

Management Slant

VOL. 50 • NO. 2 June 2010

000 Measurable Emotions: How Television Ads Really Work: How the Patterns of Reactions to Commercials Can Demonstrate Advertising Effectiveness

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- Emotions play at least the same level of importance as conscious rational thought in consumer reactions to brand messages.
- It is likely advertising researchers have exaggerated the role of conscious thought.
- Verbal inquiries about people's spontaneous preferences are neither sufficient nor adequate.
- Physiological measures add depth to our understanding of how commercials work by allowing us to tap into the moment by moment emotional reactions commercials generate.
- Storytelling in advertising enhances anchoring of the brand name into memory because consumers co-create the meaning of the brand together with the advertiser at an emotional level.

Measurable Emotions: How Television Ads Really Work

How the Patterns of Reactions to Commercials Can Demonstrate Advertising Effectiveness

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Emotional responses are complex and should be measured against a variety of metrics. Five advertising research companies spanning three physiological (GSR, HRT, and facial EMG), one symbolic (ZMET), and three self-report (verbal, visual, and moment-to-moment) measures tested the effectiveness of the same four television commercials. This study compared and contrasted the physiological, symbolic, and self-report measure results and found they should be used in combination, depending on the information needed. Traces from the physiological measures indicate the peaks of lower-order emotions. Self-report measures capture conscious emotional reactions using preset labels. Symbolic measures provide a mental map of the brand. The authors suggest brand managers could use different criteria in setting the advertising objectives and reorient the creative briefing process. Emotional experiences are co-created, and advertising planning should link the “brand story” with a consumer’s “life story.”

INTRODUCTION

THREE TYPES OF EMOTIONAL REACTIONS

Both practitioners and academics are convinced affect plays an important part in the processing of brand messages. A rich stream of academic research stresses the importance of emotional reactions to advertising and focuses on the study of the effect of ad-evoked feelings on advertising responses.

Steering away from classic “hierarchy-of-effects” models, more recent studies have applied current knowledge from neuroscience and consumer psychology to test consumer processing of advertising as narrative structures of meaning in which emotions play an important role (Escalas, 2004; Lobler, Maier and Markgraf, 2005; Passyn and Sujan, 2006). Emotional reactions and the unconscious are important when painting a full picture of people’s interpretations of stimuli (Zwaan and Radvansky, 1998; Wyer, Adaval and Colcombe 2002).

It is crucial to evaluate whether current methods used to measure emotions in advertising reflect the

new learning from neuroscience and psychology (Poels and deWitte, 2006). The sources of commercially employed advertising research methods not mirroring such current knowledge are thought to be the entrenched beliefs about rational consumers and marketing and advertising processes based on the old attention-interest-desire-action or think-feel-do models (Micu and Plummer, 2007).

The main concern of this study is to investigate whether there is a gap between the knowledge about the primacy of emotional response in the consumer’s mind and the tools widely used to assess the effects of advertising on consumers.

The first part of this study draws on the consumer psychology literature and presents the different types of emotional reactions people have when exposed to stimuli. Following Kardes, Posavac and Cronley (2004) and Heath and Hyder (2004), the authors differentiate between spontaneous and prompted thoughts and point to the pitfall of using verbal measures alone when researching

responses to advertising. Next, the authors present a short summary of the existing advertising research methods available to study emotional reactions to advertising (for detailed descriptions of the measures, see Poels and Dewitte, 2006). The authors indicate which type of emotional reaction each method measures.

In the second part of the article, findings from an exploratory study are presented wherein five advertising research companies agreed to employ their individual methods for measuring emotional responses to the same four beer television commercials. The added value of employing nonverbal measures of emotional response in addition to verbal ones is researched. The study ends with a discussion of the findings and implications to advertising practice.

LITERATURE REVIEW

Changing direction from an emphasis on rational thought, this study points to the importance of the initial emotional reaction to a stimulus and distinguishes it from the subsequent mesh of feelings and judgments. Drawing on the affect-as-information literature, Pham, Cohen, Pracejus, and Hughes, writing in the *Journal of Consumer Research* (2001), differentiate among three types of emotional reactions:

- Type I: Physiological changes happening during the initial reaction
- Type II: Automatic mapping of stimulus features onto an existing mental model
- Type III: Conscious assessment of the stimulus' significance

The initial physiological response will prompt subsequent thought generation (*i.e.*, feelings and judgments) through both automatic (type II) and controlled/conscious (type III) processes. According to Pham and his colleagues, both physiological changes and mapping of stimuli

on existing mental models are automatic reactions and are fairly consistent across individuals. People are unaware of the automatic processes, yet this initial unconscious emotional reaction cues affect-congruent materials in memory. In addition, knowledge may be actively recruited to access more fully the emotion-eliciting stimulus and to transform the initial emotional reaction into a motivationally relevant response (Wyer et al., 2002).

After exposure to a stimulus, people generate inferences (thoughts) about it. Some inferences are spontaneous; others may be prompted. Spontaneous inferences are formed by consumers as judgment-relevant information is encountered and occur without the biasing influence of questions. Prompted inferences are those encouraged by questions during the questions-and-answers phase of a study (Kardes et al., 2004).

Spontaneous Thoughts about Brands More Authentic than Prompted Thoughts

Using both verbal and nonverbal measurements of thoughts (or inferences) that consumers generate about products after advertising exposure, Kardes et al. observe, in the *Journal of Consumer Psychology* (2004), that spontaneous inferences have a greater impact on subsequent judgments and behavior than prompted inferences. Formed along the actual exposure, spontaneous inferences occur in the field and in controlled laboratory settings.

In contrast, prompted (or measurement-induced) inferences are formed only in response to questions that set off inferential processes that would not have been initiated in the absence of direct questioning. Kardes and his colleagues build the argument that spontaneous inferences are more accessible from memory and held with greater confidence, leading to more confidently held judgments, and hence have a greater impact on other judgments

and behavior (for a detailed discussion, see Kardes et al., 2004).

Spontaneous thoughts that occur in low-elaboration conditions follow a narrative format (Escalas and Luce 2004). Such narrative processing creates or enhances self-brand connections (Escalas 2004), which further impact brand attitudes and behavioral intentions. The authors conclude that spontaneous thoughts as opposed to prompted thoughts are more authentic and thus more accurately predict behavioral intentions however they are more difficult to measure.

VERBAL MEASURES INSUFFICIENT AND INADEQUATE

Spontaneous inferences fit together in an event or an episode model that people construct in the course of comprehending an event (Wyer et al., 2002). Such episode models can have both meta-linguistic (verbal) and "image" (nonverbal) components.

According to Wyer and his colleagues, while the image component of an episode model in the brain is obligatory, the verbal component is optional. Hence, people may not always be able to readily verbalize their impression of an event, so verbal measures are insufficient to produce the full picture of a consumer's spontaneous impression.

In addition, Heath and Hyder (2004) state that advertising research currently relies on *verbal* questions that ask people their opinions of advertising, using questions that invite people to recall things they have no reason to remember. Having people introspect about their reasons for liking or disliking certain options decreases the quality of their judgments and decisions (Wilson and Schooler, 1991). Cognitive operations performed with the explicit goal of reaching a reason-based assessment may bring to mind judgmental considerations that are highly accessible and easy to verbalize—criteria that might

be different from those one would normally use in spontaneous evaluations and choices (Pham et al., 2001).

To sum up, verbal inquiries about people's spontaneous preferences are neither sufficient nor adequate when trying to identify and weigh the various items that might tip the balance in favor of a certain option. The importance of a metaphor-based, nonverbal measure also is stressed by Zaltman and Coulter (1995), who propose a metaphor-elicitation-technique, and by Young (2004), who proposes classic archetypes as brand meaning metaphors.

In advertising research, practitioners ask people questions about how they make decisions and why they approach certain brands, thus favoring prompted responses drawn from the conscious and rational brain processes. The case is built here for the need for additional measures besides verbal ones when researching reactions to brand information so that advertisers have a closer look at spontaneous inferences about brand messages.

It is likely advertising researchers have exaggerated the role of conscious thought. Emotions come before thought, and an emotional response can occur even when people have no awareness of the stimuli that caused it. In fact, emotions can be considered as the gatekeeper for further ad processing (Poels and Dewitte, 2006). What happens in consumers' brains is likely to be a mixture of processes, some of which they are not aware of and cannot articulate.

There are other measures of emotions besides verbal inquiry that are available to advertising researchers. The measures are presented next, followed by the exploratory study. The authors believe the study is the first one to examine seven different measures of advertising exposure results employed commercially when testing for emotional responses to television commercials.

THREE TYPES OF MEASURES

In the *Journal of Advertising Research* (2006), Poels and deWitte provide a review of existing measures of emotional response and divide them into (1) autonomic measures and (2) self-report measures.

Autonomic (Physiological) Measures

Autonomic measures are physiological measures of emotional reactions, and they include: skin conductance measures (SC), heart rate turbulence measures (HRT), and facial muscle movement measures (facial EMG). More recently, brain-imaging techniques (functional magnetic resonance imaging) have been added to the list of physiological measures.

Physiological measures help confirm the existence and strength of the initial spontaneous emotional reaction, the base of the subsequent feelings and judgments. From previous literature that involved the use of physiological methods in the testing of advertisements, SC emerges as a good indicator of *arousal* (Bolls, Lang, and Potter, 2001; Ravaja, 2004). As it confirms the increase in activation of the autonomic nervous system, the SC measure helps confirm the existence of an emotional reaction however lacks the capability to indicate the valence of emotions (Poels and Dewitte 2006).

By measuring changes in the heart rate of participants exposed to commercials, in addition to arousal researchers also generate information about the valence of the emotional reactions, as heart rate increases or decreases as stimuli are positive or negative respectively (Cuthbert, Bradley, and Lang 1996; Bolls et al., 2001). Heart rate is operationalized as the number of milliseconds since the previous heart beat. Its main use is as a valid real-time continuous measure of *attention*. In terms of shedding light on the valence of emotions, HRT could prove hard to interpret when both positive and negative stimuli are present.

Poels and Dewitte (2006) conclude that it is not appropriate to use heart rate as the single measurement method of emotional response. Facial EMG turns out to be the better measure of the *valence* of the emotional reaction as it records facial muscle movement from two different muscles, the zygomatic muscle (more active at exposure to positive stimuli) and the corrugator muscle (reacts more at exposure to negative stimuli; Bolls et al., 2001).

Self-Report Measures

Self-report measures include verbal (when consumers answer questions about their feelings) and visual (when consumers indicate the visual representations that best match their feelings) measures and magnitude scaling (moment-to-moment measures) such as dial turns or mouse movement on a continuum. Self-report measures assess prompted inferences or thoughts about advertisements or brands.

First, in the case of verbal self report, people answer questions from a questionnaire that asks about their feelings after being exposed to an advertisement. The questions carry specific words that trigger thoughts and prompt words that most likely have not been present spontaneously after seeing the advertisement (*e.g.*, "Did this ad make you feel lively/outgoing/carefree?"). After some introspection, the respondent indicates how well each descriptor matches his or her interpretation of his or her feelings.

Second, in the case of visual self report, respondents point to a sketch of emotion (*e.g.*, self-assessment manikin, PrEmo) that best matches their feeling or sort through stills from a commercial and rate the pictures in terms of the strength of the feeling generated. The researcher puts a verbal label on either the sketch or the type of feeling represented in the still frame, thus "prompting" the participant's thoughts during the testing.

Third and last, magnitude scaling or moment-to-moment measurement is a test where the respondents turn a dial or move a cursor along a continuum between researcher-provided end-descriptors. Moment-to-moment affective reactions are integrated into overall judgments and hence happen at a conscious level (Baumgartner, Sujan, and Padgett, 1997.)

To sum up, all three self-report measures are adequate for gauging people’s prompted thoughts or inferences about advertisements or brands.

Symbolic Measures

Missing from Poels and Dewitte’s classification are measures that shed light on spontaneous inferences and thoughts in addition to prompted ones. The researchers do mention the “implicit association test” that overcomes the social desirability bias that may distort self reporting (Brunel, Tietje, and Greenwald, 2004).

The Zaltman metaphor-elicitation technique (ZMET) is one research method based on implicit associations. In a ZMET study, before coming in for an in-depth interview, participants are asked to gather pictures that reflect their thoughts and feelings about an advertisement and brand. Both conscious and unconscious reflection ensues (for a complete description of the method, see Zaltman, 1997) through this process. The ZMET technique may be used in mapping the consumers’ mental models that include both judgments and feelings (Christensen and Olson, 2002).

The results of a ZMET study are self-reported at face value. The method taps into the unconscious, however, and triggers both spontaneous and prompted thoughts. Considering that ZMET involves symbols to help shed light on consumer’s mental models of advertisements or brands, the authors of this study have labeled it a symbolic method. Qualitative in nature and too time-consuming to

be applied using a large sample of participants, ZMET may be used in the interpretation of brand meaning as conveyed by the advertisement.

Another symbolic measure available commercially is an archetype-selection method (Young, 2004). Based on implicit associations as well, participants examine and select photographs of classical archetypes (e.g., “rebel,” “hero,” “couch potato,” “nerd”) and indicate which represents a brand best post advertising exposure.

Thus, the authors of this study added symbolic measures as a separate category to autonomic and self-report ones (see Figure 1).

Comparing the Different Measurement Methods

Verbal self-report measures are the ones most commonly employed in the study of consumer reactions to television advertisements. For this literature review, the authors identified three studies in which verbal self-report results are compared to magnitude scaling, visual self report, and facial EMG results, respectively. All three studies found the nonverbal measures of

advertising effectiveness to be better predictors of brand measures.

In the *Journal of Marketing Research* (1997), Baumgartner et al. confirmed that an increasing pace of emotional reactions to a commercial has beneficial effects on overall ad and brand judgments. In a study that compared verbal with moment-to-moment self-report testing results, the researchers found significant correlations between moment-to-moment self reports of affective reactions from 27 participants (with verbal self-report measures of ad liking, brand liking and brand recall) for 30 commercials promoting various products and services. The research stressed the importance of an emotional peak in the “story” the commercial tells. Their measure for a peak emotional experience (i.e., the maximum of the affect trace) was significantly correlated with the verbal self-report measures of ad and brand liking.

In another study of emotional responses, reported in the pages of the *Journal of Advertising Research* (2002), Morris, Woo, Geason, and Kim used a visual self-report method, AdSAM, and verbal self-report measures of advertising effectiveness in a

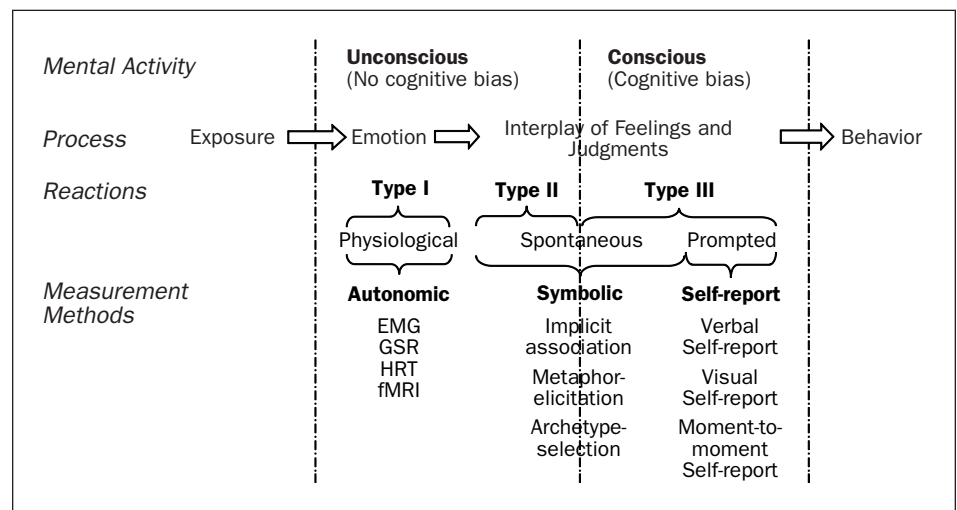


Figure 1 Measurement Methods and the Types of Reactions They Measure

various set (TV, print, radio) of advertising stimuli. They concluded that, when using the visual self-report measure, emotions dominate over cognitive aspects in predicting brand attitudes and purchase intent.

Going beyond comparing various self-report measures, Hazlett and Hazlett (1999) employed a physiological measure (facial EMG) and verbal self-reports (1999). Their results indicate that, compared to self report, facial EMG results were more related to brand recall measures administered 5 days later.

For this literature review, no other academic study that compared physiological with verbal self-report measures was located, as use of autonomic measures in advertising has been rather scarce (Vakratsas and Ambler, 1999). Poels and Dewitte (2006) mention industry case studies that were very promising in showing a difference between self-report measures and autonomic ones in predicting advertising effectiveness, with the physiological measures being the most powerful. Poels and Dewitte also conclude that it is a major challenge for advertising researchers to explore the potential and compare the predictive power of autonomic measures with self-report measures in well-designed research experiments.

Next, the authors present a study involving five different advertising research companies that (among them) employed all three types (autonomic, symbolic, and self-report) of measures to test the same four television commercials. While still far away from Poels and Dewitte's suggested thoroughly designed experiments, this exploratory study does examine further the methodologies available for testing emotional reactions to television commercials.

With this study, the authors examine whether nonverbal measures of emotional reactions developed in response to the

advances in neuroscience and consumer psychology provide an improved way to assess advertising effectiveness compared to the traditional verbal method. There are at least two reasons for conducting a study on the benefits of nonverbal measures of advertising effectiveness. First, the physiological and magnitude-scaling measurements presented earlier are authentic continuous measures that reveal the changes of levels of emotions along the advertisement length and the peak reaction moments in addition to the overall evaluation of the ad and brand resulting from verbal evaluations. Second, as presented earlier, physiological measures are unbiased and tap into the unconscious while symbolic and visual self-report measures tap into the consumers' spontaneous inferences.

Hence, when a brand message stirs emotions, nonverbal measures will indicate so. Thus, the central research question of this study asks whether nonverbal measures provide additional information about the consumer's emotional reaction to verbal measure results.

RQ1: Do nonverbal measures of emotional response to television commercials provide additional information to verbal measure results?

Based on the same two arguments about nonverbal measures' being authentic and tapping into either the unconscious or spontaneous inferences, the authors hypothesize nonverbal measures to be effective tools to evaluate whether an advertising message is emotion-based (as opposed to argument- or cognition-based).

H1: Nonverbal measures identify and differentiate emotion-based advertising messages from argument-based ones.

Previous literature established storytelling-type brand messages to be emotion-based (Escalas, 2004). Storytelling in advertising enhances anchoring of the brand name into memory because consumers co-create the meaning of the brand together with the advertiser at an emotional level. Argument-based messages work on a cognitive level and, hence, they do not generate relevant brand associations at a subconscious level. Hence, the authors hypothesize that storytelling-type (emotion-based) commercials will reveal an increased emotional reaction on all nonverbal measures compared to argument-based ones.

H2a: Emotion-based advertising messages will show greater emotional reactions on the SC measure than argument-based ones.

H2b: Emotion-based advertising messages will show greater emotional reactions on the HRT measure than argument-based ones.

H2c: Emotion-based advertising messages will show greater emotional reactions on the facial EMG measure than argument-based ones.

H2d: Emotion-based advertising messages will show greater emotional reactions on the visual self-report measure than argument-based ones.

H2e: Emotion-based advertising messages will show greater emotional reactions on the moment-to-moment self-report measure than argument-based ones.

Verbal self-report measures are the ones most commonly employed in the study of consumer reactions to television advertisements.

In an advertising context, “meaningfulness” implies that the ad message should convey information relevant to the product. The theme of an ad would be the main message benefit that the ad is trying to convey. The ad theme thus serves to position the brand based on one or two key benefits in the marketplace. Beyond being meaningfully different, a creative ad must also connect with the audience. Research on measuring advertising effectiveness reinforces the importance of the correspondence between ad meaning creation by the advertiser and ad attention and comprehension by the audience (Ang, Lee, and Leong, 2007).

- H3: Argument-based advertising message will score higher on meaningfulness than emotion-based ones.
- H4: Emotion-based messages will score higher on connectedness than the argument-based messages.

THE STUDY

To examine the research question and test the hypotheses the authors sampled five advertising research companies in an effort to span methodologies from the three types of measures. The companies agreed to employ their individual methods to measure emotional responses to the same four beer television commercials, which were chosen among several with proven market results.

Included were three physiological measures (SC, HRT and facial EMG), a symbolic

measure (ZMET), and one of each category of self-report measures (verbal, visual, and moment-to-moment). Differences among emotional reactions recorded using physiological and self-report (both quantitative) methods were examined, and then findings were related to the interpretations of advertisement meanings provided by the symbolic (qualitative) measure.

Participants and Stimuli

The advertising testing companies recruited participants from the core target group of the beer product category. All participants from the studies were males between the ages of 21 and 35 who drink beer on one or more occasions in a typical week. All participants were familiar with all four beer brands. There were 50 participants in the physiological tests (40 for facial EMG), 6 participants in the symbolic test, and 640 participants in the self-report tests (exception, 203 in the visual self report).

The four commercials were chosen carefully by a panel of judges consisting of five industry experts. The judges picked three commercials that they considered involving and emotionally arousing and a control commercial that used a cognitive type of appeal. So, following the lead of Escalas (2004), three of the commercials were of the storytelling type (Budweiser, Heineken, and BudLight) while the fourth was chosen for its strong low-carbohydrates argument (Miller Lite). From the first three commercials with a narrative thread, each told a story: Budweiser’s “Whassup” spot about friends connected by a special greeting and beer; Heineken’s

“Weasel” commercial about a young man playing a trick at a party where he decides to drink Heineken instead of the beer he bought; and BudLight’s “Ice” ad about players from a team engaged in locker room banter. As we argue here that emotional responses come first as a response to any brand stimulus, the fourth commercial selected had a strong cognitive message: there are fewer carbs in Miller Lite. All commercials selected for the project were successful in the market and had positive sales results—some greater than others but all considered effective by advertisers and their agencies.

Measurements of Emotional Reactions

A summary of the measurement methods included in the study (See Table 1 for brief descriptions and sample size) includes the following:

- *Physiological*: As presented heretofore, three of the physiological measures were represented in the study: skin conductance (SC), heart rate turbulence (HRT), and facial electromyography (facial EMG). For the facial EMG measure, zygomatic muscle activity (positive emotions) was recorded. The authors looked at the emotional reactions to the four beer commercials from these three measures of attention, arousal, and levels of positive emotion respectively.

As this study is exploratory in nature and given the limitations in the data provided by the companies, the authors examined the patterns in the traces of data recorded via the three measures by normalizing the three sets of physiological data. Previous research found that people prefer an improving series of events (Loewenstein and Prelec, 1993) and are also sensitive to the rate of improvement over time (Hsee and Abelson, 1991). Hence, the authors looked at the trend lines throughout the length

TABLE 1
Classification of Measurement Methods

Measure	Description of Measure	N
Physiological		
HRT (Bolls et al., 2001)	• Heart rate turbulence is recorded by attaching a device to participants' fingers while they watch	50
SC (Aaker et al., 1986)	• Skin conductance is recorded by attaching electrodes to the palm of participants' hands while they watch	50
Facial EMG (Bolls et al., 2001)	• Zygomatic muscle activity (smiling) is recorded by attaching electrodes to the participants' faces while they watch	40
Symbolic		
ZMET (Zaltman, 1997)	• Participants collect random images representing their thoughts and feelings about the commercial and then come in for a depth-interview during which a meaning map is developed	6
Self Report		
<i>Verbal</i>		
Attitude toward the Ad (Aad)	• Participants answer questions online (Mean for 160 respondents per ad)	640
Attitude toward the Brand (Ab)	• Participants answer questions online (Mean for 160 respondents per ad)	640
Message Relatedness (Ang et al., 2007)	• Participants answer questions online (Mean for 160 respondents per ad)	640
Message Meaningfulness (Ang et al., 2007)	• Participants answer questions online (Mean for 160 respondents per ad)	640
<i>Visual</i>		
Flow of emotion (Young, 2004)	• Using a picture-sorting technique, participants rank stills from the commercial by the strength of their emotional reaction	203
<i>Moment-to-Moment</i>		
Feelings monitor (Baumgartner et al., 1997)	• Participants move a cursor on the computer from "Not at all interesting" to "Very interesting" while watching the commercial	640

of the commercials. Also, in addition to examining trend lines, the facial EMG physiological measure of positive emotion (the one autonomic measure that shows emotional valence) was used to identify the peak moments of each of the four commercials.

- *Self report:* Self-report measures register the respondent's conscious subjective feeling. A "subjective feeling" is defined as the consciously felt experience of emotions as expressed by the individual (Stout and Leckenby, 1986). The

literature review established that there are three categories of self-report methods that all measure subjective feelings: verbal self report, visual self report, and moment-to-moment measures or magnitude scaling.

First, the verbal measures included in this study were self-reported attitude toward the ad, attitude toward the brand, and message meaningfulness and connectedness (Ang et al., 2007).

Second, visual self report was employed, as the verbal measures included here suffer from cognitive bias

(Poels and Dewitte, 2006). Using visual self-report methods reduces cognitive processing of participants when compared to verbal self report. However, visual self reports can measure only perceptions of emotional reactions. The authors used C. Young's flow-of-emotion picture-sort measure (2004).

To obtain a flow of emotion information for each commercial, the 203 respondents rated each randomly presented image from the deck based on how they were feeling when they first watched it. Though with this

visual self-report measure the authors attempted to capture a flow of emotion throughout the commercial, the measure is not a continuous one of emotional response.

Third, the authors added a computer-based magnitude scaling measure. Low-cost and easy to understand and use, moment-to-moment rating instruments do provide a prompt continuous measure of responses to the ads. As the advertisements were played in their entirety, respondents were instructed to move their mouse to the right as they become more interested and to the left as they become less interested (similar to Baumgartner, Sujan, and Padgett's [1997] "feelings monitor").

- *Symbolic:* Owing to circumstances outside the authors' control, only three of the commercials were examined via the ZMET technique: the Budweiser and Heineken spots from the narrative (more emotional) set and the argument-based (more cognitive) Miller Lite commercial. Each ZMET interview was a one-to-one discussion approximately 2 hours long. In preparation for the interview, participants were asked to collect (about 10) visual images that represent their thoughts and feelings about the research topic. As a result of this pre-interview work, participants arrived for their in-depth interview at an advanced stage of thinking, ready to discuss their thoughts and feelings. At the end of the interview, each participant created a summary collage of images with the assistance of a trained computer graphics artist. A brand-meaning map was constructed for each brand throughout the process.

Analysis

To analyze the data, the resulting emotional responses from the quantitative

measures were examined. The authors checked for consistency in participants' physiological and self-reported responses and then aggregated them per measure as they demonstrated high consistency on each of the individual measures (50 participants for the HRT and SC tests, 40 participants for the facial EMG test, 160 per commercial on the self-reported measures except for the visual self-report measure wherein there were 50 respondents per commercial).

The data were normalized as they were on different scales. Descriptive statistics were computed for the verbal measure results for each commercial (attitude toward the ad, attitude toward the brand, message connectedness, and meaningfulness). To compare the magnitude of emotional reactions to each commercial, the slopes of the resulting trend lines per measure were computed and the variance explained in emotional change by exposure to the commercial per measure. In addition, *t*-tests were computed to examine the differences in results between the argument-based Miller Light commercial and each of the three story-telling advertisements.

FINDINGS

In a quest for the right combination of measures, the authors first explored what each type of measure (corresponding to the three types of reactions) uncovered about the responses to the four beer commercials. While only broadly comparing the three measure types, these exploratory findings warrant further investigation of the specific measures under each type to delineate the finer differences among them. For example, it is likely that not all physiological measures may measure the exact same kind or level of emotional reaction. More directions for further research are discussed in the last section of the article.

First, the patterns of attention (HRT), arousal (SC), positive emotion (facial EMG) and visual self-report and magnitude scaling were examined. Then, the authors looked at the qualitative interpretations and representations of ad meaning that resulted from the ZMET technique. Then, the results were compared to the verbal measure results.

Second, the authors examined the slopes and variance explained by each commercial and *t*-test results to compare the three emotion-based commercials with the argument-based one.

Third, the results for message connectedness and meaningfulness were evaluated. The research question and hypotheses are evaluated next.

Do Nonverbal Measures Add Value?

To answer the central research question of the study, the authors looked at the patterns of reactions to each commercial using each measure and at the resulting ranking of effectiveness per measure. The research question specifically asked whether the nonverbal measure added to the verbal measure results. The study found the nonverbal measures added information that could not be obtained using verbal measures alone. In addition, findings suggest commercials (at least in the beer category) that generate an increase in emotions also score high on attitude toward the ad and attitude toward the brand.

To begin, the authors looked at the pattern of attention paid to the four commercials and the pattern of arousal generated (our HRT and SC measure results). They interpreted that, for the beer category, attention paid to the ad follows a decreasing trend throughout the commercial with at least one peak moment and an upturn toward the end.

The decreasing trend in physiological reactions may be a natural stimulus novelty wear-off effect. Previous studies that

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employed self-report measures found that both the peak moment and the final moment of a commercial have a disproportionate influence on the evaluation of the entire advertisement (Baumgartner et al., 1997). In terms of peak moments, the Bud Light and Heineken commercials have an obvious emotional peak in terms of attention and arousal, the Budweiser ad has several, and the Miller Lite has none.

The pattern of physiological reactions shows that the Budweiser commercial takes viewers on an emotional roller coaster while the Miller Lite commercial works in the opposite way, the SC and HRT traces showing little variance throughout the ad. The traces for both attention and arousal for all four commercials show an increase in physiological reactions toward the end of the commercial. Participants attended more attentively and fully to the ending moments of the commercials. This

finding is consistent with the literature on the importance of the final moment as it shows that for the beer category, viewers tend to be more engaged at the end of the commercial.

While there was an increase in attention and arousal at the final moment for all four commercials, emotional peaks were recorded only for the three narrative-type commercials that told stories. The argument-based Miller Lite commercial generated no emotional reaction peaks, viewers watching it at a steady emotional level. Looking at the traces of the positive emotion (facial EMG measure) for the four commercials, results show again that the commercials for Bud Light and Heineken have one strong emotional peak, the Budweiser commercial having wide variations in emotions with several peaks, and the Miller Lite commercial having no obvious emotional peak except for the final moment.

While physiological reactions tend to decrease, participants report an increasing conscious emotional reaction throughout the ad for the narrative commercials. Self-reported emotional reactions to the argument-based commercial follow a rather flat pattern again. Evidently, storytelling commercials work differently from argument-based ones.

The upward trend found when using self-report measures is consistent with the Baumgartner et al. 1997 patterns of reactions. They recorded reactions to 30 commercials for various products. The slopes of the trend lines of reactions for the three narrative commercials are similar across visual and moment-to-moment measures respectively (See Table 2). As found using the physiological measures, the trace of reactions for the Budweiser commercial shows a greater variation in reaction throughout the commercial.

The symbolic method (ZMET) was used to better understand and interpret the meaning associated with these three commercials (Budweiser, Heineken, and Miller Lite).

Tapping into Spontaneous Inferences and Thoughts with Symbolic Measures

Symbolic measurement results help with interpretation of brand meaning as understood after watching the commercial. Results are presented in metaphors

TABLE 2

Slopes and Variances Explained (Adjusted R^2) by Commercial Exposure for Physiological and Self-Report Measures

Brand	SC		HRT		Facial EMG		Visual		Moment-to-Moment	
	B	R ²	B	R ²	B	R ²	B	R ²	B	R ²
Bud Light	-0.0529	87.56	-0.1563	43.14	0.0005	1.1	0.0314	47.85	0.0083	86.69
Heineken	-0.0792	84.54	-0.1838	47.11	-0.001	2.87	0.0228	20.95	0.0092	87.21
Budweiser	0.0029	9.76	-0.016	2.08	-0.0012	17.81	0.005	7.71	0.0054	63.69
Miller Lite	0.0016	0.78	-0.0088	8.47	-0.0004	2.32	0.0166	5.03	0.00009	0.18

associated with the brands and in meaning maps generated from participants' unconscious (interpreted by trained researchers from images selected by the participants) and conscious associations.

The metaphor associated with the Budweiser brand after participants seeing the "Whassup" commercial was "connection." Respondents related Budweiser to various ways of being connected with one's friends, either by sharing a secret ritual or through football or sports in general. One participant said

It made me think about just hanging out—just being with your friends, and just kind of like hanging out and you are doing nothing but you are actually doing something. They are sitting around watching football, but they are still doing something, they are hanging out. So it

reminded me of that and the stupid things that you and your friends have in common.

This interpretation of "connection" is different from the one measured (message connectedness). Message connectedness referred to connecting the situation in the ad to self, while connection as resulting from the ZMET symbolic measure is a type of social connection, self to others.

The Heineken commercial was the one scoring highest on message connectedness, meaning it did a good job of having the viewer relate the situation in the ad to himself. Using ZMET, a metaphor of "the ideal" was generated for the Heineken brand. According to ZMET respondents, the ad features the ideal guy at the ideal party having ideal relationships with those around him. It is only natural our respondents could easily place themselves

in that situation. Describing the main character, one participant said

"...there are all these people just surrounding, hording around him; they happen to be taking photos of him. They're looking at this guy who's really handsome, attractive; he's just a popular guy. So I had that image, or that perception, of the guy in this commercial. ...he seems like he's pretty confident; he's pretty self-assured, whether he's in a party of all really close friends.

For Miller Lite, the metaphor was "motion." Participants saw motion in the flow of beer in the glass, and the very close shots gave an immersive feel of surfing on or swimming in the beer. Many of the pictures brought in before the Miller Lite interviewing phase featured images of waves, water sports, or just active sports

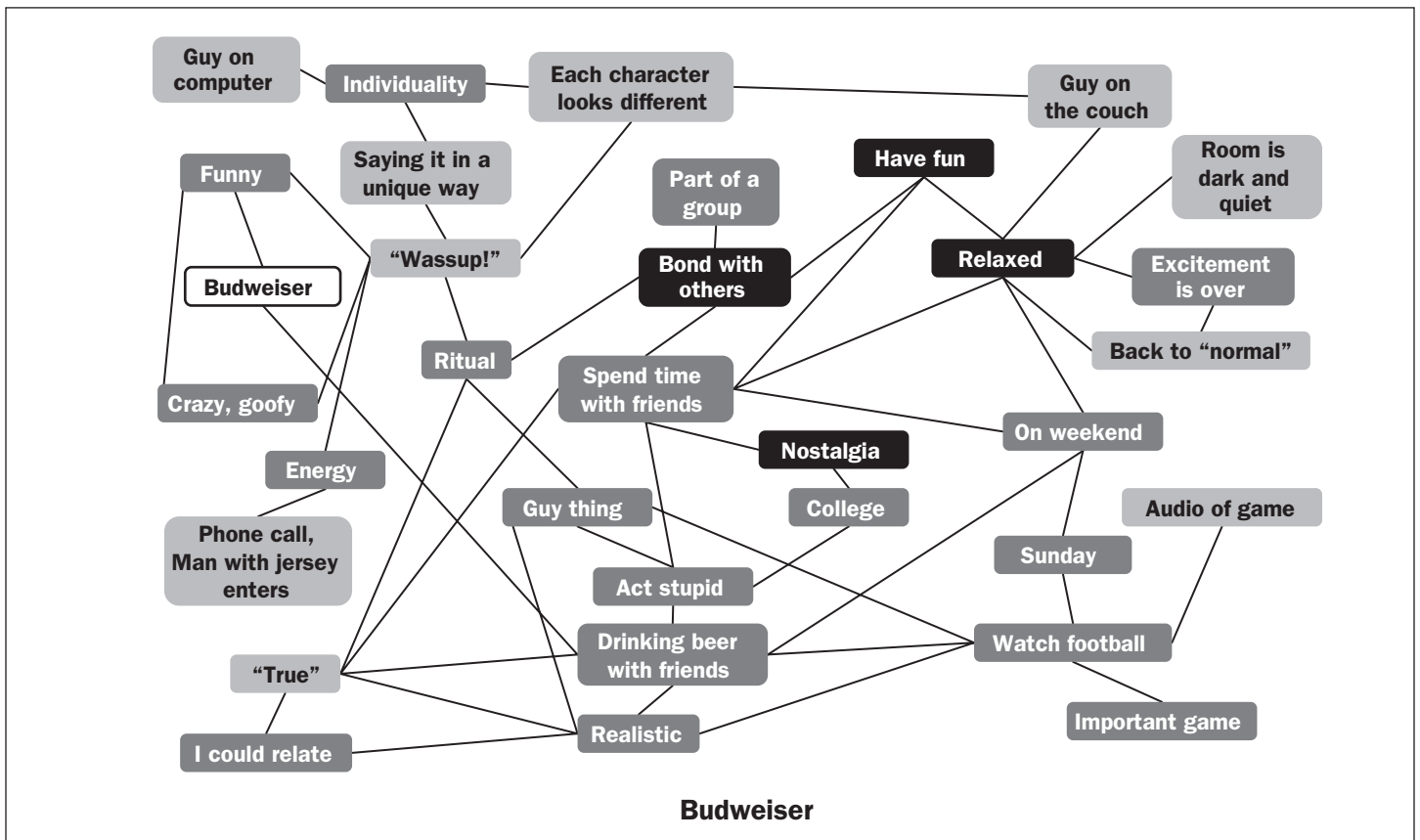


Figure 2 Meaning Maps Developed during the ZMET Process

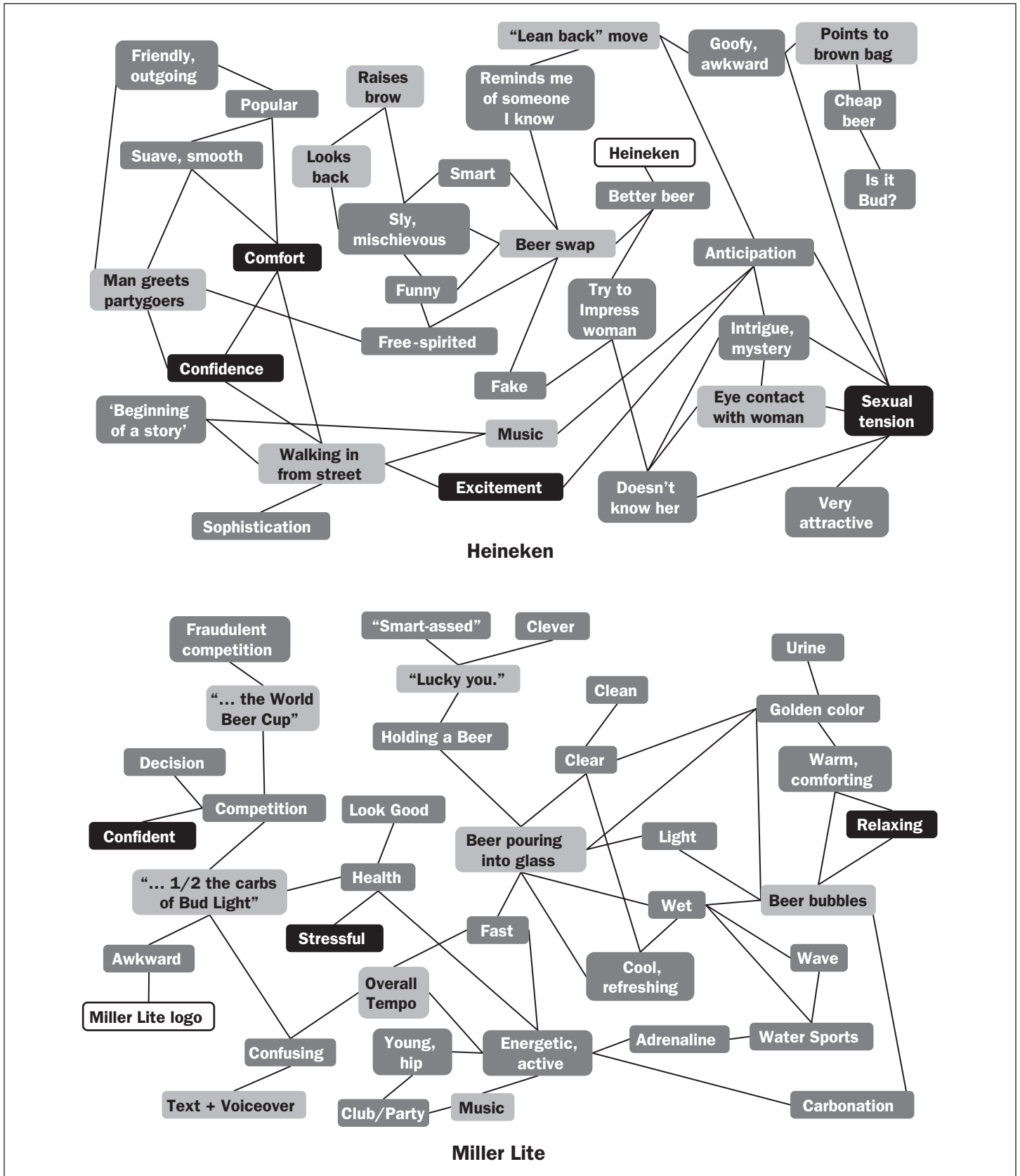


Figure 2 (continued)

in general. Specific items that were mentioned during the depth interview were mapped as they relate to one another. One can see that while the message of beer having half the carbs of Bud Light is clear, the message is awkwardly related to the brand (See Figure 2).

In summary, to answer the research question, nonverbal measures indicate the emotional peak(s) of a commercial as opposed to the verbal measures that provide the score of an overall emotional reaction. Verbal measurement results show the Budweiser commercial scores highest on both attitude toward the ad and attitude toward the brand measurements.

This superiority of the Budweiser commercial was not carried over in the nonverbal results. Furthermore, symbolic measures provide a meaning map for the brand, and the other nonverbal measures differentiate emotion-based commercials from argument-based commercials by showing a flat pattern of emotional reaction for the Miller Light commercial. This latter finding is supported by the fact that the Miller Light commercial scored lowest on both *B* (the slope of the emotional reaction) and *R*² (the variance in emotion explained by the exposure to the commercial) on all nonverbal measures (as presented in Table 2). Thus, the first hypothesis is supported. The traces of emotional reactions (SC, HRT, moment-to-moment and visual self report) and trend lines are presented (See Figures 3 to 10).

Do Emotion-Based Commercials Score Higher on Nonverbal Measures than Argument-Based Ones?

Next, the authors examined *t*-test results from comparing reactions to the Miller Light commercial (argument-based) to each of the three emotion-based commercials. The results indicate no consistent pattern (See Table 3). The argument-based commercial scored higher on attention and

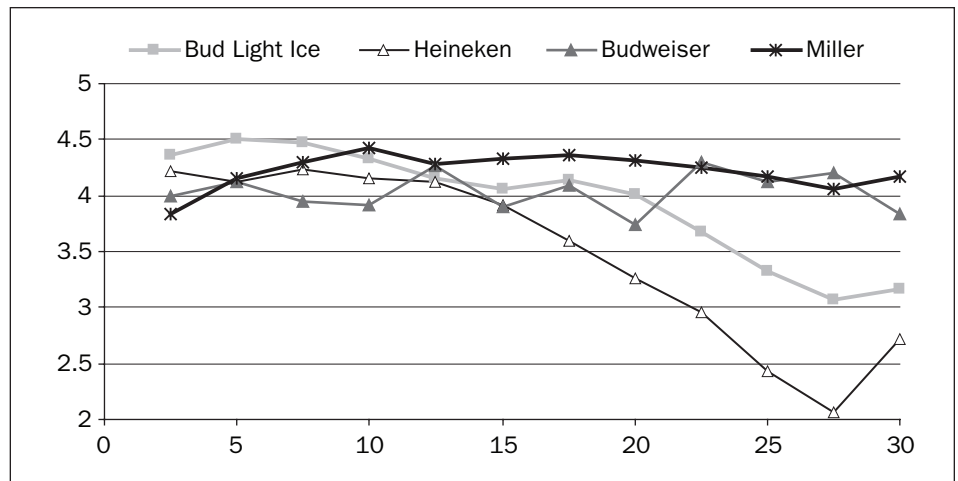


Figure 3 Skin Conductance Traces

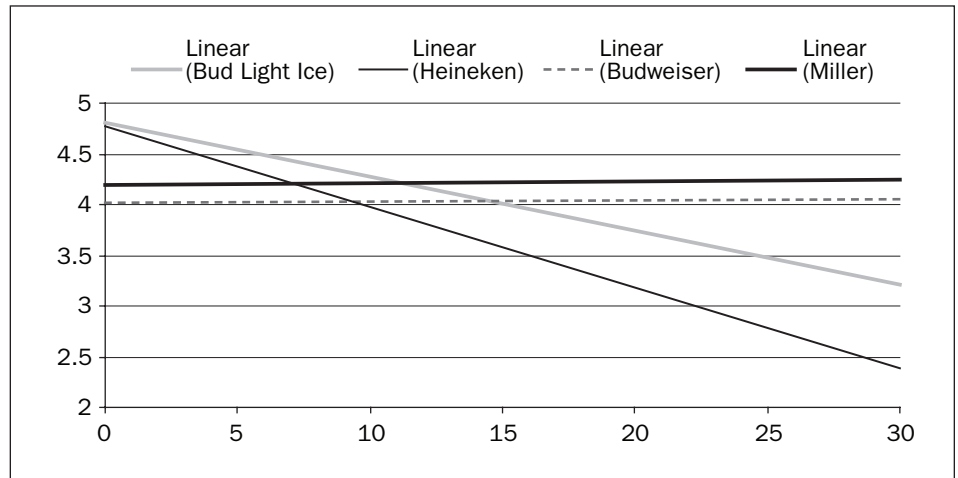


Figure 4 Skin Conductance Trend Lines

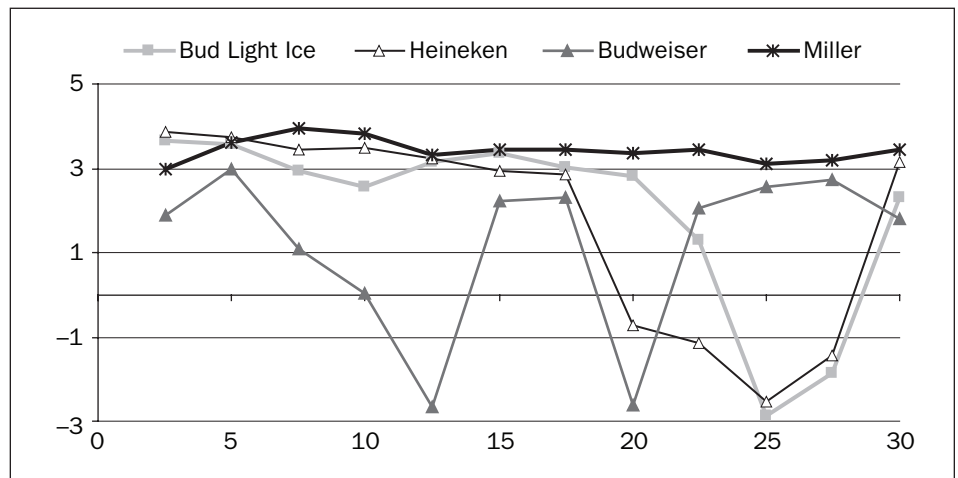


Figure 5 Heart Rate Turbulence Traces

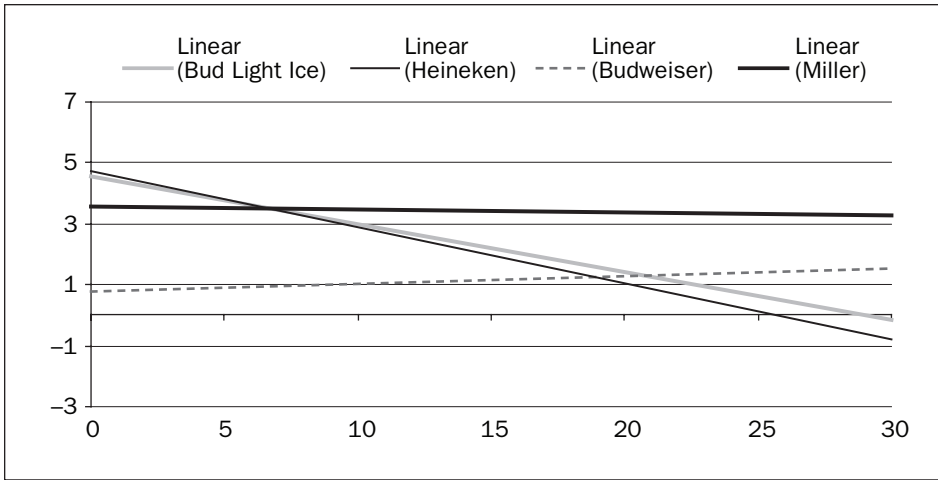


Figure 6 Heart Rate Turbulence Trend Lines

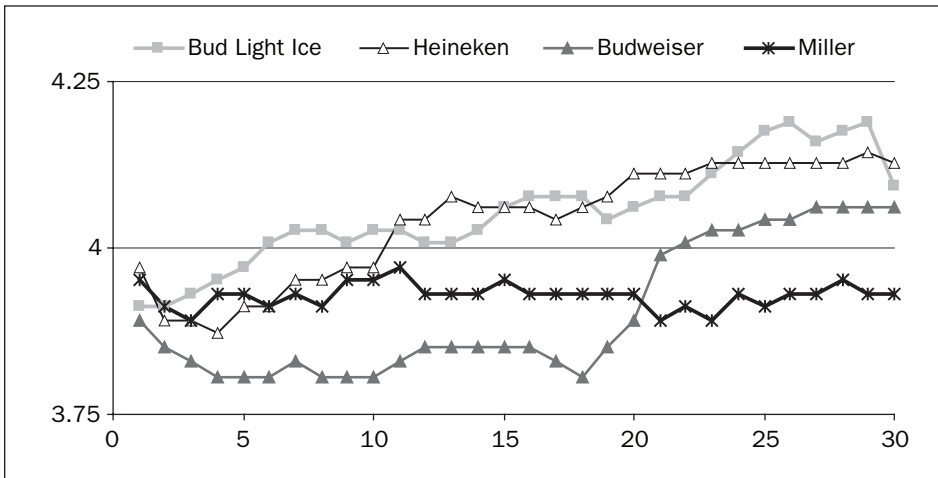


Figure 7 Moment-to-Moment Self-Report Traces

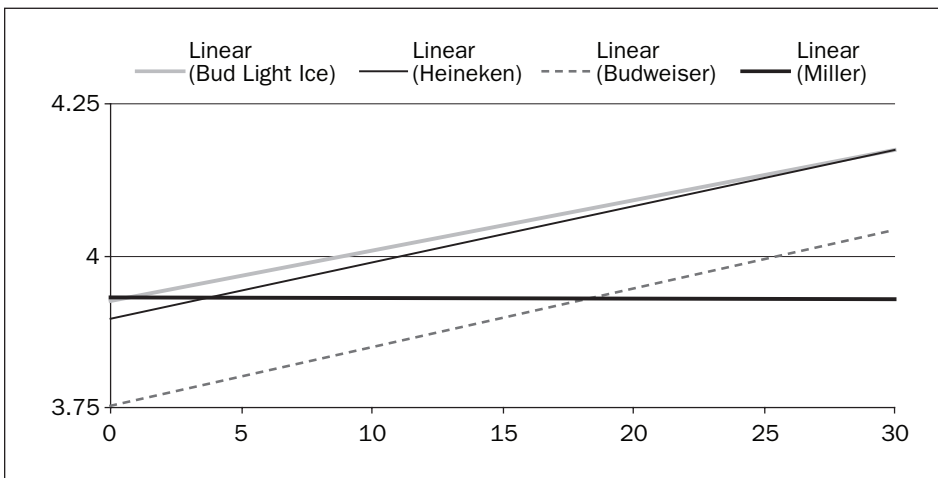


Figure 8 Moment-to-Moment Self-Report Trend Lines

Both practitioners and academics are convinced affect plays an important part in the processing of brand messages.

arousal than the emotion-based commercials and lower on visual self report and moment-to-moment tracking. It appears each measure assesses a different aspect or emotional reaction. Thus, hypotheses 2a to 2d were not supported, and hypothesis 2e was.

To conclude, the argument-based Miller Light commercial scored consistently lower than the emotion-based commercials on all nonverbal measures on the range of emotional reaction generated. While storytelling commercials took viewers on an emotional roller coaster, the argument-based one generated a flat pattern of emotion even if at a sometimes higher level than the lower points of the others.

Emotion-Based versus Argument-Based

Verbal measurement results show the Budweiser commercial scores highest on both attitude toward the ad and attitude toward the brand measurements. This superiority was not present, however, in the results on either message connectedness or meaningfulness. The Heineken commercial connected best with respondents, and the Miller Lite ad presented the most meaningful message to participants in this study (See Table 4).

Thus, hypotheses 3 and 4 are supported about an emotion-based commercial scoring highest on message connectedness and the argument-based commercial scoring highest on message meaningfulness.

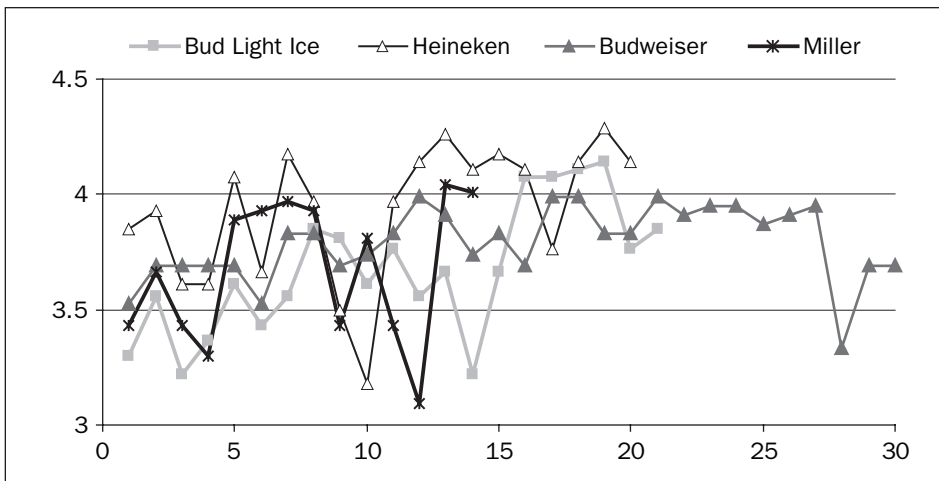


Figure 9 Visual Self-Report Traces

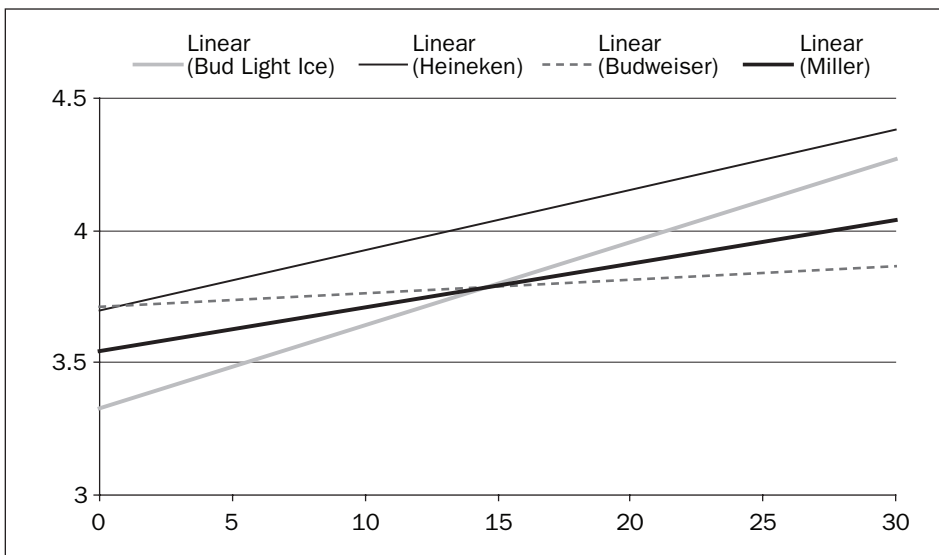


Figure 10 Visual Self-Report Trend Lines

TABLE 3

T-test Results from Comparing Argument-Based (Miller) to Storytelling (Heineken, Bud Light, and Budweiser Respectively) Commercials' Physiological and Self-Report Measure Results

Brand	SC			HRT			Facial EMG			Visual			Moment-to-Moment		
	Mean	t	p	Mean	t	p	Mean	t	p	Mean	t	p	Mean	t	p
Miller Light	4.221			3.425			4.614			3.669			3.929		
Heineken	3.483	3.356	0.006*	1.738	2.529	0.028*	4.648	-7.136	0.000*	3.861	-1.893	0.081	4.040	-6.830	0.000*
Bud Light	3.939	1.953	0.077	1.993	2.419	0.034*	4.631	-4.138	0.000*	3.525	1.592	0.135	4.054	-8.853	0.000*
Budweiser	4.027	3.427	0.002*	1.298	5.212	0.000*	4.578	9.058	0.000*	N/A	N/A	N/A	3.993	-4.111	0.000*

*Significant at 0.05 level

DISCUSSION AND PRACTICAL IMPLICATIONS

Although self-report measures—especially verbal self report—have been used commercially for decades in advertising research, physiological and symbolic measures of advertising effectiveness are not employed on a large scale.

It is possible the industry's left-brain bias is inhibiting the intuitive and creative side of advertising and brand communication. Self-report measures shed light on the conscious interpretation of reactions to the commercials (*i.e.*, what I think I felt during/after seeing the commercial). Self-report measures based on subjective feelings may not always be able to capture lower-order emotions in an accurate way, although these lower-order emotions may have a substantial influence on consumer decisions.

Although self-report measures are more likely to evaluate commercials on a pre-determined scale of descriptors, symbolic measures leave the door open for painting a picture of ad response from the variety of items automatically triggered in the brain by the exposure. Symbolic measures point to specific items from the inner workings of the brain that were triggered by the commercial.

Physiological measures provide the confirmation of the initial emotional arousal and of the emotional peaks that are then

TABLE 4
Means for Verbal Self-Report Measures

Verbal Measure	Bud Light		Heineken		Budweiser		Miller Lite	
	Mean	N	Mean	N	Mean	N	Mean	N
Aad	4.49	160	3.23	160	4.8	160	2.34	160
Ab	4.49	160	4.41	160	4.74	160	4.11	160
Message Connectedness	5.06	160	6.15	160	5.2	160	2.59	160
Message Meaningfulness	3.29	160	4.35	160	2.96	160	4.68	160

reflected in both symbol generation and descriptor evaluations. The use of the various methods will probably differ depending on the information wanted, from looking to sketch a personality of a brand as presented in the commercial when consistent brand communication is desired, to identifying those frames of a commercial that definitely should not be cut when editing, to focusing on utilizing ad time most effectively to generate preferred patterns of emotional reactions.

With this exploratory study from the beer product category, the authors sought to examine what kind of information about emotional reactions to television commercials is provided by each type of measure. This article presents a case study for one product category. Further testing for other product categories is warranted.

With this study, the authors examine whether nonverbal measures of emotional reactions provide an improved way to assess advertising effectiveness compared to the traditional verbal method. There are at least two reasons for conducting a study on the benefits of nonverbal measures of advertising effectiveness. First, the physiological and magnitude-scaling measurements presented earlier are authentic continuous measures that reveal the changes of levels of emotions along the advertisement length and the peak reaction moments in addition to the overall evaluation of the ad and brand resulting from verbal evaluations. Second, as

presented earlier, physiological measures are unbiased and tap into the unconscious while symbolic and visual self-report measures tap into the consumers' spontaneous inferences. Hence, when a brand message stirs emotions, nonverbal measures will indicate so. This study found nonverbal measures provide additional information (to verbal measure results) about the consumer's emotional reaction and can indicate whether a brand message is emotion-based. It is argued in the first part of this article that behavior is determined by feelings and judgments, which are in turn determined by (mostly) unconscious physiological and mental responses. Hence, future studies should link emotion scores obtained via nonverbal methods to in-market brand performance (*i.e.*, sales or at least intention to purchase).

Physiological measures add depth to our understanding of how commercials work by allowing us to tap into the moment-by-moment emotional reactions commercials generate. The story-oriented Budweiser, Bud Light, and Heineken commercials work on a highly emotional basis generating peaks of emotional engagement. Baumgartner and his colleagues (1997) found that the length of the commercial had no impact whatsoever if not leading to an emotional peak. Respondents might report no new product learning in follow-up questioning, but they may show high commercial (Aad) and brand (Ab) liking. Further investigation

is definitely warranted into the results of our self-report measures to confirm the superiority of the Budweiser commercial (highest Aad and Ab). Considering the wide range of methodologies covered in this study, the authors did not include a full spectrum of variables in the verbal measure to cover a broader range of perceived (cognitively processed) reactions to the commercials. Message connectedness and meaningfulness along with message novelty are part of what Ang et al. (2007) labeled the *ad creativity cube*. In addition to these three aspects of a commercial that measure creativity, there are other aspects that impact Aad and Ab (e.g., propensity of the ad to generate word-of-mouth, social relevance).

Thus, advertising messages generating emotions motivate behavior (consistent with Passyn and Sujun 2006). As emotions play at least the same level of importance as conscious rational thought in consumer reactions to brand messages, the authors strongly encourage further research of the various methods of emotional reactions that would compare them and pinpoint and refine their utility.

Zaltman (2003) argues that high-impact communication is, in fact, a co-creative process that is highly emotionally driven. The meaning of a commercial is co-created by the advertising creative department and the customer (Lobler et al., 2005). The researchers believe the co-creation of meaning follows a process, where the story told is the initiating part of the communication, and the customer's experience adds to the meaning of the communicated message—hence, co-creation of meaning.

This co-creation process involves the stories, experiences, and rich symbols in the minds of the audience connecting with those crafted into the commercials. ZMET findings in this study show that the two tested commercials that told a story generated strong brand associations and

relevant brand metaphor. Storytelling in advertising enhances anchoring of the brand name into memory because consumers co-create the meaning of the brand together with the advertiser at an emotional level. The argument-based Miller Lite commercial worked on a cognitive level and, hence, it did not generate relevant brand associations at a subconscious level. Once the metaphor describing the meaning of a brand is known, all communication messages from the marketer should be consistent with this meaning assigned to the brand by the consumer.

The authors believe advertisers today have to take a fresh look at their target prospects as human beings with both emotions and thoughts. The advertising research industry needs to more openly adopt new measures to capture emotion, unconscious thought, and recognition of symbols and metaphors that are not filtered through words and cognitive thought. Scholars Mooradian, Matzler and Szykman (2008) suggest that "there may, in fact, be different empathetic responses for different individuals in response to different advertising content."

A focus on emotional reactions may mean advertisers would begin to use different criteria in setting the advertising objectives. For example, they might incorporate criteria that would evaluate the creative presentations based on the clarity of the storylines, the degree that the brand is integrated into the story, or the use of imagery or metaphors that would encourage richer co-creation.

Last but not least, rethinking the model for advertising might mean a reorientation in the creative briefing process. That might include items such as a more visual approach to briefing, adding key symbols, images, textures, and colors that would help the creative team in understanding and developing the nonverbal aspects of the brand, providing more emotional

insights into target audience, emphasis on brand personality, and the addition of new tools that would help with developing "narrative lines" for the brand. **JAR**

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REFERENCES

AAKER, D. A., D. M. STAYMAN, and M.R. HAGERTY "Warmth in Advertising: Measurement, Impact and Sequence Effects." *Journal of Consumer Research*, 12 (March), (1986): 365-381.

ANG, S. H., Y. H. LEE, and S. M. LEONG. "The Ad Creativity Cube: Conceptualization and Initial Validation." *Journal of the Academy of Marketing Science* 35, (2007): 220-232.

BAUMGARTNER, H., M. SUJAN, and D. PADGETT. "Patterns of Affective Reactions to Ads: Integration of Moment-by-Moment Reactions Into Overall Judgments." *Journal of Marketing Research* May (1997): 219-232.

BOLLS, P. D., A. LANG, and R. F. POTTER. "The Effect of Message Valence and Listener Arousal on Attention, Memory, and Facial Muscular Responses to Radio Advertisements." *Communication Research* 28, 5 (2001): 627-651.

BRUNEL, F. F., B. C. TIETJE, and A. G. GREENWALD. "Is the Implicit Association Test a Valid and Valuable Measure of Implicit Consumer

Social Cognition?" *Journal of Consumer Psychology* 14 (2004): 385-404.

CHRISTENSEN, G. L. and J. C. OLSON. "Mapping Consumers' Mental Models with ZMET." *Psychology and Marketing* 19, 7 (2002): 477-501.

CUTHBERT, B. N, M. M. BRADLEY, and P. J. LANG. "Probing Picture Perception: Activation and Emotion." *Psychophysiology* 33 (1996): 103-111.

ESCALAS, J. E. "Narrative Processing: Building Consumer Connections to Brands." *Journal of Consumer Psychology* 14, 1-2 (2004): 168-180.

ESCALAS, J. E., and M. F. LUCE. "Understanding the Effects of Process-Focused versus Outcome-Focused Thought in Response to Advertising." *Journal of Consumer Research* 31, 2 (2004): 274-285.

HAZLETT, R. L., and S. Y. HAZLETT. "Emotional Response to Television Commercials: Facial EMG vs. Self-report." *Journal of Advertising Research* 39 (1999): 7-23.

HEATH, R.G., and P. HYDER. "Measuring the Hidden Power of Emotive Advertising." *Journal of the Market Research Society* 47, 5 (2005): 467-486.

HSEE, C. K., and R. P. ABELSON. "Velocity Relation: Satisfaction Aas a Function of the First Derivative of Outcome over Time." *Journal of Personality and Social Psychology* 60 (1991): 341-347.

KARDES, F. R., S. S. POSAVAC, and M. L. CRONLEY. "Consumer Inference: A Review of Processes, Bases, and Judgment Contexts." *Journal of Consumer Psychology* 14, 3 (2004): 230-256.

LOBLER, H., M. MAIER, and D. MARKGRAF. "Analyzing Commercials' Success from a Social Constructivist Perspective." Paper presented at the 13th International Colloquium in Relationship Marketing, St. John's, Newfoundland, Canada, June 21-24, 2005.

- LOEWENSTEIN, G., and D. PRELEC. "Preferences for Sequences of Outcomes." *Psychological Review* 100, 1 (1993): 91–108.
- MICU, A., and J. PLUMMER. "Measuring Emotional Responses to Television Advertising." White paper, American Association of Advertising Agencies and the Advertising Research Foundation: New York, NY, 2007.
- MORRIS, J. D., C. WOO, J. GEASON, and J. KIM. "The Power of Affect: Predicting Intention." *Journal of Advertising Research* 42, 3 (2002): 7–17.
- MOORIDAN, T.A., K. MATZLER, and L. SZYKMAN. (2008) "Empathetic Responses to Advertising: Testing a Network of Antecedents and Consequences." *Marketing Letters*, 19, 2.
- PASSYN, K., and M. SUJAN. "Self-Accountability Emotions and Fear Appeals: Motivating Behavior." *Journal of Consumer Research* 32, 4 (2006): 583–589.
- PERCY, L., F. HANSEN, and R. RANDRUP. "How to Measure Brand Emotion." *AdMap* 455, November (2004): 32–34.
- PHAM, M. T., J. B. COHEN, J. W. PRACEJUS, and G. D. HUGHES. "Affect Monitoring and the Primacy of Feelings in Judgment." *Journal of Consumer Research* 28, 3 (2001): 167–188.
- POELS, K., and S. DEWITTE. "How to Capture the Heart? Reviewing 20 Years of Emotion Measurement in Advertising." *Journal of Advertising Research* 46, 1 (2006): 18–37.
- RAVAJA, N. "Contributions of Psychophysiology to Media Research: Review and Recommendations." *Media Psychology* 6, 2 (2004): 193–235.
- STOUT, P., and J. LECKENBY. "Measuring Emotional Response to Advertising." *Journal of Advertising* 15, 4 (1986): 35–42.
- VAKRATSAS, D., and T. AMBLER. "How Advertising Works: What Do We Really Know?" *Journal of Marketing* 63, January (1999): 26–43.
- WILSON, T. D., and J. W. SCHOOLER. "Thinking too Much: Introspection Can Reduce the Quality of Preferences and Decisions." *Journal of Personality and Social Psychology* 60, 2 (1991): 181–192.
- WYER, R. S., R. ADAVAL, and S. J. COLCOMBE. "Narrative-Based Representations of Social Knowledge: Their Construction and Use in Comprehension, Memory and Judgment." In *Advances in Experimental Social Psychology*, vol. 35, M. P. Zanna, ed. San Diego: Academic Press, 2002.
- YOUNG, C. "Capturing the Flow of Emotion in Television Commercials: A New Approach." *Journal of Advertising Research* 44, 2 (2004): 203–209.
- ZALTMAN, G. *How Customers Think: Essential Insights into the Mind of the Market*. Cambridge, MA: Harvard Business School Press, 2003.
- ZALTMAN, G. "Rethinking Market Research: Putting People Back in." *Journal of Marketing Research* 34, November (1997): 424–37.
- ZALTMAN, G., and R. H. COULTER. "Seeing the Voice of the Customer: Metaphor-Based Advertising Research." *Journal of Advertising Research* 35, July-August (1995): 35–51.
- ZWAAN, R. A., and G. A. RADVANSKY. "Situation Models in Language Comprehension and Memory." *Psychological Bulletin* 123, 2 (1998): 162–185.