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Implicit and Explicit Identification of Counterfeit Brand Logos based on Logotype Transposition

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Counterfeit goods are a common sight in many Asian markets and countless consumers are often duped into buying fake goods due to their inability to distinguish fake products from genuine ones (Falkowski, Olszewska & Ulatowska, 2015; MarkMonitor Research, 2015; Clear, 2013). Recent research has demonstrated that consumers' ability to recognize and recall the details of a brand logo (even of well established brands e.g., Apple), is rather limited (Blake, Nazarian, & Castel, 2015). To date, much research has been conducted on the counterfeit product culture (i.e. why people buy counterfeit goods) (Eisend & Schuchert-Güler, 2006; Staake, Thiesse & Fleisch, 2009; Wilcox, Kim, & Sen, 2009) that is prevalent in many countries. However, the predominant focus has been on both individual and cross-cultural differences (Staake, Thiesse & Fleisch, 2009) that may explain when and why people buy counterfeit goods even when they know they are fake (Eckhardt, Belk & Devinney, 2010). Despite the fact that counterfeiting is widespread in many markets, the research available on the objective measures of similarities or dissimilarities between original and counterfeit brands is rather limited (Satomura, Wedel, & Pieters, 2014). In this paper, we add to the literature on counterfeiting by examining the ability of consumers to discriminate real brand logos from counterfeits at different levels of visual and semantic similarity. The rationale behind our interest is that although some consumers actively seek out counterfeit products, many others who are looking to purchase the genuine article, are often deceived into purchasing fakes due to the similarity of the counterfeit products' logo with that of the original brand (Falkowski et al, 2015). Here, we investigate

whether and to what extent consumers can recognize differences between real and fake logotypes[1] both explicitly (i.e. at the conscious level) and implicitly (i.e. at the subconscious level). Images shown in Figure 1 (see Web Appendix A for all figures; web appendices can be accessed at https://discovery.dundee.ac.uk/en/publications/implicit-and-explicit-identification-of-counterfeit-brand-logos-b) are just a few examples of the multitude of counterfeit goods sold in many Asian markets. All of these counterfeit logos closely resemble those of many successful popular brands. Due perhaps to the lack of legal frameworks or trademark laws, the practice of using logos that resemble well-known brands, is extremely widespread (Chow, 2009).

While logos used in the counterfeit trade mostly retain the logo symbol, they typically involve a different brand name which is often a subtle modification of the logotype, in which one or two letters are transposed (e.g., Adidas vs Abibas or Ferrari vs Frearri; see Figure 2). This can often deceive consumers, particularly if they do not invest much time scrutinizing the product (Kirkpatrick, 1996; Howard, Kerin & Gengler, 2000).

The problem of look-alike logos is not only pertinent in the counterfeit trade but also extends to many legitimate businesses whose logos are very similar to each other (see Figure 3 for some examples). Importantly, from a legal standpoint, firms do not seem to be clear about what exactly constitutes a “look-alike logo”. For example, the logo of Geely group's ‘Meiri’ (a low cost model car) was very similar to Toyota’s brand logo, which the latter objected to, leading to a high profile court case. Although Toyota lost the case (Hoecht & Trott, 2014), Geely nevertheless changed its logo sometime later (Pedersen, 2008, p.77).

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[1] *Note that, by logotype we refer to text contained within a brand name and by a logo symbol to the image or the logo design that accompanies the logotype. By logo we mean both, logotype and logo symbol together.*

The Toyota-Geely case is just one of many examples which demonstrates that companies are aware of the fact that both counterfeit and look-alike logos can negatively impact their business and are taking positive actions to tackle the problem.

Literature overview

On the importance of brand logos

Given the important role that logos play in the market, it is perhaps not surprising that the counterfeiting of well-known logos has proliferated. Brand logos are a key element of a brand's identity and are specifically designed to be appealing, simple, memorable, and recognizable by consumers (Blake et al., 2015). Not only do they help consumers identify a brand but also to differentiate it from their competitors (Janiszewski & Meyvis, 2001; MacInnis, Shapiro & Mani, 1999). The process of designing and selecting a logo is often demanding and may involve the investment of anything between a few dollars to hundreds of thousands (Barnes, 1989; Henderson & Cote, 1998; Siegel, 1989). The expense is often justified because a brand logo is typically the official representation of a brand's meaning (Guzmán et al., 2012). In that sense, both logotypes and logo symbols can convey the attributes of a brand, based on their graphic design and sound symbolic connotations (Henderson & Cote, 1998; Salgado-Montejo, Velasco, Olier, Alvarado, & Spence, 2014; Van Riel & Van den Ban, 2001; Velasco, Salgado-Montejo, Marmolejo-Ramos & Spence, 2014). Furthermore, through repeated exposure to brand logos, consumers often develop strong preferences for the brand they represent (Peatfield, Parkinson, & Intriligator, 2012), which also helps a brand in building recognition, value, and meaning (Berry,

1988; Henderson & Cote, 1998; Morrow, 1992) and at the same time may explain, at least in part, the prevalence of counterfeiting of well-known logos.

Counterfeit trade and brand logos

Once a brand is highly successful, counterfeits or fakes typically start appearing in the market. The worldwide counterfeit product market is estimated to be worth over 1 trillion USD (Hoecht & Trott, 2014) and in 2016, contributed up to 2.5% of all combined global imports (OECD, 2016), with China being the biggest contributor to the global counterfeit trade (Chow, 2009; Menn, 2010). In addition, the counterfeit trade also contributes to approximately 200 billion USD in lost jobs and taxes (Furnham & Valgeirsson, 2007). And it is not just businesses that suffer, counterfeit goods pose significant problems for consumers who are often duped by illegitimate products (Burt & Davis, 1999; Miaoulis & d'Amato, 1978). Up to 66% of consumers [in studies compiled by the Anti-Counterfeiting Group and the British Brands Group (Gowers, 2006)] report that they have been deceived by counterfeit packaging or look-alike brand logos and between 17 to 21% of consumers confess to having bought a counterfeit product by mistake (Poulter, 2009). The counterfeit product market can be segregated into two categories - deceptive and non-deceptive (Penz & Stottinger, 2005). Often, consumers are complicit in the purchase of counterfeit products (non-deceptive counterfeit purchasing) (Grossman & Shapiro, 1988). However, the same consumers can also fall victim to the counterfeit trade in circumstances where they are duped into buying a look-alike product (deceptive counterfeit purchasing; e.g., as in brands shown in Figure 1). Applicable to the present study, it is not completely clear under what conditions consumers can correctly identify an original brand from its counterfeit (Pieters, 2010).

Study outline and aims

With new firms and brand extensions emerging daily across the world, copycat activities in the area of brand logos is rife. The current research explores the degree of visual dissimilarity required to mislead a consumer so that firms might be more informed in their understanding of the specific visual elements that impact the logo recognition. Moreover, we hope that our study will shed some light on the reasons why consumers are misled into purchasing counterfeit brands, particularly when decisions are made expediently.

Empirical research suggests that consumers' purchase decisions are often made automatically (Dijksterhuis et al., 2005) and at high speed. Consumers often fixate for only 500ms when browsing the shelves for a particular product (Chandon et al. 2009; Van der Lans, Pieters, & Wedel 2008). In such short search duration, features such as brand color, packaging shape and logo can play an important role in helping consumers differentiate between genuine and counterfeit goods. Consequently, research into the salient visual characteristics that aid logo recognition need to be investigated both explicitly and implicitly (mimicking the short time frames in which purchase decisions are made).

This paper contributes to the literature by identifying the potential confusion that may arise due to the visual similarities of fake and original logotypes and how it may mislead consumers into purchasing counterfeit brands. The current research is relevant in that firstly, this is an important under-researched area in the field of brand confusion. Secondly, consumers are often not able to differentiate the original brand from a fake brand especially when they both have similar designs or logotypes (Horen & Pieters, 2012). The latter authors raise two important points, first, that even when there is no brand confusion between the logos, given a certain familiarity with the brands, fake brands can still take advantage of the original ones. Second, *subtle* manipulation of logos or features by copycats remains undetected by the consumers but

not the blatant copying of the leader brand. But what it yet unclear is, what levels of manipulation can be called as subtle? And, what is blatant copying? Does this phenomenon depend on logo features and on product categories? We yet do not fully know the answers to these questions and this paper is an attempt to address some of these. In the current research, we show that although consumers can identify fake logos to a high degree of certainty explicitly, implicitly they are less able to do so which may be one of the reasons for the prevalence of non-complicit counterfeit purchases. We also demonstrate the importance of the first and last letters in logotype recognition. Here, we expand the literature on the counterfeit trade and consumer behaviour, by exploring the mechanisms by which consumers differentiate fake versus original brand logos with different levels of logotype transposition and provide new insights into the subtle processes behind the recognition of fake brand logos.

To this end, we created a range of fake logos by transposing the logotype text of 12 popular brands. In Study 1, we tested consumers' ability to identify fake logos both explicitly (Study 1a) and implicitly (Study 1b) (see Figure 4 for logos). In Study 2a and 2b (see Figure 11 and 12 for logos), we tested the importance of the first and last letters of a brand name and the effect of having a word versus a non-word as a logotype (therefore, the role of semantic meaning) on the identification of a logo as fake or real.

Study 1a

In this study, we evaluated the degree of dissimilarity required between the real and fake logotypes to facilitate a counterfeits' accurate identification. The letter transposition within the logotype was selected for several reasons: First, in many markets, it is common to use transposed text when counterfeiting (see Figure 1). Second, because word reading in adults is an automated

process (the brain typically reads what it expects), words that are misspelled are often perceived as correctly spelled and their meaning can nevertheless be conveyed (McCandliss, Cohen, & Dehaene, 2003; Pelli, Burns, Farell, & Moore-Page, 2006; Polk et al., 2002). Take, for instance the following fragment, which was circulated on the internet some years ago (Johnson & Eisler, 2012, p1): "Aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht the frist and lsat ltteer be at the rghit pclae" (see also Rayner, White, Johnson, & Livesedge, 2006). People face little difficulty in reading jumbled up text provided the first and last letters of words are in the correct place. Indeed, research suggests that the correction and coding of text is an automatic process and whenever we encounter such jumbled up words or errors, our brain frequently corrects them automatically (Rayner, White, Johnson, & Liversedge, 2006). This is also the case when it comes to logotypes; indeed, the identification of a logo is often done automatically and independently of the consumer's awareness (Dijksterhuis, Smith, Van Baaren, & Wigboldus, 2005). Due to these reasons, we hypothesized that

H1a: Consumers will be more (vs less) accurate in identifying a logo as fake when it has a high degree (vs low degree) of letter transposition

H1b: Consumers will be faster (vs slower) in identifying a logo as fake when it has a high (vs low) degree of letter transposition

Participants

62 participants between 21 to 60 years of age completed the study (M_{age} = 36.29 years, *SD* = 10.39, *Males* = 35, *Females* = 27). All studies reported in this paper were designed on Inquisit 4 software (Millisecond.com; Software downloads a utility on the participants' computer which measures reaction locally and have been shown to be accurate within fraction of a

millisecond; De Clercq, Crombez, Buysse & Roeyers, 2003; Orey, Craemer & Price, 2013; Woods, Velasco, Levitan, Wan, & Spence, 2015). Participants in all studies were recruited from the USA on Amazon Mechanical Turk (M Turk; e.g., Paolacci & Chandler, 2014).

Apparatus and materials

We transposed the logotypes of 12 popular brand logos (Budweiser, Costa Coffee, Burger King, Prada, Ferrari, Versace, YouTube, Corona Extra, Heineken, Facebook, Nike, and Domino's Pizza) in order to create three levels of logo fakeness: a Low-Level Fake logo (LLF), a Mid-Level Fake Logo (MLF) and a High-Level Fake Logo (HLF). For the LLF logos, up to two letters within the brand name were transposed, for the MLF logos 3-4 letters within the brand name were transposed, and for the HLF logos, up to 5-6 letters within the brand name were transposed (see Figure 4; also see Web Appendix C for all the versions of 12 brand logos created for Study 1a and 1b).

Design and procedure

Brand logos appeared in the center of the screen and participants had to decide whether it was a fake or original logo by pressing either the 'E' or 'I' key on a computer keyboard (key mapping was counterbalanced between participants). All the original and fake brand logos (size: 300 x 350 pixels; see Web Appendix C) were presented for a maximum time of three seconds and participants could respond at any time after the logo was shown. Before the brand logo appeared on the screen, a '*' was displayed for 700 ms to focus attention on the middle of the screen. The logos were displayed in random order (12 OLs were presented twice and each logo from LLF, MLF and HLF categories was presented once, making a total of 60 trials per participant; see Figure 5). The participants were allowed to continue only after a correct or

incorrect response was provided. Before the start of the study, there were 12 practice trials with original and fake brand logos of brands ‘Ford’ and ‘Google’

Results and discussion

Only the responses that were made between 200 ms (it is difficult to process the stimuli in less than 200 ms; Brysbaert, 2011) to 3000 ms (maximum exposure time of the logo) were included in the analyses (0.56% data were excluded due to this; after exclusion, minimum response latency was 239 ms and maximum was 2992 ms). Only errors in responses to the original brand logos were checked for the error rates as we wanted to ensure that participants could indeed recognize the original logos of brands used in this study. In total, data from three participants yielding error rates of 100%, 37.9% and 39.2% were excluded. The average accuracy of the remaining 59 participants (M_{age} = 36.00 years, *SD* = 10.47, *Male* = 33, *Female* = 26) was 94.91% (*SD* = 6.35).

A Friedman test was used to compare the participants’ accuracy in logo identification, which revealed significant differences in accuracy as a function of the level of fakeness (LLF, MLF, and HLF), $\chi^2(3) = 104.83$, $p < 0.0001$. A post hoc analysis using the Wilcoxon-rank test was conducted (with a Bonferroni correction applied, resulting in a significance level set at $p = 0.008$). Median (interquartile range) levels for the error percentages of LLF, MLF, HLF and OL were calculated as: 28.57 (20.00 to 42.8|5), 7.14 (6.66 to 20.00), 0 (0 to 7.14) and 3.44 (0 to 10.34), respectively. Significant differences were found in the error percentages in the identification of all the logo conditions except for the comparison of OL and HLF (Table 1; see Web Appendix B for all tables). The errors in the identification of LLF logos were the highest (*M*

= 31.62%, *SD* = 17.72), followed by the MLF logos (*M* = 12.09%, *SD* = 10.91), and lowest errors were found with the HLF logos (*M* = 4.58%, *SD* = 6.92) and OLs (*M* = 5.35%, *SD* = 5.44) (Figure 6) which supports H1a.

We also analyzed response latencies (all latencies analyzed in this and the subsequent studies are based on raw data). A one-way repeated measures ANOVA (using the Greenhouse-Geisser correction) revealed significant differences in participants' speed of identification of a fake logo as a function of the level of fakeness (LLF, MLF and HLF), F (2.47, 143.33) = 40.14, $p < 0.001$, $\eta_p^2 = 0.40$ (see Figure 7).

Bonferroni-corrected pairwise comparisons revealed that the speed of identification (response latencies) differed significantly between all logotype conditions (Table 2). It is worth highlighting that the fastest identification was for HLF logos and the slowest identification for LLF logos which supports H1b.

The results of Study 1a indicate that participants can identify fake logos fairly accurately in an explicit task. The maximum confusion was seen for LLF logos (which also bear the maximum similarity with the original logos) and for which the error rate in the logo identification was the highest. In contrast, the least confusion was seen for HLFs (which bear least similarity to the original logos) for which the error rate in logo identification was the lowest. Participants were also slower in identifying the LLF logos (*M* = 1007.79 ms, *SD* = 240.00) and were fastest in identifying the HLF logos (*M* = 819.62 ms, *SD* = 169.86) (Figure 7). Overall, the results of Study 1a are in line with our hypotheses H1a and H1b that is participants can identify a high degree of transposed logotype text (HLF) but not a low degree of transposition (LLF).

Study 1b

Research suggests that in many novel tasks (e.g., pressing lift buttons of an *unknown* building), people rely on explicit knowledge in order to perform the task, whereas in most everyday tasks (e.g., pressing lift buttons of a *known* home building, cycling back to work, and even shopping), people rely on implicit knowledge about the task instead (Snyder, Ashitaka, Shimada, Ulrich, & Logan, 2014). Analogously, a new brand logo may be processed consciously by the consumer, whereas a well-known logo of a popular brand may be processed more automatically (e.g., in a supermarket a consumer picks up a familiar product with a known brand logo without necessarily requiring explicit analysis of the item, whereas a new brand logo and/or unfamiliar packaging will typically be evaluated more thoroughly prior to purchase).

Research has shown that cognitive tasks which people are skilled at are not always dependent on awareness of the details associated with that task because they are represented in a different manner to novel tasks (Anderson, 1982; Beilock & Carr, 2001; Snyder et al., 2014). Note that since many purchase decisions fall within this category and happen in a rather automatic fashion (Dijksterhuis et al., 2005), the known graphic information (brand logo) associated with a (in this case well-known) brand becomes a critical input that consumers rely on for such purchase decisions (Lindgaard, Fernandes, Dudek, & Brown, 2006). Considering the aforementioned points, a reaction time task was adopted in Study 1b to evaluate the implicit identification of brand logos as a function of different levels of fakeness. Such tasks seem to be ideally suited to the evaluation of the rapid subconscious processing of brand logos and are a good measure of the automatic processes involved in such purchase decisions (Ellis, Holmes, & Wright, 2010). Moreover, such methods have been previously used effectively to investigate the automatic processing of brands (Krishnan & Shapiro, 1996; Yoon, Cole, & Lee, 2009). Since the brand logos are also processed subconsciously, we hypothesized that,

H2: Implicitly, consumers will be more (vs less) able to correctly identify a logo as fake when it has a high (vs low) degree of letter transposition

Participants

The same 59 participants recruited from M Turk for the Study 1a (*Mean age* = 36.0 years; *SD* = 10.47; *Males* = 33; *Females* = 26) took part in Study 1b as well.

Apparatus and materials

All the logos created for Study 1a (OL, LLF, MLF and HLF) were also used in this study. In addition, we created another level of logo fakeness or dissimilarity, i.e. Random Level Fake logos (RLF). RLF logos resemble the logo symbol of the original logo, however, there is a minimal, if not non-existent, match between its logotype and the original logo (see Figure 8 and Web Appendix D). This new manipulation was introduced based on the literature suggesting that people take much longer to read jumbled text when the letters are *substituted* rather than *transposed* (Rayner & Kaiser, 1975; Rayner et al., 2006) e.g., 'Ferrari vs Ferarri'(letter transposition) ; 'Ferrari vs Xtlmqrs' (letter substitution); Figure 8).

Design and procedure

Seven visual stimuli - five different types of brand logos (LLF, MLF, HLF, RLF and OL) and two visual target words ('Fake' and 'Real') were utilized. Each trial consisted of the presentation of a type of brand logo followed by a target word (see Figure 9 for a schematic representation of a trial). Participants were instructed to press the 'E' key when the word 'Fake' appeared on the screen and the 'I' key when the word 'Real' appeared [key mapping was counterbalanced and the methodological approach used here follows that of Calvert, Fulcher, Fulcher, Foster, and Rose (2014)].

Each participant completed 350 trials over four blocks with a short break in between [trials comprised of random presentation of 5 logotype conditions (LLF, MLF, HLF, RLF and OL) with 2 target words (Fake and Real) and were distributed across 4 blocks: 1st and 2nd Blocks (95 trials each) and 3rd and 4th Block (80 trials each). The numbers of trials in 3rd and 4th blocks were reduced to shorten the experiment length to ensure higher compliance and participation rate. Before starting the main test blocks, participants were familiarized with the procedure by a practice block of 30 trials, in which a random string of characters 'XXXXXXX' was presented prior to the target words. To avoid the elaborative conscious processing of the attributes, participants were encouraged to respond faster by cuing them with an orange rectangle around the target words (which disappeared after 600 ms). In the event of slow responses (>700 ms on three consecutive trials), a 'Too slow' message was shown. The rationale behind Study 1b was that if a fake logo could adequately prime the participants' responses to the target words, one may expect shorter response latencies for "fake" when a fake logo is presented before this target word (i.e. a congruent trial) and longer response latencies when it is presented before the target word 'real' (i.e. an incongruent trial; and vice versa for OLs).

Results and discussion

Only the correct response latencies (89.7% of the data) between 200 to 1000 ms were analysed (89.1% of the data, e.g.,Cutler, Mehler, Norris, & Segui, 1987; Ratcliff, 1993). LLF logos did not facilitate the desired response towards the target word 'fake' which suggests that LLFs were not able to prime the participants' responses (i.e. congruent trial mean > incongruent trial mean; $M_{Congruent}$ = 483.38 ms, SD = 59.45; $M_{Incongruent}$ = 475.27 ms, SD = 55.06; Figure 10) and that participants were not able to identify them implicitly as fake. This was expected as LLF

logos had the highest degree of similarity with the OLs and participants also made the highest number of errors in identifying them as fake even explicitly. The response latencies of the remaining trials for the MLF, HLF, RLF and OLs were in line with H2 ($MLF_{Congruent}$ = 473.93 ms, *SD* = 58.11, $MLF_{Incongruent}$= 478.08, SD = 54.99; $HLF_{Congruent}$ = 475.79 ms, *SD* = 61.14, $HLF_{Incongruent}$= 479.88, SD = 55.67; $RF_{Congruent}$ = 486.53 ms, *SD* = 57.71, $RF_{Incongruent}$ = 489.74, SD = 60.25; $OL_{Congruent}$ = 475.87 ms, *SD* = 52.71, $OL_{Incongruent}$ = 481.89, SD = 55.10). That is, congruent trials yielded faster reaction times than the incongruent trials. In other words, these types of fake logos can prime the participants' responses thereby resulting in their identification as fake, implicitly.

A 4x2 repeated measures ANOVA with brand logos (MLF, HLF, RLF and OL) and target word ('Fake' and 'Real') as factors was performed, where response latencies (in ms) were the DV. Perhaps unsurprisingly, the interaction of the brand logo and the target word was found to be significant, F (3, 174) = 4.11, p = 0.008, η_p^2 = 0.066. Moreover, the main effect of brand logo was also found to be significant, F (3, 174) = 6.54, p = 0.001, η_p^2 = 0.101, whereas the main effect of target word was not, F (1, 58) < 1, p = 0.51, η_p^2 = 0.007 (Error percentages for LLF = 8.99, SD = 8.73; MLF = 9.89, SD = 10.56; HLF = 9.56, SD = 9.99; RLF = 10.28, SD = 7.54 and OL = 8.50, SD = 5.98).

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To explore the differences further, we performed post hoc tests using the Bonferroni correction. The analysis revealed that response latencies to the target words differed significantly only after priming with RLF logos but not after priming with the other types of fake logos. This indicates that significant differences observed in the ANOVA can be attributed to RLF logos

only and there are no additional difference in the mean latencies of the other types of fake logos (Table 3).

To summarize, in Study 1a we show that participants can explicitly differentiate a fake logo from an original one with a fair degree of accuracy. The highest confusion in the identification of fake logos is seen for LLFs, which is expected as these logos share the maximum degree of similarity with original logos. As the logotype text is transposed further, the dissimilarity increases and the identification of fake logos becomes faster and more accurate. However, in Study 1b, we also show that only the RLFs (which bear the maximum level of dissimilarity) can prime a participant sufficiently to enable its accurate identification as a fake.

In creating fake logotypes for Study 1, we transposed only the *internal* letters the logotype text, while keeping the positions of the first and the last letters of the brand name intact. Do all letters of a brand name hold equal importance in a brands' identification? Research suggests that in word recognition, the first and last letters are more important than the other letter positions (Johnson & Eisler, 2012). In studies 2a and 2b we evaluated this idea in the context of counterfeit brand logotypes.

Study 2a

Research suggests that if the text of a word is transposed at its last letter, then word reading decreases to 189 word per minute (wpm; a 27% decrease from 255 wpm) as compared to a transposition performed at the first letter of the word (where the reading speed decreases to 163 wpm, approximately a 36% decline (Rayner et al., 2006). Similar results have been reported by White, Johnson, Liversedge, and Rayner (2008) who demonstrated that word external

transpositions, involving the word's first two letters or last two letters (e.g., 'rpoblem' and 'problme' in the word 'problem') disrupt reading speed more than internal transpositions. One of the proposed explanations for the importance of the first and last letters is that they are always located next to a space which provides them with a higher perceptual salience than the other letters of a word (see also Johnson & Eisler, 2012, Rayner, Pollatsek, Ashby, & Clifton Jr, 2012). Due to these reasons, we hypothesized that,

H3a: Consumers will be more (vs less) accurate in identifying a logo as fake when its logotype's exterior (vs interior) letters are transposed

H3b: Consumers will be faster (vs slower) in identifying a logo as fake when its logotype's exterior (vs interior) letters are transposed

Here, it is also important to mention that studies 1a and 1b focused only on the transposition of text within a logotype and not on the semantic meaning of the fake logotype. Would a counterfeit brand name having a semantic meaning in the English language affect its identification as a fake logo? (e.g., 'Budweiser' vs 'Behaviour'- both these words have the same first and the last letters, an equal number of constituent letters and both of them have a semantic meaning attached to them unlike the non-words or random-text names that we used in previous studies). It has been suggested that words with richer semantic meaning (e.g., higher semantic neighborhood density; Sajin & Connine, 2014; also see Goh et al, 2016 for a review) are recognized faster than words having less semantic information (Yap et al., 2015) [e.g., the word 'man' is semantically richer that the word 'armadillo'; although both these words are equal in terms of 'concreteness' but the word 'man' is highly image-able whereas 'armadillo' is not. The word 'man' is linked to more networks of words having similar contexts (e.g., woman, human, daddy, uncle etc.) than the word 'armadillo'].

Similarly, the brand logo of ‘McDonalds’ will be semantically richer than the logo of ‘Monsanto’(e.g., in general, a McDonalds logo can evoke semantic networks associated with fun, birthday, party, food etc. whereas the Monsanto logo may not evoke so many contexts for a layman; also note that this information may vary, e.g. for an employee of Monsanto). As the arrangement of letters within a word is changed from pseudo-homophone to pseudo-word to non-word, the semantic effect associated with the word minimizes and the least semantic effect is observed for unpronounceable non-words [e.g., MEEN is a pseudo-homophone; NEEN is a non-word; and BXTS is an unpronounceable non-word; (Evans, Ralph, & Woollams, 2012)]. This change is also reflected in the slower and harder identification of words when they are changed from pseudo-homophone to pseudo word to unpronounceable non-words. This information is important in the context of logotypes and suggests that a logotype imitating a known English word (e.g., Budwesier vs Behaviour) will be semantically richer than a non-word as a logotype (e.g., Budwesier vs Brthcieir).

Such counterfeit brands too are found in the marketplace where a phonologically similar name or a known English word is used as the counterfeit logotype (e.g., ‘Olay’ versus ‘Okay’; ‘Sony’ versus ‘Sonia’; see Web Appendix F for some examples). Due to these reasons, we hypothesized that,

H4a: Consumers will be more (vs less) accurate in identifying a logotype as a fake if it is a known (vs. unknown) word in English

H4b: Consumers will be faster (vs slower) in identifying a logotype as a fake if it is a known (vs. unknown) word in English

To summarize, extending the aforesaid research to the context of the counterfeit brand logos, in Study 2a and 2b we tested: 1) the importance of first and last letter positions in a fake

logotype and 2) the importance of word vs non word in a fake logotype for its identification as a counterfeit.

Method

Participants

A total of 60 participants between the ages of 22 to 60 years completed the study (*Mean age* = 40.31 years; *SD* = 11.77; *Males* = 33, *Females* = 27).

Apparatus and materials

For the purpose of this study, we created three types of logos. In Fake 1 logos (F1), the positions of first and last letters in a brand name were kept intact while the remaining letters of the brand name were modified (for all F1, F2 and F3 logos, transposed letters were chosen randomly). In Fake 2 logos (F2), only the first and last letters of the brand name were changed while keeping the rest of the letters' order intact (see Figure 11 as an example; for all brand logos see Web Appendix E). In Fake 3 logos (F3), instead of using a non-word or random text as a fake logotype, we used a similar look-alike English word (see Figure 12 and Web Appendix E).

Design and procedure

The experimental design and instructions given to the participants were similar to those used in Study 1a (see Figure 5).

Results

Only responses between 200 ms to 3000 ms were analyzed (2.61% data were excluded due to this; after exclusion, minimum response latency was 230 ms and maximum was 2964 ms). Data from one participant were excluded as all his responses were either < 200 ms or > 3000 ms,

and the data of rest of the 59 participants were analyzed (*Mean age* = 40.44 years; *SD* = 11.83; *Males* = 32, *Females* = 27; *Mean accuracy (for OLs)* = 91.53%, *SD* = 8.82).

A Friedman test revealed significant differences in accuracy (detecting whether a logo was fake or not) as a function of the level of fakeness (F1, F2, F3 and OL), χ^2 (3) = 33.45, $p <$ 0.001. Bonferroni-corrected (significance level set at p = 0.008) post hoc analysis using Wilcoxon-rank test were conducted; Median (IQR) levels for the error percentages of F1, F2, F3 and OL were 0 (0 to 8.33),0 (0 to 8.33), 8.33 (0 to 16.66) and 8.33 (0 to 12.50), respectively and statistically significant differences were found in terms of accuracy between all the logo conditions except for the F2 and F1 and F3 and OL comparisons (Table 4). The error rate for the identification of F2 was the lowest (*M* = 3.71%, *SD* = 7.00), followed by F1 (*M* = 4.59%, *SD* = 7.22), and F3 logos (*M* = 10.70%, *SD* = 11.83) (Figure 13).

We also analyzed the response latencies of the correct responses. A one-way repeated measures ANOVA (using the Greenhouse-Geisser correction) revealed significant differences in the speed of identification, F (2.44, 141.54) = 12.40, $p < 0.001$, $\eta_p^2 = 0.17$) as a function of logo condition. Bonferroni-corrected pairwise comparisons revealed that that the speed of identification differed significantly between F1 and F3/OLs and F2 and F3/OLs. Specifically, participants were able to identify the F1 and F2 types of fake logos more rapidly than the F3 and OLs (Table 5). The fastest responses were observed for the F1 logos (*M* = 800.61 ms, *SD* = 189.33) although they were not statistically different from those associated with F2 logos (*M* = 825.74 ms, *SD* = 190.51) and the slowest responses were observed with the F3 logos (*M* = 868.63 ms, *SD* = 237.71) although, again, they were not statistically different from the OLs (*M* = 869.78 ms, *SD* = 172.74) (Figure 14).

The results of Study 2a suggest that a fake brand logo created with the substitution of the first and last letters in a logotype is identified by consumers with a higher degree of accuracy and at a faster rate than other types of fake logos which supports H3a and H3b but we could not find support for H4a and H4b. Here we would also like to comment that the change made in the F2 logos was minimal when compared to the F1 logos, however, participants were still very accurate in classifying F2 logos as fake, which signifies the importance of the first and last letters of the logotype. Practically, this means that the identification of counterfeit logos as those shown in 1a (same first and last letters in the original brand and its counterfeit; Figure 15) will be more difficult than the identification of counterfeit logos shown in 1b (different first and last letters in the original brand and its counterfeit; Figure 15) and therefore, consumers may be more easily deceived into buying products of 1a but not of 1b.

Study 2b

Participants, design and procedure

The design and procedure of Study 2b was identical to the one used in Study 1b, though using F1, F2, F3, and original logos as stimuli. The same 60 participants (*Mean age* = 40.31 years; *SD* = 11.77; *Males* = 33, *Females* = 27) who took part in Study 2a also participated in Study 2b. Six visual stimuli (four different types of brand logos; F1, F2, F3 and OL) and two visual target words (‘Fake’ and ‘Real’) were utilized (Figure 10) and we hypothesize that,

H5a: Implicitly, consumers will be more (vs less) accurate in identifying a logo as a fake with its exterior (vs interior) letters transposed

H5b: Implicitly, consumers will be more (vs less) accurate in identifying a logo as a fake if it is a known (vs. unknown) word in English

Results and discussion

Data from two participants were excluded as they had only a few responses within 200 to 1000 ms and the data of rest of the 58 participants was analyzed (*Mean age* = 40.60 years; *SD* = 11.87; *Males* = 31, *Females* = 27; *Mean accuracy* = 93.66%, *SD* = 4.84). Only the correct response latencies (92.38% of the data) between 200 to 1000 ms were analyzed (91.5% of the data) (Cutler et al., 1987; Ratcliff, 1993). Our data revealed that, implicitly, F1 logos did not facilitate the response towards the target word 'fake', therefore, suggesting that F1 logos did not prime the participants adequately to recognize them as fake (i.e. congruent trial mean > incongruent trial mean, $M_{Congruent\ trial}$ = 523.95 ms, *SD* = 68.77; $M_{Incongruent\ trial}$ = 519.20, *SD* = 63.90; Figure 16). The response latencies of the remaining trials for the F2, F3 and original logos were in line with our hypothesis H5a (i.e. congruent trial mean < incongruent trial mean; which is the expected response and means that these type of fake logos could prime the participants sufficiently in the desired manner and that participants could recognize these type of logos as fake even implicitly). The data were analyzed by means of a 3x2 repeated measures ANOVA with brand logos (F2, F3 and OL) and target word ('Fake' and 'Real') as factors. The interaction term between brand logo and target word was found to be significant, F (2, 114) = 11.16, p < 0.001; η_p^2 = 0.164. In contrast, neither the main effect of brand logo, F (2, 114) = 1.58, p = 0.21, η_p^2 = 0.027, nor the main effect of target word were significant F (1, 57) < 1, p = 0.34, η_p^2 = 0.01.

In order to assess the interaction term further, we performed paired sample t-tests; the analysis revealed that response latencies to the target words differed significantly only after priming with F2, F3 and OL logos but not with the F1 logos (Table 6 and Figure 16; here we

show uncorrected *p* values but if the Bonferroni correction is applied, the reference *p* value is 0.006).

To summarize, F1 logos were created with maximal substitution of text and involved the substitution of the entire text of the logotype except for the first and last letters, whereas F2 logos involved substitution of only the first and last letters of the name. Errors in the identification rate were lowest for F2 logos (which supports H5a for F2 logos but not for F1 logos). In addition, implicitly, F2 logos facilitated the participants' responses to the target word "fake", whereas F1 logos did not. Similar results were found for F3 logos; despite their high degree of similarity with original brand logos, participants were still able to implicitly identify F3 logos as fake (which supports H5b). These results are surprising as normally one would assume that F3 logos would create the maximum confusion in a consumer's mind due to their close resemblance to the original logo. However, research in the field of 'word-to-meaning' translation suggests that a semantically richer word (e.g., F3 logotypes) have richer mental representations and multiple contexts which triggers their faster implicit recognition (Pexman, Hargreaves, Siakaluk, Bodner, & Pope, 2008; Yap, Pexman, Wellsby, Hargreaves & Huff, 2012; Yap et al, 2015). Consequently such words (e.g., F3 logotypes) are processed much faster in the brain than non-words (e.g., F1, F2 logotypes) (Besner, 1990). Overall, these results demonstrate the importance of the first and last letters in a fake logotype and the semantic meaning of a logotype in its identification as a counterfeit.

General discussion

In the current paper, we evaluated whether consumers are able to identify counterfeit logotypes varying in levels of similarity (letter transposition) with the original brand logo. Results of Study 1 demonstrated that, explicitly, consumers can identify fake logos with a high degree of accuracy (even for minimally altered logotypes). However implicitly, the identification of even a highly altered logotype is often inaccurate, which we argue is one of the key reasons that consumers are misled into counterfeit purchases (non-complicit type). We also found that consumers can easily discriminate a randomly created fake logo (RLF) both explicitly as well as implicitly. Results of Study 2 showed that the first and last letters of a brand logotype are more salient in the identification of a fake logo, and any transposition involving these two letter positions are easily identified by consumers.

Prior research has also shown the importance of the first and last letters of a word in its identification (Johnson & Eisler, 2012). These letter positions seem more important because they are always located next to a space, which provides them with a higher perceptual saliency, with lesser interference (and crowding) from the nearby letters (Grainger, Tydgat, & Issele, 2010; Levi, 2008; Pelli et al., 2007). As a result, transpositions involving first and last letter positons disrupts sentence reading much more than the within-word transpositions (Rayner, Pollatsek, Ashby, & Clifton Jr, 2012). Results of Study 2 also showed that people are highly accurate at identifying a logo as fake (vs. original) when the logotype is a known English word (vs. a random arrangement of letters). This is in line with the past research which suggests, words having richer semantic representations than random letter arrangements (i.e., number of features, semantic neighbourhood density, semantic diversity, concreteness, emotional valence, among others, see Goh et al, 2016 for a review) are recognized faster (Pexman, Hargreaves, Siakaluk, Bodner, & Pope, 2008; Yap, Pexman, Wellsby, Hargreaves & Huff, 2012; Yap et al, 2015). One

explanation for this is that the lexical system (i.e. the system which allows a written word to be recognized and understood) has access to the meaning of a semantically richer word even before the word has been fully identified (Balota, 1990; Yap, Lim & Pexman, 2015). Another suggested explanation for this phenomenon is that since semantically richer words have multiple contexts, their meaning is fully available via priming from their related representations and contexts (Balota, 1990, p.10). The aforesaid research explains the results of Study 2. In the current paper we also explored the role of exposure times to a brand logo (both fake and real) in its accurate identification. The logo exposure time may seem unimportant but research suggests that often consumers engage with brands for short durations (Chandon et al., 2009) which nevertheless can affect their implicit knowledge about the brand (Friese, Wänke, & Plessner, 2006).

Consumers are often overconfident about their knowledge of the features of a brand logo, yet display poor recall and recognition of these logos (e.g., logo of brand ‘Apple’; Blake, Nazarian, & Castel, 2015). Due to this reason, it makes more sense for firms to make their brand logos more distinct and less prone to imitation. Often firms spend millions of dollars on research to create a unique brand logo, yet uniqueness and repeated connection with the consumer (e.g. advertising) does not necessarily translate into making a particular brand less prone to counterfeiting. Knowledge about a brand logo does not mean that consumers will also be able to accurately recall the features within a popular brand logo. On the contrary, we provide evidence that though consumers may be able to recognise a brand and its logo well, they are still liable to be duped by lookalikes or counterfeits. This is where the future research in this field becomes important. Notably, we have looked at just one aspect of counterfeit logotypes, in the future, researchers may look at other aspects of the logo e.g., colours and typefaces of logotypes.

Future research and limitations

Popular brand logos often contain both the logotype as well as a logo symbol, and many counterfeits copy the logo design but use different colour combinations to create a fake logo (see Figure 18). These manipulations of the visual features of the logo symbol, may be an interesting area for future research. Since consumers' visual memory of logos is not always clear (Blake, Nazarian, & Castel, 2015), it is likely that fake logos produced by subtle manipulation of the colour (or design) are effective at duping consumers. Future research may also test the relative importance of the first versus last letters in a logotype. Researchers may also extend these findings to languages where script is read from right to left (e.g., Arabic).

Here we acknowledge some limitations of the present research. Firstly, studies 1a and 1b, and studies 2a and 2b were not counterbalanced within participants and it is possible (though unlikely) that the exposure to the fake logos in studies 1a and 2a have led to potential confounds in studies 1b and 2b respectively. Secondly, we could not control for the semantic richness of the fake logotypes used in F3 logos [e.g., fake logotypes 'Behaviour' and 'Footwork' (Web Appendix E) may not be equally rich in their semantic representations]. How these may have affected the results, is not addressed in the current paper.

Despite these limitations, to our knowledge, this is one of the few studies (except perhaps, Pathak, Velasco & Calvert, in press) which examines counterfeit brand logos from the perspective of identifying levels of dissimilarities between logos and their identification as a fake. While in the past counterfeit products were mostly limited to products like watches, designer apparel, and DVDs, with the advent of E-commerce, the counterfeit trade is now flourishing and fake goods are even found in product categories such as medicines, baby formulas, and software (Berman, 2008). The problem has grown to such serious proportions that,

Louis Vuitton and Dior Couture have filed lawsuits against eBay alleging that one in every ten of their products sold on the e-commerce platform are counterfeit (Berman, 2008; Peene, 2010).

In conclusion, with new brands emerging daily across the markets, similarity in logo symbols and logotypes is inevitable and findings from this sort of research will help practitioners and firms alike to alert the unwary consumers, understand similarity, and the mechanisms behind counterfeit purchases

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