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Fast track report

The puzzle of joking: Disentangling the cognitive and affective components of humorous distraction

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Abstract

Studies in cognitive psychology, marketing, and education indicate that humor distracts attention from non-humorous information presented at the same time. Two experiments investigated why humor distracts attention. The two basic components of humor comprise (1) incongruency resolution, which poses cognitive demands and (2) positive affect. We disentangled the contributions of cognitive demands and positive affect on distraction based on the notions that (a) both components are possible sources of distraction, and (b) the components were always confounded in previous research. In an evaluative conditioning paradigm, novel products were consistently paired with humorous stimuli, whereas other products were paired with stimuli that were either (1) equally demanding but neutral, (2) equally positive but undemanding, and (3) undemanding and neutral. The results showed that cognitively demanding stimuli distracted attention, irrespective of stimulus positivity. These findings suggest that the cognitive demands of humor, not the positive affect it evokes, underlie the distraction effect. Copyright © 2009 John Wiley & Sons, Ltd.

The widespread use of humor in persuasive messages, education, and politics is supported by quite consistent evidence that humorous messages generally receive more attention than non-serious messages (see Gulas & Weinberger, 2006 and Martin, 2007, for reviews). However, using humor may have ironic effects on memory encoding. On the one hand, humorous messages are generally better remembered than non-humorous messages. On the other hand, selective attention to humor may come at the expense of encoding the serious parts of a message (Gulas & Weinberger, 2006). This impaired memory for serious message content may not always harm the effectiveness of the message. Recent studies on humorous advertisements show that, although humor impairs memory for advertised products, participants still preferred these products over products that were advertised with non-humor (Strick, Van Baaren, Holland, & Van Knippenberg, 2009). Specifically, using an evaluative conditioning paradigm (for a review, see De Houwer, Thomas, & Baeyens, 2001), it was shown that products that were paired with humorous cartoons were less accessible in memory than products paired with control (i.e., non-humorous) cartoons, but at the same time were liked more in terms of implicit attitudes and overt product choice.

Although it is clear that the positive affect evoked by humor is responsible for the enhanced liking of associated products, it is unclear which aspect of humor is responsible for its harmful effect on product memory. The present research was designed to investigate this issue. One possibility is that humor distracts attention from neutral context information because it elicits positive emotions. Several studies have shown that emotional information generally attracts and holds attention more strongly than neutral information does (Calvo & Lang, 2004; Fenske & Raymond, 2006; Fox, Russo,

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Bowles, & Dutton, 2001). If emotional stimuli fully absorb attentional resources they may interfere with the processing and memory encoding of unrelated neutral context information. Indeed, such unintended distraction effects have been observed with various emotional cues used in advertisements such as celebrities, music, and sexual appeals (Judd & Alexander, 1983; Kellaris, Cox, & Cox, 1993; Macinnis, Moorman, & Jaworksi, 1991). Regarding humor specifically, studies have shown that a higher level of humor funniness—which reflects the emotional response or reward elicited (Mobbs, Greicius, Azim, Menon, & Reiss, 2003)—relates to lower memory for humor-unrelated advertising claims (Krishnan & Chakravarti, 2003, see also Schmidt, 1994). All these findings suggest that the distracting effect of humor may be related to its emotional impact.

On the other hand, humor may also be distracting due its specific structure. Although the definition of humor differs somewhat between the disciplines that study it, researchers generally agree that humor is a pleasurable experience that arises from an idea or event that is in some sense incongruous (e.g., Alden, Mukerjee, & Hoyer, 2000; Mobbs et al., 2003; Suls, 1972; Woltman-Elpers, Mukherjee, & Hoyer, 2004; for a review see Martin, 2007). Information that is incongruent with prior expectations or schemata enhances attention and elaborative processing (Heckler & Childers, 1992). However, this enhanced attention is usually directed at information that is relevant for solving the incongruity, and may not support the processing of unrelated information that is placed in temporal proximity (e.g., Heckler & Childers, 1992). It is thus conceivable that the inherent incongruities in humor place cognitive demands on processing, and therefore distract attention from unrelated context information (see also Schmidt, 1994).

In sum, humor poses cognitive demands and elicits a pleasurable response, and both are possible sources of distraction. In previous studies on humor and memory, these two aspects of humor were always confounded. Humor was typically contrasted with non-humorous, neutral information, that is, information that was not incongruent nor was positive. Hence, from these previous studies it is impossible to disentangle if and how cognitive demands and positive affect in humor relate to memory performance. To critically assess the contributions of these two aspects, direct comparisons are necessary between humor and undemanding positive stimuli on the one hand, and between humor and demanding neutral stimuli on the other hand.

We present two experiments that intend to fill this gap in the literature. In an evaluative conditioning paradigm, the effects of cognitive demands and positive affect posed by unconditioned stimuli (USi, or its singular, US) on the memory accessibility of associated products (conditioned stimuli, CSi, or its singular, CS) were assessed. To operationalize humor, we used humorous cartoons (Experiment 1) and semantic jokes (Experiment 2). Both humor manipulations are context-independent humorous stimuli that need incongruity-resolution (Martin, 2007). Within participants, we consistently paired some CSi with humor, whereas other CSi were paired with stimuli that were either (1) equally demanding but neutral, (2) equally positive but undemanding, and (3) undemanding and neutral. Afterwards, CS memory was assessed in a surprise recognition test. Additionally, attitudes and preferences of the CSi were measured.

EXPERIMENT 1

Method

Participants and Design

Forty-nine students (9 males) participated, receiving course credits or 2 Euros in return. The experiment had a 2 (cognitive demands: demanding or undemanding) $\times$ 2 (evoked affect: positive or neutral) within participants design.

Pilot Study of Stimulus Materials

Sixty pictures were used as USi that fitted the 2 (cognitive demands: demanding or undemanding) $\times$ 2 (evoked affect: positive or neutral) design (for examples of these pictures see Figure 1). For the demanding/positive cell of the design, these were 15 humorous cartoons. To manipulate cognitive demands and evoked affect, we collected pictures that fitted the three remaining cells of the design. For the demanding/neutral condition we selected 15 neutral pictures from the

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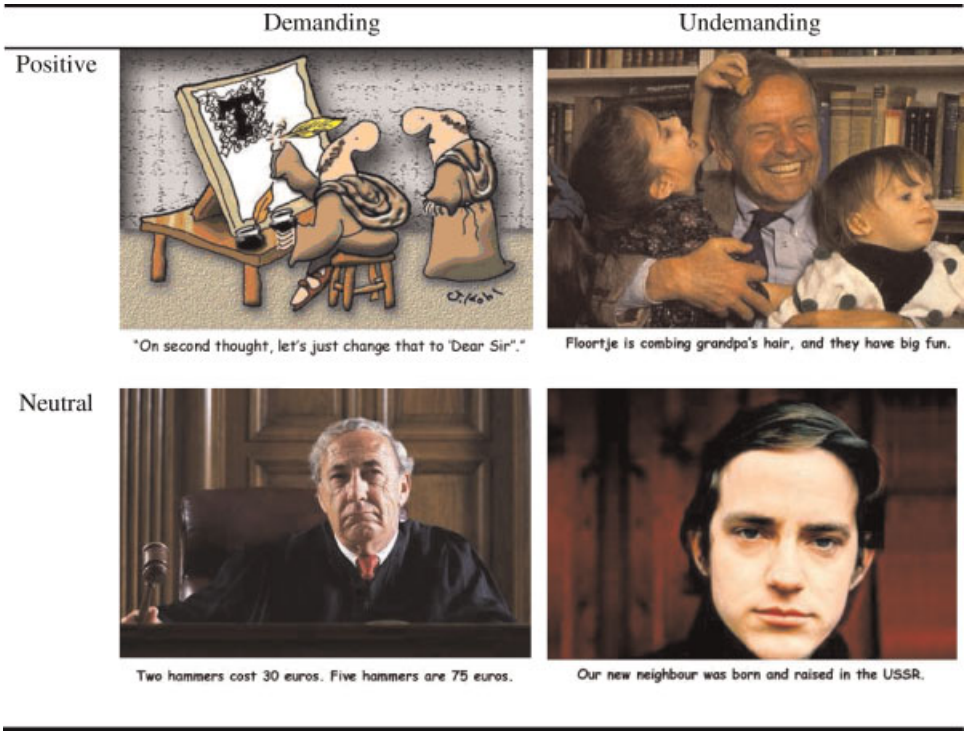

Figure 1. Examples of humorous (i.e., demanding positive) pictures, demanding neutral pictures, undemanding positive pictures, and undemanding neutral pictures, Experiment 1

International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1999), and added a mildly challenging cognitive task (i.e., a simple math problem) to each of these pictures. For the undemanding/positive and undemanding/neutral cells respectively, we selected 15 positive IAPS pictures and 15 neutral IAPS pictures, and added captions with mere descriptions of the picture content. The captions had the same sentence structure and average number of words across conditions. The pictures with captions were presented in square frames of size 300×300 pixels.

The USi were first subjected to a pilot study. The relevant means of this study are displayed in Table 1. In the first phase of the pilot study we measured the cognitive demands of the stimuli. Twenty-four participants processed all 60 pictures one by one at their own pace and were asked to continue with the next picture as soon as they felt they had understood it (see Strick, Holland, Van Baaren, & Van Knippenberg, 2009 for a similar procedure). As expected, the USi assigned to the demanding conditions were on average processed slower ($M = 6807$ milliseconds) than the USi assigned to the undemanding conditions ($M = 4781$ milliseconds), $F(1, 23) = 125.15$, $p < .01$. The second phase of the pilot study measured the affect evoked by the USi. All pictures were shown again, and participants indicated what feeling the pictures

Table 1. Mean processing time, feeling ratings, and humor ratings of humorous (i.e., demanding positive), demanding neutral, undemanding positive, and undemanding neutral pictures, Experiment 1

		Pilot test		
Demand	Valence	Processing time (millisecond)	Feelings	Humorousness
High demand	Positive	6899 (1616)[a]	4.33 (0.77)[c]	4.46 (1.01)[e]
	Neutral	6714 (1441)[a]	3.51 (0.78)[d]	1.09 (0.67)[f]
Low demand	Positive	4810 (1353)[b]	4.48 (0.81)[c]	1.24 (0.91)[f]
	Neutral	4751 (1217)[b]	3.47 (0.72)[d]	1.13 (0.88)[f]

Note: SD in parentheses. Feeling ratings ranged from 1 (very negative) to 7 (very positive), and humorousness ratings ranged from 1 (not at all humorous) to 7 (very humorous). Means that do not share superscripts differ within columns at $p < .05$.

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evoked on a 7-point Likert scale, ranging from 1 (*very negative*) to 7 (*very positive*). The USi assigned to the positive conditions evoked more positive feelings ($M = 4.40$) than the USi assigned to the neutral conditions ($M = 3.49$), $F(1, 23) = 31.06$, $p < .01$. The final phase of the pilot study tested the humorousness of the pictures. For each picture the participants indicated how humorous they found it on a 7-point Likert scale, ranging from 1 (*not at all humorous*) to 7 (*very humorous*). The USi assigned to the demanding/positive affect (i.e., humorous) condition were rated as more humorous ($M = 4.46$) than the USi in the three other conditions (all Ms < 1.25), all Fs < 1.

The CSi were pictures of four novel energy drink brands, 120 pixels in width, and 300 pixels in height. According to a pretest these brands were unknown to Dutch participants, and had equally attractive packaging.

Procedure

The CSi were assigned to the four different conditions by consistently presenting them next to the USi of the respective condition. Participants were informed that pairs of pictures would be presented on the computer monitor. In line with most studies on evaluative conditioning (e.g., Baeyens, Eelen, Crombez, & Van den Bergh, 1992), participants were merely asked to watch these picture pairs. The US–CS pairs were positioned screen-centered against a white background, with their midpoints at a 200 pixels distance from the screen center. Each CS was presented next to 15 different pictures of one condition, resulting in 15 pairings per condition, and 60 pairings in total. Picture pairs were shown for 8000 milliseconds each, in random order, and the position of the CS (either left or right) varied within the conditions. The assignment of CSi to conditions was counterbalanced between participants.

After this learning phase and a subsequent 3 minutes filler task (solving anagrams), participants received a surprise recognition test. A series of 10 pictures was presented in random order, consisting of the four CSi and six new energy drink brands. Participants were asked to indicate as quickly and accurately as possible whether they had seen this brand before during the first phase of the experiment (i.e., the learning phase). Responses were made by pressing a left ''seen before'' or right ''not seen before'' key on the keyboard (see Strick, Van Baaren, et al., 2009).

After that, we assessed product preference. Participants were given a sheet of paper showing pictures of the four CS energy drink brands and one new control brand. They were asked to imagine that the energy drink manufacturer offered them a total of eight coupons, each worth 50 eurocents off the purchase price of the drinks. Participants were asked to indicate how many coupons they wanted for each of the brands. This coupon task has been used successfully in previous studies to assess product preference (Bushman, 2005; Strahan, Spencer, & Zanna, 2002).

Next, participants indicated how much they liked each CS brand by answering the question ''How much do you like this brand?'' on a 7-point scale, with scale anchors 1 (*do not like at all*) to 7 (*like very much*).

Finally, demand awareness was assessed. Through open-ended questions, participants were asked to guess the study's hypothesis, report anything they had observed that could be related to the hypothesis, or anything else remarkable. None of the participants was classified as demand aware, as none of them reported that certain types of stimuli were paired. Most participants indicated that they thought the experiment was about the effect of repeated presentation of stimuli on consumer behavior.

Results and Discussion

Data Analyses

All data of Experiment 1 and 2 were analyzed using a 2 (cognitive demands: demanding or undemanding) $\times$ 2 (evoked affect: positive or neutral) repeated measures ANOVA. With regard to the recognition task, both accuracy and speed were analyzed. Whereas accuracy gives an indication of the recognition of the CSi, speed gives an indication of the accessibility of the CSi in memory. Across the two experiments we used the same procedure to remove outliers from the reaction times of the recognition task: Incorrect responses and responses faster than 300 milliseconds or slower than 3000 milliseconds were excluded, and the remaining reaction times were log-transformed (Ratcliff, 1993). The statistical analyses were performed on these log-transformed data, but for the sake of interpretability the non-transformed data are presented here.

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CS Recognition

Two participants were dropped from the analysis of Experiment 1 because their mean number of incorrect responses was more than 3 standard deviations from the sample mean. Analysis of the recognition accuracy yielded no significant main or interaction effects, which may be due to a ceiling effect in accuracy ($M = 93\%$). Analysis of the recognition speed, however, revealed a main effect of cognitive demands, $F(1, 39) = 6.17.61$, $p = .02$, $\eta^2 = .14$, such that the recognition of CSi associated with demanding pictures ($M = 886$ milliseconds, SE = 43) was on average slower than the recognition of CSi associated with undemanding pictures ($M = 818$ milliseconds, SE = 35). The main effect of cognitive demands was not qualified by a Cognitive Demands × Evoked Affect interaction. These results indicate that humor and demanding/neutral USi equally decreased the memory accessibility of the CSi. There was no significant main effect of evoked affect on memory accessibility.

CS Preference

Replicating the well-known evaluative conditioning effect (De Houwer et al., 2001), participants on average chose more coupons of CSi that were associated with positive pictures ($M = 1.81$, SE = 0.09) than neutral pictures ($M = 1.42$, SE = 0.08), $F(1, 48) = 6.78$, $p = .01$, $\eta^2 = .12$. They chose 1.57 coupons (SE = 0.16) of the control brand. There were no other significant main or interaction effects.

CS Liking

The liking ratings revealed that participants liked the CSi associated with positive pictures ($M = 3.86$, SE = 0.09) marginally better than CSi associated with neutral pictures ($M = 3.47$, SE = 0.08), $F(1, 48) = 3.18$, $p = .08$, $\eta^2 = .06$. There were no other significant main or interaction effects.

The results of Experiment 1 indicate that cognitive demands reduced the memory accessibility of the CSi, whereas positivity of the stimuli had no effect on CS memory. Humor reduced CS memory to the same extent as demanding/neutral stimuli. These findings suggest that the cognitive demands of humor, not the positive affect it evokes, underlie its distracting effect. Additionally, participants chose more coupons of CSi that were paired with positive stimuli than of CSi that were paired with neutral stimuli, and the liking ratings were in line with these preferences. Interestingly, evaluative responses toward the CSi were equally enhanced by pairing with demanding/positive (i.e., humorous) and undemanding/positive information. This result implies that the cognitive demands in humor do not harm evaluative conditioning.

Experiment 2 aimed to replicate the findings of the first experiment while employing a number of methodological improvements. First, we changed to more controlled USi. Although the pictures used in Experiment 1 were matched on sentence structure and number of words, the pictures may have differed in visual complexity. To control for this possibly confounding factor, Experiment 2 used verbal stimuli instead of pictures as USi. Moreover, in order to prevent a ceiling effect on recognition accuracy, a higher number of CSi was used for each cell of the design, and the number of pairings per CS was reduced from 15 to 5.

EXPERIMENT 2

Method

Participants and Design

Fifty-one students (18 males) participated, receiving course credits or 2 Euros in return. The experiment had a 2 (cognitive demands: demanding or undemanding) × 2 (evoked affect: positive or neutral) within participants design.

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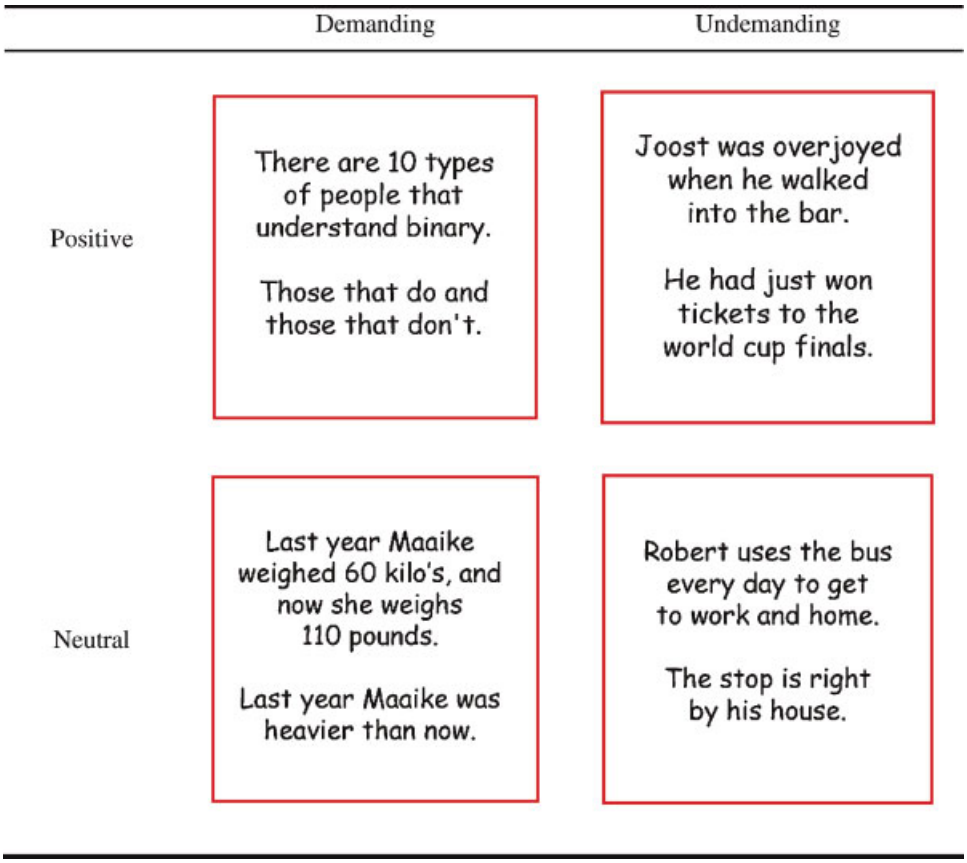

Figure 2. Examples of humorous (i.e., demanding positive) texts, demanding neutral texts, undemanding positive texts, and undemanding neutral texts, Experiment 2

Stimulus Materials

Sixty texts in total (15 in each condition) were selected for the second experiment (for examples see Figure 2). We conducted a pilot study that was similar to the pilot study of Experiment 1. The relevant means of this pilot study are displayed in Table 2. The pilot test affirmed that the texts assigned to the demanding conditions were on average processed slower ($M = 4752$ milliseconds) than the texts assigned to the undemanding conditions ($M = 3915$ milliseconds), $F(1, 23) = 64.84$, $p = .01$. The texts assigned to the positive conditions evoked more positive feelings ($M = 4.67$) than the texts

Table 2. Mean processing time, feeling ratings, and humor ratings of humorous (i.e., demanding positive), demanding neutral, undemanding positive, and undemanding neutral texts, Experiment 2

		Pilot test		
Demand	Valence	Processing time (millisecond)	Feelings	Humorousness
High demand	Positive	4646 (1318)[a]	4.62 (0.81)[c]	4.30 (0.98)[e]
	Neutral	4858 (1708)[a]	3.81 (0.50)[d]	1.01 (0.50)[f]
Low demand	Positive	3841 (1029)[b]	4.71 (0.83)[c]	1.90 (0.78)[f]
	Neutral	3989 (1388)[b]	3.87 (0.59)[d]	1.27 (0.81)[f]

Note: SD in parentheses. Feeling ratings ranged from 1 (very negative) to 7 (very positive), and humorousness ratings ranged from 1 (not at all humorous) to 7 (very humorous). Means that do not share superscripts differ within columns at $p < .05$.

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assigned to the neutral conditions ($M = 3.84$), $F(1, 23) = 39.44$, $p < .01$. Finally, the demanding/positive (i.e., humorous) texts were rated as more humorous ($M = 4.30$) than the other three types of texts (all Ms < 1.91), all Fs > 123. The CSi consisted of 12 different novel energy drink brands.

Procedure

The procedure was similar to Experiment 1, except that we used 12 CSi that were each paired with 5 USi. Furthermore, in the surprise recognition test, a series of 24 pictures was presented, comprising the 12 CSi that were shown in the learning phase and 12 filler CSi. In the coupon task, participants now could divide 20 coupons over 12 CS brands (there was no control brand). Finally, the order of the liking scale and the coupon choice task was counterbalanced between participants, but this had no effect on the results. Again, the demand awareness check indicated that none of the participants guessed the hypothesis under investigation.

Results and Discussion

CS Recognition

This time, a significant main effect of cognitive demands on recognition accuracy emerged, $F(1, 50) = 8.66$, $p < .01$, $\eta^2 = .15$. On average, CSi paired with demanding USi (83%, SE = 2.56) were less accurately recognized than CSi paired with undemanding USi (91%, SE = 1.64). The speed of the correct answers also revealed a main effect of cognitive demands, $F(1, 49) = 7.93$, $p < .01$, $\eta^2 = .14$. On average, the recognition of CSi paired with demanding USi ($M = 819$ milliseconds, SE = 31) was slower than the recognition of CSi paired with undemanding USi ($M = 759$ milliseconds, SE = 24). No other significant main or interaction effects were observed.

CS Preference

Again, participants on average chose more coupons of CSi that were associated with positive USi ($M = 1.76$, SE = 0.04) than on CSi that were associated with neutral USi ($M = 1.58$, SE = 0.04), $F(1, 43) = 3.95$, $p = .05$, $\eta^2 = .08$. No other significant main or interaction effects emerged.

CS Liking

The liking ratings of the beverages revealed that participants liked CSi associated with positive USi ($M = 3.85$, SE = 0.15) marginally better than CSi associated with neutral USi ($M = 3.64$, SE = 0.15), $F(1, 50) = 3.37$, $p = .07$, $\eta^2 = .05$. No other significant main or interaction effects were observed.

In line with the results of Experiment 1, we found that stimuli that posed cognitive demands decreased CS recognition, irrespective of their positivity. Moreover, the evaluative conditioning effect found in Experiment 1 was replicated.

GENERAL DISCUSSION

The idea to disentangle the contributions of cognitive demands and positive affect in humor on distraction was based on the notions that (a) both cognitive demands and positive affect have been identified as possible sources of distraction, and (b) these two factors were always confounded in previous research on humor and distraction. Therefore, previous studies left us with the fundamental question whether it is the incongruity in humor or the positive affect it evokes that causes the distraction. Two experiments provided evidence that the distracting effect of humor is driven by cognitive demands rather than positive affect. Humorous and demanding neutral USi distracted attention from the products to the same extent. In contrast, positive affect had no effect on product recognition.

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The effect of humor on memory resembled that of a neutral cognitive task—a math problem—which fits well with the idea that humor arises from resolving an incongruity (Alden et al., 2000; Suls, 1972; Woltman-Elpers et al., 2004). This suggests that the processing of humor draws on limited cognitive resources, and thereby withdraws attention from the context. The effect of humor on product preference, on the other hand, resembled the effect of non-humorous positive stimuli. This suggests that, although humor distracts attention from advertised products and thereby reduces product memory, it still enhances product liking. We should be cautious, however, to generalize this conclusion to real-world advertising situations. It is possible that decreased product memory is harmless in situations where consumers choose between visibly available products, such as in the present experiments. When consumers have to search their memory in order to buy a product, for example when they have to serve to a specific Internet website, brand memory may become more important.

Whereas humor distracted attention from the context, non-humorous positive stimuli did not. At first sight, this result contrasts with previous studies showing that affectively laden stimuli generally receive more attention than neutral stimuli. For example, Calvo and Lang (2004) observed that valenced pictures (either positive or negative) generally receive more online attention than neutral pictures, even when these stimuli are matched on arousal level. A possible explanation for this contradiction is that we measured afterward memory rather than online attention. Attention for emotional stimuli occurs automatically, i.e., without drawing on limited cognitive resources (e.g., Taylor & Fragopanagos, 2005). It is therefore conceivable that the positive pictures used in our study received enhanced online attention without reducing context memory. Humor and other demanding stimuli, on the other hand, may withdraw cognitive resources, leaving less recourses available for memory encoding of the context[1].

The present findings challenge the conclusion drawn in advertising research that humor funniness (the affective response or reward elicited by humor) harms the recognition of advertising messages (Krishnan & Chakravarti, 2003). However, Krishnan and Chakravarti defined humor strength as the potential of eliciting an amused response, without controlling for factors that generally enhance humor funniness. It is therefore possible that the funniest jokes in these studies were also the most incongruent, aggressive, or sexual. These confounding factors of humor funniness may attract attention in their own right (Martin, 2007).

An interesting finding was that the distraction of humor did not attenuate evaluative conditioning. This result is in line with earlier findings that evaluative conditioning withstands the distraction of humor (Strick, Van Baaren, et al., 2009). Yet, it contrasts with recent studies showing that evaluative conditioning effects disappear when attention is distracted with a secondary task, such as counting backwards from 300 in intervals of three (Field & Moore, 2005). It is possible that evaluative conditioning survives a mild distraction such as induced by humor, yet is reduced under stronger distractions that completely withdraw attention from the stimuli, such as counting backwards. Note, however, that evaluative conditioning effects have been demonstrated using subliminal stimuli, thus in the absence of any conscious attention given to the stimuli (e.g., Aarts, Custers, & Holland, 2007; Dijksterhuis, 2004). Moreover, some findings indicate that cognitive distraction enhances evaluative conditioning (Walther, 2002). Clearly, more research is needed to establish the boundary effects of evaluative conditioning in the face of distraction.

In sum, humor reduces the memory encoding of the context by posing cognitive demands, not by eliciting positive affect. At the same time, the positive affect in humor enhances liking of associated objects. The combination of distraction and positive affect in humor has obvious implications for persuasion and social influence. Humor reduces the capacity to use cognitive resources for careful information processing. This may enhance the perceived credibility of advertising messages (Gilbert, 1991; Gilbert, Krull, & Malone, 1993) and reduce consumer resistance (Fennis, Das, & Pruyn, 2004; Knowles & Linn, 2004). It is up to future research to further explore this possible role of humor in enhancing persuasion and influence.

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[1]The discrepancy between previous findings on the preferential attention for valenced stimuli and the present data is not due to differences in the positivity of the stimuli. To compare, the normative IAPS-ratings of the positive stimuli used by Calvo and Lang (2004) and our Experiment 1 were respectively 7.38 and 7.81.

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