GRIPPING THE GIST:
WHAT ADS COMMUNICATE IN A SINGLE GLANCE

Rik Pieters and Michel Wedel *

* Rik Pieters, Tilburg University, Marketing Department, 5000 LE Tilburg, The Netherlands, Telephone: (+31) 13 4663022, Email: pieters@uvt.nl. Michel Wedel, Robert H. Smith School of Business, University of Maryland, 3303 van Munching Hall, College Park, Maryland, MD 20742-1815, Telephone: (+1) 301.405.2162, Email: wedel@rhsmith.umd.edu. We thank Ezgi Akpinar for help in stimulus selection.
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ABSTRACT

This study investigates if consumers can extract any meaning from ads that receive only a cursory and coarse glance, which is common in ad practice, and whether companies’ investments in all ads that receive such a glance are completely wasted. We find that typical ads communicate their gist better and faster than atypical ads under these conditions, and that they capture immediate interest. In less than 100 msec., consumers already know with a high degree of certainty whether something is an ad or editorial material, and—if the ad is typical—which product category is advertised. Even the advertised brands are identified well above chance levels. Such snapshot perception is based on consumers’ visual memories of typical ads, and on coarse visual information in the ads. Even rudimentary “blobs” of visual information suffice to grasp the gist of typical ads, but atypical ads require more detail and lag far behind. We propose a new AdGist metric to assess this immediate performance of advertising in a single glance.

Keywords: Advertising, Gist, Typicality, Visual, Perception, Mixed-outcome models.
It is increasingly challenging for advertisers to cut-through the clutter and reach consumers. Consumers have opportunities to see several thousands of ads a day, according to some guesstimates\(^1\). These ads appear in magazines, newspapers, catalogs, yellow pages, supermarkets, movies, video games, and on billboards, trucks, TV, TIVO and websites, and are mostly surrounded by editorial and other material. If consumers would look at all these ads for merely a few seconds, they would be exposed to commercial messages for several hours a day. Yet, most ads remain unnoticed or are given a brief glance only, much less than a second. Not only are exposures to the majority of ads cursory at best, but they mostly occur in the periphery or in motion, such as when quickly flipping through magazines, walking through a mall, or driving past billboards. Therefore, the impression that is obtained of ads under these exposure conditions is coarse and lacks visual detail.

This begs the question if consumers can extract any meaning from ads that receive such a cursory and coarse glance, and whether companies’ investments in all these ads are completely wasted. A great deal is known about the processing and effectiveness of the small fraction of ads that receive very long, extended exposures of up to twenty seconds and more (Meyers-Levy and Malaviya 1999). Insights are also accumulating about the potential effects of very short, subliminal exposures of a few milliseconds to ads (Fitzsimons et al. 2002). Yet, surprisingly little is known about the information processing that takes place in-between these two extremes, during the single glance that most ads receive at best. In addition, almost nothing is known about potential downstream effects of ad processing in a single glance.

Our research aims to aid in closing this gap in current knowledge. We seek to gain insight into advertising performance under such adverse but common ad exposure conditions, by answering the question how the duration of the glance and the coarseness of

visual information in the image contribute to the gist perception of advertisements, and what the consequences of gist perception are for the immediate interest in the ads.

Vision research has shown the remarkable capacity of the human visual system to rapidly grasp the general idea or meaning of images, i.e., their “gist.” For instance, people can indicate with over 90% accuracy whether briefly presented images contain a forest, street, office, or beach scene (Castelhano and Henderson 2008; Rousselet, Joubert, and Fabre-Thorpe 2005). This has led to the generally accepted conclusion that “... observers recognize a real-world scene at a single glance” (Oliva 2005, p. 251) and that a glance is “... all that is required to comprehend most scenes” (Biederman 1981, p. 216). Our research challenges this conclusion in the case of ads. It tests the proposition that grasping the gist of typical ads actually requires much less than the duration of a single glance even with coarse visual information, and that the gist of atypical ads cannot be grasped even in a single glance and with detailed visual information. In addition, we investigate whether perceiving their gist enhances the immediate interest value of ads, which is as yet unknown.

We examine this in the context of magazine advertising. In 2007, for example, spending of the one hundred leading advertisers in the US on magazine advertising was second only to TV, with major spending in categories such as food, cars, financial services and beauty and health2, and these are studied here. We find that consumers have remarkably detailed memory representations of what typical ads in these product categories look like (Study 1). Therefore, they already know in less than 100 msec. whether an image is an ad or editorial material, and--if the ads are typical--which product category is advertised. We find that atypical ads trail typical ones by far in this respect (Study 2). Because of their superior gist performance, immediate interest in typical ads is higher than in atypical ads (Study 3). Coarse “blobs” of visual information already suffice to grasp the

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gist of typical ads even at the brand level, but atypical ads require more visual detail (Study 4). Based on these results, we propose and illustrate a new AdGist metric to assess this communication performance of ads in the first glance (Study 4). The metric can be used in practice to assess what meaning an ad conveys in a single glance, and how well it does that compared to other ads. Our findings reveal the advantage of typical ads in the first glance, provide new insights into gist perception of ads more generally, and have practical implications for assessing the immediate performance of ads.

**THE GIST OF ADVERTISING**

Gist is the meaning of an image in terms of the main categories that it belongs to, such as that an image depicts an indoor or outdoor scene, a forest or beach, a sandy or pebble beach. Gist perception has important survival value. It helps consumers to navigate through the world and rapidly decide which of the numerous images in the environment are interesting and deserving of more attention, which images to ignore, and which specific locations in the selected images to inspect more closely.

Gist perception can take place at different levels of specificity (Grill-Spector and Kanwisher 2005; Oliva 2005). We propose that in the context of advertising, respectively the ad-, product- and brand-levels are essential. At the first, generic level, an image can be an advertisement or surrounding material such as a magazine editorial article, web content or television program. At the second, intermediate level, an image can be an ad for a particular product category, such as cars, financial services, food, or skincare products. At the third, more specific level, the image can be an ad for a specific brand in the product category, such as Garnier skincare or Dove skincare. These three levels reflect the depth of gist perception from shallow detection (“Advertisement or not?”), via categorization (“Which advertised product?”), to deep identification (“Which branded advertised...
product?” We examine how the typicality of ads, the duration of the glance, and coarseness of visual information in the ad contribute to gist perception at the various levels.

Typical and Atypical Ads

Consumers have developed memories of typical scenes that they encounter. Such memories contain visual details about objects that are probably present in the scene, their spatial relationships, and the overall layout of the scene (Biederman 1981; Oliva 2005). A memory representation of a typical beach scene, for example, includes sand, sun, sea, and palm trees. Though some actual beach scenes may contain pebbles and clouds, a typical memory representation does not include these. Gist perception should occur faster and deeper when the scene in an image is similar to memory representations of typical scenes.

Indeed, Grill-Spector and Kanwisher (2005) found that people were highly accurate in detecting typical objects (versus meaningless shapes) and in categorizing them (e.g., car, face, or flower) in a flashed image. Both reached a ceiling of 90% accuracy after 80 msec. exposure. This led to their conclusion that “As soon as you know it is there, you know what it is.” These and similar studies with typical stimuli (Greene and Oliva 2009) suggest that “… observers recognize a real-world scene at a single glance” (Oliva 2005, p. 251).

But what about atypical stimuli? No research has addressed this question yet, but a study by Mack, Gauthier, Sadr, and Palmeri (2008) is relevant. They used the same images of typical objects that Grill-Spector and Kanwisher had used, but showed the objects either in their regular position or upside-down, which is atypical. People were indeed equally accurate in detecting whether an image contained an object as in categorizing it, for upright objects. However, for inverted objects, people were much better in detecting that an image contained an object than in categorizing the object. This led to the conclusion: “Sometimes you know that it is there, before you know what it is.”
Research has also not yet explored the influence of typicality on gist perception at deeper levels. However, even for typical objects the accuracy of identification (“what type of car?”) already lagged far behind the accuracy of detection and categorization (Grill-Spector and Kanwisher 2005). The idea is that people have a natural tendency to perceive objects and scenes at an intermediate, basic level of categorization which optimally balances high accuracy and fast speed of perception. If needed, people devote additional glances to perceiving the gist at more specific, deeper levels.

If these findings generalize to ads, gist perception of typical ads would be highly accurate both at the ad and product level, but gist perception at the brand level would lag behind. In contrast, gist perception of atypical ads would be worse at all levels. Support for these predictions would imply that the gist of atypical ads cannot be grasped in a single glance, counter to common belief. It would also suggest that the gist of typical ads can be grasped in less than the duration of a single glance, to which we turn next.

*Duration of a Single Glance on Ads*

An eye fixation on an ad and similar stimuli generally lasts up to about 250 to 300 msec. (Wedel and Pieters 2000). In-between fixations, rapid saccadic movements direct the eye-focus to other locations in the scene. There are two distinct stages in the duration of an eye fixation. In the first stage, information is rapidly acquired from the stimulus and saccadic movements are actively suppressed. This stage is estimated to last around 100 msec. (Harris, Hainline, Abramov, Lemerise, and Camenzuli 1988). Therefore, the accuracy of categorizing typical objects in images increases steeply between exposure durations of 20 and 100 msec. (Loftus and Harley 2004; Loftus and McLean 1999). In the second stage of an eye fixation, after about 100 msec., information is acquired at a diminishing rate and the saccade to the next fixation location is being planned and executed.
(Reingold and Rayner 2006). The information in this second stage mostly improves the certainty of gist perception, which is reflected in faster task responses (Lamberts 2000).

Building on this, we predict that for typical ads accuracy of gist perception also rapidly builds up to reach a ceiling around exposure durations of 100 msec., and that the speed of responding becomes faster at longer durations. We expect that typical ads outperform atypical ads already at the shortest exposure duration--an early advantage--, and that they retain this advantage over longer exposure durations within a glance,--a constant advantage. This prediction is based on research in which images were or were not preceded by brief visual primes (Loftus and Harley 2004, Study 2). Primed images achieved better gist perception than non-primed images already at the briefest exposure of 27 msec. and they kept this advantage until the final 160 msec. exposure duration. The memory activation by the prime led to an “early-and-constant” advantage across the duration of a single glance. Thus, it was not the case, for example, that the prime led to an early advantage that faded after longer exposures, or that the benefits of the prime only kicked-in later after longer exposures. In a similar vein, we predict that gist perception of typical ads as compared to atypical ads is more accurate over the entire time course of a single glance.

**Coarseness of the Information in Ads**

How well will typical and atypical ads do when visual information in the image becomes increasingly coarse, as is common in ad practice? During a single eye fixation an area of only about 2 degrees of visual angle around the exact fixation point is perceived with fine detail. Beyond that foveal area, the visual detail that can be seen rapidly tapers off into the periphery. There only coarse “blobs” of visual information remain discernible. So, in any single glance most information in the image is seen only coarsely, and coarseness quickly increases towards the periphery of the visual field (Janiszewski 1998). Yet, there is recent evidence that even such coarse visual information can already contribute to gist
perception (Loftus and Harley 2004; Oliva 2005). It is unknown how coarse information can be to still grasp the gist, and no research has compared typical with atypical scenes in that regard.

Because gist perception of atypical ads should be at low performance levels to begin with, rising degrees of coarseness cannot reduce this much further. On the other hand, the similarity of typical ads with memory representations of ads ensures that coarse visual information in the image still provides evidence about diagnostic objects and scene layouts (Biederman 1981; Oliva 2005). Although the image appears increasingly “blobby” when coarseness rises, the overall scene layout and some rough shapes and colors of objects remain discernible. This can support gist perception. Therefore, gist perception of typical ads should still remain high when the image contains only coarse information. Thus, we predict that increasing coarseness reduces accurate gist perception, that typical ads outperform atypical ads, in particular when coarseness is not extreme. Until what levels of coarseness typical ads retain their high levels of gist perception is an empirical issue.

**Immediate Interest in a Single Glance**

In the first glance, ads need to stir up interest to enable subsequent communication of the message about the brand and product. Interest has been called "the curious emotion" motivating people to explore and learn (Silvia 2008), and gaining instant interest is important for ads in cluttered environments. This has been popularized in the AIDA model, where “interest” is the downstream effect directly following “attention” (Starch 1923).

Motivation theory suggests that in the first instance of exposure, people desire cognitive control over the stimuli and want to comprehend them, and that only once these desires are met desires for novelty and variety become more prominent (Skinner 1996). Therefore stimuli that are consistent with expectations and easy to comprehend arouse immediate interest (Silvia 2008). This suggests that typical ads, which are consistent with
memory representations of the product category and whose gist can be readily perceived, should be found more interesting in a single glance. This prediction appears to go against beliefs in advertising practice that atypical ads are more interesting than typical ones, and appraisal theories predicting that the novelty/unexpectedness of a stimulus arouse interest (Berlyne 1958). But, desires for novelty gain importance only later during exposures. Prior research has focused on slow appraisals of ads after long exposure durations (20 seconds and more; see Meyers-Levy and Malaviya 1999 for a review). Our focus is on effects of typicality and gist perception on immediate interest.

Based on this, we predict that in a single glance, typical ads will be more interesting than atypical ads. This is due to their gist being immediately grasped accurately, which contributes to their comprehensibility. It implies that the effect of ad typicality on immediate interest is mediated by gist perception.

**OVERVIEW**

We report the results of four studies to test the proposed theory of ad gist perception and the predictions that derive from it.

Study 1 has a dual purpose. It explores the assumption that consumers hold distinct memory representations of typical ads for specific product categories, and provides criteria for the selection of typical and atypical ads to be used in Studies 2 to 4.

Study 2 examines how rapidly ad gist accumulates within a single glance. It varies exposure durations between 20 and 160 msec. while holding the amount of visual information in the images constant. It tests whether the gist of typical ads is indeed grasped at the more specific, product level while the gist of atypical ads is grasped predominantly at the more general, ad level only (gist perception at the brand level is deferred to Study 4, once gist perception at the product level has been established). Study 2, in addition, tests whether typical ads in comparison to atypical ads indeed have an early-and-constant
advantage in gist perception across the time course of the glance. The results of Study 2 are used to determine the exposure duration for Studies 3 and 4.

Study 3 tests whether typical ads compared to atypical ads in fact gain more immediate interest, because of their more accurate gist perception.

The final Study 4 has a dual purpose. First, it investigates whether gist can be perceived accurately not only at the product level (Study 2) but also at the brand level. Second, it tests whether gist perception of typical ads is indeed better protected against the increasing visual coarseness that comes with ad exposures in the periphery. These two features of Study 4 provide us with the opportunity to develop a new AdGist metric. The metric describes the joint gist performance of ads at the product and brand level under increasingly adverse visual conditions.

Taken together, support for our predictions would reveal that even within a single glance, the gist of typical as compared to atypical ads can be grasped faster, at deeper levels of meaning, and based on coarser visual information, and that this raises immediate interest in them. The AdGist metric assesses gist performance of ads in a single glance.

STUDY 1: MEMORY SCHEMAS FOR TYPICAL ADS

Study 1 examines whether consumers in fact have detailed memory representations for typical ads in particular product categories. Motivated by Bartlett’s (1932) memory production task, we asked people to make drawings of ads for particular product categories, which were subsequently content-analyzed.

Method

Eighty undergraduate students (50 males, average age 21) participated in return for a monetary compensation (about $7 for the complete session that comprised this study). They were randomly assigned to one condition of a four-group design (four product

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categories: cars, financial services, food, and skincare). Each participant was asked to draw a typical advertisement for one product category. To this end, they received a (A4 size) sheet of paper, with the instruction to draw “A Typical Ad.”

The first column of figure 1 shows an example of a drawing for each of the product categories. The following information was coded from the in total 80 drawings of ads: pictorial presence (yes-no), pictorial size (in mm²), pictorial content (yes/no presence of respectively product, consumer, sales person, specific locations and/or general consumption context; multiple codes possible), brand presence in text/logo (yes-no), brand size (in mm²), price or other financial information presence (yes-no), headline presence (large font text often at the top; yes-no), and total number of words in the ad.

Results

A four-group (product category conditions) multiple discriminant analysis (MDA) showed that 76.3% of the ads could be correctly classified based on this content information only ($\chi^2 (1) = 84.05, p < .001$). That is, financial ads predictably did not contain pictorials of the target product (0%), although one showed rolling coins as a metaphor for spending money, but food (75%), car (70%) and skincare ads (65%; $F (3, 76) = 15.10, p < .001$) did. Most skincare ads showed the consumer (70%; typically body parts and facial close-ups, always female), and more so than financial ads (30%), food ads (15%) or car ads did (0%; $F (3, 76) = 12.58, p < .001$). Sales persons appeared in financial ads (25%, all male), but in none of the other categories (0%; $F (3, 76) = 6.33, p < .01$). Monetary information such as price more often appeared in financial ads (50%) than in car (25%), food (5%) and skincare ads (5%; $F (3, 76) = 6.51, p < .01$). Whereas these results point to the presence of a central diagnostic object in typical ads, there is also evidence that the ad-scene is diagnostic. Outdoor scenes were more often present in car ads (50%) than in
financial (25%), food (15%), and skincare ads (10%; F (3, 76) = 3.67, p < .05). None of the other variables differed significantly between ad categories.

**STUDY 2: THE SPEED OF GIST PERCEPTION**

Study 1 demonstrated that people hold remarkably detailed representations of ads in memory. These representations are characteristic for specific product categories rather than for ads in general, and can be readily reproduced. Study 2 builds on this by examining gist perception of typical and atypical ads under varying exposure durations, all shorter than the duration of a normal eye fixation.

**Method**

*Participants and Design.* One-hundred undergraduate students (56 males; mean age 23) participated in return for a monetary compensation (about $7 for the experimental session). All had normal or corrected-to-normal vision. They were randomly assigned to one of five conditions of a 5 (exposure duration: 20, 60, 100, 140, 180 msec.) between x 3 (image: typical ad, atypical ad, editorial material) within-participants mixed design. Participants saw 40 images, namely 32 ads (8 per product category, cars, financial services, food and skincare, 4 typical and 4 atypical) and 8 pages with editorial material from general consumer magazines. The editorial material was included in the study to provide a natural context and as a benchmark. Image order was counterbalanced to control for serial-position effects. The total number of observations is 4000 (100 participants x 40 images).

*Images.* The second and third columns of figure 1 present examples of typical and atypical ads in the sample. Ads were selected from various issues of general consumer magazines, based on the guidelines that followed from Study 1 and a separate content analysis of a set of ads. The selected typical ads differed from atypical ones in the objects and scenes depicted. That is, all typical car ads contained a large pictorial of a car, and
none of the atypical ones did. All typical skincare ads showed a face or body parts in close up, and none of the atypical ones did. Typical financial ads showed a service provider, final consumers in financially safe situations and/or much text, and atypical ads did not. Typical food ads showed large pack-shots or the prepared food, and none of the atypical ones did. In addition, eight regular editorial pages were selected from the magazines.

To establish that the selected ads differed in typicality, they were evaluated by a sample of 38 judges (trained students, 16 males), who indicated for each ad whether it was respectively “typical,” “normal,” and “fitting,” for the product category in question, using 5-point response scales (1) “not at all,” to (5) “completely.” Average reliability of the three-item ad typicality scale was .71 across ads. Typicality scores were significantly higher for typical ($M = 3.96$) than atypical ads ($M = 2.80$) in a repeated measures ANOVA ($F (1, 37) = 165.87, p < .001$). Atypical ads had scores close to the midpoint of the typicality scale. This is desirable because it expresses that atypical ads are still common rather than oddball or simply confusing ads.

A quantitative image analysis established that the images of typical and atypical ads did not differ in respectively visual complexity (JPEG filesize), luminance value (Mean and SD) and size of the brand (in image pixels) (all $F$s $\geq 1$, $ns$.). This is desirable because visual complexity increases the difficulty of naming objects, search errors and latencies (Donderi 2006), and luminance and brand size can influence the visual salience and attention value of ads (Itti and Koch 2001; Wedel and Pieters 2000). Typical and atypical ads did differ, however, in average brand familiarity, assessed by a separate sample of 39 judges (6-point scale, $M$ typical = 4.33, $M$ atypical = 4.03, $F (1, 38) = 44.39, p < .001$). Therefore, we adjust for brand familiarity in our analyses.

Procedure. This and the next studies followed a similar procedure (Rousselet, Joubert, and Fabre-Thorpe 2005). Image presentation and response measurement was
carried out using Macromedia Authorware 7 (Kellogg and Bhatnagar 2005). Participants sat in normally lit, individual cubicles, 50-60 cm from a 17 inch TFT-computer screen with a maximum resolution of 1024 x 768 pixels. Images were shown centrally and almost filled the screen vertically, with white space to their left and right, with a display area subtending approximately 20° (horizontal) and 26° (vertical) of visual angle at the viewing distance.

Participants read instructions on the screen, and engaged in a practice trial. Then, actual data collection started. Figure 2 presents the set-up of a single trial. A fixation cross (about 0.1° of visual angle) appeared for 900 msec. on the screen to direct the eye gaze. This was immediately followed by an image presented in the middle of the screen with a duration depending on the exposure condition (respectively, 20 msec., 60 msec., 100 msec., 140 msec. and 180 msec. between-subjects). These brief exposures prevent saccadic eye movements (Reingold and Rayner 2006). Immediately after this, question 1 appeared on the screen: “Is it an advertisement or editorial,” with the two possible responses which participants could select and confirm by mouse clicks. If participants selected “editorial,” a black screen appeared for 300 msec., after which a new trial began, until the end of the image set. If they selected “advertisement,” a new screen appeared with question 2: “To which category does the ad belong?” with the response alternatives, respectively car, financial services, food, and skincare. They selected and confirmed their response by mouse clicks. Then, a black screen appeared and a new trial began until the end of the set.

[Insert figure 2]

Analysis. Dependent variables were the accuracy and latency of perceiving an image as ad or editorial, and in case of ads, the advertised product. Latency is the time (log-seconds) between onset of a particular question screen and confirmation of the response. Independent variables were Ad or Ed (A), Typicality (T), Exposure duration (E), Exposure duration squared (E^2), and the interactions of E and E^2 with A and T.
The data were analyzed with heterogeneous mixed-outcome regression models (e.g., Wedel and Pieters 2000). Mixed-outcomes models account for the fact that accuracy is binary and latency log-normal. Heterogeneity needs to be accounted for because each participant responds to multiple images. These models improve over the prevailing single-outcome aggregate ANOVA models and appropriately account for unmeasured sources of variation. The appendix provides details about the models and estimation.

Results

Even at the lowest exposure duration of 20 msec. already 65% of all ads and 65% of their product categories were perceived accurately. Although they were used as distracters, the editorial material’s high performance is remarkable too. At 20 msec. exposure duration, editorial material was perceived accurately (88%), and as fast as the typical ads were.

Gist Perception: Ad. Table 1 shows the mean parameter estimates and their standard deviations. Accuracy of gist perception at the ad level was significantly influenced by whether the image was an ad or ed (A) --with editorial material performing better than ads on average--, ad typicality (T) --with typical ads performing better than atypical ones at the ad level--, by exposure duration (E), and by the A x E interaction --which reveals that accuracy of gist perception of ads differs from that of editorials and varies with the exposure duration--. The significant main effect of ad-typicality supports our prediction about the more accurate and faster gist perception of typical as compared to atypical ads. Note that the T x E interaction is not significant. Thus, we cannot reject the hypothesis that typical ads have an early-and-constant advantage across the entire exposure duration range.

Latency is affected by exposure duration squared (E^2), and the T x E^2 interaction. We describe the significant results in detail below, based on figure 3. Figure 3 presents the estimated accuracies and latencies of gist perception. Error bars are the 2.5-97.5% credible
intervals. Non-overlapping error bars between typical, atypical ads and editorials, and between exposure-durations reveal differences significant at 5%.

Panel A in figure 3 shows that the accuracy of perceiving the editorial is high (87%), regardless of exposure duration. Accuracy of perceiving typical ads as compared to atypical ads was immediately better at the shortest exposure duration of 20 msec. The accuracies of perceiving typical and atypical ads improve similarly with exposure duration (from 73% to 86%, respectively from 57% to 69%). Typical ads are uniformly more accurately perceived by about 15%. The accuracy of gist perception increased monotonically, with some evidence (but not significant) of a ceiling which was reached at an exposure duration of about 100 msec., after which it remained fairly constant. Speed of gist perception does not differ between editorials (2.3 sec.) and typical ads (2.1 sec.), but is significantly slower for atypical ads by over half a second (2.6 sec.). Latency shows a quadratic relationship with exposure duration for all three types of images, with the maximum latency occurring at about 100 msec. exposure (2.3, 2.0, and 2.6 sec., respectively for editorials, typical and atypical ads; the optimum computed from the estimates was 86 msec.) after which response latencies became shorter, as expected.

Gist Perception: Product. Perception of the advertised product was influenced by typicality (T) --for typical ads the product was much more accurately perceived--, and by exposure duration and exposure duration-squared (E, E^2). Its latency was significantly influenced by typicality only, as predicted. The accuracy of perceiving the advertised product, given that the image was perceived to be an ad, was extremely high for typical ads (95%), regardless of exposure duration (figure 4) (net accuracy = ad accuracy \times product accuracy: \(82\% \times 95\% = 78\%\)). For atypical ads the accuracy of perceiving the advertised product was uniformly worse (53%; net accuracy: \(66\% \times 53\% = 35\%\)). For these ads accuracy increased with exposure duration from 36% to 61%, with some evidence (but not
significant) of diminishing returns and stable values after 100 msec. Responses were again much faster for typical (1.6 sec.) than for atypical ads (2.2 sec.), and, although the squared effect of exposure was not significant, it peaked at 100 msec. for the latter (at 2.3 sec., the optimum computed from the estimates was 93 msec. exposure duration). This provides evidence that gist perception of typical ads occurs jointly at the product and ad level (“When you know it is an ad, you know what it is for”), whereas gist perception of atypical ads mostly takes place at the ad level only, and is not as accurate. In a follow-up analysis, we adjusted for brand familiarity by including the familiarity scores (averaged over 39 judges) in the analyses. The effects of familiarity were significant in all cases, but all other effects remained qualitatively and directionally similar.

[Insert table 1 and figure 3]

Study 2 reveals the predicted early-and-constant advantage of typical over atypical ads across the time course of a single glance. After an exposure of 100 msec. to a typical ad, consumers already know with high degree of accuracy and certainty what it is and what it is for. Upon exposure to an atypical ad, however, they know with some degree of accuracy and certainty whether it is an ad, but they mostly do not know what product it is for. To reach the same levels of gist perception, multiple glances on atypical ads would be required. Notably, accuracy and latency co-vary negatively both for ad and product perception, as table 1 shows. This implies that accuracy and speed of gist perception were not traded-off, but went hand in hand. The general discussion returns to the implication of this finding. Study 3 examines an immediate implication of accurate gist perception.

**STUDY 3: GIST IMMEDIATELY EVOKES INTEREST**

Study 3 tests the effect that gist perception in a single glance has on the immediate interest in ads. Based on the findings of Study 2, exposure duration was set at 100 msec.
Method

Eighty-two undergraduate students (43 males; mean age 23) participated in return for a monetary compensation (about $7). All had normal or corrected-to-normal vision. The same 32 ads and 8 editorial pages as in Study 2 were shown for 100 msec., with the same measures and procedures. Following the product question, participants were asked “is it interesting to you,” with a binary “yes-no” response option. We simultaneously analyzed the marginal probability of accurate perception (across ad and product level) and the probability of immediate interest (all parameters are heterogeneous between participants, and the two binary measures (accuracy of gist perception and immediate interest) are correlated through co-varying constants). We estimate two models. Model 1 establishes the influence that Typicality and Ad/Ed have on respectively accurate product perception and separately on immediate interest. Model 2 adds to model 1 the (mediating) influence of accurate product perception and its interaction with Ad/Ed on immediate interest. This generalizes the standard mediation analysis to binary variables, in a Bayesian framework and accounts for heterogeneity (Zhang, Wedel, and Pieters 2009). The appendix provides details about the models and estimation procedure.

Results

Editorials were accurately perceived as such in 84% of the cases, as compared to typical ads in 83% and atypical ads in 74% of the cases. Conditional upon this, accurate perception of the product was 96% for typical and 55% for atypical ads. Immediate interest was 32% for editorials, 38% for typical and 32% for atypical ads.

Table 2 summarizes the results of model estimations. Ad/Ed (A) and Typicality (T) have similar effects on accurate gist perception (model 1 and model 2) as in Study 2. Typicality influences immediate interest as predicted: typical ads arouse more immediate interest (model 1: estimate .288, SD = .106). Importantly, the direct effect of typicality on
interest becomes insignificant when accuracy of gist perception is included in the model (model 2: estimate .227, SD = .160). The effect of accuracy of gist perception itself is significant and positive (model 2: estimate .381, SD = .110).

Thus, as predicted ads and editorials that are accurately perceived in a single glance arouse more interest than those that are not. In particular editorials that are accurately perceived as such arouse more interest (estimated at 32%) compared to those that are not (13%). This reflects that, because consumers tend to buy and read magazines for the editorial material, images that are accurately perceived as editorials are immediately deemed interesting. In addition, accurate gist perception raises interest (typical ads: inaccurate 33%, accurate 37%; atypical ads: inaccurate 28%, accurate: 32%). The effect of typicality on interest is fully mediated by accuracy of gist perception, as predicted: immediate interest in typical ads is higher, because they are comprehended better.

The effect of Ad/Ed is significant: editorials arouse more interest than ads. The interaction between Ad/Ed and Accuracy is significant and negative (model 2: estimate -1.003, SD = .355). This reveals that accurately identified ads stimulate at least as much interest (typical 37% and atypical 32%) as accurately identified editorials do (32%).

Thus, in less than a single glance, people are indeed more interested in typical than atypical ads, because they perceive their gist. This makes it relevant to go deeper into the limits of gist perception in a single glance.

STUDY 4: INCREASING COARSENESS AND DEEPER GIST

Study 4 addresses two questions. Question 1 is whether, given that perceiving the advertised product arouses immediate interest, ad gist can be grasped even deeper in a single glance, namely at the brand level. Of course we test for differences between typical and atypical ads in this regard. Grill-Spector and Kanwisher (2005) found that even for
their typical objects, accurate identification (oak or elk) lagged much behind accurate categorization (tree or car). If these findings generalize to ads, accurately perceiving the brand lags significantly behind accurately perceiving the product, even for typical ads.

Ads are often seen from the periphery or in motion, e.g., when paging through magazines, inspecting a webpage with ads at the borders, or driving past billboards while focusing on the traffic. Such ad exposures provide visually coarse impressions without fine detail. Question 2 is therefore how coarse typical and atypical ads can still be before gist perception falls below chance levels. This is of particular interest for gist perception at the brand level, as a main communication goal of ads, even when seen in a glance.

Method

Participants and design. One-hundred and seventy-seven undergraduate students (86 males; mean age 21) participated in return for a monetary compensation (about $7). All had normal or corrected-to-normal vision. Participants were assigned to a condition of a 5 (coarseness: normal, low, medium, high, very high) between- x 2 (image: typical ads, atypical ads), within-participants mixed design.

Images and procedure. The same 32 ads as in Studies 2 and 3 were used, without editorial pages because of the focus here on gist perception at the product and brand levels. Adobe Photoshop 10 was used to prepare images. In the “normal” visual condition, images were left intact. Degree of coarseness was manipulated by changing the visual resolution in the images (Loftus and Harley 2004; Loschky, McConkie, Yang, and Miller 2005). Based on pretesting, four degrees of coarseness were produced using the Gaussian Blur filter, setting the radius respectively to four (Coarseness: low), eight (medium), twelve (high), and twenty-four pixels (very high). Figure 5 presents a sample ad at these degrees of coarseness. Note how fine detail in the ad gradually disappears when coarseness increases. This reflects the effects of exposures that are more in the visual periphery.
All ads were shown for 100 msec. as in Study 3. The product question appeared directly after ad exposure. Upon responding, a new screen appeared with eight brand names from the product category that had been selected by the participant. Brands were in alphabetic order in two columns of four. Participants selected and confirmed their response by mouse clicks. This continued until all ads had been shown. The rest of the procedure was as before. The appendix provides details about the models and estimation procedure.

Results

Gist Perception: Product. Table 4 and figure 5 summarize the findings. Typicality (T), Coarseness (C) and their interaction (C x T) influence accuracy of gist perception at the product level. Typical ads (estimated 95%) outperform atypical ads (61%) by a wide margin under normal visual conditions, as was the case in Studies 2 and 3. With increasing coarseness accurate perception of the product drops significantly, but less so for typical than for atypical ads, as predicted. At the lowest degree of coarseness (LSF-4), performance of typical ads drops significantly less (to 79%; 16% down from normal) than of typical ads (to 38%; 23% down from normal). With progressing coarseness, accurate product perception continues to drop, but remains remarkably high. Even at the highest degree of coarseness, when only colored blobs of the ad images remain, accurate product perception for atypical ads is still above chance levels (32%), although typical ads perform much better (70%).

Gist Perception: Brand. Table 5 and figure 5 summarize the findings. Coarseness (C) influences gist perception at the brand level, but Typicality (T) and their interaction (C x T) do not. Figure 5 shows the detrimental effects of increasing coarseness. Accurate gist perception at the brand level drops from 46% (normal) to 26% (low), 25% (medium), 24% (high) and 22% (very high coarseness). As expected, gist perception at the brand level is
indeed much lower (50% or more in all cases) than at the product level and coarseness hurts it. Yet, it is still well above chance levels (1/8 = 12.5%) even at the highest degree of coarseness. This accuracy of gist perception at the brand level under such adverse conditions is surprisingly high, and is good news for advertisers.

Accuracy of gist perception at the brand level, given that the product was perceived accurately, is not significantly different between typical ads (28% across degrees of coarseness) and atypical ads (29%). Figure 5 shows the two completely overlapping brand perception curves for typical and atypical ads. The net accuracy of gist perception (product accuracy × brand accuracy), however, is substantially higher for typical as compared to atypical ads because gist perception at the product level is much better for typical ads. Net accuracies for typical ads and atypical ads are, respectively, 42% (= 95% × 45%) and 29% (= 61% × 48%) under normal visual conditions, 20% and 10% at low, 18% and 9% at medium, 17% and 8% at high, and 15% and 7% at a very high degree of coarseness. In a follow-up analysis, we adjusted for brand familiarity by including the familiarity scores (averaged over 39 judges; Study 2) in the analyses. The effects of familiarity were significant in all cases, but all other effects remained qualitatively and directionally similar. Based on these findings, we inspect individual ads in more detail, and develop a metric that reflects their gist performance.

GIST PERFORMANCE METRIC

Advertisers have great interest in knowing how well a specific ad performs in communicating its meaning at the product and brand levels in a single glance. We propose a metric that captures this gist performance. The metric is computed as the normalized product of the surfaces under the curves of accurate product- and brand-level gist
perception against degrees of coarseness. We use the trapezoid rule to approximate the integral, based on the posterior mean identification accuracies for each ad, and normalize the metric to be between 0 and 1 by dividing it by its maximum value (obtained when both accuracies equal one for all values of coarseness). This AdGist metric measures the total accuracy of gist perception integrated over the levels of coarseness in the study.

The results are presented in figure 6, and reveal the performance of each individual ad in conveying the product and brand in a single glance. The axes indicate the estimated surfaces under the gist perception curves, separately at the product (horizontal axis) and brand (vertical axis) levels. Brand names of the ads are indicated and the letter ‘T’ designates typical and the letter ‘A’ atypical ads. Inspection of the AdGist map shows that most ads that do well in getting the product across are typical (towards the right of the map), whereas most ads doing poorly are atypical (towards the left of the map). There is no clear relation of typicality with communicating the brand well which was also clear from our analyses above. The best performing ad overall, located in the top right corner of the figure is the DrOetker ad for frozen pizza, that is shown in figure 4. But other ads, including those for Dove and Garnier perform very well too.

For the purpose of ad comparison and testing, we propose a three-tiered classification metric of “AdGist” performance, which is indicated in Figure 6. The classification is based on the overall performance, i.e., the product of the separate performances at the product category and brand levels shown on the horizontal and vertical axes of Figure 6. The idea is that the higher this product of an ad's product- and brand-level accuracies is, the better the ad communicates its gist under the often short and coarse exposure conditions in practice. Figure 6 shows that at 100 msec. of exposure across the range of coarseness, the ads fall naturally into three classes. In Figure 6, two iso-contour lines, one for an AdGist value of 0.05 and one for a value of 0.20, delineate these classes.
Ads are a “Star” when the product of the surfaces under the product category and brand accuracy curves is above 20% of the theoretical maximum. They are classified as a “Moon” when the metric is below 20%, but above 5%, and as a “Black hole” when the metric is below 5% of the maximum attainable value. These cutoffs are based on the following reasoning. “Stars” do significantly better than chance both at the product and brand levels, for all degrees of coarseness. These ads are all above a cutoff of 20% for the AdGist metric. “Black holes” do not do significantly better than chance, neither at the product nor at the brand level. This corresponds to ads that fall below a 5% cutoff for the AdGist metric. "Moons" are in-between these two extremes. They do better than chance at the product level for all coarseness degrees, but usually only do better than chance at the brand level for the intact, unfiltered images. Among the six “Stars” in our data, two are atypical (Dove and Maggi), and the remaining four ads are typical. Among the fourteen Black Holes in our sample, only one (ABN Amro) was a typical ad. This underlines the potential of a strategy based on ad typicality for single glance communication.

[Insert Figure 6]

GENERAL DISCUSSION

This research demonstrates the remarkable capacity of people to grasp the gist of typical ads in less than a single glance and from coarse impressions only. That finding is important for advertising practice, because the vast majority of ads need to perform under such adverse conditions. Advertisers want to know what their ads can communicate then, and which strategies are effective. Our findings show not only how rapidly and accurately the gist of typical ads can be perceived from coarse images, but also that accurate gist perception improves immediate interest in ads. Typicality benefitted gist perception at the ad and product levels. After an exposure of 100 msec., which is much shorter than a single
eye-fixation, the gist of typical ads was accurately perceived at the ad and product levels in close to ninety percent of the cases. Atypical ads did much less well, at around seventy percent accuracy for gist perception at the ad level, and around forty percent for gist perception at the product level. These findings counter the received idea that people can perceive the gist of most scenes in a single glance: the gist of typical ads is in fact perceived in much less than a single glance, but atypical ads require multiple glances to achieve the same performance level. Moreover, our research is the first to provide evidence that typical ads arouse more immediate interest too, because of this accurate gist perception in a single glance.

Detailed memory representations that consumers have of typical ads for specific products assist the fast build-up of gist perception. Therefore, typical ads already outperformed atypical ads at an 20 msec. exposure, and they retained this advantage over the time course of the glance, up to the final 180 msec. Gist perception of typical ads occurs jointly at the ad and product levels: the instance you see a typical ad, you know what it is for. Gist perception of typical ads is based on coarse visual information processed across the entire retina, more so than on visual detail captured mostly in the fovea in its center. In fact, even extremely coarse blobs presented for only 100 msec. allow consumers to accurately perceive typical ads, their advertised products and brands at high levels.

Interestingly, conditional upon accurate perception of the product, typical and atypical ads did not differ in accurate perception of the brand. Of course, because accurate perception of the product was much better for typical than for atypical ads, the net effect of typicality on gist perception at the brand level was still positive (product accuracy x brand accuracy). Perception of the brand was accurate in over forty percent of the cases, which is well above chance but much lower that ad and product perception. One strategy to communicate the gist of ads in a single glance is to mimic the typical ad layouts in product
categories. We found that this works only for gist directly at the ad and product level. Other creative ad strategies are needed to convey the brand in a single glance, without harming communication of the product. Which strategies are available and effective is an important area for future research.

One caveat of our studies is that necessarily the number of response options in the gist perception tasks was limited. Accuracy of gist perception may be lower when the number of product categories increases or for free response formats. However, the ad-product structure of the questions resembles the natural perception process for ads in magazines, and the product-brand structure resembles that for billboards and other out-of-home communication, for example. Nevertheless, further establishing the influence of task characteristics on the gist performance of ads is an area for future research too.

Tradeoffs between speed and accuracy of task performance are common when people experience a conflict between being fast and avoiding mistakes (Förster, Higgins, and Bianco 2003). Then, more accurate responses are slower, and faster responses more error-prone. Interestingly, we found evidence for the opposite: gist perception of typical ads as compared to atypical ads was both more accurate and faster; higher accuracies were correlated with lower response latencies. Thus, there was no evidence of speed-accuracy trade-off in gist perception. This suggests that gist perception proceeded essentially automatically. The present research is to our knowledge the first to document this speed-accuracy correspondence rather than trade-off.

**Implications**

These findings have implications for advertising theory and practice. Quite unexpectedly, because we included them mostly as distracter images, editorial material was accurately identified at high levels even at the shortest exposure duration. It is important to note that we selected typical editorial material only, which generally contains large, orderly
blocks of text, and smaller pictorials. This layout is easily recognized, even under brief and coarse exposure conditions. One increasingly popular advertising strategy is to present ads in such an editorial format. Advertisers favor these advertorials because they add credibility to their message. Media owners are increasingly hesitant, because editorial credibility may suffer3. One worry is that advertorials are confused with editorial material in the first glance (and perhaps beyond that). The methodology that we proposed may help advertisers and the media to assess the boundaries of ad and editorial perception. For instance, when an advertiser’s goal is to provide service to consumers, such as by adding recipes to food ads, ads should perhaps initially be perceived to be editorial material and thus arouse more interest. Yet, feelings of being duped by such “false front” ads once they receive subsequent glances may backfire on the advertised brands, and we suggest that future research may examine the conditions under which this occurs.

The proposed measures of gist perception in a single glance bear some similarity to ad recognition tests that are used in advertising practice (Baldinger and Cook 2006; Finn 1992; Starch 1923). In such ad recognition testing, consumers are shown an ad for an extended exposure-duration (several seconds) and asked whether they remember having seen it before in a specific medium, and whether they remember having identified the advertised brand at that time, among others. Although the measures derived from such recognition tests may be related to various advertising and campaign characteristics, they are also prone to systematic memory biases that lower their validity as diagnostic tools (Aribarg, Pieters, and Wedel 2010). Our measures of ad gist perception do not suffer from these biases and assess what ads can communicate in a single glance.

Whereas previously the vast numbers of ads that received no more than a glance seem to have been considered wasted, the proposed AdGist metric captures the communication

effectiveness of ads in a single glance. Application of the metric to the sample of ads in this study revealed that some ads can be highly effective in this regard. AdGist tests can be readily used in academic and applied research. Based on our results we recommend ad gist testing to be performed at 100 msec. exposure duration, and visual resolution settings of at least zero and twenty-four, to identify stars, moons, and black holes. The AdGist metric provides potent diagnostic information about the ability of ads to convey their gist in a single glance. The “astronomic” classification in Star, Moon and Black Hole ads, based on single glance perception of the product and brand across a range of coarseness of the image, helps advertisers and agencies to determine which ads instantly communicate the advertised product. Such information is vital when testing, selecting and adapting ads that need to perform well in cluttered environments under adverse exposure conditions, such as in-store ads, outdoor ads, banner ads, catalogue ads, and magazine ads. Moon and Black-hole ads, often atypical ads with low to very low gist performance, may do well on other dimensions of communication effectiveness, for instance, by being more persuasive or likable once they receive sustained attention. Yet, gist perception of these ads requires more time and we are not aware of evidence that ads can attract and retain attention in absence of accurate perception of their gist in the first glance.
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### TABLE 1
TYPICALITY AND DURATION EFFECTS ON GIST PERCEPTION (STUDY 2)

<table>
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<th>Gist Perception: Ad</th>
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<th></th>
<th>Gist Perception: Product</th>
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<td>SD</td>
<td>Latency</td>
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<td>.022</td>
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<td>T x E</td>
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<table>
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<th>Predictors</th>
<th>Accuracy</th>
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Note – Accuracy of gist perception: 1 = accurate, 0 = inaccurate; Latency is log-seconds. Orthogonal contrast coding: Ad or ed: .2 = ad, -.8 = ed; Ad typicality: .5 = typical, 0 = editorial, -.5 = atypical; Exposure duration: -1 = 20 msec., -.5 = 60 msec., 0 = 100 msec., .5 = 140 msec., and 1 = 180 msec. Bolded (italicized) parameter estimates indicate that probabilities of the parameters to be larger or smaller than zero are greater than .95 (.90). Heterogeneity SD is the standard deviation of the distribution of the parameter across individuals.
### Table 2
*TYPICALITY AND GIST EFFECTS ON IMMEDIATE INTEREST (STUDY 3)*

<table>
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<tr>
<th>Parameter</th>
<th>Model 1: Independent</th>
<th>Model 2: Mediation</th>
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<tr>
<td></td>
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<td><strong>Accuracy of Gist Perception</strong></td>
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<td>T</td>
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<td>G x T</td>
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<td>Covariance</td>
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</table>

*Note –* Accuracy of gist perception: 1 = accurate, 0 = inaccurate; Interest: 1 = yes, 0 = no. Orthogonal contrast coding: Ad or ed: .2 = ad, -.8 = ed; Ad typicality: .5 = typical, 0 = editorial, -.5 = atypical; Bolded (italicized) parameter estimates indicate that probabilities of the parameters to be larger or smaller than zero are greater than .95 (.90). Heterogeneity *SD* is the standard deviation of the distribution of the parameter across individuals.
## TABLE 3
TYPICALITY AND COARSENESS EFFECTS ON GIST PERCEPTION (STUDY 4)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Accuracy of Gist Perception: Product</th>
<th>Accuracy of Gist Perception: Brand</th>
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<tbody>
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<td>Mean</td>
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<td>Constant</td>
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<tr>
<td>C x T</td>
<td>-0.126</td>
<td>0.029</td>
</tr>
<tr>
<td>Heterogeneity SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.376</td>
<td>0.045</td>
</tr>
<tr>
<td>Ad typicality (T)</td>
<td>0.176</td>
<td>0.079</td>
</tr>
</tbody>
</table>

*Note* – Accuracy: 1 = accurate, 0 = inaccurate; Ad typicality: .5 = typical, -.5 = atypical; Coarseness: log-coarseness mean centered with .01 = normal resolution, 4 = low coarseness (LSF-4), 8 = medium coarseness (LSF-8), 12 = high coarseness (LSF-12), and 24 = very high coarseness (LSF-24). Bolded (italicized) parameter estimates indicate that probabilities of the parameters to be larger or smaller than zero are greater than .95 (.90). Heterogeneity SD is the standard deviation of the distribution of the parameter across individuals.
### FIGURE 1
EXAMPLES OF MEMORY REPRESENTATIONS OF ADS (STUDY 1), AND TYPICAL AND ATYPICAL ADS (STUDIES 2, 3 AND 4)

<table>
<thead>
<tr>
<th>Memory representations</th>
<th>Typical ads</th>
<th>Atypical ads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cars</strong></td>
<td><img src="image1" alt="Car Ad" /></td>
<td><img src="image2" alt="Car Ad" /></td>
</tr>
<tr>
<td><strong>Financials</strong></td>
<td><img src="image3" alt="Financial Ad" /></td>
<td><img src="image4" alt="Financial Ad" /></td>
</tr>
<tr>
<td><strong>Food</strong></td>
<td><img src="image5" alt="Food Ad" /></td>
<td><img src="image6" alt="Food Ad" /></td>
</tr>
<tr>
<td><strong>Skincare</strong></td>
<td><img src="image7" alt="Skincare Ad" /></td>
<td><img src="image8" alt="Skincare Ad" /></td>
</tr>
</tbody>
</table>
FIGURE 2
SET-UP OF A TRIAL IN STUDY 2

Sequence

Q2: Product category?

Black screen (300 ms)

Response latency

Fixation cross (900 ms)

Image

Q1: Ed or Ad?
FIGURE 3
INFLUENCE OF EXPOSURE DURATION: STUDY 2
Chance levels for accurate gist perception are .50 at the ad level and .25 at the product level.
Error bars represent 2.5-97.5% credible intervals.

A. Accuracy of Gist Perception: Ad

B. Latency of Gist Perception: Ad

C. Accuracy of Gist Perception: Product

D. Latency of Gist Perception: Product
FIGURE 4
COARSENESS OF VISUAL INFORMATION IN ADS
Example of an ad for frozen pizza by the DrOetker brand.
LSF is low spatial frequency filtering, with the number being the filter setting.

<table>
<thead>
<tr>
<th>Normal Resolution LSF - 0</th>
<th>Low Coarseness LSF - 4</th>
<th>Medium Coarseness LSF - 8</th>
<th>High Coarseness LSF - 12</th>
<th>Very High Coarseness LSF - 24</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Normal Resolution" /></td>
<td><img src="image2" alt="Low Coarseness" /></td>
<td><img src="image3" alt="Medium Coarseness" /></td>
<td><img src="image4" alt="High Coarseness" /></td>
<td><img src="image5" alt="Very High Coarseness" /></td>
</tr>
</tbody>
</table>
FIGURE 5
INFLUENCE OF VISUAL COARSENESS: STUDY 4
Chance levels for accurate gist perception are .25 at the product level and .125 at the brand level. Error bars represent 2.5-97.5% credible interval.

A. Accuracy of Gist Perception: Product

B. Accuracy of Gist Perception: Brand
FIGURE 6
MAPPING ADGIST PERFORMANCE
The axes indicate estimated surfaces under the gist perception curves, separately at the product (horizontal axis) and brand (vertical axis) levels. Brand names of the ads are indicated. The letter ‘T’ is for typical and the letter ‘A’ for atypical ads. Two iso-contour lines are shown, one for an AdGist value of 0.05, and one for a value of 0.20 that delineates classes of 'Stars', 'Moons', and 'Black Holes'.
APPENDIX
MODELS OF AD GIST PERCEPTION

The data in Studies 2 to 4 were estimated with MCMC methodology, using WinBugs (Lunn et al. 2000). The posterior means and standard deviations of the hyper-parameters of the models are reported from 30,000 MCMC draws from which 1 in 10 are retained, after a burn-in of 20,000. We let $i = 1, \ldots, N$ denote participants; $N$ varies between studies, and $j = 1, \ldots, J$ denote images (32 ads and 8 editorial pages).

In Study 2, the $(3 \times 1)$ vector $x_{i,j}$ contains the factors that were varied within-individuals, that is, the constant, Ad/Ed (.2 = Ad, -.8 = Ed), and Typicality (.5 = typical, 0 = editorial, -.5 = atypical). The image-level model for accuracy ($y_{i,j,1}$ is a Bernoulli variable with success probability $\pi_{i,j}$) and latency ($y_{i,j,2}$) is specified as:

(A.1) \[
\log\it(\pi_{i,j}) = x'_{i,j}\beta_i + \rho \epsilon_{i,j} \\
\log(y_{i,j,2}) = x'_{i,j}\alpha_i + \epsilon_{i,j}
\]

The parameter $\rho$ captures the covariance between the residuals of the accuracy and the latency regressions according to a parameterization by Woolridge (2002). $\epsilon_{i,j} \sim N(0, \sigma_\epsilon^2)$ is the residual component of latency. The $(3 \times 1)$ vector $z_i$ contains the constant, the exposure duration ($E$), (-1 = 20 msec., -.5 = 60 msec., 0 = 100 msec., .5 = 140 msec., and 1 = 180 msec.), which was varied between-individuals, and its square ($E^2$) to allow for diminishing returns of increasing exposure durations (Loftus and McLean 1999). The individual-level model then is:

(A.2) \[
\beta_{i,p} \sim N(z'_{i,p}\lambda_p, \sigma_{\beta,p}^2) \\
\alpha_{i,p} \sim N(z'_{i,p}\theta_p, \sigma_{\alpha,p}^2)
\]

The means of the distributions of the individual-specific coefficients are parameterized as functions of the between-individual (= exposure duration, $E$ and $E^2$) factors. The same model
is used for the ad-level and product-level perception, but in the latter case $x_{i,j}$ is a $(2 \times 1)$ vector that contains the constant and Typicality (T).

In Study 3, the $(3 \times 1)$ vector $x_{i,j}$ contains the constant, Ad/Ed and Typicality coded as before. The image-level model for marginal accuracy of gist perception ($y_{i,j,1} \sim \text{Bernoulli} (\pi_{i,j,1})$) and immediate interest ($y_{i,j,2} \sim \text{Bernoulli} (\pi_{i,j,2})$) is specified using a logit link:

\[
\begin{align*}
\log \text{it}(\pi_{i,j,1}) &= x_{i,j}^\prime \beta_i \\
\log \text{it}(\pi_{i,j,2}) &= x_{i,j}^\prime \alpha_i
\end{align*}
\]

(A.3)

In Model 2, accuracy and its interaction with Ad/Ed are added to the model for the immediate interest probability. The individual-level model is:

\[
\begin{align*}
\beta_{i,p} &\sim N(\lambda_p, \sigma_{\beta,p}^2) \\
\alpha_{i,p} &\sim N(\theta_p, \sigma_{\alpha,p}^2)
\end{align*}
\]

(A.4)

The constants in the model are allowed to co-vary: $\text{Cov}(\beta_{i,1}, \alpha_{i,1}) = \rho$.

The design of Study 4 is similar to Study 2, but Coarseness (C) with five levels is manipulated between-individuals. Accuracy of gist perception at the product and brand level is examined ($y_{i,j,1}^{\text{ad}}$, $y_{i,j,1}^{\text{category}}$, are Bernoulli variables). The remainder of the model is the same as that in equations (A.1) and (A.2). The $(3 \times 1)$ vector $x_{i,j}$ contains a constant, and Typicality (.5 = typical, -.5 = atypical). The $(4 \times 1)$ vector $z_j$ contains a constant, the factor Coarseness (C) (log-coarseness mean-centered: .01 = normal, 4 = low, 8 = medium, 14 = high, and 24 = very high, with numbers reflecting the spatial frequencies in pixel space that are passed Loschky, McConkie, Yang, and Miller 2005). The model that is used in Study 4 to compute the marginal ad-specific accuracy across degrees of Coarseness (C) is similar, but includes a crossed random ad-effect $\omega_j \sim N(0, \sigma_\omega^2)$ to capture differences between ads.