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Ad wearout wearout: How time can reverse the negative effect of frequent advertising repetition on brand preference

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ABSTRACT

This paper reports a surprising reversal in the effect of advertising repetition over time. A field study shows higher annoyance with a more frequently advertised brand at the time of advertising, but greater preference for this same brand several weeks later. A longitudinal online experiment replicates the reversal in brand preference across four time points and tests an underlying mechanism for this reversal. It shows that initial annoyance with frequent ad repetition is highly susceptible to decay over time, whereas brand memory remains relatively stable. Through these two processes, brands with heavier advertising exposure move over time from lower preference to higher preference. Finally, a third experiment demonstrates a crucial condition for this reversal — product relevance at the time of consideration. This study shows that the reversal occurs only if at the later time the product category is relevant. We discuss the substantial implications of these findings for marketing theory and practice.

1. Introduction

The premise of this work is to inform extant research by identifying an over-time pattern of consumer reaction to repetitive advertising, and by investigating an underlying mechanism for this pattern. Numerous studies have shown that ad repetition can be quite annoying. It can directly reduce ad effectiveness and brand preference (e.g. Goldstein, Suri, McAfee, Ekstrand-Abueg, & Diaz, 2014). Consumers who encounter the same ad over and over again can become weary and turned off (e.g. Calder & Sternthal, 1980; Craig, Sternthal, & Leavitt, 1976), and research has been examining the point when more repetition can hurt a brand. However, the research of the wearout effect of advertising repetition has been traditionally focused on immediate effects (e.g. Joo, Wilbur, & Zhu, 2016). The ultimate objective of advertising effectiveness, however, is to build long-term familiarity (Büschken, 2007; Hall, 2002; Hise & Strawser, 1976; Tellis, Chandy, MacInnis, & Thaivanich, 2005; Wood & Poltrack, 2015). What happens when attitudes towards a brand are generated not at the time of exposure to repetitive advertising for the brand, but later, when the product category is being considered to be acquired? Is it possible that ad wearout itself wears out?

This paper focuses on the question of the effectiveness of promoting a product at a time when it is not relevant or needed. As examples, companies repeatedly advertise wedding halls, cars, emergency products and vacation destinations, despite the fact that those products and services are largely irrelevant to most consumers at the time of ad exposure. The frequent occurrence of heavy

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promotion at times when the product is not needed suggests that it may be a useful strategy, but there has been little specific evidence supporting this practice.

To assess whether advertising repetition has different immediate and long-term outcomes, we investigate the changes in its effect over time in one field study and two online lab studies. These studies assess the effect of time on three major outcomes of ad repetition: annoyance, memory and brand preference. Our investigation yields three novel findings. First, we consistently find a reversal in the effect of ad repetition on brand preference over time. Initially, more frequent ad repetition generates less brand preference, but with the passage of time, *greater preference* is generated for the more frequently advertised brand. Second, we provide support for an important mechanism underlying this reversal. We find that initial annoyance from the frequent repetition fades quickly, whereas the greater memory for the frequently advertised brand is sustained. Finally, we demonstrate that the reversal favoring the more heavily promoted brand occurs when and if the product category is a relevant consideration for the consumer.

This work contributes to advertising research and practice first by identifying a long-term reversal of the effect of ad repetition that was not identified before. Second, unlike extant literature, which focused either on memory or on attitudes, we implicate the relative decay rates of memory and annoyance and demonstrate that this difference in decay contributes to the reversal in preference over time. In this we extend beyond Schmidt and Eisend's (2015) meta-analysis of advertising repetition effects by adding a joint analysis of memory and annoyance effect on preference over time, and by using multi-stage measure of time delay, as opposed to the binary approach in the meta-analysis. These two primary differences allow us to offer novel conclusions about the appropriate time to measure the effects of ad repetition and to offer a mechanism underlying these patterns over time. Finally, this work bears clear managerial implications; measurement of the effect of advertising repetition at the time of advertising could be deceptively negative, as it could reverse later, at the time of consideration of the product category for purchase. The next section summarizes the substantial research on the effect of ad repetition on memory and on attitudinal responses and then provides specific hypotheses that follow from these reviews.

2. Theoretical background

2.1. The short term effects of advertising repetition on memory

Literature on the effects of ad repetition on memory consistently shows that greater repetition strengthens memory (Janiszewski, Hayden, & Sawyer, 2003; Pechmann & Stewart, 1988; Schmidt & Eisend, 2015). Table 1 in the Appendix reports 27 published studies that experimentally assessed the impact of ad repetition on memory. The table shows that 25 of these studies found a significant and positive effect of ad repetition on memory, showing that ad and brand recall consistently increase with repetitions. However, the majority of these works measured ad repetition effect on recall either within the same survey or within a day. There are only a few works that measure memory over longer periods. We consider those few studies below.

2.1.1. The slow decay of memory over time

Studies examining longer-term memory effects find relatively minor decreases in memory over time (Singh, Rothschild, & Churchill Jr, 1988). For example, Law (2002) found no significant difference between immediate memory and memory one week later. This result is consistent with research showing very slow decay in memory over time, especially for recognition. Shepard and Chang (1967) found 85%–90% recognition for stimuli that subjects had seen several weeks earlier.

These durable memory effects then can have a positive impact on attitudes towards the brands and their ads through elevated fluency and familiarity. Numerous studies have shown that brand memory enhances familiarity and that familiarity in turn has a positive effect on brand attitudes and preference (Campbell & Keller, 2003; Fang, Singh & Ahluwalia, 2007; Janiszewski, 1993; Janiszewski & Meyvis, 2001; Mantonakis, Whittlesea, & Yoon, 2008). Overall, research overwhelmingly demonstrates that repetition has a positive influence on memory, measured by variables such as ad and brand recall, brand awareness or claim recognition. It also demonstrates that recall and recognition generated by repetition are remarkably persistent over time.

2.2. The short term effects of advertising repetition on attitudinal responses

A very different picture emerges for both the short- and the long-term impact of advertising repetition on measures of ad and brand attitudes. Table 2 in the Appendix summarizes articles on the impact of ad repetition on ad and brand attitudes. Out of the 22 articles, 13 find a negative short-term effect of repetition on attitudes, showing that repetition is generally annoying. One work reports no significant findings (Gorn & Goldberg, 1980). The remaining 12 show that attitudes towards brands can increase with exposures up to a peak and then become less positive with further repetition. These latter findings are consistent with an inverted-U effect of repetition on attitudes (Anand & Sternthal, 1990; Bornstein, 1989; Cacioppo & Petty, 1979; Janiszewski & Meyvis, 2001; Kirmani, 1997; Nordhielm, 2002). The number of repetitions required to achieve wearout may depend on the nature of the stimuli and the medium in which they occur (e.g. Bornstein & D'Agostino, 1992; Campbell & Keller, 2003; Chang, 2009). Most research showing an inverted-U effect finds a peak after about three repetitions (e.g. Calder & Sternthal, 1980; Campbell & Keller, 2003; Chang, 2009; Stayman & Aaker, 1988).

Some works distinguish between ad and brand attitudes (e.g. Brown & Stayman, 1992; Miniard, Bhatla, & Rose, 1990). For example, Pauwels, Aksehirli, and Lackman (2016) suggest that ad-related eWOM conversation has different influences on online and offline shop traffic, compared to brand-related eWOM. However, this research also suggests that even if brand and ad attitudes

differ, they are strongly associated with each other (see also Table 2). To sum, the majority of works are consistent with the notion that short-term negative affect can be generated by relatively few, closely spaced repetitions.

2.2.1. The rapid decay of attitudinal responses over time

How durable is this negative attitudinal response generated by too many repetitions? Although work exists on long-term effects of advertising (e.g. Burmester, Becker, van Heerde, & Clement, 2015; Frison, Dekimpe, Croux, & De Maeyer, 2014; Gijsenberg, 2014; Kopalle & Lehmann, 2015) and specifically to changes in ad attitudes over time. For example, Chattopadhyay and Nedungadi (1992) find an increase in ad attitude after a one-week delay for neutral ads. Only one work examined attitude changes over substantial time following ad *repetition*. Burke and Edell (1986) found in a field study that people who were exposed to repetitive ads during a basketball tournament had more *negative* attitudes towards the ads and the brands that were heavily promoted during those games. However, eight months later, brand and ad attitudes reverted to their original levels, so that there was no longer a measurable negative effect of repetition on ad attitudes.

Indeed, general research of attitudes suggests that responses, and particularly negative ones, are highly susceptible to decay (Kemp, Burt, & Furneaux, 2008; Neisser, 1982; Wirtz, Kruger, Scollon, & Diener, 2003). For example, Walker, Vogl, and Thompson (1997) find that the unpleasantness of an event becomes less intense with the passage of time. Further, people remember past events in a more positive light than the way they felt at the time of its occurrence (Frederickson & Kahneman, 1993; Mitchell, Thompson, Peterson, & Cronk, 1997), and they generally react to painful experiences with fading intensity (Taylor, 1991). Other researchers demonstrate that people's evaluations of past events are more positive than their initial attitudes, again consistent with a general decrease of negative attitudes over time (Kemp et al., 2008; Wirtz et al., 2003). Similarly, Fading Affect Bias Theory predicts that negative responses fade faster than positive ones (e.g. Gibbons, Lee, & Walker, 2011; Ritchie et al., 2006; Ritchie et al., 2009; Walker & Skowronski, 2009). Contradicting those findings, Gijsenberg, van Heerde, and Verhoef (2015) report that negative experiences due to service crises such as train schedule delays have a stronger negative effect on perceived service quality than positive experiences such as service restorations. Concluding from these works, we suggest that the negative effects of annoyance with repetition will quickly decay over time.

2.3. Hypotheses development: Annoyance, memory and brand preference

Schmidt and Eisend (2015) perform a meta-analysis of advertising repetition effects. The authors do not make a direct comparison, but they report (pp. 424–425) that the decay rate for affect over time is (−0.62), whereas the decay of memory after a measurement delay is half as large (−0.32). This result supports the notion that annoyance decays faster than memory. Consistent with these findings, we test within a study whether the negative effects of ad repetition on annoyance have a greater decay over time than memory. To the extent that brand preference is formed by a combination of brand memory and brand attitudes (e.g. Biehal, Stephens, & Curio, 1992; Shimp, 1981), it is possible that the different rates of decay of memory and annoyance over time will influence brand preference. Specifically, we expect that higher frequency of advertising will cause greater immediate annoyance with the ad, resulting in lower preference for the more frequently advertised brand. However, the initial annoyance with the heavily promoted brand will decay over time. At the same time, the more frequently advertised brand will be better remembered due to the greater repetition, and this memory will remain relatively stable over time. Therefore, as time goes by, there will be greater preference for the more frequently advertised brand as the high annoyance with that brand decays while the increased memory for that brand remains.

Our specific hypotheses then are as follows:

H1. In the short run, higher levels of advertising frequency lead to greater ad annoyance, but also higher brand memory.

H2. With the passage of time, annoyance with the ad decays more than brand memory.

H3. As a result, the effect of ad repetition on brand preference will reverse over time, turning from greater annoyance with the more frequently advertised brand to higher preference for that same brand.

3. Method

3.1. Study 1 — field experiment

In this field study we test the prediction that more (less) frequently advertised brands will be more (less) annoying at the time of exposure (H1), but will become more (less) preferred after time passes (H3).

3.1.1. Participants and procedure

The study had two stages. Stage 1 took place in mid-September, six weeks before Halloween. Ads promoting branded Halloween decorations were posted on four billboards inside of each of two residence halls located on the campus of a large Midwestern university. The residences were similar in size and population mix. The ads, shown in Appendix A, differed visually in color (one orange and black and the other black and white) and promoted two distinct fictitious brand names. The pretests of the ads showed no differences on intrinsic ad annoyance, clarity, valence, and perceived quality (see Appendix A for results). After seven days, one of the two ads was removed from all billboards in one hall and the other ad was removed from all billboards in the other hall, leaving the remaining ad on the

billboards for additional 4 days. Thus, the two ads were posted for seven- or eleven-day durations for the two brands across the two halls, representing counterbalanced higher and lower exposure frequency. On the 11th day, we removed the remaining ad from both halls.

One day later, an experimenter blind to our predictions showed both ads to students passing by in the corridors of the two halls. The experimenter asked a memory question for each of the two ads ("Have you seen this ad hanging on the boards in the hall?"; 1—yes, 2—no) and a relative annoyance question ("Which of the ads is more annoying?"; 1—orange, 2—black). Participants then were thanked and dismissed. We asked memory first and annoyance later to avoid having to ask annoyance about ads participants did not remember. We collected data until we had responses from 200 passers-by in each of the two halls (total $N = 400$). Notably, we intentionally did not measure brand preference at Stage 1, because we did not want respondents to make a relative preference judgment that might carry over to a later valuation.

Stage 2 occurred in the same halls on October 28, about six weeks after Stage 1 and three days before Halloween. An experimenter blind to our predictions located a table in the halls and displayed two boxes holding Halloween decorations. Each box was adorned with a poster featuring the background color of the brand (orange or black), the brand name and the picture that appeared on the associated ad six weeks earlier. Each of the boxes was filled with 100 decorative Halloween rubber spiders, but the contents were not visible to those passing by. Residents were encouraged to approach the experimenter one by one and to choose a free decoration from one of the two boxes. When one box was emptied because 100 gifts were taken, the experimenter stopped the activity and left the hall. In all, we gave away 194 spiders in Hall A and 137 spiders in Hall B. In this and other studies, we did not measure brand preference at Stage 1, in order to avoid confounding that preference at Stage 2.

3.1.2. Results

3.1.2.1. Stage 1 brand memory. As expected, memory for the more frequent ad was significantly better ($N = 200/400$) than for the less frequent ad ($N = 106/400$; $\chi^2\ (1) = 50.54$, $p < .001$; 94 participants said they did not remember any ads at all). Appendix Table 3 panel A breaks these results down into halls.

3.1.2.2. Stage 1 ad annoyance. As expected, initial annoyance with the more frequent ad was significantly greater ($N = 227/400$) than with the less frequent ad ($N = 173/400$; $\chi^2\ (1) = 7.2$, $p = .007$). This result was even stronger when we removed participants from the analysis who indicated they remember neither of the ads ($\chi^2\ (1) = 8.2$, $p = .004$). Appendix Table 3 panel B details those results broken down into halls.

In sum, results of Stage 1 demonstrate that the ads with greater exposure were more annoying and also better remembered than those with less exposure.

3.1.2.3. Stage 2 brand preferences. In both halls, the box decorated with the orange ad was emptied first, indicating greater general preference for the orange brand. In Hall A, where the black ad was more frequent, there was directional preference for the orange brand ($N = 100/194 = 52\%$) over the black brand ($N = 94/194 = 48\%$, $p > .5$). In Hall B, where the orange ad was more frequent, the orange brand was significantly more preferred ($N = 100/137 = 73\%$), compared with the black brand ($N = 37/137 = 27\%$). Pooled together, these results suggest higher preference for a gift from the more frequently advertised brand ($\chi^2\ (3) = 9.5$, $p = .009$). Fig. 1 panels A

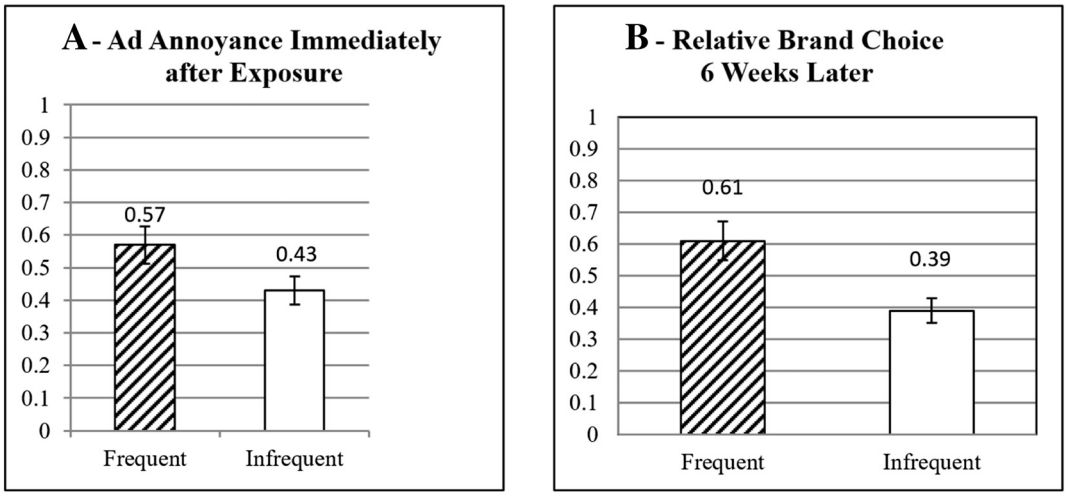


Fig. 1. The effect of advertising frequency on ad annoyance immediately after exposure, and on brand choice 6 weeks later (Study 1).

and B portray the aggregated results for initial annoyance and later choice of a more frequently exposed versus less frequently exposed brand.

3.1.3. Discussion

Study 1 provides an intriguing demonstration of the reversal in product attitudes and brand preference over time. Immediately following exposure, attitudes were more negative towards the more frequently advertised brand, thus confirming H1. However, six weeks after exposure, just before Halloween, when the product category was more likely to be under consideration, there was greater choice for the brand that was more heavily advertised earlier, confirming H3. The results were skewed due to the general superiority of the orange ad. Nevertheless, they demonstrate an immediate negative effect of ad repetition but a positive effect of advertising frequency on product choice after a lag of time.

However, Study 1 suffered from a number of issues common to field studies. First, it could not assure that the passers-by in Stage 1 were from the same sample as those in Stage 2. Second, precision was limited because our data was at the level of the residence hall rather than the individual. Third, we could not ascertain who saw the ad but instead collected self-reported memories of the ads. In that sense, our reported repetition may be regarded as exposure probability. This approach has been utilized in prior field experiments testing ad repetition (e.g. Burke & Edell, 1986). Further, asking about memory first might have elicited a carryover to the annoyance question, but we obtained a different number of people who indicated remembering the frequent ad versus the number of people who were annoyed with it, suggesting no carryover effect. Despite these limitations, this Halloween ornament study provides a surprising outcome that suggests an important qualification of earlier studies on the impact of ad repetition on preferences that justifies validation and generalization with further studies.

3.2. Study 2 — the role of decay in memory and in annoyance

Study 2 replicates the reversal in ad preference over time in a controlled experiment and assesses the underlying mechanism through the differential temporal decay of memory versus annoyance (H2). Study 2 had two stages for each respondent, but the timing between the stages differed across respondents. As shown in Fig. 2, participants in Stage 1 were exposed to ads for two brands of travel mugs, one of which was repeated more frequently than the other. Stage 2 occurred either one day, one week, two weeks, or four weeks later, and measured brand recall, ad annoyance, brand preference and choice for the same individuals.

3.2.1. Participants and procedure

3.2.1.1. Stage 1. MTurk workers ($N = 402$, $M_{age} = 33.5$, 45.4% women) read a mock-up e-magazine article about Darwin Awards (1310 words long) which was compiled from several stories posted on the relevant website (http://www.darwinawards.com). While reading, participants were interrupted by 14 pop-up ads (Edwards, Li, & Lee, 2002).

We created two focal ads for fictitious brands of travel mugs, HotPot and Thermaway, and two filler ads, one for baby formula and one for apples. A pretest showed that the travel mug ads did not differ on informativeness, clarity, interest, ease of understanding, product category relevance, brand familiarity, or liking (all p's > .2). See Appendix A for materials and pretest results. The four ads appeared in random order, but we controlled the number of repetitions for each ad in each condition. Of the two focal ads, one repeated seven times and the other three times in one condition, and reversed in the other repetition condition. Each of the two filler ads appeared twice throughout the reading. Overall, participants saw 14 ads. Participants were able to remove the ads by clicking on a "next" arrow.

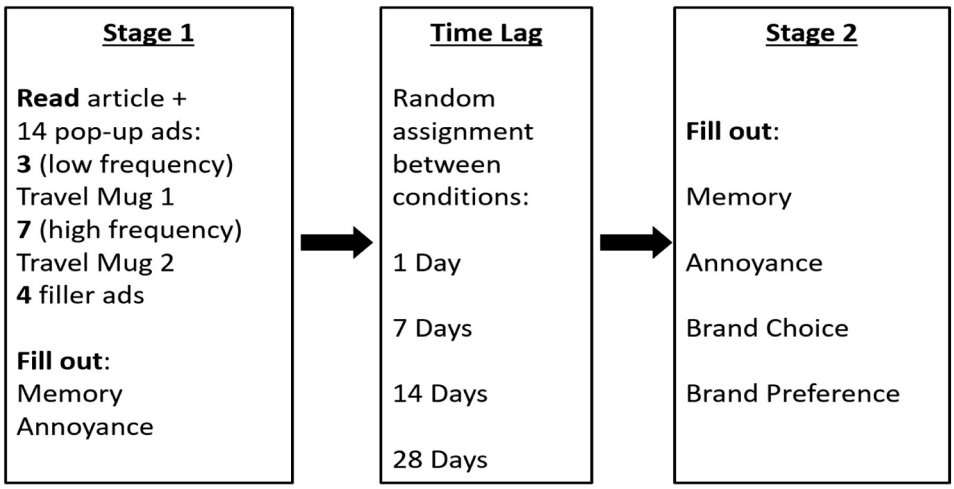


Fig. 2. Two stage study design (Study 2).

After reading the article, participants rated their memory for the focal brands and for two additional fictitious brands of travel mug that did not appear during reading (ThermoCup and HotCold) on a 7-pt. scale (1—'Definitely Did Not Appear', 7—'Definitely Appeared', Humphreys et al., 2003). Participants then indicated their annoyance with the two focal ads on 7-pt. scale item (1—'Not annoyed At All', 7—'Very Annoyed', Kirmani, 1997; Stayman & Aaker, 1988). Finally, participants were paid for Stage 1 and told they would be asked to participate in another study sometime in the next four weeks.

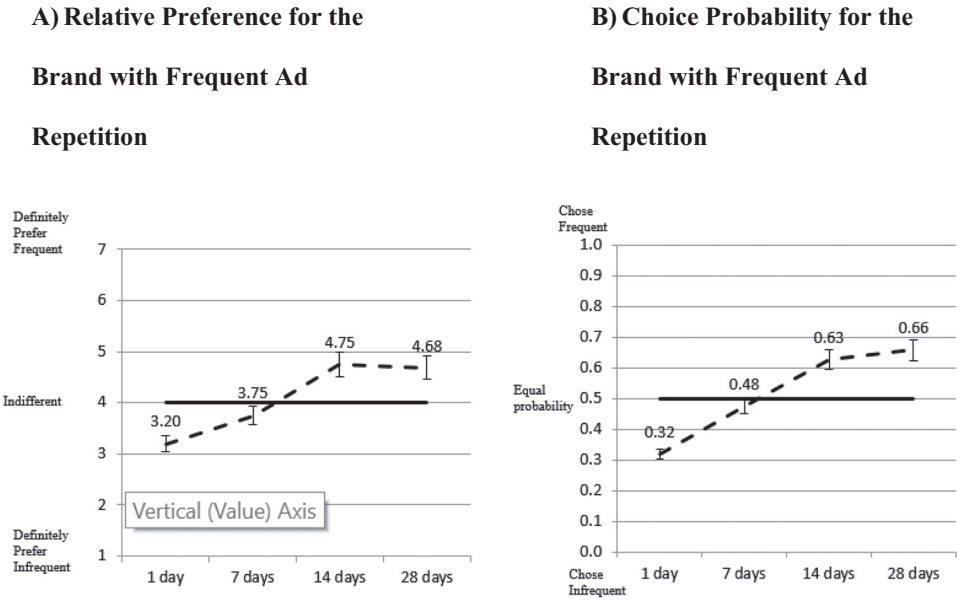
3.2.1.2. Stage 2. Participants in each of the conditions in Stage 1 were assigned randomly into four time lag conditions: one day, one week, two weeks, or four weeks later. At their assigned time, participants received an email link inviting them to participate for an additional small payment. Upon acceptance, participants rated how well they remembered each of the focal brands and the two fictitious brands (1—'Definitely Do Not Recall' to 7—'Definitely Recall') and current annoyance with each of the travel mug ads (1—'Not Annoying at All' to 7—'Very Annoying'). Brand preference was then assessed in two ways. First participants chose between HotPot and Thermaway, and then they were asked to assume that they were considering purchasing a travel mug and to indicate the brand they prefer on a 7-pt. scale (1—'Definitely Prefer HotPot' to 7—'Definitely Prefer Thermaway').

3.2.2. Results

3.2.2.1. Participant attrition and group comparisons. Out of the 402 participants who took part in Stage 1, 309 took part in Stage 2 (M_{age} = 34.0, 47% women). There were no significant differences in age, gender, Stage 1 ad annoyance, or Stage 1 brand memory between participants who continued to Stage 2 and those who did not (all p's > .2). The number of participants in each of the four Stage 2 conditions was one day (N = 85), one week (N = 84), two weeks (N = 67) and four weeks (N = 73). Participants in the four conditions did not differ in age, gender, and Stage 1 recall and annoyance for the two focal ads (all p's > .2).

3.2.2.1.1. Stage 1. 3.2.2.1.1.1. Memory and annoyance with the ads. We found greater immediate memory for the frequently repeated brand ($M_{frequent}$ = 6.31) compared with the less frequently repeated brand ($M_{infrequent}$ = 5.88, $F(3,308)$ = 11.90, p < .001). Additionally, annoyance was significantly greater for the more frequently repeated brand ($M_{frequent}$ = 5.28) than the less repeated brand ($M_{infrequent}$ = 4.50, $F(3,308)$ = 13.8, p < .001). Supporting H1, greater repetition generated better memory and greater annoyance immediately after exposure.

3.2.2.1.2. Stage 2. 3.2.2.1.2.1. Changes in choice and preferences. A logistic regression with choice for the more frequently advertised brand as a binary outcome and time as a predictor indicated a significant increase in the choice of the more frequently advertised brand over time (p < .001, OR_{adj} = 1.63, $Wald$ = 20.75). Decomposing the analysis into the different time stages, we found a significant increase in the choice for the more frequently advertised brand after 2 weeks (p < .001, OR_{adj} = 2.07, $Wald$ = 19.71), after 3 weeks (p < .006, OR_{adj} = 1.58, $Wald$ = 7.48) and after 4 weeks (p < .001, OR_{adj} = 1.72, $Wald$ = 10.89). The difference between



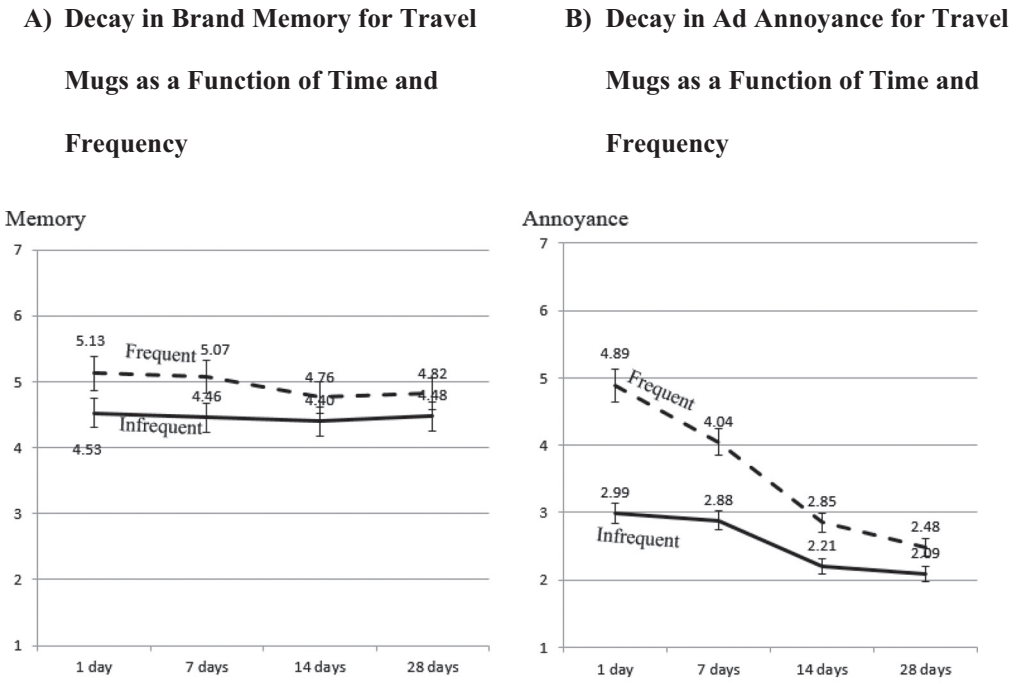
In Figure 3a preference for the more frequently advertised brand starts at lower than midscale point and increases over time to higher than midscale point (7-pt. scale).
In Figure 3b the percent of choice for the more advertised brand starts at 32% (significantly lower than 50%) and increases over time to 66% (significantly over 50%.)
Error bars reflect one standard deviation in each direction.

Fig. 3. Changes in preference and choice over time for the more frequently advertised brand.

weeks 3 and 4 however was not significant ($p = .398$), suggesting a non-linear relationship in our data. An analogous 2-way ANOVA, with advertising frequency and time as predictors, revealed a significant increase in relative preference for the more frequently advertised brand over time ($F(1,305) = 13.8$, $p < .001$). Fig. 3 shows an increase in choice of and preference for the more frequently repeated brand over time, which by the second week crosses the mid-scale line.

3.2.2.1.2.2. Memory and annoyance over time. Next, we can link these differences in choice and preference to differences in memory and annoyance. A 2 (brand: Thermaway/Hotpot, between Ss) by 2 (repetition frequency: high/low, within Ss) by 4 (time lag: one day = 1, one week = 2, two weeks = 3, four weeks = 4, between Ss) mixed repeated measures analysis revealed no interaction or main effect for brand on memory or annoyance (p's > .2). All analyses were therefore aggregated across the two focal brands to focus on the contrast between frequent versus infrequent exposure. For memory, the difference in slopes across time was not significant ($\beta = -0.010$; $t(308) = -1.57$, $p = .47$), but the difference of annoyance for the more frequent brand and the less frequent brand on time was strongly significant ($\beta = -0.54$; $t(308) = -4.52$, $p < .01$). The trends in Fig. 4A show relatively little decay for memory, while annoyance in Fig. 4B drops strongly. More importantly, the figures show that the annoyance decay rate is different for the more frequent versus the less frequent ad. Thus, the decay in annoyance was greater for the more frequently repeated brand than for the less frequently repeated one. We also found an overall main effect for frequency on brand recall (the more frequent brand was recalled better at any time, $F(1,305) = 11.39$, $p < .001$). Appendix Table 4 reports the full results.

3.2.2.1.2.3. Mediation of the change in memory and annoyance. A mediation analysis of the differences between frequent and infrequent condition over time assessed whether the difference in the effect of time on memory and annoyance mediates the effect of advertising repetition on brand preference. First, we created two variables: Delta Annoyance and Delta Memory. To obtain Delta Annoyance we subtracted Stage 2 infrequent ad annoyance from frequent ad annoyance. To obtain Delta Memory we subtracted Stage 2 memory of the infrequent ad from memory of the frequent ad. We then conducted a mediation analysis using the PROCESS macro Model 4 (Hayes, 2012, 2013) based on 1000 bootstrap samples, with log transformed Time as the independent variable, preference for the frequently promoted brand as the dependent variable, and Delta Annoyance and Delta Memory as the mediators. The analysis indicated that the indirect effect of time on preference through Delta Annoyance and Delta Memory is significant ($B = 0.149$, $SE = 0.072$, 95% *CI*: [0.015, 0.296]). The mechanism follows our expectations. As expected, the effect of time on Delta Annoyance was significant and negative ($B = -1.15$, $SE = 0.226$, $t = -5.06$, $p < .001$, 95% *CI*: [−1.590, −0.700]), while the effect of time on Delta Memory was not significant ($B = -0.182$, $SE = 0.255$, $t = -0.714$, $p = .48$, 95% *CI*: [−0.684, 0.319]). Both effects of Delta Annoyance and Delta Memory on preference were significant (Delta Annoyance: $B = -0.148$, $SE = 0.047$, $t = -3.11$, $p = .002$, 95% *CI*: [−0.241, −0.054]; Delta Memory: $B = 0.112$, $SE = 0.042$, $t = 2.67$, $p = .008$, 95% *CI*: [0.029, 0.195]). Thus, these latter results indicate that the effect of greater annoyance is negative while that of greater memory is positive. The direct effect of time on preference was significant ($B = 1.033$, $SE = 0.196$, $t = 5.28$, $p < .001$, 95% *CI*:



In Figure 4a brand memory remains relatively high for 28 days. In Figure 4b annoyance is significantly higher for the more frequently advertised brand, but annoyance for both brands considerably decays over the time period of 28 days.
Error bars reflect one standard deviation in each direction.

Fig. 4. Underlying mechanism for the reversal in brand preference over time.

[0.649, 1.419]), meaning that time increases preference for the brand with greater repetition even controlling for changes in memory and annoyance. Thus, the more time passes, the more the reduction in annoyance relative to memory leads to enhanced preference for the frequently advertised brand. The resulting model of the mediation analysis is given in Appendix Fig. 1.

3.2.3. Discussion

Results of Study 1 and Study 2 provide support for our three major hypotheses: First, we find that the short-term outcome of greater ad repetition is greater memory and greater annoyance. Second, we directly demonstrate the reversal in preference over time, from preference for a less frequently advertised brand initially to preference for a more frequently advertised brand later. Finally, this study demonstrates that the relatively faster decay in annoyance, compared to memory, mediated this reversal in preference.

It is important to acknowledge that in Fig. 4 the effect of time does not increase substantially between weeks 3 and 4. It is reasonable that the memory advantage due to a difference in repetition should eventually level off. Indeed, after several months one would not reasonably expect any differential advantage of frequent exposure. That expectation is consistent with the results of Burke and Edell (1986) who found short-term negative effects from frequent promotion but no difference a year later. It does suggest that new studies about the conflicting effects of memory and annoyance should expand the range of the manipulation of time from the ads to track the eventual decay of stimuli over time.

3.3. Study 3 — the importance of product relevance at the point of consideration

As noted earlier, product relevance is a key to the effects of ad repetition over time. In Study 1 product relevance naturally increased as time approached Halloween, while the travel mugs in Study 2 were largely relevant to participants throughout the study. In both studies the product was relevant in the second stage. The purpose of Study 3 is to directly test whether an initially irrelevant product that remains so at Stage 2 would still generates a reversal in preference over time.

This question arises because there is substantial research to suggest that repetition is more harmful for brands in irrelevant product categories (e.g. Baker & Lutz, 2000). By contrast, the negative effects of ad repetition on ad attitudes are attenuated for high involvement products (Hitchon & Thorson, 1995), and repetitive online ads closely associated with website content elicit greater brand memory and clicking (Yaveroglu & Donthu, 2008). At the brand level, advertising repetition leads to less negative responses for more familiar brands (Belch, 1981; Raj, 1982; Campbell & Keller, 2003; Kirmani, 1997; Ray & Sawyer, 1971; Robinson & Elias, 2005; Stewart & Furse, 1986). Since more familiar brands are more likely to be relevant (Cacioppo & Petty, 1985), this literature suggests that relevance can moderate the effect of repetition on ad responses.

Further, research shows that people reconstruct their memories based on current beliefs and expectations (Robinson & Clore, 2002; Ross & Conway, 1986; Schacter, 1996). It is plausible then that if the product category is still irrelevant at the time of preference measurement, then merely seeing the ad for the irrelevant product later may reinstate the previous annoyance. Conversely, a person who was earlier annoyed by repetitive ads for an irrelevant product may not be annoyed later if the product is now relevant. These considerations lead to the prediction that the reversal of the effect of repetition on brand preference will occur only when the initially irrelevant product category later becomes desired. The reversal will not occur for products that remain irrelevant at the time of preference measurement.

3.3.1. Participants and procedure

To test whether the reversal would occur when the product category becomes relevant, but not when it remains irrelevant, we manipulated for half of our sample the second-stage relevance of an initially irrelevant category — beets. We created six pop-up print ads, two of which promoted different fictitious brands of beets: BeetSweets and BeetBites. Subjects also saw two pairs of filler ads; one pair for a generally irrelevant category — baby formula and one pair for a generally relevant category — apples (see Appendix A for materials and pretests).

We implemented a 2 (Stage 1 repetition frequency: 3 vs. 7, within subject) by 2 (high repetition brand: BeetSweets vs. BeetBites, between-subjects) by 2 (Stage 2 relevance: high/low, between-subjects) mixed design. Qualtrics Panels provided 80 panel participants (M_{age} = 36, 53% women) who completed the experiment in two stages. At Stage 1, participants' reading of the Darwin article used in Study 2 was interrupted by the six ads in varying frequency across the focal beet brands. The filler ads appeared two times for each filler product and for the beet ads either 3 or 7 times. After reading the article, participants indicated their annoyance with the ads using the same measure from Study 2, and indicated the extent to which beets were a relevant product for them. They were then notified that they would be contacted three weeks later.

Three weeks later at Stage 2, all participants received an introductory message reminding them that this is the second stage of the study they agreed to take. Then we manipulated relevance of beets for half of the participants by asking them to imagine the following: "You are invited to a Russian Folklore Party! Please bring with you a Russian Dish! For your convenience, here is a picture and a short recipe for the famous Russian "Svekolnik" Soup, which is mainly made of beets. Bon Appetite!" A short recipe followed with a color picture of a Svekolnik soup (see Appendix A). The other half of the participants did not see the party invitation or recipe. Then both groups rated their relative preference between the two beets brands (1—brand A more preferred, 7—brand B more preferred). Finally, as a manipulation check, participants indicated the extent to which beets were relevant to them on a 7-point scale (1 = Not Relevant At All; 7 = Very Relevant). In this experiment, our focus was on preference and the boundary for its reversal. We therefore measured annoyance at the first stage as a check for the frequency manipulation but refrained from measuring annoyance again at Stage 2, to simulate realistic situations when, after time passes, consumers choose brands rather than explicitly recalling ads for these products.

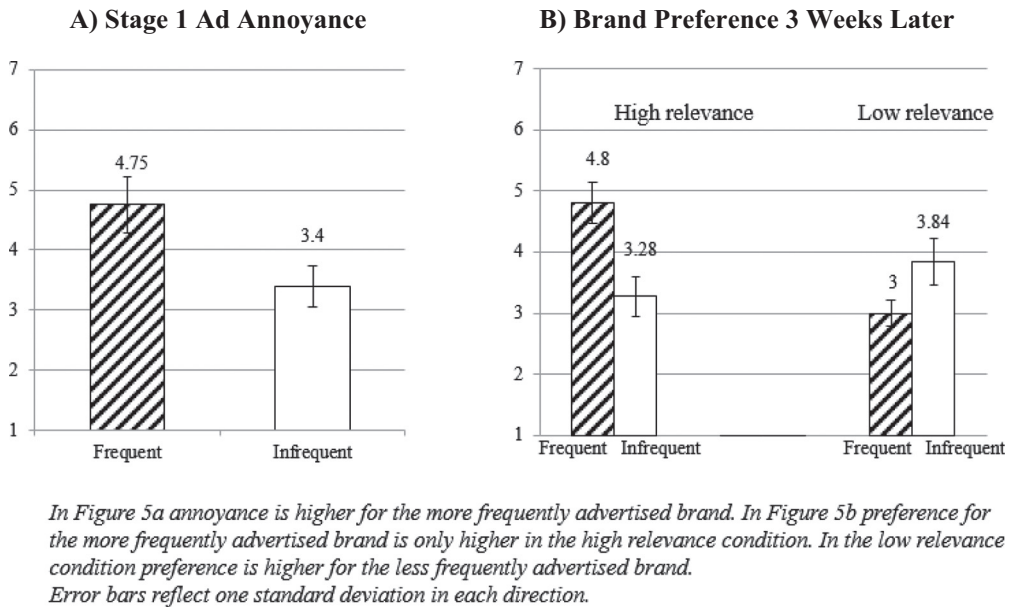


Fig. 5. The effect of advertising frequency on ad annoyance immediately after exposure, and on brand preference 3 weeks later, for high and low relevance conditions (Study 3).

3.3.2. Results

3.3.2.1. Stage 1. A 2 (brand) × 2 (frequency) mixed repeated measures analysis revealed no brand effects ($p > .5$). Annoyance for the more frequently advertised beets brand was higher ($M = 4.75$) than the less frequently advertised brand ($M = 3.40$, $F(1,78) = 18.9$, $p < .001$. Fig. 5A shows the differences in annoyance at Stage 1.

3.3.2.2. Stage 2. All participants completing the first stage completed the second. A 2 (brand) × 2 (frequency) × 2 (relevance) mixed repeated measures analysis revealed no effect of brand ($p > .5$). However, the interaction of frequency of advertising and manipulated relevance in Stage 2 was significant. Fig. 5B shows that participants who received the Svekolnik recipe indicated significantly higher preference for the more frequently advertised brand ($M = 4.80$), compared with the less frequently advertised brand ($M = 3.28$, $F(3,77) = 7.03$, $p = .010$). In contrast, participants who did not see a Russian party invitation in Stage 2 indicated lower preference for the brand that was advertised more frequently in Stage 1 ($M = 3.00$), compared with the less frequently advertised brand ($M = 3.84$, $F(1, 78) = 3.11$, $p = .003$). Thus, those shown the party invitation and the recipe displayed the same reversal as occurred in the first two studies, while those without that invitation consistently showed greater annoyance and lesser preference for the heavily promoted brand.

3.3.3. Discussion

Study 3 shows that the relevance of a product at the stage of product consideration can be critical for the reversal to occur. Specifically, participants who read the Russian party introduction in the second stage replicated the first study by showing a reversal over time, but this pattern was not observed among participants for whom beets remained irrelevant at Stage 2. This result suggest that greater repetition of ads for undesired categories could generate continued annoyance, and that annoyance will be maintained until the category becomes relevant at a later time. This study mimics a real life situation that occurs for product categories with low purchase frequency, where consumers are annoyed by irrelevant ads before a purchase occasion occurs, but then are more likely to recall the heavily advertised brand when the need for purchase occurs.

4. General discussion

More often than not, ads are viewed by consumers who are not in the market for the product at that time. Repeated advertising of a currently irrelevant product can be expected to generate negative responses. Our three studies provide evidence that, although repetitive ads generate negative brand response in the short run, a reversal of ad wearout can occur once the category is relevant. We demonstrate that the passage of time leads to a considerable fading of the negative affect while the more durable memory leads to greater recognition of, and preference for the more frequently advertised brand. We also show that this reversal takes place only when the product category is relevant at the time of consideration.

This work is the first to bring together in one conceptual model three prominent processes in the research of advertising repetition: time, affect and memory. Previous works evaluated these processes separately, and these separate evaluations might have

missed both the prediction of the reversal and the explanation of the underlying process. By combining memory effects and affective responses in a single conceptual model, we offer a novel area of experimentation and theory, which can bring phenomena in marketing to a new level of clarity and suggest creative explanations.

These results build on those of Schmidt and Eisend's (2015) meta-analysis of advertising repetition effects. Their work resolves a number of intriguing questions, such as the reason that advertising repetition does not have a logarithmic shape of effect on recall, and it assess a number of moderators that we do not test, such as message spacing, advertising length, brand novelty, advertising novelty, involvement and embedded advertising. However, it differs from the current paper in several ways. First, Schmidt and Eisend (2015) test each effect separately (delay, attitudes, memory), in contrast to our simultaneous measurement of memory and annoyance effect on preference over time. Second, we use multiple levels to measure of time delay, which allows us to reach conclusions about the specific time when the reversal occurs. Conversely, Schmidt and Eisend (2015) use a binary definition of time: delayed versus not delayed. Finally, their meta-analysis supports the view in literature that more repetitions are beneficial for advertising effects, but also includes studies reported in the current work (e.g. Anand & Sternthal, 1990; Janiszewski & Meyvis, 2001; Nordhielm, 2002) which find an inverted-U effect on responses to advertising. To sum, our work can be viewed as enriching and extending the literature on advertising repetition reported in Schmidt and Eisend (2015), while providing novel conclusions about the timing of measuring advertising repetition effects and an explanation for the processes underlying the changes that occur over time.

4.1. Theoretical implications

This work supports previous literature showing that brand memory enhances familiarity that then has a positive effect on brand attitudes and preference (e.g. Campbell & Keller, 2003; Fang et al., 2007; Janiszewski, 1993; Janiszewski & Meyvis, 2001; Lee & Labroo, 2004; Mantonakis et al., 2008).

Beyond that, our findings imply that the higher preference for repeated brands may not take place right when the ad is experienced, but later, when the product category is considered for purchase (Feldman & Lynch, 1988). At that time the relative decay in memory and annoyance plays a mediating role that generates positive attitudes towards more frequently advertised brands.

Our research findings also provide insights into the processes that occur during the time between ad exposure and product consideration. We assess the relative decay in memory versus annoyance, highlighting the mediating role of the combined effect of these two basic processes on attitude formation. Further, the theoretical implications of our findings resonate with the Biased Recall Theory which suggests that retrospective evaluations can arise from current feelings (e.g. Balcetis, 2007; Loftus, 1993; McFarland, Ross, & Decourville, 1989; Tversky & Marsh, 2000).

There is an intriguing theoretical parallel between the reversals we find and the well-researched sleeper effect (for reviews, see Hannah & Sternthal, 1984; Kumkale & Albarracín, 2004). The sleeper effect occurs when the passage of time allows the negative response to a less credible source to be overcome by a positive message from that source. Multiple studies find evidence for the effect and relate it to a greater decay in the negative attitude towards a non-credible source compared with the resilience of the positive message in memory. In this way, the sleeper effect carves a similar arc to the one we find for ad repetition: attitude is initially negative and through resilient memory gradually becomes positive.

Finally, it is important to acknowledge that the mediation analysis suggests that the reversal of preference over time remains even if differences in annoyance and memory decay are included, suggesting there are other factors also driving the reversal. One theoretical mechanism is consistent with research showing that time itself fundamentally favors positive over negative information (e.g. Kemp et al., 2008; McAlister, 1982; Walker & Skowronski, 2009). Relatedly, a recent work by Lench, Bench, and Davis (2016) suggests that distraction facilitates the temporal decay of negative information. Another interesting explanation lies in research suggesting that repetition of an idea, even if untrue or negative, serves to make the idea more plausible (e.g. Arkes, Hackett, & Boehm, 1989; Begg, Anas, & Farinacci, 1992; Dechêne et al., 2010; Skurnik et al., 2005). This literature implies that the frequency of repetition may have generated greater perceived truthfulness of the ads with greater exposure. Future research could fruitfully examine kinds of distraction that increase or decrease the decay of negative attitudes.

4.2. Managerial implications

Nielsen, one of the largest American market research companies, takes pride in its ability to monitor the effectiveness of advertising campaigns in real-time: “Our solutions measure in a timely manner, so you can optimize campaign performance in flight” (Nielsen, 2018). Questioning that practice, our results suggest that the benefits of measuring the effects of advertising repetition at the time of running an advertising campaign can be misleading. Inappropriate managerial reactions are possible if the immediate negative reactions connected with ad repetition are considered, and the firm underestimates the possibility that the ads will become effective as time passes and consumer needs evolve. Thus, it may be important for managers to be willing to accept short term consumer annoyance with their repeating ads, as greater acceptance may come later, once the consumer is in need for a brand in that category. The practical recommendation for marketers is to assess product relevance at the time of evaluation. Otherwise, the response is likely to differ from the effect once the category becomes relevant.

A second managerial recommendation concerns ways to limit annoyance when campaigns are run before a brand is considered for purchase. Oftentimes, advertising professionals include planned reminder ads during the time lag after the initial massive advertising repetition. Short reminders and highly spaced ads as such can reinforce memory with minimal annoyance.

Work contrasting pulsed with evenly spaced ads (e.g. Naik, Mantrala, & Sawyer, 1998) finds that while both types positively influence memory, pulsing may have an advantage through time intervals between exposures. Thus, for brands that are promoted before they are relevant, such as baby products, higher education, or funeral services, a reach campaign with relatively low repetition frequency and later reminder ads may be an effective strategy. Future research, which would pose the question of the influence of reminders on our proposed effects, may reveal managerially and theoretically relevant effects on product preference.

Our results apply most directly to brands such as those tested here, with short messages and distinct visuals, rather than to those with more complex messages (e.g. Lee, Ahn, & Park, 2015). The simplicity of the ads and focus on low-cognition and high-recognition elements mirrors the efforts of many firms to define and reinforce brands names and logos that are easily recognized and appear in multiple media. We expect future research would validate the idea that repeated ads in currently unneeded categories should keep the story simple as this helps develop strong associations between a future need and a brand.

Finally, our findings are relevant to real life situations where durable product categories with low purchase frequency, such as cars, refrigerators or insurance, are continuously advertised. Most consumers see such ads before a purchase occasion occurs, possibly becoming annoyed (e.g. Flint, 2014; Johnson, 2006). However, at a later time (sometimes months after the exposure to the repetitive ad), the consumer remembers the advertised brand when the purchase occasion comes up. In that way, our phenomenon may hold for durables, where there is a greater likelihood that ads occur when the product is not needed, and there is typically a longer time span between advertising and purchase. However, research is needed to clarify how both annoyance with repetition and the reversal in preference over time occur with rarely purchased durables.

4.3. Limitations and future research

Our Halloween study has the usual limitations of a field study. The setting was not a real retail setting because we asked process questions such as recall, and the action variable was a free gift rather than a purchase. Second, the control was at the level of the residence hall rather than the individual so that there was no way to ensure that the passers-by in Stage 1 were from the same sample as those in Stage 2; finally, we could not ascertain who saw the ad but instead collected self-reported memories of the ads. In contrast, Study 2 has a tightly controlled setting and cleaner design, but the use of seven repetitions of the same advertisement during a single reading of an article does not mimic real market ad exposure frequency and reflects a reasonable limitation to the generalizability of our findings. However, despite the possible issue with ecological validity of this manipulation, the finding of a reversal in a field setting and then in a highly controlled experiments makes our basic findings more credible. Finally, Study 3 validates the reversal while defining a critical boundary condition, showing that the reversal only occurs if the product category becomes relevant at the time of preference measurement.

In all studies, we intentionally did not measure brand preference at Stage 1, for two reasons. First, if explicitly asked, participants might remember their indicated preference at Stage 1, and this could distort the results. Second, our focus was preferences at the time when the product is under consideration, not at the time of exposure to advertisement about the product. Therefore measuring preferences at Stage 1 in both studies was not consistent with our theoretical logic.

A possible limitation of our measurements, especially in Study 1, may be a carryover from memory indications to annoyance indications at stage 1 of the experiment. Specifically, in Study 1 participants indicated on a binary scale which of the two brands they remember to have been advertised on boards in the residence halls. Next, participants indicate which of the two ads they found more annoying. The binary nature of the memory question might have created an artifact of deeming the better remembered ad as more annoying. This potential limitation can be interpreted as a conservative test of our theory, because at stage 2 memory is associated to preference rather than to annoyance, which can support the reversal effect we are predicting. Further, Study 2 shows that the same ad that was more annoying at Stage 1, has become less annoying and more preferred over time. These results suggest that the potential carryover at Stage 1 is transformed into an association between frequency of advertising and brand preference at Stage 2.

All our experiments measure annoyance and memory by asking participants to report on single rather than multi-item scales (e.g. Kirmani, 1997; Stayman & Aaker, 1988). While we believe that the robustness of our reversal will be replicated with multiple measures, additional experimentation employing more general measures of annoyance with repetition, brand memory and product preference would further validate the effects found here.

Our measure of memory is recognition rather than recall, and thus our results may only weakly generalize to measurements of unaided recall. Recall may have a greater time decay function than recognition, and therefore differences in decay over time may be harder to detect. Recall is likely to be a more important managerial measure for consumer initiated search behavior. By contrast, recognition is most relevant in situations where the alternative brands are arrayed before a consumer, as occurs in a well-stocked supermarket, choosing an eating establishment while driving or following a web search. Further, building recognition among customers involves different marketing strategies than recall. Recall is strengthened by repeating the name through audio and visual channels, whereas recognition is strengthened by displaying a well-recognized logo or brand identifier in as many places as possible. Promotion of brand markers can be viewed peripherally and incidentally, whereas developing brand recall relies much more on intrusive and directive commercials. Thus, recognition-based measures of effectiveness may be less applicable to longer, more narrative- and benefit-based ad campaigns but more applicable to the faster more associative display capabilities available on the internet and cell phones.

Finally, we conducted all studies within the same culture. As research has found an influence of country of origin on perceptions of advertising (e.g. Feick & Gierl, 1996; Verlegh, Steenkamp, & Meulenberg, 2005; Zarantonello, Jedidi, & Schmitt, 2013), as

well as a different perception of time (e.g. Wang, Wang, & Keller, 2015), the validity of our findings in various cultures needs further support. Specifically, it is possible that time perception would influence the way the passage of time influences the relation between advertising and its effects.

4.4. Conclusion

To summarize, this paper returns to classical works and extends our knowledge about advertising repetition by testing the effects over time of more versus less frequently advertised brands. Beyond demonstrating the ways time can reverse brand preferences, the current work helps identify the underlying mechanism, focusing on differential changes in positive memory and negative attitude over time. We suggest two major takeaways: First, advertising effectiveness may indicate more managerial relevant metrics when measured at the time of product consideration rather than immediately after exposure to advertising. Second, and more generally, annoying advertising of all stripes may benefit from the passage of time.

Table 1
Effects of ad repetition on memory — literature review.

Author(s) and publication year	Memory measure	Effect on memory	Number of exposures
Bellman, Schweda, and Varan (2010)	Ad recall	Increase	0, 2
Batra and Ray (1986)	Ad recall	Increase	1, 2, 4
Cacioppo and Petty (1979, 1985)	Ad recall	Increase	0–5
Gorn and Goldberg (1980)	Ad recall	Increase	1, 3, 5
Kirmani (1997)	Ad recall	Increase	2, 3, 5, 8
McQuarrie and Mick (2009)	Ad recall	Increase	1 to 6
Ray and Sawyer (1971)	Ad recall	Increase	0 to 6
Rethans, Swasy, and Marks (1986)	Ad recall	Increase	1, 3, 6
Singh, Mishra, Bendapudi, and Linville (1994)	Ad recall and recognition	Increase	1, 2, 4
Singh et al. (1988)	Ad recall	Increase	1, 2
Vakratsas and Ambler (1999)	Ad recall	Increase	3 to 5
Zielske (1959)	Ad recall	Increase	1 to 13
Cauberghe and De Pelsmacker (2010)	Brand recall	n.s.	2, 4
Hitchon and Thorson (1995)	Brand recall	Increase	2 to 12
Craig et al. (1976)	Brand recall	Increase	7 to 24
Haugtvedt, Schumann, Schneier, and Warren (1994)	Brand recall	Increase	3 (varied ads)
Unnava and Sirdeshmukh (1994)	Brand recall	Increase	1, 2 (2 versions)
Yaveroglu and Donthu (2008)	Brand recall	Increase	4
Singh and Cole (1993)	Brand recall for short ads	Increase	1, 4, 8
Sawyer (1973)	Recall of competitive brand	Increase	1 to 6
Bellman et al. (2010)	Ad recognition	Increase	0, 3
Singh et al. (1988)	Ad recognition	Increase	1, 3
Gorn and Goldberg (1980)	Brand recognition	n.s.	1, 3, 5
Jeong, Tran, and Zhao (2012)	Brand recognition	Increase	0, 1, >1
Law (2002)	Claim recognition	Increase	1, 3
Rethans et al. (1986)	Claim recognition	Increase	1, 3, 7
D'Souza and Rao (1995)	Brand awareness	Increase	1, 2, 4

The works are organized alphabetically within each memory type.

Table 2
Effects of ad repetition on attitudes — literature review.

Author(s) and publication year	Attitude measure	Effect of repetition	Number of exposures/comments
Burke and Edell (1986)	Ad and brand attitudes	Decrease	No count
Hitchon and Thorson (1995)	Ad and brand attitudes	Decrease	4 to 12
Moorthy and Hawkins (2005)	Ad attitude and product quality	Increase, for complex ads	1, 3, 5
Anand and Sternthal (1990)	Ad attitudes	Increase, for complex ads	3, 5, 8
Bellman et al. (2010)	Ad attitudes	Decrease	0, 1
Chang (2009)	Ad attitudes	Increase, for complex ads	1, 2
Kirmani (1997)	Ad attitudes	Decrease	2, 3, 5, 7
Unnava and Burnkrant (1991)	Ad attitudes	Decrease	1, 2
Batra and Ray (1986)	Brand attitude	Increase, for complex ads	1, 2, 4
Gorn and Goldberg (1980)	Brand attitude	n.s.	1, 3, 5
Belch (1981, 1982)	Brand attitudes	Decrease (n.s.)	1, 3, 5
Cauberghe and De Pelsmacker (2010)	Brand attitudes	Decrease	2, 4
Stayman and Aaker (1988)	Brand attitudes	Decrease	1 to 3
Campbell and Keller (2003)	Brand attitudes	Increase, for familiar brands	1 to 5
D'Souza and Rao (1995)	Brand preference	Increase, for familiar brands	1, 2, 4
Gelb and Zinkhan (1985)	Perceived humor	Decrease	3, 6
Rethans et al. (1986)	Preference to see the ad again	Decrease	1, 3, 5
Haugtvedt et al. (1994)	Product attitude	Increase, for varying ads	3 (varied ads)

(continued on next page)

Table 2 *(continued)*

Author(s) and publication year	Attitude measure	Effect of repetition	Number of exposures/comments
Calder and Sternthal (1980)	Product evaluation	Decrease	1–6 (3 versions)
Belch (1981, 1982)	Purchase intention	Decrease (n.s.)	1, 3, 6
Ray and Sawyer (1971)	Purchase intention	Increase, for complex ads	1 to 6
Pieters, Rosbergen, and Wedel (1999)	Visual attention duration	Decrease	1–3 (2 versions)

The works are organized alphabetically within each attitude type, and then by increase or decrease.

Table 3
Ad memory and ad annoyance for halloween field study (Study 1).

Panel A — ad memory

	Hall A	Hall B	Total
Remember frequent ad	91	109	200
Remember infrequent ad	55	51	106
Do not remember any ad	54	40	94
Total	200	200	400

Panel B — add annoyance

	Hall A (black ad more frequent)	Hall B (orange ad more frequent)	Total
Black ad more annoying	**129**	102	231
Orange ad more annoying	71	**98**	169
Total	200	200	400

Panel B: bolded numbers are the more frequent ads within their halls.

Table 4
Means and SDs for memory, annoyance and preference by brand, frequency and time for Study 2.

			Mean	SD
Recall hotPot	High frequency: hotpot	1 day	5.06	2.05
	Low frequency: thermaway	1 week	5.41	1.63
		2 weeks	4.85	1.49
		4 weeks	4.74	1.60
		Total	5.02	1.73
	High frequency: thermaway	1 day	4.41	2.18
	Low frequency: hotpot	1 week	4.38	1.72
		2 weeks	4.22	2.04
		4 weeks	4.24	1.94
		Total	4.32	1.94
Recall thermaway	High frequency: hotpot	1 day	4.65	1.96
	Low frequency: thermaway	1 week	4.54	1.92
		2 weeks	4.58	1.47
		4 weeks	4.71	1.30
		Total	4.62	1.69
	High frequency: thermaway	1 day	5.19	2.11
	Low frequency: hotpot	1 week	4.73	1.79
		2 weeks	4.67	1.92
		4 weeks	4.89	1.50
		Total	4.88	1.82
Annoyance hotPot	High frequency: hotpot	1 day	5.13	1.66
	Low frequency: thermaway	1 week	4.82	1.89
		2 weeks	2.70	1.60
		4 weeks	2.54	1.60
		Total	3.90	2.05
	High frequency: thermaway	1 day	3.14	1.67
	Low frequency: hotpot	1 week	3.02	1.66
		2 weeks	2.19	1.62
		4 weeks	2.34	1.58
		Total	2.72	1.67
Annoyance thermaway	High frequency: hotpot	1 day	2.85	1.65
	Low frequency: thermaway	1 week	2.74	1.87
		2 weeks	2.23	1.19
		4 weeks	1.83	1.29
		Total	2.45	1.58
	High frequency: thermaway	1 day	4.65	1.90
	Low frequency: hotpot	1 week	3.27	2.03
		2 weeks	3.00	2.32
		4 weeks	2.42	1.69
		Total	3.35	2.12

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Orange

Black and White

Appendix A

Focal Ads:

Filler Ads:

The top two ads are the focal ads that appeared either three or seven times while the lower two are filler ads that appeared twice. Ad order was randomized and repetition for the travel mugs was randomized across subjects

A.1. Materials and pretests

A.1.1. Study 1: field experiment ads

These ads were pretested with a group of 10 students from the same university, who rated the ads on several 7-pt. scale items. The pretest showed that the ads did not differ on ad annoyance ($M_{orange} = 2.34$, $M_{B\&W} = 2.55$), message clarity ($M_{orange} = 5.55$, $M_{B\&W} = 5.58$), valence (negative/positive; $M_{orange} = 5.83$, $M_{B\&W} = 5.72$), and perceived ad quality ($M_{orange} = 4.61$, $M_{B\&W} = 4.47$, all p's > .2).

A.1.2. Study 2: ads for Study 2

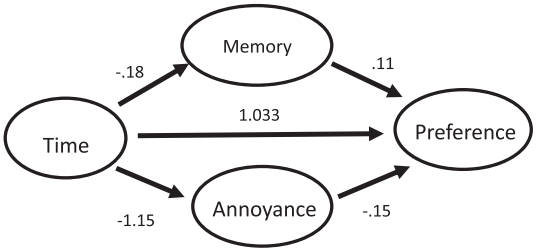

Fig. 1. Mediation analysis path model: impact of time on preference for the more frequently advertised brand mediated by changes in memory and annoyance.

Beets ads

Apple and baby formula ads (two of the ads are the same as in Study 2)

A.2. Materials pretest

To assure that respondents would have similar responses to the ads we pretested the travel mug ads with an online sample of 121 MTurk participants (M_{age} = 31.2; 49 women). A pretest showed that the ads did not differ on informativeness, clarity, interest, ease of understanding, product category relevance, brand familiarity, or liking (all p's > .2). The mean of relevance rating for a travel mug (5.6 on a 7-point scale) indicates moderately high product relevance. Both ads were characterized on 7-pt scales as being easy to read (M_{HotPot} = 5.5, $M_{Thermaway}$ = 5.7); these differences were very small, although significant (F(1,120) = 3.3, p = .044). While the ads differed on degree of ad annoyance (F(1,120) = 17.9, p < .001; M_{HotPot} = 3.1, $M_{Thermaway}$ = 2.5), the fact that their averages were below scale midpoint suggests that neither ad was especially annoying by itself.

A.2.1. Ads for Study 3

The Message Used at Stage 2 to Elevate Relevance of Beets (Study 3)

You are invited to a Russian Folklore Party!
Please bring with you a Russian Dish!
For your convenience, here is a picture and a short recipe for the famous **Russian "Svekolnik" Soup**, which is mainly made of beets.

Bon Appetite!

Recipe:
- Open a can of sliced beets.
- Pour the dark red water of the beets into a pot.
- Take out the sliced beets and cut them up into small cubes.
- Add to the pot. Add also a carrot, cut into circles, and 3 potatoes, cut into small cubes.
- Add salt and cover with a lid. Allow to boil till the carrot is soft.
- **Serve with lots of sour cream!**

A.3. Materials pretest

34 panel participants recruited via Qualtrics Panels (M_{age} = 35, 15 females) viewed the ads in random order and rated them on a 7-point scale ranging from 1—Not at all, to 7—Very much, on ad fluency ("Is the ad easy to understand?"), ad annoyance ("Is the ad annoying?"), product importance ("Is the product important for you?") and product relevance ("Is the product relevant to you?"). Comparing the three different product categories, we found no significant differences in perceived fluency of the ad (F(2,66) = 2.2, p > .05) or ad annoyance (F(2,66) = 3.7, p > .05). Importance of apples (M = 5.3) was significantly higher than importance of beets (M = 2.8) and baby formula (M = 1.38, F(2,66) = 18.1, p = .001). Apples category was also significantly more relevant (M = 5.16) than beets (M = 1.17, F(2,66) = 63, p = .001), but the beets category was as irrelevant as baby formula (M = 1.4, n.s.).

In sum, results indicate that the ads did not differ within product category, but that beets category was less relevant and less important than apples category, and similarly low on both aspects as baby formula.

A.3.1. Additional analyses

Results of the main study were qualified by annoyance measure: for the Svekolnik recipe condition, annoyance with the more frequently advertised brand dropped at Stage 2 ($M = 2.62$), compared with Stage1 ($M = 5.35$, $F(1,78) = 20.04$, $p < .001$). Annoyance with the less frequently advertised brand was also lower at Stage 2 ($M = 3.73$), compared with Stage 1 ($M = 4.27$), but not as much ($F(1,78) = 5.13$, $p = .026$). For the condition with no relevance manipulation, annoyance with the more frequently advertised brand also decreased at Stage 2 ($M = 3.85$) compared with Stage 1 ($M = 5.3$, $F(1,78) = 7.51$, $p = .008$), but this decrease was smaller than within the higher relevance condition. Annoyance with the less frequently advertised brand was also lower at Stage 2 ($M = 3.40$), but not significantly lower than at Stage 1 ($M = 4.07$, $F(1,78) = 1.54$, $p = .218$). Additionally, and not surprisingly, we found a main effect of stage on annoyance. On average, participants indicated lower annoyance towards both ads at Stage 2 ($M = 3.40$) compared with Stage 1 ($M = 4.7$, $F = 18.6$ $p = .001$), regardless of the relevance or frequency manipulations. This result is consistent with the proposition of a general decay in annoyance over time.

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