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Counterfeit brand logos: On the importance of first and last letters of a brand name

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Abstract

Purpose

Counterfeiting is a menace in the emerging markets and many successful brands are falling prey to it. Counterfeit brands not only deceive consumers but also fuel a demand for lower priced replicas, both of which can devalue the bona-fide brand. But can consumers accurately identify a counterfeit logo? This paper explores this question and examines the accuracy and speed with which a consumer can identify a counterfeit (vs. original) logo.

Design/methodology/approach

Seven popular brand logos were altered by transposing and substituting the first and last letters of the logotypes. Consumers then classified the logos as counterfeit (vs. original) across two experiments.

Findings

Participants were faster and more accurate in identifying a counterfeit logo when the first letter (vs. last letter) of a logotype was manipulated, thus revealing last letter manipulations of a brand's logotype to be more deceptive.

Research limitations/implications

This paper comments only on the manipulation of logotypes but not of logo symbols. Similarly, findings may not be generalizable across languages which are read from right to left.

Practical implications

Counterfeit trade is already a multibillion dollar industry. Understanding the key perceptual differentiators between a counterfeit (vs. original) logo can be insightful for both consumers and firms alike.

Originality/Value

Research available on objective measures of similarities (vs. dissimilarities) between counterfeit (vs. original) brand logos is limited. This paper contributes by examining the ability of consumers to discriminate between counterfeit (vs. original) logos at different levels of visual similarity.

Key Words: Counterfeit trade, Look-alike products, Fake brand logos

Type: Research Paper

Introduction

A brand's logo is often identified as one of the most important elements of a brand (Wheeler, 2012). Perhaps, that is one of the main reasons why logos of successful brands are counterfeited. The counterfeit trade is becoming an increasing menace in the emerging markets and many successful brands are falling prey to it. Counterfeit logos not only deceive consumers looking to purchase the real brand but can also have a negative impact on sales of the original. Due to the importance of counterfeit trade for both practitioners and academics, a vast body of research is now available on the industry (Eisend & Schuchert-Güler, 2006; Staake, Thiesse, & Fleisch, 2009; Wilcox, Kim, & Sen, 2009) with a predoninant focus on the individual and cross-cultural differences that may explain why consumers buy counterfeit goods even when well aware that they are fake (Eckhardt, Belk, & Devinney, 2010; Staake et al., 2009).

Despite the fact that counterfeit trade has grown to a multi-billion dollar industry, research available on the perceptual (dis)similarities between original brand logos and their counterfeits is limited (Satomura, Wedel, & Pieters, 2014). In this paper, we contribute to the growing body of literature on counterfeiting by examining the ability of consumers to identify different kinds of fake vs. original logos. In particular, we build on psychological research about the relative importance of first and last letters in word recognition (Grainger, 2018; Grainger, Bertrand, Lété, Beyersmann, & Ziegler, 2016) (e.g., Ferrari vs Efrrari & Ferrari vs Ferrair) to study consumers' ability to identify fake logos varying in terms of the transpositions (or

substitutions) of the characters of the logotype[1]. The rationale behind this research is that while some consumers actively seek out counterfeit products (due perhaps to their lower prices and easy availability), many others desire the genuine product but are often deceived into purchasing

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Note that, by 'logotype' we refer to letters or text contained within a brand name and by a 'logo symbol' to the image or the logo design that accompanies the brand name text. By logo we mean both, logotype and logo symbol together (e.g., Wheeler, 2012).

a counterfeit as they are unable to differentiate a fake logo from a real one.

Literature review

One might think that since consumers are invariably bombarded with certain brand logos through various media platforms, such substantial exposure would enable them to identify those brands with a high degree of accuracy. On the contrary, research suggests that despite a high exposure to brand logos, consumers often make mistakes in differentiating fake logos from genuine ones. Indeed, consumers' ability to recognize and recall details of even well-known brands (e.g., Apple) is rather limited (Blake, Nazarian, & Castel, 2015). That said, it is not always clear under what conditions consumers are able to correctly identify a brand from its counterfeit (Pieters, 2010).

Most counterfeit brands frequently retain the visual appearance of the original brand logo symbol (e.g., colors, shape, design, and visual elements of the logo except the logotype) but deceptively use an alternative brand name, which is often similar to the original brand name (see Figure 1). This subtle modification involves transposition or manipulation of one or two letters within the logotype (e.g., 'Adidas vs Abibas' or 'Ferrari vs Frearri' or 'Nike vs Hike'; Figure 1). Though subtle and seemingly trivial, this modification may deceive the consumer into thinking that the brand is original, when actually it is not, and perhaps particularly when he/she is under time constraints (and when most features of the logo match those of the original).

Insert Figure 1 about here

Notably, not all letter positions within a logotype seem to be equally important. Prior research on the topic of lexical processing has shown that the exterior letters of words (i.e. first and last letters) occupy a more important position during processing than the interior letters (Johnson & Eisler, 2012). In addition, any transposition involving the exterior letter positions disrupts word reading to a greater extent than within-word transposition of letters. For example, transpositions 'rpoblem' and 'problme' associated with the word 'problem' will be more disruptive than 'prbolem' and 'prolbem' (Rayner, Pollatsek, Ashby, & Clifton Jr, 2012). It has also been reported that if a word's text is transposed at its first letter, then the reading speed decreases to 163 words per minute (wpm; approximately a 36% decline) from 255 wpm, whereas if the transposition involves the last letter, the reading speed declines to 189 wpm (a 27% decline, i.e. a lesser decline when compared to the first letter transposition) (Rayner et al., 2012; White, Johnson, Liversedge, & Rayner, 2008).

Research has also shown that a words' exterior letters have a processing advantage over the other letters and when a participant is primed with a word's exterior vs. interior letters, his/her recognition of the word results in faster naming latencies (Grainger & van Heuven, 2003; McCusker, Gough, & Bias, 1981), faster identification (for e.g., identification of letter T will be faster in the jumbled text 'TMLRF' & 'LMFRT' as compared to its identification in 'LMTRF'; Hammond & Green, 1982; Whitney, 2001), higher recall (Humphreys, Evett, Quinlan, Besner, & Coltheart, 1987) and shorter lexical decision times (Foster, 1976; Johnson & Eisler, 2012). For example, to illustrate such a lexical decision task, if participants are primed with, 'B_____r' (the exterior letters of the brand Budweiser) then their reaction time to the brand name Budweiser will be faster than if they are primed with ' __dweis__' or '_udweis__' (the interior letters of the brand Budweiser).

The importance of a letters position within a word has been a focus of research for many decades now (Grainger, 2008). Researchers have shown robust results for both the first letter position advantage (Gomez, Ratcliff, & Perea, 2008; Scaltritti & Balota, 2013) and the last letter position advantage (Mewhort & Campbell, 1978; Tydgat & Grainger, 2009). First letters of a word are believed to provide more information about the word in the recognition process (Stevens & Grainger, 2003). Moreover, changes made to the first letter position disrupts reading to a greater extent than changes made to the last or middle letter positions (Bruner & O'Dowd, 1958; Gibson & Levin, 1975; Rayner & Kaiser, 1975). In fact it has been shown that mere exposure to just the exterior letters of a word can enhance its eventual recognition (Foster, 1976; Humphreys, Evett, & Quinlan, 1990; McCusker, Gough, & Bias, 1981). Similarly, words created with transposed letters have been shown to be similar to the original word in terms of processing speed, when compared to the word created with a substitution [for e.g., Frerari (transposition) and Focrari (substitution) for the word Ferrari] (Chambers, 1979; Kinoshita & Norris, 2009; Perea & Lupker, 2003; Schoonbaert & Grainger, 2004). Research also appears to suggest that transposition is more deceiving than substitution (O'Connor & Forster, 1981).

However most of the research cited above has been carried out in the context of either words (non-words) or nouns. But brand names, although nouns, are considered to be ambiguous as they are believed to be more complex than other categories of nouns, having different processing speeds (Gontijo, Rayman, Zhang, & Zaidel, 2002). Moreover, brand names are usually presented in a sort of logo type design. Will a sub-category of fake brand names (i.e. brand names or non-words) created with either transposition or substitution of letters) follow the pattern shown by earlier research? To answer this question, in the current paper, we extended the aforesaid research to the context of counterfeit brand logos. In particular, we hypothesized that first letter manipulations in counterfeit logos would be easier to identify as fake than last letter

manipulations. To test this hypothesis, we created fake logos by systematically transposing (or substituting) the first and last letters of seven popular brands' logotypes. In Study 1, we tested whether consumers were able to identify fake (vs. original) logos created with the *transposition* of the first and last letters. In Study 2 we tested fake logos created with *substitution* of the first and last letters with *visually similar or dissimilar* letters. Both studies used reaction time-based paradigms.

Since many purchase decisions are made automatically (Dijksterhuis, Smith, Van Baaren, & Wigboldus, 2005) and consumers often spend only a single eye fixation (up to 500 ms of a still eye) when searching for a specific product on a shelf (Chandon, Hutchinson, Bradlow, & Young, 2009; Van der Lans, Pieters, & Wedel, 2008), in the two studies reported, we investigated the impact on perception of two different exposure times of the counterfeit logos (100 ms and 3000 ms). Here it should be noted that while 100 ms may not permit the full processing of a written stimulus, it is sufficiently long enough exposure to influence consumer's behaviour towards that stimulus, as the brain continues to process it. Indeed, previous research suggests that information from a visual scene can be extracted with a high degree of accuracy, even when a stimuli is presented for 26 ms (Kapferer, 1995; Rousselet, Joubert, & Fabre-Thorpe, 2005) and the same is true for the marketing information too. Pieters and Wedel (2012) showed that even at an exposure time of 100 ms, consumers are able to perceive an advertisement or a product with up to 90% accuracy. Consumer often face clutter at the point of purchase, due to the juxtaposition of genuine brands and their counterfeits or look-alikes (Van der Lans, Pieters, & Wedel, 2008), and in the confusion often pick up either unintended brands or their counterfeits. Research in advertising shows that even if a consumer has sufficient time for an Ad, still the eye fixates for up to 300 ms at one point and then saccades to another point (Pieters & Wedel, 2012). If that is so, can a consumer identify a fake logo at an exposure of up to a single eye fixation?

Previous studies have used longer stimuli (e.g., Vartanian et al, 2013) as well as briefly presented ones (e.g., Bar & Neta, 2006), to study explicit (by enabling top-down processing) versus implicit responses (by suppressing top down processing). Since, we hypothesized that both longer (cognitively elaborated responses) as well as brief (”gut instinct”) responses affect the purchase of counterfeit goods, we studied two different presentation times of 100 ms and 3000 ms.

Study 1

Participants

A total of 95 American participants between the ages of 20 to 60 years completed the study (M_{age} = 36.24 years, *SD* = 9.00, *Males* = 53, *Females* = 42). All studies reported here were designed and conducted on Inquisit 5 software (Millisecond.com) and participants were recruited through Amazon Mechanical Turk (M Turk; Paolacci & Chandler, 2014). The present research was reviewed and approved by the Institutional Review Board Committee. All participants agreed to a standard consent form before the beginning of the experiments and were paid USD 1.80 for their participation.

Apparatus and materials

The first and last letters of the logotypes of 7 popular brands (Budweiser, Costa Coffee, Burger King, YouTube, Heineken, Facebook and Domino’s Pizza) were transposed in order to create different counterfeit versions (see Figure 2). Three groups of logos were used: original logos (OL) and manipulated versions of the OL with the first letter transposed (FLT) and the last letter transposed (LLT, see Web Appendix B; all web appendices can be found at https://discovery.dundee.ac.uk/en/publications/identifying-counterfeit-brand-logos-on-the-importance-of-the-firs). Here we acknowledge that there may be a potential confound related to

one of our stimuli: specifically, the Heineken logo which contains the logotype in the centre as well as the upper crest of the logo. In the current study, only the central logotype was manipulated. However, as shown in the F2 analysis (page 9, 10, 15 and 16) this does not appear to have impacted on the interpretation of the results.

Insert Figure 2 about here

Design and procedure

The study followed a 3 x 2 within-participant experimental design with factors of logotype transposition (OL, FLT, and LLT) and logo presentation time (100ms and 3000ms). At the beginning of the study, participants were told that a brand logo would appear in the center of the screen and they had to decide whether the logo appearing on the screen was fake or genuine by pressing either 'E' or 'I' keys on the computer key board. The key mapping was counterbalanced across participants.

All original and fake brand logos (fitted in 300 x 350 pixels) were presented, one at a time, in the center of the screen. Before the brand logo appeared, a '*' was displayed at the center of the screen for 500 ms. Logo presentation time was manipulated throughout the experiment; in some trials, the logos were presented for 100 ms, in others for 3000 ms. In total, participants were presented with four blocks of trials in two blocks, logos were presented for a maximum of 100 ms and in the rest two blocks, logos were presented for a maximum of 3000 ms (presentation time was counterbalanced). Participants could respond at any given time after the presentation of the stimuli. In each block of trials, each of the 7 OLs were presented seven times and each logo from FLT and LLT categories was presented four times, leading to 105 trials per participant per block and a total of 420 trials per participant for the whole experiment (see Figure 3). One of the reasons why we presented the original logo more times than the transposed logos

was to have a similar likelihood of either the transposed (0.53) or original logos (0.47) appearing on the screen at any given time.

Insert Figure 3 about here

Participants were instructed to respond as quickly and accurately as possible. Before the main task began, they were presented with 10 practice trials to familiarize themselves with the procedure. The design of the practice trials was similar to that used in main trials (Figure 3), however, the original and fake brand logos of brands Ford and Google were used instead. Participants were also cued with a red 'X' symbol below on the screen in case their response was incorrect, although they were allowed to proceed further without any penalty.

Results and discussion

To check participants' familiarity with the brands, we evaluated accuracy in response to the OLs (in 3000 ms presentation time blocks) to ensure that participants were familiar with the brand logos used in this study. Data from two participants having less than 75% accurate responses for OLs were excluded from the analyses. The average accuracy for the identification of OL for the remaining 93 participants was 94.12%, SD = 4.68 (M_{age} = 36.10 years, SD = 8.92, *Males* = 53, *Females* = 40), suggesting that the participants were able to correctly identify what the original brand logo looked like.

Accuracy. A 3 (type of logo: FLT, LLT and OL) x 2 (presentation time: 3000 ms and 100 ms) repeated measures ANOVA (the Greenhouse-Geisser correction was applied whenever sphericity was violated in any of the analysis reported in Studies 1 and 2) was conducted in order to evaluate the effect of logo fakeness on the accuracy with which participants identified whether the logos were fake or not. Significant main effects of type of logo, F (1.60, 147.11) = 163.52, p < .001, η_p^2 = .640, and presentation time, F (1, 92) = 147.24, p < .001, η_p^2 = .615, were

observed. The interaction between type of logo and presentation time was also significant, F (1.75, 161.37) = 3.61, p = .035, η_p^2 = .038. Tukey HSD post-hoc comparisons revealed that participants responded more accurately while responding to OL, followed by FLT, and then LLT (p < .01 for all comparisons; see Table A1 (in Web Appendix A) & Figure 4). Notably, participants were also more accurate when the stimuli were presented for 3000 ms than for 100 ms, suggesting that, overall, they were more likely to misidentify whether a logo was fake or not at the lower exposure time. As for the interaction term, two independent ANOVAs revealed that participants responded similarly to different logos at exposure lengths of 100 ms, F (1.72, 158.63) = 96.90, p < .001, η_p^2 = .513 (and ps < .01 for all Tukey HSD post-hoc comparisons), and at 3000 ms, F (1.46, 134.40) = 182.67, p < .001, η_p^2 = .665 (and ps < .01 for all Tukey HSD post-hoc comparisons), though the differences appeared to be larger in the longer exposure condition. An F2 analysis (Brysbaert, 2007) was also conducted to test the inter item generalizability of results for all the seven brand logos used as stimuli. F2 analysis, along with the minF^2 provide a reliable estimate of the effect across both participants as well as the stimuli (Brysbaert, 2007). In psycholinguistic research, a significant participant level finding may often be attributed to just a few items (or stimuli used), which makes the F2 (item level) analysis important to clear this confound and to ensure that the effects are generalized across all the stimuli and is not over-influenced by a few items alone. F2 analysis revealed a similar pattern of results across the stimuli used [For 100 ms: F (2, 12) = 8.18, p = .006, η_p^2 = .577, minF (2, 14) = 7.54, p = .005; For 3000 ms: F (1.10, 6.58) = 9.52, p = .018, η_p^2 = .614, minF (2, 13) = 9.05, p = .003; minF provides a reliable estimate of the effect across both participants and stimuli (Brysbaert, 2007)].

Insert Figure 4 about here

RTs. We also analyzed response latencies of the correct responses using a 3 (type of logo: FLT, LLT and OL) by 2 (presentation time: 3000 ms and 100 ms) repeated measures

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2 We thank one of the anonymous reviewers for recommending an additional F2 analysis. In F 2 analysis, MinF (i, j) = (F1*F2)/(F1+F2) where i = df1 of F1= df1 of F2 and j = (F1+F2)2 /(F12/ df2 of F2) + (F22/df2 of F1), where F1 is the participant level analysis whereas F2 is the item level analysis. Wherever the Greenhouse-Geisser correction is used in the paper, the corrected sphericity assumed df has been used to calculate the minF, but for reporting purposes, the Greenhouse-Geisser corrected df have been quoted. To illustrate, in Study 1, the minF for the accuracy in the 100 ms block was calculated as follows: F1= 96.9, F2 = 8.18, df1 of F1= df1 of F2 = 2, df2 of F1= 184, df2 of F2 = 12, minF (2, 14) = 7.54, associated p value as per FDIST function in excel = 0.005. Other minF values were similarly calculated.

ANOVA. Note that only the trials between 200 ms and 2 SD above the mean were included in the analyses. Therefore, the analyses were performed on 81.89% of 100 ms trials and 92.02% of the 3000 ms trials. The analysis revealed significant main effects of the type of logo, F (2, 184) = 132.29, $p < .001$, $\eta_p^2 = 0.592$, and presentation time, F (1, 92) = 166.66, $p < .001$, $\eta_p^2 = 0.644$. The interaction between type of logo and presentation time was also significant, F (2, 184) = 63.09, $p < .001$, $\eta_p^2 = 0.407$. Tukey HSD post-hoc comparisons revealed that the participants responded fastest to FLTs, followed by OLs, and slowest to LLTs ($p < .023$, for all comparisons whilst no difference was observed between RTs of FLTs and OLs; see Table A2 in Web Appendix A & Figure 5). What is more, participants responded faster when the logos were presented for 100 ms than when they were presented for 3000 ms, suggesting that they were faster in making responses at shorter exposure times (though less accurately).

Insert Figure 5 about here

We also conducted two independent ANOVAs for each presentation time. Significant differences were observed between type of logos at 100 ms, F (2, 184) = 54.54, $p < .001$, $\eta_p^2 = 0.372$, and at 3000 ms, F (1.88, 172.92) = 137.02, $p < .001$, $\eta_p^2 = 0.598$. Tukey HSD post-hoc comparisons revealed that participants responded fastest to FLTs, followed by OLs, and slowest to LLTs when logos were presented for a longer exposure time ($p < .035$, for all comparisons). In

contrast, for the shorter exposure time, participants responded faster to FLTs and OLs than LLTs (*ps* < .036), whilst no difference in RTs was observed between FLTs and OLs (p = .991). F2 analysis revealed similar pattern of results across all the stimuli used (For 100 ms: F (2, 12) = 28.62, p < .001, η_p^2 = .827, minF (2, 27) = 18.75, p < .001; For 3000 ms: F (2, 12) = 22.61, p < .001, η_p^2 = .790, minF (2, 16) = 19.40, p < .001.

Results of Study 1 suggest that both exposure time and letter transposition in a logotype can influence the accuracy and speed of identification of a fake logo. Results indicate that a fake logo created with the transposition of first 2 letters will be identified with a higher degree of accuracy (and will be less deceptive) by consumers and that a fake logo created with the transposition of last 2 letters will be identified with lesser accuracy, therefore, becoming potentially more deceptive.

In Study 2, we aimed to replicate and extend the results of Study 1. Whilst letter transposition might be one way in which counterfeit brands imitate original brands, it is also common to find brands that replace one or various letters of an original brand's name with similar look-alike letters (for e.g., KFC & KFG; Fletcher & Crawford, 2013, p 62). Therefore, in Study 2, first and last letters of logotypes were *substituted* with *visually similar or dissimilar* letters and their identification as a fake was further tested, following a similar approach as in Study 1.

Study 2

Participants

A total of 92 participants between the age of 20 to 58 years completed the study (M_{age} = 36.14 years, *SD* = 9.03, *Males* = 49, *Females* = 43).

Apparatus and materials

The first and last letters of the logotypes of 7 popular brand logos (Budweiser, Costa Coffee, Burger King, YouTube, Heineken, Facebook and Domino's Pizza) were substituted with visually similar or dissimilar letters in order to create five different levels of logo fakeness: first letter substituted with dissimilar letter (FLD), a first letter substituted with similar letter (FLS), last letter substituted with dissimilar letter (LLD), last letter substituted with similar letter (LLS), and an original logo (OL) [visual similarity or dissimilarity of letters was selected based on the work of Boles & Clifford (1989); Table A3 in Web Appendix A and Figure 6; also see Web Appendix C for all the fake logos used in Study 2].

Insert Figure 6 about here

Design and procedure

The experiment followed a 5 x 2 within-participants experimental design with factors of logotype substitution (OL, FLD, FLS, LLD & LLS) and logo presentation time (100ms and 3000ms). The design and experimental procedure were similar to those used in Study 1. Study 2 included 6 blocks of trials, 3 blocks where the brands were presented for 3000 ms and 3 blocks where the brands were presented for 100 ms (presentation time was counterbalanced). Each block had 105 trials (presented in random order), comprising of 56 trials with 5 types of fake logos and 49 trials with the OLs and instructions given to participants were same as in Study 1.

Results and discussion

As in Study 1, we evaluated accuracy in response to the original brand logos (in 3000 ms presentation time blocks) to ensure that participants were familiar with the brand logos used in this study. Data from two participants having less than 75% accurate responses for OL were excluded from the analyses. The average accuracy for the identification of OL for the remaining 90 participants was 93.67%, *SD* = 5.51 (M_{age} = 36.15 years, *SD* = 9.02, *Males* = 48, *Females* =

42), suggesting that participants were able to correctly identify what the original logo looked like.

Accuracy. A 5 (type of logo: FLD, FLS, LLD, LLS and OL) by 2 (presentation time: 3000 ms and 100 ms) repeated measures ANOVA was conducted to evaluate the effect of logo fakeness on the accuracy with which participants identified them as fake. Significant main effects of the type of logo, F (3.11, 277.23) = 130.67, $p < .001$, $\eta_p^2 = .595$, and presentation time, F (1, 89) = 107.42, $p < .001$, $\eta_p^2 = .547$, were observed. The interaction between type of logo and presentation time was also significant, F (3.38, 300.52) = 12.03, $p < .001$, $\eta_p^2 = .119$. Tukey HSD Post-hoc comparisons revealed that participants responded most accurately to FLD, followed by FLS, OL, LLD, and LLS (in the same order) ($p < .01$ for all comparisons, except between FLS & OL which was found to be non-significant; see Table A4 in Web Appendix A & Figure 7). As in Study 1, participants were more accurate when the stimuli were presented for 3000 ms than for 100 ms, suggesting that, overall they were more likely to misidentify a fake logo at the lower exposure times (as in Study 1).

As for the interaction term, two independent ANOVAs revealed that participants responded similarly to different logos at the exposure time of 100 ms, F (3.25, 288.95) = 76.83, $p < .001$, $\eta_p^2 = .463$ (and $ps < .01$ for all Tukey HSD post-hoc comparisons, except for FLS & LLD ($p < .05$) and FLS & OL which was found to be non-significant), and 3000 ms, F (3.19, 283.97) = 86.18, $p < .001$, $\eta_p^2 = .492$ (and $ps < .01$ for all Tukey HSD post-hoc comparisons except FLS & OL and LLD & OL which were found to be non-significant). The differences appeared to be larger for the longer exposure time, though. F2 analysis revealed similar pattern of results across the stimuli only for 100 ms but not for the 3000 ms presentation times; For 100 ms: F (4, 24) = 3.63, $p = .019$, $\eta_p^2 = .377$, minF' (4, 26) = 3.47, $p = .021$; For 3000 ms: F (4, 24) = 2.62, $p = .060$, $\eta_p^2 = .304$, minF' (4, 25) = 2.54, $p = 0.06$, paired t tests revealed that only

FLD & FLS (t = 5.094, p = .002), FLD & LLD (t = 2.91, p = .027) and FLD & OL (t = 5.52, p = .001) were significantly different from each other.

Insert Figure 7 about here

RTs. We also analyzed RTs by means of a 5 (type of logo: FLD, FLS, LLD, LLS, and OL) by 2 (presentation time: 3000 ms and 100 ms) repeated measures ANOVA. Only the trials between 200 ms and 2 SD above the mean were included in the analyses, therefore, the analyses were performed on 83.22% of 100 ms trials and 91.72% of 3000 ms trials. The analysis revealed significant main effects of the type of logo, F (3.35, 297.96) = 109.85, $p < .001$, $\eta_p^2 = 0.552$ and presentation time, F (1, 89) = 71.15, $p < .001$, $\eta_p^2 = 0.444$. The interaction between type of logo and presentation time was also significant, F (3.88, 345.36) = 30.00, $p < .001$, $\eta_p^2 = 0.252$. Tukey HSD post-hoc comparisons revealed that participants responded fastest to FLD followed by FLS, OL, LLD and LLS (in the same order. $p < .01$ for all comparisons, except between FLS & OL for which was found to be non-significant; see Table A5 in Web Appendix A & Figure 8). As in Study 1, participants responded faster when the logos were presented for 100 ms (though less accurately).

We also conducted two independent ANOVAs in order to assess participants' RTs to different logos at each exposure time. Significant differences were observed between logos in 100 ms exposure time, F (3.54, 315.35) = 40.19, $p < .001$, $\eta_p^2 = 0.311$, and in 3000 ms exposure time, F (3.49, 310.24) = 115.06, $p < .001$, $\eta_p^2 = 0.564$. Tukey HSD post-hoc comparisons revealed that participants responded faster to FLDs, followed by FLS, LLD, OL, and slowest to LLS ($p < .01$, for all comparisons except between LLD & OL which was found to be non-significant). In contrast, for the shorter exposure time, participants responded fastest to FLD, followed by OL, FLS, LLD, and slowest to LLS ($p < .01$, for all comparisons except between FLS & OL and LLD & LLS which were found to be non-significant). F2 analysis also revealed

similar pattern of results across the stimuli used [For 100 ms: F (4, 24) = 7.88, $p < .001$, η_p^2 = .568, minF (4, 34) = 6.59, $p < .001$; For 3000 ms: F (4, 24) = 8.70, $p < .001$, η_p^2 = .592, minF (4, 28) = 8.08, $p < .001$.

Insert Figure 8 about here

Results of Study 2 are similar to those of Study 1 in that they highlight the importance of the first letter of a logotype in the identification a fake logo. Result also show that if a fake logo is created with the substitution of just one first letter (i.e. while retaining a maximal resemblance with the OL), still consumers can identify it with a high degree of accuracy (even at a short exposure duration of 100 ms). However, a fake logo similarly created with the substitution of just the last letter, is less accurately identified by consumers (almost 25% of the time), making such fake logos as more deceptive. Results also highlight the importance of the visual similarity (dissimilarity) of the substituted letters used in fake logotypes. The fastest identification was found to be for FLDs and at shorter exposure time (100 ms), which ironically was faster than the identification of even the OLs (see Table A5 in Web Appendix A). The slowest identification was found to be for LLSs which was seen at the longer exposure time (3000 ms), suggesting that LLSs are the most deceptive type of fake logos (considering the difficulty and confusion such logos create in a consumers mind), among the various logos used in the study.

General discussion

During the process of word recognition, the special status afforded to the letters occupying the first and last positions is a well-established finding (Chanceaux & Grainger, 2012). Both the exterior letters of a word have been shown to have a robust first position advantage (Davis, 2010; Gomez et al., 2008; Grainger & van Heuven, 2003; McCusker et al., 1981; Scaltritti & Balota, 2013) or last position advantage (Davis, 2010; Grainger & van Heuven, 2003; Mewhort & Campbell, 1978; Tydgat & Grainger, 2009). Studies on word

recognition (Gibson & Levin, 1975) and word reading (Rayner & Kaiser, 1975) have illustrated the importance of the initial letters of a word compared to the middle and end letters (Gomez et al., 2008) and it is now believed that both the exterior letters and even a words' shape provide important cues during word reading. It has also been reported that any mutilations of the beginning letters of word (Bruner & O'Dowd, 1958; Rayner & Kaiser, 1975) or any substitutions/changes at these letter positions, disrupts reading speed much more than disruptions involving the interior letters (Jordan, Thomas, Patching, & Scott-Brown, 2003; Rayner & Kaiser, 1975; White, Johnson, Liversedge, & Rayner, 2008). Even studies using random strings of letters have demonstrated higher accuracy and response times for the first and last letters relative to other letters (Butler & Merikle, 1973; Hammond & Green, 1982; Mason, 1982; Merikle & Coltheart, 1972; Tydgat & Grainger, 2009). Similar evidence has also been reported in priming studies (for e.g., Grainger & van Heuven, 2003), where visually similar words with the same first and last letters [for e.g., dentjst vs dentgst (Foster, 1976; Marcet & Perea, 2017); or 4 as a substitute for A in M4TERI4L (Perea, Duñabeitia, & Carreiras, 2008); or words with shorter inter-letter distance (homoglyphs e.g., docurnento (in Tahoma) vs docurnento (in Calibri) (Marcet & Perea, 2018)] are more effective primes. According to one account, the importance of first and last letters is believed to derive from the fact that they are always located next to a space which gives them a perceptual saliency, with lesser interference and crowding from the nearby letters (Grainger, Tydgat, & Isselé, 2010; Levi, 2008; Pelli et al., 2007). Other research suggests that a words' exterior letters are perceived differently from the other letter groups within a word (Jordan, Patching, & Thomas, 2003) or provide orthographic cues which aid word recognition to a greater extent than the interior letters (Jordan, 1990, 1995).

The aforementioned research on the importance of various letter positions has mostly been carried out using words, nouns, non-words and random letter strings. But can brand names

be placed in the same category? This distinction is important because research in linguistics and psychology suggests that different grammatical and semantic categories of words (e.g., proper names, nouns) in the lexicon have differing processing speeds (Bradley & Garrett, 1983; Mohr, Pulvermüller, & Zaidel, 1994) and although brand names are nouns, they are ambiguous as a category as they are more complex (than proper names and nouns) and are processed faster and more accurately than non-words but slower (and less accurately) than common nouns (Gontijo, Rayman, Zhang, & Zaidel, 2002). Some authors even suggest that brand names are conferred a special status amongst the category of nouns and have a special recognition process distinct from other proper nouns; for e.g., in the case of brand names, visual features associated with them (e.g., capitalization of BURGER KING) becomes inseparable from the name itself and is said to aid in a brand names' processing and retrieval during its recognition (Gontijo & Zhang, 2007). Brands names are more complex than proper names because in many cases, they do not refer to any unique object per se (e.g., the brand 'Unilever' identifies a range of products from shampoos to home care products, all under same brand despite their clear differences). In spite of their importance to marketers, brand names have largely not been researched as a separate subset by psycholinguistic researchers (Gontijo & Zhang, 2007). If brand names are a special category of words which are distinct from proper nouns, how will fake brand names be classified- as a non-word (which linguistically they are) or as a non-brand-name? To date, there is little relevant literature to guide us in these questions.

The current paper aimed to answer some of the questions presented above and sought to establish whether consumers can differentiate (and at what speed) an original logo from its counterfeit version created by transposing or substituting the first and last letters of a brand name. Past research in lexical processing has demonstrated the importance of first and last letter positions in words' recognition and processing (Johnson & Eisler, 2012). The current paper

demonstrates that this pattern is also true in the context of counterfeit brand logos. In two studies we demonstrate that the manipulation of the first letter in a brand name, even with a visually similar letter (for e.g., P with R) can easily be identified by consumers with a high degree of accuracy but the same is not true for the last letter manipulation. Our results also show that if a counterfeit logo is created by manipulating the last letter of the logotype, then both the accuracy and speed with which it is identified as fake is reduced.

Indeed, one previous paper (van Horen & Pieters, 2012) reported that between two hypothetical copycat brand name pairs- 'Orme vs Omer' and 'Orme vs Osve', the former pair was likely to be perceived as more similar to each other and thus was more deceptive. These authors also highlighted that orthographic similarity has often been cited as a basis to settle numerous pertinent court cases in the past (see van Horen & Pieters, 2012 for details). The current paper extends this research and provides evidence in line with this idea and shows that although hypothetical brand name pairs -'Orme vs Trme' and 'Orme vs Ormt', share one letter manipulation each and are highly similar to each other, manipulating the last letter (as in the latter pair) is more deceptive than the first letter manipulation (as in the former pair).

There are two possible explanations for these results: (a) some researchers have suggested that the exterior letters of a word are more important for its lexical processing (than the interior letters) as they are related to the way in which lexical information is stored and later retrieved in the brain (Grainger & Segui, 1990; Johnson & Eisler, 2012; Jordan, 1990; Jordan, Thomas, Patching, & Scott-Brown, 2003). These researchers argue that exterior letters form an 'access code' which in turn help the brain to link the exposed word to the possible word candidates (with similar exterior letters), which in turn results in faster word recognition (for e.g., according to this logic, 'Budweiser' and 'Behaviour' will be stored closer to each other, as they share same number of letters, and same first and last letters) (b) Another possible explanation is

that the first and last letters are always located in a less crowded letter position (i.e. next to a space) which provides these letters with higher perceptual salience and less interference or crowding from nearby letters (Grainger, Tydgat, & Isselé, 2010; Johnson & Eisler, 2012; Levi, 2008; Pelli et al., 2007; Rayner et al., 2012). This, in turn, might enable the faster processing of first and last letter positions compared to the word-interior letter positons, which are of lower perceptual salience. Alternatively, exterior letters may be more informative in spelling-to-sound meaning conversion (see Stuart & Coltheart, 1988 for a review). In fact, the advantage of the first letter position has been shown to be quite robust (for words, legal non-words, and even for random consonant strings) and has been shown to be equally effective for words varying in their length (Scaltritti & Balota, 2013). We extend these results in the current paper by showing that these principles are equally applicable to brand names of different lengths.

Since brand names have been shown to be a separate category of words (or nouns), it will be logical to assume that exterior letters of a brand logo will be processed differently than simple brand name text. Brand logos and logo types are also rich and varied in terms of colour, font, cases, size etc. which are specific to a particular brand and over time, with repeated exposure, these features are increasingly associated with that particular brand [for e.g., capitalized text of IKEA vs ikea; (Perea, Jiménez, Talero, & López-Cañada, 2015)]. In view of these differences, it will be difficult to argue that the similar manipulations in the brand name text and brand logo will be processed in exactly the same way; for e.g, '**facebook**' (as plain text) vs '**facebook**' (in font and colour characteristic of the Facebook logo) vs '**facebook**' (in different colour) vs '**facebook**' (in a different font but same colour). The results reported in this paper shows that as far as the manipulation of first and last letters within a brand logo is concerned, the rules on orthographic cues (Peressotti, Cubelli, & Job, 2003) still apply. However,

whether the same law holds true for other manipulations within a logo for e.g. manipulation of interior letters, type of fonts, text colour etc., remain a topic for further research.

The current study also goes beyond mere letter position in the context of counterfeit logos to assess the role of exposure duration on brand identification. Consumers do not always engage with brand logos for extended periods of time, rather, under time pressure they typically rely only on the cursory processing of brand names (Chandon et al., 2009). As such, the time a consumer is exposed to and/or engages with brand elements might influence the cues on which they rely to make their purchase decisions. Research suggests that under shorter exposure times or time pressure, consumers may rely on implicit knowledge about the brand (Friese, Wänke, & Plessner, 2006). In that sense, they may quickly search for the products on shelf and select their favorite brands (or those properties that resemble their brands such as colours, shapes, typefaces etc.). In such short exposures, we argue that consumers are more likely to be deceived by the counterfeit brands.

Whether a consumer can recognize a counterfeit logo and the elements contained therein, is a question that has considerable applied relevance for many markets worldwide. Indeed, the images shown in Figure 1 are just a few examples of the vast number of counterfeit products sold in certain Asian markets. All of these fake brand logos closely resemble those of successful, popular brands across many industries and countries. Due to the lack of an adequate legal framework and sometimes due to poor implementation of trademark and intellectual property (IP) laws, the practice of utilizing logos resembling popular brands, is rather common, especially in China (Chow, 2009). To our knowledge, this is the first study which examines counterfeit brand logos from such a perspective. With new brands emerging every day across the globe, similarity in logo design and brand names is bound to occur. The findings from this research will help firms to identify features in counterfeit logos that can damage their businesses vis-a-vis non-

deceptive counterfeits (i.e., which may be look-alikes, but are easily identifiable by consumers as fake). There was a time when firms in the counterfeit trade copied only high value products (watches, designer apparel etc.; Berman, 2008), but with the boom of e-commerce, the counterfeit industry is flourishing and some estimates suggest that out of ten Louis Vuitton items on sale on E Bay, nine are counterfeits (Berman, 2008; Peene, 2010). In future, this problem is set to increase and we hope that the findings of this paper will provide some insights that can be used by firms in fighting their counterfeit adversaries and in strengthening the trademark laws.

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Figures

Figure 1. Counterfeit products being sold in the Asian markets

Original Logo (OL)	First letter transposed (FLT)	Last letter transposed (LLT)
		
		

Figure 2. Examples of the fake logos used in Study1

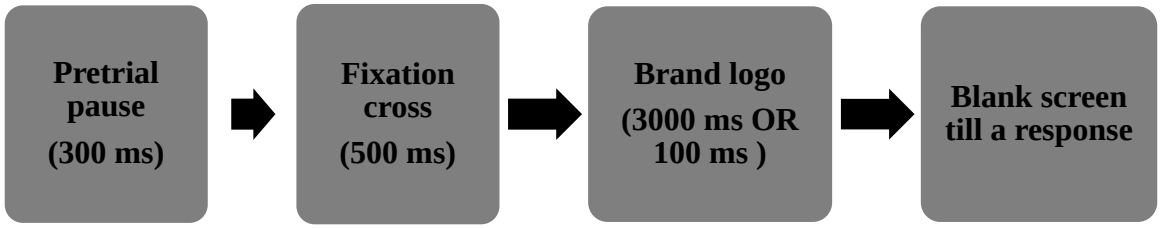

Figure 3. Sample trial used in Study1

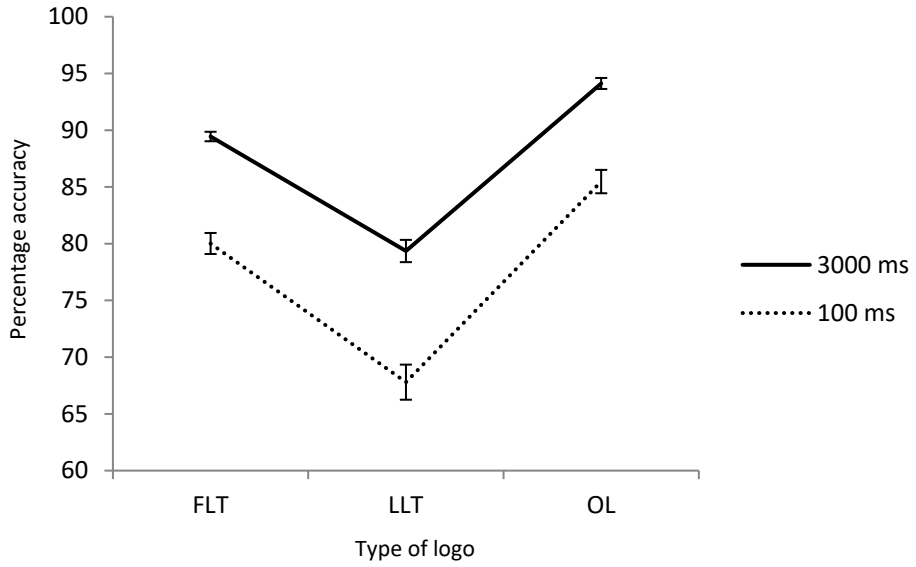

Figure 4. Accuracy in Study 1.
(Error bars represent the standard error of the means)

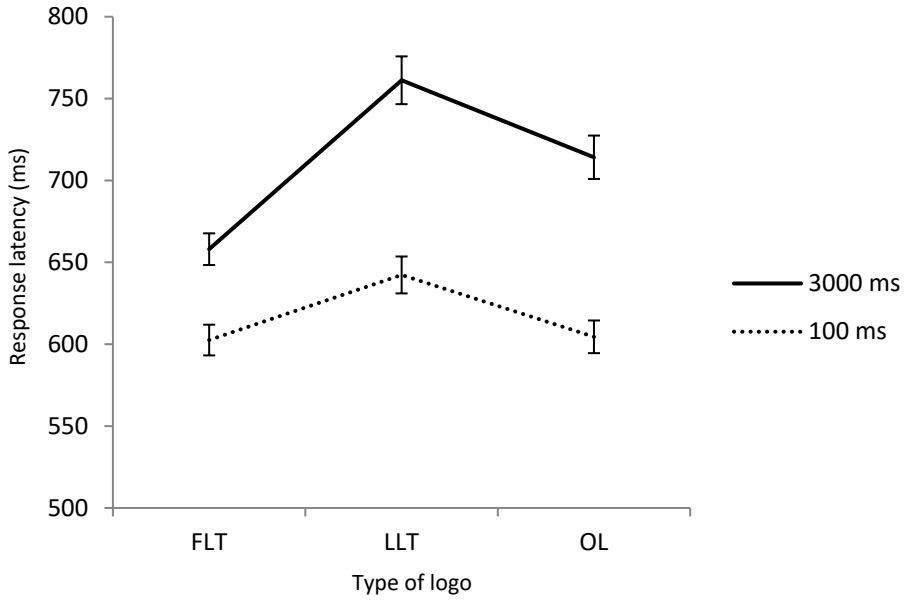

Figure 5. RTs in Study 1.
(Error bars represent the standard error of the means)

Original Logo (OL)	First letter substituted with a dissimilar letter (FLD)	First letter substituted with a similar letter (FLS)	Last letter substituted with a dissimilar letter (LLD)	Last letter substituted with a similar letter (LLS)
				
				

Figure 6. Examples of fake logos used in Study 2

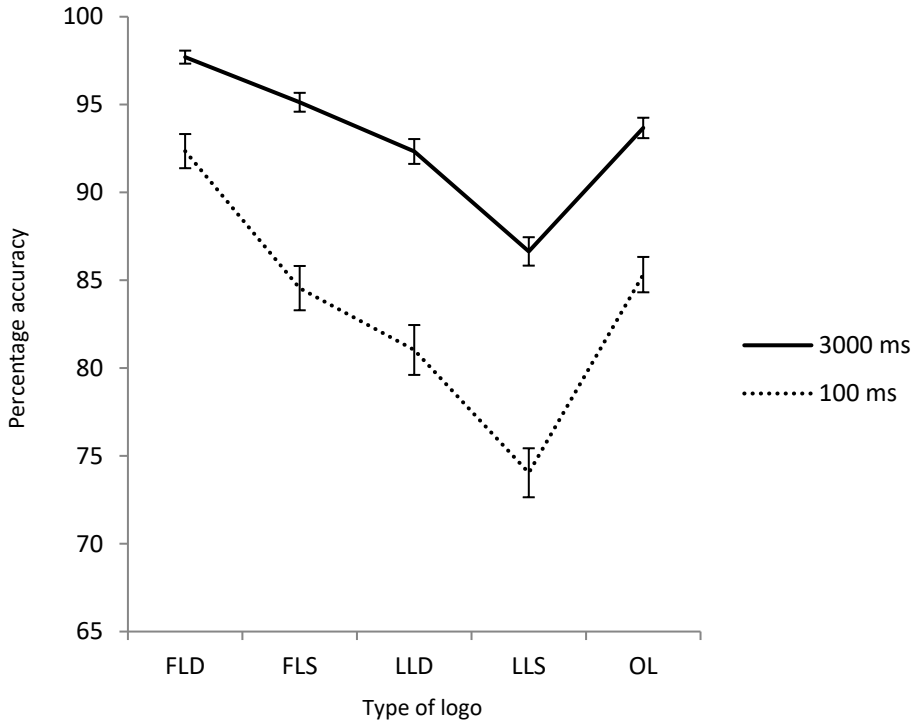

Figure 7. Accuracy in Study 2.
(Error bars represent the standard error of the means)

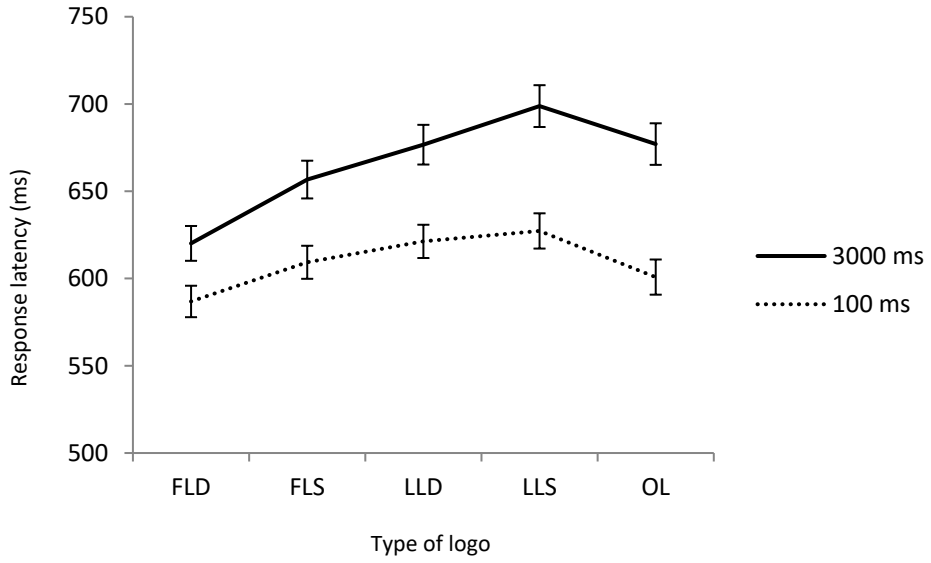

Figure 8. RTs in Study 2.
(Error bars represent the standard error of the means)