakening the retrieval of unfamiliar brands, and linking them with new episodic memories (Alba & Hutchinson, 1987; Reder et al., 2002). Study 2 also found no evidence of age or gender bias, suggesting the Mirror Effect is stronger than these biases.

5. Study 3

In our final study, we consider branded apps to explore the likelihood of a boundary condition for the Mirror Effect, as these digital brands are likely to have the same level of unfamiliarity as *very* rare words, for which familiarity is possible, but at a very low level (Wixted, 1992). Very unfamiliar words have weak semantic associations, or none, which makes it hard to link these words with new episodic memories (Reder et al., 2002). This means very unfamiliar words will never have hit rates equal to familiar words, or higher. Instead of a Mirror Effect, the data will exhibit a *Concordant Effect*, and hits and false alarm rates will return parallel positive slopes (Maddox & Estes, 1997).

For robust conclusions, Study 3 also tests for *category usage*, an enhancer of brand familiarity (Alba & Hutchinson, 1987; Nordfält et al., 2004). High category usage should increase experience with unfamiliar apps, providing semantic associations linkable to new episodic memories. If this were the case, a Mirror Effect may be found for apps users and a Concordant Pattern would emerge for non-users. At the same time, we consider *consumer innovativeness* (Goldsmith & Hofacker, 1991). Innovative consumers may be the first to be aware of and use new offerings, including branded apps. This could mean that extremely unfamiliar apps might be familiar to innovative consumers; hence, for these consumers a Mirror Effect is likely to emerge, instead of the Concordant Effect.

5.1 Data and Survey Structure

Study 3 used the same protocol as Studies 1 and 2, with everyday brands replaced with branded apps. We relied on publicly available downloads data (from Data.ai and SensorTower) to select 18 familiar and 18 unfamiliar branded apps from three popular categories: health and fitness, work and productivity, and social media (12 apps per category, six familiar and six unfamiliar). Unfamiliar branded apps had fewer than 5,000 US downloads (see the Appendix). We again used PureSpectrum to recruit an online sample of

US consumers representative of the population in terms of age (range 20 to 78 years, $M = 46$, $SD = 15$) and location (Midwest 33%, Northeast 14%, South 25%, West 28%), but revealing again a skew for gender (72% females, 28% males). After deleting participants who failed attention and other checks, the final sample was $N = 107$.

The survey structure and procedure replicated Studies 1 and 2. In the study phase, participants rated branded apps' familiarity on the same 7-point familiarity scale. During the experiment phase, participants determine whether each branded app was 'new' or 'old' on the 6-point confidence scale. The instructions for Study 3 were slightly different from those for Studies 1 and 2. Participants were told they would be asked their opinions of mobile apps, rather than about words or brands as ideas for branding. At the start of the survey, we asked participants whether, in the last year, they had downloaded or used mobile apps from eight categories, including the three categories forming the focus of this study. This question enabled us to measure *category usage*, coded as 1 = yes, downloaded/used or 0 = otherwise. A final difference was that, in addition to the consumer life cycle questions used in the memory clearance task in Studies 1 and 2, Study 3 measured *consumer innovativeness* (seven 7-point Likert-scale items, e.g., "*I know the names of new apps before other people do*", $\alpha = .90$, adapted from Goldsmith & Hofacker, 1991).

5.2 Empirical Tests

The manipulation of branded app familiarity was successful ($M_{\text{unfamiliar}} = 1.4$, $SD = 0.8$ vs $M_{\text{familiar}} = 4.1$, $SD = 0.9$, $t(106) = 37.3$, $p < .001$, $d = 3.6$). The unfamiliar branded apps were significantly less familiar than the unfamiliar brands used in Study 2 ($M_{\text{unfamiliar brands}} = 3.6$, $SD = 1.1$, $t(210) = 16.7$, $p < .001$, $d = 2.3$), and the unfamiliar words used in Study 1 ($M_{\text{unfamiliar words}} = 4.7$, $SD = 1.0$, $t(213) = 26.7$, $p < .001$, $d = 3.6$). The significant difference between unfamiliar and familiar branded apps emerged for all three categories: health and fitness apps ($M_{\text{unfamiliar}} = 1.5$ vs $M_{\text{familiar}} = 2.6$); work and productivity apps ($M_{\text{unfamiliar}} = 1.4$ vs $M_{\text{familiar}} =$

4.5); and social media apps ($M_{unfamiliar}$ = 0.8 vs $M_{familiar}$ = 5.1). The difference between unfamiliar and familiar branded apps was even more significant after natural-log-transforming familiarity to normalize its distribution (Wilks' Λ = .1, $F(1, 97) = 1230.8$, $p < .001$, $\eta_p^2 = .93$), and controlling for the positive effects of innovativeness ($F(1, 97) = 18.8$, $p < .001$, $\eta_p^2 = .16$) and category usage (productivity apps $F(1, 97) = 6.6$, $p = .012$, $\eta_p^2 = .06$; health/fitness apps $p = .44$; social media apps $p = .42$), even though a randomization check revealed no need for covariates to control for differences between the six groups.

5.3 Results

Figure 4 shows a Concordant Effect with parallel slopes for hits and false alarms (Maddox & Estes, 1997). Unfamiliar branded apps performed like very rare words and the Mirror Effect 'breaks down': familiar branded apps get more hits and false alarms than their highly unfamiliar counterparts. In more detail, Table 2 compares the mean hit and false alarm rates and d'. We see that familiarity had a similar effect on hits and false alarms, d' (discrimination between 'old' and 'new' apps) was not higher, or at least equal for unfamiliar apps, as one would expect with a classic Mirror Effect. However, after controlling for innovativeness and category usage, the MANOVAs revealed a significant main effect of familiarity on hits and false alarms (Wilks' Λ = .5, $F(3, 95) = 29.0$, $p < .001$, $\eta_p^2 = .48$), in line with a Concordant Effect. Familiar branded apps produced significantly more hits ($M_{familiar}$ = .71, SE = .02, 95% CI = [.67, .76] vs $M_{unfamiliar}$ = .45, SE = .03, 95% CI = [.38, .51], $p < .001$) and false alarms ($M_{familiar}$ = .41, SE = .03, 95% CI = [.35, .47] vs $M_{unfamiliar}$ = .15, SE = .02, 95% CI = [.11, .19], $p < .001$); and there was no significant difference in d' ($M_{familiar}$ = 1.4, SE = .20, 95% CI = [1.0, 1.8] vs $M_{unfamiliar}$ = 1.4, SE = .18, 95% CI = [1.0, 1.7], p = .9).

Similar results emerged, individually, for health and fitness apps (hits $p = .008$, false alarms $p < .001$, d' $p = .6$) and social media apps (hits $p < .001$, false alarms $p < .001$, d' $p = .1$). For work and productivity apps, there was also a significant Concordant Effect for d'

($M_{familiar}$ = 1.5, *SE* = .21, 95% CI = [1.1, 1.9] vs $M_{unfamiliar}$ = 1.1, *SE* = .21, 95% CI = [0.7, 1.5], p = .03), as well as for hits and false alarms (both $p < .001$).

****Figure 4 about here*

****Table 2 about here*

For completion, we also tested whether category usage or consumer innovativeness moderated this effect of extreme brand unfamiliarity. Overall, there were no significant main effects of category usage (health/fitness apps p = .11; productivity apps p = .72; social media apps p = .18) or consumer innovation (Wilks' Λ = .9, $F(3, 95) = 2.3$, p = .08, η_p^2 = .07), and no significant two-way interactions with familiarity either. A Concordant Effect emerged for users and non-users of these apps categories, and for participants with low and high innovativeness. Nonetheless, there were some notable exceptions to this overall result. The Mirror Effect emerged for users of social media apps, as d' was significantly higher for unfamiliar apps (p = .04), despite familiar apps having more hits and false alarms (both $p <$ .001). For health and fitness apps, the Mirror Effect emerged again, as there was no significant difference in hit rates between familiar and unfamiliar branded apps for highly innovative participants, or for category users.

5.4 Discussion

Study 3 explored a likely boundary condition to the Mirror Effect, and two potential moderators. With extremely unfamiliar brands, like virtually unknown branded apps, the Mirror Effect is replaced by a Concordant Effect, in which familiar brands are always superior to unfamiliar brands, for hits, false alarms and d' (discrimination between 'old' and 'new'). Yet, consumers who have some knowledge of the app category, either because they are users of that specific apps category or highly innovative, returned a Mirror Effect.

6. General Discussion

The results of three empirical studies show evidence of the Mirror Effect in online survey settings. In particular, the recognition of words and day-to-day brands varying in familiarity is consistent with activation confusion triggered by episodic memory activation over-riding semantic memory, evening differences between familiar and unfamiliar stimuli. However, for extremely unfamiliar brands competing under harsh market conditions such as branded apps, the Mirror Effect reaches a boundary condition. These digital brands struggle for *any* memory activation and a Concordant Effect is found. The Mirror Effect can still be seen among users of the app category and highly innovative app users, whose semantic memories are strong enough to prevail over episodic memory. The resulting implications for marketing theory and practice are as follows.

6.1 Theoretical Implications

Evaluations of the Mirror Effect are very common in psychology research, as it is an empirical pattern widely documented in two-stage recognition tests run in lab-settings. The implications of Mirror Effect studies are also far-reaching in psychology and interwoven with memory and information processing theories forming the backbone of cognitive psychology. In contrast, prior to the present research, the marketing literature lacked a robust evaluation of the Mirror Effect, and unambiguous empirical evidence of this important pattern. As we noted, this is a knowledge void at odds with widely established branding and advertising research models and methods, which share with the Mirror Effect the same psychological principles of recognition memory performance. In particular, in marketing research that explores the processing of information linked to brands in memory, no existing study has reported the Mirror Effect by comparing hits, false alarms and discrimination measures like d'. Through this knowledge expansion, we significantly contributed to showcasing the replicability of analytical protocols typically run across multiple investigation steps (e.g., two

step word recognition experiments) in conventional marketing settings such as online consumer surveys. The successful use of these analytical protocols yields practical and methodological value (elaborated below), but also implies that there are unexpected opportunities for *rethinking* how memory performance is approximated and measured in marketing research. To this end, our studies highlighted the importance of challenging theories by starting with known empirical patterns to better interpret research results, as opposed to deriving theories based on raw empirical results. Following this logic, it is possible to update theoretical assumptions concerning information processing and memory functions, which form the basis of branding and advertising research.

Furthermore, the present research expanded literature signaling the need to delineate more effectively between the role of familiarity vs. recollection, and semantic vs. episodic memory (Stocchi et al., 2016; Konopka et al., 2019). We highlighted that since stimuli used in research that entails recognition memory performance evaluations will always differ in familiarity, the crux of the matter is ensuring concomitant appraisal of recollection and of episodic memory activation. The need for more explicit accounts of episodic memory activation can be addressed with the analysis of superordinate consumer knowledge, known to reflect episodic memories, such as product category knowledge (see Stocchi et al., 2016). In line with psychology theory such as the SAC model, the evaluation of episodic memory activation in conjunction with familiarity-driven semantic memory activation is particularly insightful when examining consumer response to stimuli varying in familiarity. A delineation between types of memory activation also seems essential to accurately theorize and evaluate the recognition of unfamiliar stimuli, which need episodic recollection to reach basic thresholds of memory processing, due to the absence of strong semantic networks.

Finally, as an ancillary contribution, the present research has reconciliated contrasting findings by Chandon et al. (2002), Jin et al. (2008) and Kronlund (2006), thanks to empirical results that confirmed the likelihood of a Mirror Effect in online surveys about brands.

6.2 Managerial Implications

The result that unfamiliar brands can have similar chances to be recognized to familiar brands (as we report in Study 2 for everyday brands, and then in Study 3 among current users of branded mobile apps) suggests there could be untapped marketing opportunities for smaller players. Brands lacking in familiarity could improve recognition chances by leveraging episodic memories instead of semantic memories. For instance, unfamiliar brands could capitalize on untapped recognition potential by building ample networks of associations with relevant superordinate *contextual* information such as relevant consumption needs or 'Category Entry Points' (Romaniuk, 2023), given the episodic and semi-autobiographical nature of product category knowledge (Stocchi et al., 2016). Doing so would take advantage of the Mirror Effect, increasing the chances of recognition irrespective of the deficit in familiarity. Familiarity could still be built up in the background, enhancing the processing fluency of the brand via distinctive branding (Hartnett et al., 2016; Romaniuk, 2018). The same principle could also apply to brands entering a new market, and thus lacking familiarity because of being 'the new kid on the block'. In contrast, for highly familiar brands, the strategic priority would be maintaining strong semantic associations in consumer memory, especially amongst those not currently purchasing and/or using the brand. An excessive strategic emphasis on heightening episodic recollection could trigger activation confusion in memory, as one would expect in line with the Mirror Effect. Finally, in instances of extremely low familiarity (see Study 3) for all offerings, not just the new entrant (e.g., a new product category), since the Mirror Effect will predictably break down, building any form of

semantic memory association through a classic reinforcement role of marketing would be a more sensible strategy to reach and exceed thresholds of memory activation.

A second fundamental practical implication of the present research is that the Mirror Effect could also be used to reduce the impact of brand usage bias on surveys measuring consumers' ability to recognize brands. Otherwise, face-value interpretation of brand recognition performance could be partly an artefact of *brand usage bias*, rather than real differences in the ability of advertising efforts to attract attention from light users and new buyers, whose purchases are needed to grow market penetration (Martin & Javalgi, 2019; Graham & Kennedy, 2022).

In more detail, the Mirror Effect could be used to help even the playing field for unfamiliar and familiar brands in marketing surveys. First, managers and agencies conducting surveys entailing the recognition of brands could run *pre-tests* to ascertain the likelihood and magnitude of a potential Mirror Effect and then, accordingly, refine the measurement approaches in use. For example, in our Study 2 of everyday brands, a Mirror Effect emerged even though the familiar brands were significantly less familiar the familiar words we tested in Study 1. That is, familiar brands were above the midpoint (4) of the 7-point familiarity scale we used, while the unfamiliar brands were just below the midpoint. In contrast, in Study 3, both familiar and unfamiliar apps were below the midpoint of the familiarity scale, suggesting they were both objectively very unfamiliar; thus, a Mirror Effect was unlikely to occur. Second, if a Mirror Effect is to be expected, the effects of brand usage bias on recognition rates could be reduced by using an episodic cue, rather than a semantic cue, to prompt recognition. Indeed, when multiple episodic cues are presented in a survey setting as we often see in advertising research (i.e., product category, advertising execution and media exposure), brand usage bias is reduced up to 1.3 times in favor of familiar brands, whereas it can be five times as large for product category-cued recall (Vaughan et al., 2016). In line with

this reasoning, if it is not possible to rely upon the Mirror Effect's benchmarks (e.g., when brands are highly unfamiliar, or if pre-tests were not feasible due to lack of time and resources), it would still be possible to mitigate the risk of confounds by supplementing recognition measures with analytical approaches that control for brand usage bias. For example, brand usage or brand familiarity could be explicitly measured in the survey as well, or the strength of semantic memory associations could be inferred from composite measures of brand image (Romaniuk, 2013) and product category knowledge measures capturing episodic recollection (Stocchi et al., 2016). More explicit delineations of episodic recollection vs. semantic associations could be also particularly relevant in the interpretation of complex brand performance assessments – e.g., when developing and validating brand equity scales (see Cho et al., 2014), or in the context of marketing mix modeling (see Datta et al., 2017).

6.3 Conclusions, Limitations and Future Research Directions

Our research sought to advance marketing theory and research by investigating the Mirror Effect, an empirical pattern characterizing recognition memory in psychology. Across three complementary studies, we showed that we can robustly replicate Mirror Effect evaluations typically run with lab-experiments in online consumer surveys. In particular, surveys gauging the recognition of words varying in lexical frequency and day-to-day brands varying in market share both reveal a standard Mirror Effect robust to potential confounds (e.g., age and gender biases in recognition memory). However, surveys evaluating the recognition of extremely unfamiliar stimuli, such as virtually unknown branded apps that struggle to attain any recognition due to unique market constraints (e.g., low entry barriers and limited price differentiation opportunities), reveal a Concordant Effect and, as with any good, falsifiable theory, the Mirror Effect predictably 'breaks down' (only to re-emerge among more experienced users of the market in analysis). A similar logic could be applied to explore contexts where the Mirror Effect might reach a boundary condition, such as instances where

all brands are extremely familiar and market concentration is incredibly high (e.g., when just a few large brands dominate competition, like large retailing conglomerates). Likewise, there are ample opportunities for future research exploring the presence and relevance of the Mirror Effect in other marketing settings other than surveys, such as eye-tracking and brain imaging in advertising and shopper behavior research.

Furthermore, our findings are based on three studies with three rather small yet representative samples. Therefore, we encourage extensions and replications using bigger samples from different populations, exploring likely differences in brand resonance (or relevance) amongst certain groups of consumers (e.g., specific income levels reflecting lower levels of consumption generally), or cultural differences in memory for episodic context (Wong et al., 2018). At the same time, our evaluations of recognition memory entailed the use of real stimuli (words, brands, and branded apps). While this approach was intended to ensure real-world validity, future studies could present recognition tests with real versus fake stimuli, extending prior studies using pseudowords (Reder et al., 2002).

In terms of translating research outputs into practical implications, while we have made recommendations for alternative approaches to developing and analyzing brand recognition surveys, more work is required to appraise the best managerial implementation of these points. To this end, future extensions of the present research could consider other dependent variables with closer correspondence to decision-making and behavior like purchase intentions; or other measures of recognition performance, such as the ratio of hits to false alarms, which determines whether a person's criterion for a hit is biased in a conservative or liberal direction (Shapiro, 1994). Future studies could also assess recognition memory performance over time, using longitudinal data collection. Crucially, evaluations of recognition across multiple waves of data collection and, where possible, from the same individuals, would account for memory decay and marketing interventions.

Tables and figures

***Table 1**: Mean Hits, False Alarm Rates and d' for Familiar and Unfamiliar Brands*

	Familiarity (1–7)	Hit Rate	False Alarm Rate	*d'*
All Brands				
Familiar	5.5 (0.9)	.81 (.23)	.54 (.39)	1.3 (1.9)
Unfamiliar	3.6 (1.1)	.70 (.27)	.40 (.33)	1.4 (2.0)
Supermarkets				
Familiar	5.8 (0.8)	.74 (.34)	.49 (.40)	1.2 (2.2)
Unfamiliar	3.5 (1.0)	.66 (.36)	.35 (.32)	1.4 (2.2)
Banks				
Familiar	4.8 (1.3)	.82 (.28)	.54 (.40)	1.2 (2.0)
Unfamiliar	3.5 (1.3)	.72 (.35)	.44 (.40)	1.3 (2.4)
Cars				
Familiar	5.8 (1.1)	.88 (.22)	.58 (.44)	1.4 (2.1)
Unfamiliar	3.9 (1.4)	.71 (.30)	.40 (.37)	1.4 (2.3)

Notes: Standard deviations shown in brackets; $N = 105$.

***Table 2**: Mean Hits, False Alarm Rates and d' for Familiar and Unfamiliar Branded Apps*

	Familiarity (1–7)	Hit Rate	False Alarm Rate	*d'*
All Branded Apps				
Familiar	4.1 (0.9)	.72 (.23)	.41 (.32)	1.4 (2.2)
Unfamiliar	1.4 (0.8)	.44 (.37)	.14 (.22)	1.4 (1.9)
Health Apps				
Familiar	2.6 (1.1)	.55 (.38)	.25 (.31)	1.5 (2.5)
Unfamiliar	1.5 (0.9)	.46 (.41)	.14 (.24)	1.5 (2.1)
Productivity Apps				
Familiar	4.5 (1.1)	.80 (.25)	.47 (.40)	1.5 (2.2)
Unfamiliar	1.4 (0.8)	.41 (.38)	.17 (.29)	1.1 (2.1)
Social Media Apps				
Familiar	5.1 (1.0)	.80 (.28)	.50 (.40)	1.4 (2.4)
Unfamiliar	1.4 (0.8)	.45 (.42)	.11 (.22)	1.6 (2.1)

Notes: Standard deviations shown in brackets; *N = 109*.

Figure 1: *Summary of research contributions*

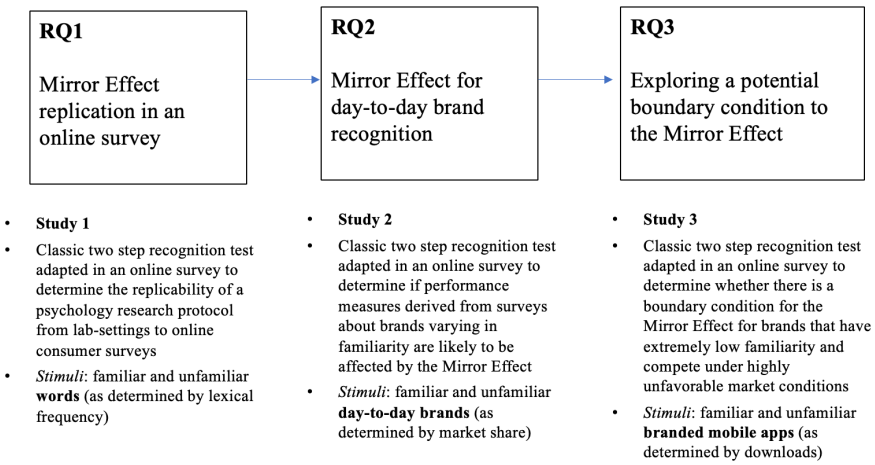
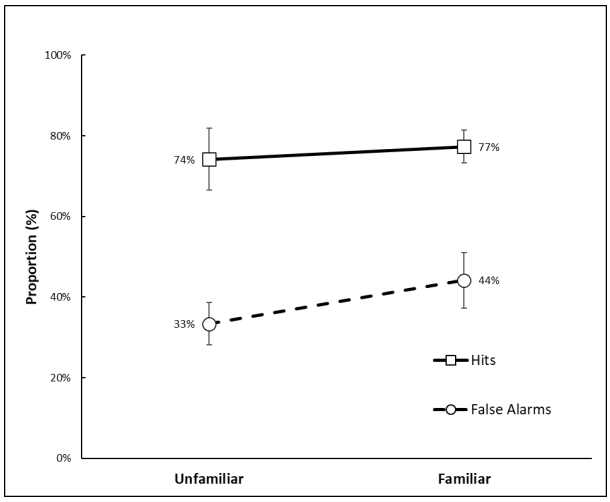
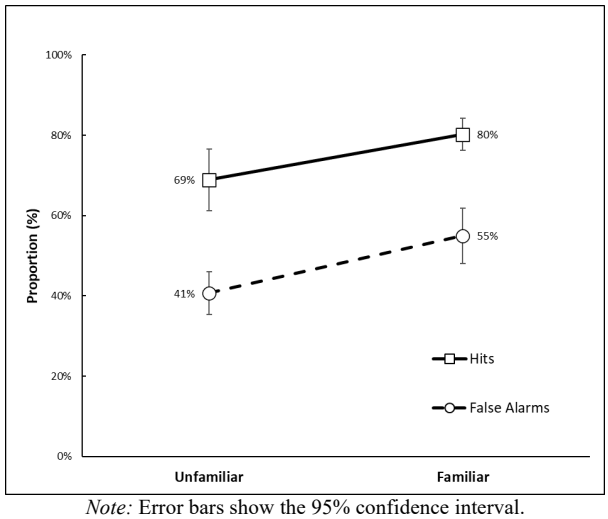


Figure 2: *Proportion of hits and false alarms rates for familiar and unfamiliar words*



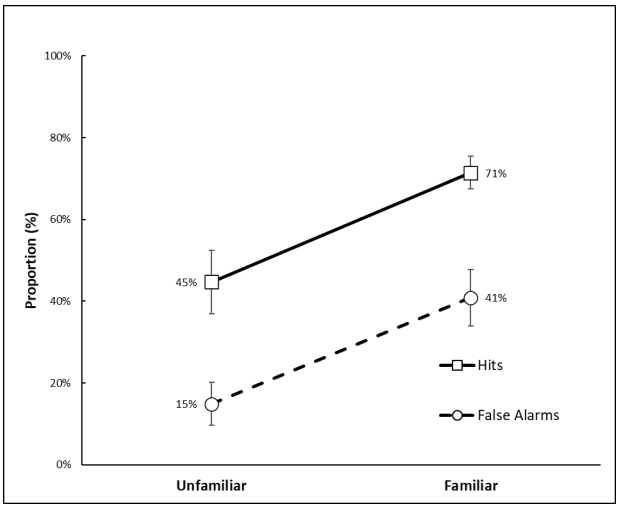
Note: Error bars show the 95% confidence interval.

Figure 3: *Proportion of hits and false alarms rates for familiar and unfamiliar brands*



Note: Error bars show the 95% confidence interval.

Figure 4: *Proportion of hits and false alarms rates for familiar versus unfamiliar apps*



Note: Error bars show the 95% confidence interval.

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Appendix: Stimuli used in the studies

Study 1: Words	
Familiar	*Frequency*
thing	1088.67
important	207.59
either	182.51
gentlemen	154.39
broke	105.00
building	99.57
eight	98.24
security	94.31
master	87.25
history	83.92
third	74.53
prove	70.39
starting	69.76
reach	56.92
played	56.27
horses	40.92
telephone	32.37
staff	32.00
Average	**146.37**
Unfamiliar	
pockets	12.27
forbid	8.55
rushed	5.25
Peters	3.49
Bueno	1.04
mobsters	0.33
dingus	0.31
zydeco	0.27
melee	0.27
juiced	0.25
proponent	0.22
wantonly	0.20
taxicabs	0.18
whodunit	0.16
Promethean	0.08
Triassic	0.06
engenders	0.04
engenders	0.04
steamships	0.04
Average	**1.83**

Study 2: Brands	
Supermarkets	
Familiar	*Market Share*
Walmart	21.30
Kroger	10.20
Costco	7.00
Sam's Club	4.70
Aldi	2.90
Target	2.80
Average	**8.15**
Unfamiliar	
Wakefern	1.50
Trader Joe's	1.20
BJ's	1.10
Dollar Tree	1.00
Wegmans	1.00
Winco Foods	0.90
Average	**1.12**
Banks & Finance	
Familiar	*Market Share*
JPMorgan Chase	7.34
Bank of America	6.85
Wells Fargo	5.00
Citibank	2.72
U.S. Bank	1.62
Capital One	1.34
Average	**4.15**
Unfamiliar	
Goldman Sachs	1.17
TD Bank	1.12
Charles Schwab	1.05
BMO Harris	0.75
Bank	0.68
Washington	0.68
Mutual Bank	
Bank of New	0.67
York Mellon	
Average	**0.91**
Cars	
Familiar	*Annual Sales*
Toyota	1,849,313
Ford	1,786,147
Chevrolet	1,490,882
Honda	1,094,839
Nissan	800,920
Jeep	726,663
Average	**1,291,461**
Unfamiliar	
Porsche	69,606
Genesis	52,914
Infiniti	52,586
Mini	32,334
Alfa Romeo	15,548
Jaguar	13,409
Average	**39,399**

Study 3: Branded Apps	
Health & Fitness	
Familiar	*Downloads*
Calm	400,000
Fitbit	300,000
Headspace	200,000
Daily Ab Workout	5,000
Sweat Walking for Weight Loss	5,000
Average	**152,500**
Unfamiliar	
Blobs	2,500
Fasting - Get Healthy Together	2,500
Goodable	2,500
Healthworks Fit	2,500
Lorestry	2,500
SL Fit Club	2,500
Average	**2,500**
Work & Productivity	
Familiar	
Gmail	7,000,000
Google Drive	4,000,000
Microsoft Outlook	3,000,000
Dropbox	1,000,000
Microsoft OneNote	400,000
Evernote	100,000
Average	**2,583,333**
Unfamiliar	
Alux	2,500
FlexList	2,500
Pixie	2,500
Pomidor	2,500
TimePlan	2,500
Work Log	2,500
Average	2,500
Social Networking	
Familiar	
WhatsApp	10,000,000
Instagram	9,000,000
Facebook	7,000,000
Messenger	5,000,000
Pinterest	4,000,000
Viber	900,000
Average	**5,983,333**
Unfamiliar	
APPICS	5,000
barq.social	5,000
Pepul	5,000
Qtrly	5,000
theright.fit	5,000
lit.it	2,500
Average	**4,583**