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DOI

[10.1515/commun-2015-0013](https://doi.org/10.1515/commun-2015-0013)

Publication date

2015

Document Version

Final published version

Published in

Communications : The European Journal of Communication Research

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[Link to publication](#)

Citation for published version (APA):

van der Goot, M. J., van Reijmersdal, E. A., & Kleemans, M. (2015). Age differences in recall and liking of arousing television commercials. *Communications : The European Journal of Communication Research*, 40(3), 295-317. <https://doi.org/10.1515/commun-2015-0013>

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Age differences in recall and liking of arousing television commercials

DOI 10.1515/commun-2015-0013

Abstract: This article examines whether there are differences between older and younger adults in recall and liking of arousing television commercials. As hypothesized, the experiment demonstrated that older adults remembered brands and products in calm commercials better than in arousing commercials, and they also liked calm commercials more. In contrast, younger adults remembered brands and products in arousing commercials better and they liked these commercials more. In addition, (curvi)linear relationships showed that for older adults arousal deteriorates their recall and liking, whereas for younger adults arousal – up to a certain point – is beneficial. These findings strongly suggest that advertising effects found in younger samples are unlikely to be the same for older target groups. An important practical implication is that it currently seems wise to make commercials targeted towards older adults calm instead of arousing when the aim is to generate brand recall and liking.

Keywords: advertising, age, arousal, cognitive aging, sensation seeking, television commercials

1 Introduction

It is widely recognized that older adults are an increasingly important target group for commercial organizations (Ahmad 2003; Moschis 2012; Simcock and Sudbury 2006; Williams, Ylänne, Wadleigh and Chen 2010; C. Yoon, Cole and Lee 2009), which renders insight in this age group much needed. However, research focusing on older consumers and their responses to advertising has

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been surprisingly limited, as several authors have pointed out (e.g., Moschis 2012; Simcock and Sudbury 2006; C. Yoon et al. 2005; H. Yoon and Powell 2012).

One of the unanswered questions is how older adults respond to arousing television commercials. In the current era of advertising clutter, advertisers are increasingly trying to attract audiences by making ‘noisy’ commercials including flashy visuals. However, these features may not be well-suited for older adults’ information processing capacities and preferences. Therefore, the aim of the present study is to examine whether there are differences between older and younger adults in recall and liking of arousing versus calm television commercials.

The study expands the available scientific literature in at least two ways. First, cognitive psychologists and gerontologists have studied age-related changes in memory and cognition for decades (for a review, see, for example, Gutchess 2010; Moschis 2012), but the effects of cognitive aging on the processing of television commercials remain understudied so far (Lang 2006). Although there have been a few empirical studies showing age differences in recall of television advertising (Dubow 1995; Johnson and Cobb-Walgren 1994; Stephens 1982), the current study is unique in its focus on commercials with specific audiovisual production features. Audiovisual production features that generate arousal supposedly have a heightened cognitive load which may constitute a cognitive *overload* for older adults who need to process the message (e.g., Lang 2006). Second, whereas the body of literature on cognitive aging focuses on memory, the present study also examines liking of commercials. Previous studies have shown that older adults hold less favorable attitudes toward advertising than younger adults (Alwitt and Prabhaker 1994; Obermiller and Spangenberg 1998; Shavitt, Lowrey and Haefner 1998; Smit and Neijens 2000), and this study assesses whether these negative attitudes may be caused by television commercials’ boisterous, fast-paced and noisy nature.

The study provides important practical implications for advertisers and advertising agencies who wish to design television commercials that are attractive and effective for older adults. Insights into older adults’ responses to advertising are vital for the industry because older adults constitute a large and lucrative market: The world population is aging (United Nations 2012) and consumers of 50 years and older have more disposable income than younger consumers (Carrigan and Szmigin 2000; Mares and Woodard 2006; Moschis 2012; Williams et al. 2010; C. Yoon et al. 2009; H. Yoon and Powell 2012). The present experiment, which uses real television commercials to add to the external validity of the study, generates recommendations regarding which audiovisual production features to use in television commercials directed at an older

target group. At the same time, the study leads to recommendations on how to produce television commercials that appeal to younger consumers.

2 Theoretical background and hypotheses

2.1 Arousing commercials

The current study focuses on television commercials with audiovisual production features that generate arousal. Arousal is the state of an organism that means alertness, vigor, peppiness, and activation, and ranges from extreme drowsiness to extreme excitement (Humphreys and Revelle 1984; Singh and Churchill 1987; Steenkamp, Baumgartner and Van der Wulp 1996). This arousal is the result of internal and external stimulation. High levels of sensory input are associated with high levels of arousal. Specifically, loud noises, bright lights, time pressure and complex stimuli lead to increases in arousal (Humphreys and Revelle 1984). Therefore, arousal can be elicited by television messages with certain audiovisual production features.

The most studied production feature in this respect is pacing, which is commonly defined as the number of camera changes in a message (Lang, Bolls, Potter, and Kawahara, 1999). Studies found that fast-paced messages elicited both physiological and self-reported arousal (Lang et al. 1999; Lang, Zhou, Schwartz, Bolls and Potter 2000; Lang, Schwartz, Chung and Lee 2004; K. Yoon, Bolls and Lang 1998). In addition, studies have demonstrated that arousal is evoked by audio features such as sound effects, music, and the pace, tone and flow of voices (Grabe, Zhou, Lang and Bolls 2000; Grabe, Zhou and Barnett 2001; Grabe, Lang and Zhao 2003; Husain, Thompson and Schellenberg 2002).

2.2 Age differences in recall of brands and products in arousing commercials

Age differences in recall of elements in arousing commercials are to be expected. Cognitive psychologists and neuroscientists have studied age-related changes in memory and cognition for decades, and age-related impairments in working memory. Long-term memory and processing speed have been well-documented (e.g., Gutchess 2010; John and Cole 1986; Mather 2010; Nielsen and Mather 2011; Salthouse 1996; Salthouse 2009; C. Yoon 1997; C. Yoon et al. 2005). These ‘deficits’ resulting from the deterioration of various bodily (e.g., nervous and sensory) systems have consequences for a person’s ability to pro-

cess information (Moschis 2012; C. Yoon et al. 2009). Age differences in recall have been reported, whereas findings for recognition have been less univocal: This is logical because recall requires more processing resources than recognition (e.g., Craik and McDowd 1987). Therefore we may expect age differences in recall of (particularly arousing) television ads.

The few empirical studies that tested the consequences of this cognitive aging for the processing of advertising indeed found an age-related decrease in cognitive speed (Johnson and Cobb-Walgren 1994) and in recall of normal (Dubow 1995; Johnson and Cobb-Walgren 1994; Stephens, 1982) and time-compressed television commercials (Stephens 1982), and in text descriptions of destinations (MacKay and Smith 2006).

To understand how cognitive aging affects processing of arousing television commercials, that is, commercials with arousal-eliciting audiovisual production features, we turn to theoretical work within communication science that utilizes a limited capacity information processing approach (e.g., Buijzen, Van Reijmersdal, and Owen 2010; Lang 2000). (Audiovisual) Messages have a certain cognitive load, which can be viewed as the cost the viewer needs to pay to process the message (Buijzen et al. 2010; Lang, Chung, Lee, Schwartz and Shin 2005). When the message requires more mental resources than there are available, cognitive overload occurs (Buijzen et al. 2010; Lang, Chung et al. 2005). This means that there are insufficient resources available to process all the information to the level required (Lang 2006). When fewer resources are allocated to processing the message than it requires, the message will not be thoroughly processed and it potentially cannot be retrieved (Buijzen et al. 2010; Lang 2000; Lang 2006).

Processing messages with audiovisual production features that generate arousal requires more cognitive resources than processing messages without such features; in other words, arousing messages have a higher cognitive load (Lang, Chung et al. 2005). This is predicted to cause the automatic allocation of resources to the processing of the information (Lang et al. 1999; Lang et al. 2004), which will improve subsequent message recall (Buijzen et al. 2010). However, arousal may also push the system into cognitive overload when there are not sufficient mental resources available (Lang, Chung et al. 2005), which results in deteriorating message recall (Buijzen et al. 2010). This inverted U-shaped relationship between arousal and performance has also been explained in theories that do not focus specifically on production features in messages, for instance, in Easterbrook's (1959) cue-utilization theory, using the Yerkes-Dodson law (for a review, see Hanoch and Vitouch 2004; Yerkes and Dodson 1908).

Whether arousing commercials enhance recall or not will be different for older and younger adults, because communication research on information processing and age has shown that older adults are different from younger adults in at least four ways (Lang 2006). First, regarding cognitive overload: Research shows that older viewers are more easily overloaded by aspects of arousing messages, such as pacing (Lang et al. 2005) and complex structure, than younger viewers (Lang 2006). When the cognitive system is overloaded, recall decreases (Buijzen et al. 2010). Second, older adults' orienting responses habituate more slowly (Lang 2006). Orienting responses are the first automatic responses that are elicited by the message, and they result in the allocation of mental resources to the processing of incoming messages (Lang, Chung et al. 2005). Production features such as cuts and sound effects elicit these orienting responses (Lang, Chung et al. 2005), but when these orienting responses habituate slowly, arousing messages go 'too fast' and have less chance to be processed. Third, less arousing stimuli elicit greater motivational activation for older people than for younger people (Lang 2006). When older adults are more motivated (automatically or consciously) to process less arousing stimuli, these messages have a higher chance of being remembered. Research indeed shows that older adults spend more cognitive effort on slow-paced messages, and remember them better, than younger adults (Lang, Shin et al. 2005). Fourth, arousing messages may elicit greater aversive activation in older adults than in younger people (Lang 2006). Aversive activation is not about information intake but rather about protection against it (Lang 2006), which means that older adults may be less open to processing arousing messages, resulting in diminished recall.

These characteristics of older adults' information processing warrant the expectation that older adults recall brands and products in calmer commercials better than those in more arousing commercials. For younger adults we can expect that they reach the point of cognitive overload later than older adults, implying that younger adults may remember more brands and products from more arousing commercials than from calmer ones.

Moreover, it is interesting to note that while we expect the proposed age differences in recall mainly because of cognitive aging, they may be intensified by generational differences. Since the formative years of today's younger adults took place in an arousing, fast-paced media environment in which they encounter rapidly shifting images and absorb visual information quickly (e.g., Oblinger, Oblinger and Lippincott 2005; Tapscott 1998, 2008), arousing messages may be more natural to them (Kleemans, Hendriks Vettehen, Eisinga and Beentjes 2014; Tapscott 1998, 2008), which is an additional explanation why arousal

commercials may be recalled better by younger than by older adults. In sum, we present the following hypothesis:

- [H1] The effect of arousal in commercials on recall of brands and products is moderated by age, such that older adults recall more brands and products from calmer commercials than from more arousing commercials, whereas younger adults recall more brands and products from more arousing commercials than from calmer ones.

2.3 Age differences in liking of arousing commercials

Based on the postulation in the previous section that arousing messages may not match older adults' cognitive information processing very well, one may also anticipate that older people appreciate arousing messages less than younger people do (Hendriks Vettehen, Nuijten and Peeters 2008). Potentially, older adults are subtly aware of the quality of their information processing, noticing that the messages go too fast for them to process and that they are missing information, resulting in a negative viewing experience which transfers to their appreciation of the commercial.

An additional reason to predict age differences in liking of arousing commercials is that age groups supposedly differ in their optimal level of arousal. The activation model of information exposure (Donohew, Palmgreen and Duncan 1980) posits that at the optimum level of arousal, people experience activities and stimuli as most pleasant. When an experience is above or below the optimal level, it is perceived as less positive. In other words, at the optimal level of arousal, the audience will like the message most. Zuckerman's (1994) concept of sensation seeking may be helpful in explaining age differences at this optimal level of arousal (Kleemans et al. 2014). Optimal arousal levels are supposed to be related to the individual characteristic of sensation seeking, which is the need for varied, novel and complex sensations and experiences (Zuckerman 1994). Sensation seeking as a trait changes with age: It has been shown to peak in adolescence and the early twenties and to decline with age thereafter (Ball, Farnill, and Wangeman 1984; Steinberg et al. 2008; Zuckerman, Eysenck, and Eysenck 1978; Zuckerman 1988, 1994), suggesting that younger viewers have higher optimum levels of arousal than older viewers (Kleemans, Vettehen, Beentjes and Eisinga 2012).

The motivation that drives sensation seekers to search for and participate in thrill-seeking behaviors extends to their preferences for media and message exposure (Bartsch, Mangold, Viehoff, and Vorderer 2006; Böcking and Fahr

2009; Hasebrink and Popp 2006). Messages with audiovisual production features such as multiple camera changes and suspenseful or intense sound saturation have the greatest potential for meeting the optimal stimulation needs of high sensation seekers (Donohew, Lorch and Palmgreen 1991; Morgan, Palmgreen, Stephenson, Lorch and Hoyle 2003). These features provide a level of stimulation that addresses sensation seekers' need for arousal. In contrast, people who are less prone to sensation-seeking behavior are far less attracted to arousing message features, often preferring calmer content (Donohew et al. 1991).

The notion of optimal level of arousal, as expressed in the activation model of information exposure (Donohew et al. 1980), and age differences in sensation seeking that have been found consistently (e.g., Zuckerman 1994) may imply that, on the one hand, more arousing commercials are above older adults' optimum level of arousal and are therefore not appreciated. On the other hand, younger adults are expected to like more arousing commercials because these commercials approach their need for stimulation.

Again, these age differences may be intensified by generational differences: The younger generation grew up in a fast-paced media environment (e.g., Oblinger et al. 2005; Tapscott 2008), which may make them more prone to like more arousing commercials. In sum, the following hypothesis was formulated:

[H2] The effect of arousal in commercials on liking of commercials is moderated by age, such that older adults like calmer commercials better than more arousing commercials, whereas younger adults like more arousing commercials better than calmer ones.

3 Method

Older and younger adults participated in the experiment. All participants watched the same eight real television commercials, four arousing and four calm ones. Recall of brands and products was measured after the participants had watched all commercials; liking and perceived arousal were measured directly after each commercial.

3.1 Pretest and stimulus materials

A pretest was performed to select eight real Dutch television commercials: an arousing and a calm commercial for four product categories that were equally

Table 1: Description of the eight commercials.

Arousing commercials		
Brand (product category)	Audiovisual production features	Message
<i>Unox</i> (Food)	Camera changes ($N = 87$), upbeat and loud music, sound effects	Unox sausages are typically Dutch
<i>Duo penotti</i> (Sandwich toppings)	Camera changes ($N = 104$), upbeat and loud music, fast-speaking voice-over	Duo Penotti chocolate paste contains the best ingredients
<i>Hi</i> (Phone companies)	Camera changes ($N = 24$), sound effects, fast-speaking voice	Save phone numbers online
<i>Nuon</i> (Electricity companies)	Camera changes ($N = 45$), loud music	Energy saving tips
Calm commercials		
<i>Heinz</i> (Food)	Camera changes ($N = 18$), soft music	Heinz tomato sauce contains healthy tomatoes
<i>De Ruijter</i> (Sandwich toppings)	Camera changes ($N = 7$), soft background music, calm voice-over	De Ruijter chocolate sprinkles are irresistible
<i>Ben</i> (Phone companies)	Camera changes ($N = 15$), calm voice-over	Ben has a lot of advantages for everyone
<i>Eon</i> (Electricity companies)	Camera changes ($N = 10$), no music, only some background noise, calm voice-over (in the last seconds)	Save energy

relevant for younger and older adults. We chose non-risky products that are unlikely to lead to product-induced arousal (Cheong and Kim 2011). The pretest was conducted among 47 older (60–85 years; $M = 66.49$, $SD = 5.32$) and 48 younger adults (18–25 years; $M = 21.54$, $SD = 2.18$). Participants were asked about their involvement with the product categories sandwich toppings, food, phone companies and electricity companies using four items for each product category with a 5-point semantic differential scale (Zaichkowsky, 1994) (for example, “For me sandwich toppings are ... irrelevant-relevant”). All items were averaged to create a single measure of involvement ($\alpha = 0.80$, $M = 3.25$, $SD = 0.58$). The pretest confirmed that there were no differences between older and younger adults in their product involvement, $F(1, 93) = 0.640$, $p > 0.05$, $\eta^2 = .007$, $M_{\text{young}} = 3.20$, $SD = 0.49$, $M_{\text{old}} = 3.30$, $SD = 0.66$). In addition, we measured brand use for the eight brands in the commercials (no (0) or yes (1), overall 34% yes). The pretest showed that the two groups also did not differ with respect to their brand use in the past month ($F(1, 93) = 2.160$, $p > 0.05$, $\eta^2 = .023$, 37% versus 32%).

The arousing commercials contained many camera changes per minute (24 to 104), combined with excited fast-speaking voices, upbeat music, and sound effects. The calm commercials had fewer camera changes per minute (7 to 18), combined with a calm voice-over, and gentle background music or no music. We ensured that the commercials had approximately the same length, around 30 seconds. The commercials were broadcast between 2007 and 2010, and were not being broadcast anymore at the time of the experiment. The commercials did not show people between 20–25 years or people aged 60 years and older (see Table 1 for a description of the commercials).

In the questionnaire, the four arousing commercials and the four calm ones for the different product categories were mixed, meaning that people saw one arousing commercial, then a calm commercial, then an arousing commercial, etcetera. The order in which the commercials were shown was reversed for half of the participants, to check for recency effects on recall. However, there were no differences in recall between the two orders.

3.2 Procedure and participants

The experiment was conducted online.¹ Participants were instructed to watch the commercials only once, and to put the volume at the level they would do when watching television. The introduction to the questionnaire stated that the survey was about appreciation of television commercials; it did not say it was about arousal or recall.

Snowball sampling was used to recruit the participants. Students from several faculties of a university in the Netherlands received an e-mail invitation with the request to fill out the questionnaire, to send it to their peers in their faculty, and to send it to their family members aged 60 and older.² The young group ($N = 34$) thus consisted of students from several faculties of a Dutch university; their mean age was 23.00 ($SD = 1.60$), with a range of 20 to 25 years.

¹ We have no reason to assume that conducting the study online (instead of offline) has generated confounding problems regarding the two age groups. All participants were invited by e-mail and did not experience problems when filling out the questionnaire, which leads us to believe that computer skills did not constitute a systematic difference between the two groups. Moreover, participants watched television commercials that did not contain any characteristics that are specific for online messages.

² We would like to point out that we did not work with a cluster sample. The data are not fully paired as some students invited more than one person, while others did not invite a family member. Moreover, the mean age difference (41 years) between the younger and older participants shows that students did not invite close family members (like parents or siblings).

Of this young group, 16 participants were male and 18 were female. The older group ($N = 32$) consisted of 14 men and 18 women. Their mean age was 64.03 ($SD = 5.40$), with a range of 58 to 78 years.

3.3 Measures

For each commercial, perceived arousal was assessed by using the Self-Assessment Manikin (Bradley and Lang 1994; Morris 1995; Poels and Dewitte 2006). This assessment is a non-verbal pictorial measurement technique, depicting graphic characters that range from calm or sleepy (1) to aroused or excited (9) ($M = 4.54$, $SD = 1.04$). Brand and product recall was measured with an open-ended question at the very end of the questionnaire. Participants were asked to write down the brands and products or services they remembered seeing in the commercials (e.g., Furnham and Price 2006). Free recall indexes the retrieval process, that is, how well a person can retrieve a piece of information without any cues at all (Lang 2000). Per commercial the scores ranged from 0 (when neither brand nor product was remembered), 1 (when brand or product was remembered) to 2 (when both brand and product were remembered) ($M = 1.02$, $SD = 0.42$). For the arousing and for the calm ads, an average recall score was calculated. Liking was measured by asking participants to grade each commercial on a scale ranging from 1 (negative) to 10 (positive). Again, an average score was calculated ($M = 5.84$, $SD = 1.08$). In addition, educational level was asked. Respondents indicated whether their highest completed education was low (not more than junior vocational training), medium (senior vocational training or general secondary education), or high (at least pre-university education).

4 Results

4.1 Manipulation and confound checks

To test whether the arousing commercials were indeed perceived as more arousing than the calm commercials a repeated measures ANOVA was conducted. The analysis showed that the manipulation was successful, $F(1, 67) = 158.95$, $p < .001$, $\eta^2 = .70$. The arousing commercials were perceived as significantly more arousing ($M = 5.49$, $SE = 0.14$) than the calm commercials ($M = 3.59$, $SE = 0.15$).

To control for alternative explanations, we first checked whether the two age groups differed on several background characteristics. The two groups did not differ with respect to gender ($\chi^2(1) = .07, p > .05$), but they did differ with respect to educational level ($\chi^2(2) = 31.52, p < .001$). Educational level was not significantly related to commercial liking ($r = .10, p > .05$), but it was significantly related to recall of brands and products ($r = .32, p < .05$). Therefore, educational level was included as a covariate in the analysis for recall. As we used commercials for different product categories, this was included in the analyses.

4.2 Recall of brands and products

Hypothesis 1 stated that the effect of arousal in commercials on recall of brands and products is moderated by age. To test this hypothesis, two different types of analyses were performed. First, we conducted a repeated measures ANCOVA with arousal (arousing versus calm commercials) and product category as within-subjects factors, age as the between-subjects factor, and level of education as covariate. This analysis showed a significant main effect of age on recall, $F(1, 64) = 35.93, p < .001, \eta^2 = .38$. Overall, older adults remembered fewer brands and products from the commercials ($M = 0.71, SE = 0.07$) than younger adults ($M = 1.31, SE = 0.07$). There was no main effect of commercial type (arousing versus calm) on recall, $F(1, 64) = 1.39, p > .05, \eta^2 = .02$.

In line with hypothesis 1, the repeated measures ANCOVA yielded a significant interaction effect between arousal and age, $F(1, 63) = 10.28, p < .01, \eta^2 = 0.14$. As Table 2 shows, older adults remembered significantly fewer brands and products from arousing commercials than from calm commercials (mean difference = $.20, SE = 0.09, p < .05$), while younger adults remembered significantly more brands and products from arousing commercials than from calm commercials (mean difference = $.25, SE = 0.09, p < .01$). In addition, older adults remembered significantly fewer brands and products from the arousing commercials than the younger adults (mean difference = $.82, SE = 0.11, p < .001$). There was no significant three-way interaction between arousal, age and product category, $F(3, 61) = 1.71, p > .05, \eta^2 = .08$. Thus, these effects held for all product categories, and hypothesis 1 was confirmed.

The second analysis consisted of repeated measures analyses with the mixed-effects models procedure using an unstructured covariance matrix. Here, perceived arousal (instead of the dichotomous distinction between arousing versus calm commercials) was the independent variable which enabled us to test the potential curvilinear relationship between arousal and recall. We

Table 2: Effects of arousing versus calm commercials for younger and older adults ($N = 66$).

	Age group			
	Younger ($N = 34$)		Older ($N = 32$)	
	Arousing commercials	Calm commercials	Arousing commercials	Calm commercials
Brand and product recall*	1.42 ^a (0.33)	1.12 ^b (0.41)	0.62 ^c (0.35)	0.88 ^d (0.49)
Liking of commercials	6.41 ^a (1.19)	5.91 ^b (1.15)	4.95 ^c (1.81)	6.02 ^d (1.24)

Note. Mean scores are presented with standard deviations in parentheses.

* Level of education ($F(1, 63) = 1.283$; $p > .05$) was included as a covariate in the analysis for recall.

^{a, b, c, d} Means with different superscripts in the same row differ significantly in Bonferroni post hoc tests at $p < .05$.

Scale recall: 0 (no brand and no product recalled), 1 (brand or product recalled), 2 (brand and product recalled).

Scale liking of commercials: 1 (negative) to 10 (positive).

searched for the model with the best model fit, based on likelihood ratio tests ($-2\ell\ell$) and the Schwartz Bayesian Information Criterion (BIC). In all models, we controlled for the distinction in arousing versus calm commercials.

Model 1, in which the effect of arousal on recall of brands and products was estimated based on both a linear and a quadratic term, tested the relationship between perceived arousal and recall without including age ($-2\ell\ell = 1198.385$; BIC = 1449.149). Model 2 estimated separate main effects of the two age groups (intercepts), separate interactions of respectively older adults by arousal and younger adults by arousal (linear terms), and the quadratic effects of arousal for the two age groups. Results showed that including age as a factor (Model 2) resulted in a significant improvement in fit over Model 1 ($-2\Delta\ell\ell = -44.947$; $df = 1$; $p < .001$; $\Delta\text{BIC} = -26.14$), indicating that differences between older and younger adults in recall exist.

Subsequently, we searched for the most parsimonious model. Model 3 ($-2\ell\ell = 1180.981$; BIC = 1438.014), in which only the linear and quadratic terms were estimated separately for the two age groups, whereas the intercepts were defined as invariant, did not show improvements in model fit over Model 2. In Model 4 ($-2\ell\ell = 1191.317$; BIC = 1442.081), only the effects of the quadratic terms were estimated separately for older and younger adults; intercepts and linear terms were constrained to be invariant among the two age groups. Again, the -2 log likelihood test and the BIC Criterion did not show an improvement of model fit compared to Model 2. We therefore discuss Model 2 here.

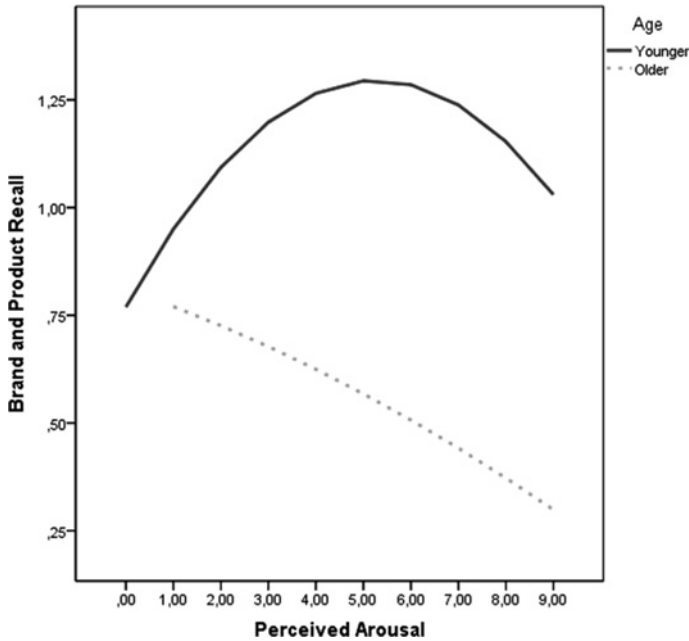


Figure 1: Predicted means brand and product recall by arousal among older adults (Recall = $.805507 \times -.038114\text{arousal} \times -.002083\text{arousal}^2 \times .101445 \times .5$) and younger adults (Recall = $.764157 \times .200013 \text{ arousal} \times -.019003\text{arousal}^2 \times .101445 \times .5$).

Figure 1 displays the effects as found in Model 2. The parameter estimates of Model 2 did not show a curvilinear relationship between perceived arousal and recall for the older adults ($\beta = -.002$; $p > .05$). As shown in Figure 1, for older adults, increasing the level of arousal decreases their recall. For younger adults, we did find a curvilinear relationship ($\beta = -.019$; $p < .05$): Younger adults' recall improved with increasing levels of arousal, up to a certain point after which their recall of brands and products decreased. In all, this analysis provides additional support for the first hypothesis: For older adults, arousal deteriorates their recall, whereas for younger adults arousal – up to a certain point – is good for their recall.

4.3 Liking of Commercials

The second hypothesis held that the effect of arousal in commercials on liking of commercials is moderated by age. Again, we performed two analyses. The first analysis, a repeated measures ANOVA with arousal and product category

as within-subjects factors and age as between-subjects factor, showed a significant main effect of age on ad liking, $F(1, 64) = 6.99, p < .05, \eta^2 = .10$. Older adults showed less liking of commercials ($M = 5.49, SE = 0.18$) than younger adults ($M = 6.16, SE = 0.18$). There was no main effect of commercial type (arousing versus calm) on liking, $F(1, 64) = 3.90, p > .05, \eta^2 = .06$.

With respect to the second hypothesis, the analysis indeed showed an interaction effect between arousal and age, $F(1, 64) = 29.60, p < .001, \eta^2 = .32$. As expected, post hoc analyses showed that older adults liked the calm commercials significantly more than the arousing commercials (mean difference = 1.07, $SE = 0.21, p < .001$), whereas younger adults liked arousing commercials significantly more than calm commercials (mean difference = .50, $SE = .20, p < .05$, see Table 2). Also, older adults liked the arousing commercials significantly less than the younger adults (mean difference = 1.46, $SE = 0.29, p < .001$).

The analysis also showed a three-way interaction effect between arousal, age and product category, $F(3, 62) = 6.99, p < .001, \eta^2 = .25$. The results demonstrated that for the product categories food, sandwich toppings and phone companies the interaction effects were as expected (older adults liked the calm commercials more, whereas young adults liked the arousing commercials more). However, for electricity companies the interaction effect between arousal and age was not significant ($p > .05$). For this category, older adults liked the arousing and the calm commercial equally; this also held for the younger adults. Thus, hypothesis 2 was confirmed for three of the four product categories.

Again, the second analysis consisted of repeated measures analyses with the mixed-effects models procedure using an unstructured covariance matrix. Using perceived arousal (instead of the dichotomous distinction between arousing versus calm commercials) as the independent variable sheds further light on the expectations as formulated in hypothesis 2.

We started to define a basic model, testing the linear and quadratic effects of arousal on liking (Model 1: $-2\ell\ell = 2049.350$; BIC = 2300.114). Model 2 (with separate intercepts, linear terms and quadratic terms for both age groups) was a significant improvement in model fit over Model 1 ($-2\Delta\ell\ell = -27.682$; $df = 1$; $p < .001$; $\Delta\text{BIC} = -8.875$). Age is thus an important moderator in the relationship between perceived arousal and liking of commercials. Again, Model 3, in which intercepts were constrained to be invariant ($-2\ell\ell = 2155.702$; BIC = 2412.735), and Model 4, having invariant intercepts and linear terms ($-2\ell\ell = 2155.713$; BIC = 2406.477), deteriorated the model fit compared to Model 2. We may thus conclude that Model 2 is the preferred model.

As displayed in Figure 2, Model 2 shows a curvilinear relationship between arousal and liking for both older ($\beta = -.057$; $p < .01$) and younger ($\beta = -.087$;

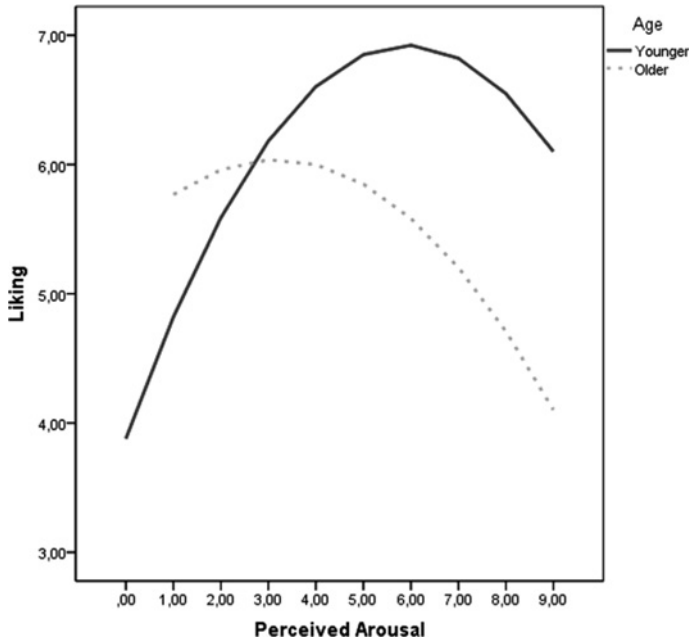


Figure 2: Predicted means liking by arousal among older adults ($\text{Liking} = 5.484226 \times .362448\text{arousal} \times -.057081\text{arousal}^2 \times -.420422 \times .5$) and younger adults ($\text{Liking} = 3.899285 \times 1.028587\text{arousal} \times -.086853\text{arousal}^2 \times -.420422 \times .5$).

$p < .001$) adults. For both groups, liking of commercials increases with increased arousal up to a certain point, after which liking decreases. Importantly, in line with the second hypothesis, Figure 2 shows that the level of arousal at which liking reaches its maximum (i.e., the optimal level of arousal) is lower for older than for younger adults. Moreover, older adults' highest level of liking is lower than younger adults' highest level.

5 Discussion

5.1 Conclusion and theoretical implications

The aim of this study was to examine whether there are differences between older and younger adults in the recall and liking of arousing television commercials. The study led to new findings. Arousing television commercials seem to be less effective for older adults than for younger adults. Older adults showed

less recall of brands and products portrayed in arousing commercials compared to calm commercials and compared to younger adults. Moreover, they liked the arousing commercials less than the calm commercials and less than the younger adults did. For younger adults, the results were the other way round: Arousing (versus calm) commercials led to better recall and more liking.

In addition, we related the perceived arousal scores to both recall and liking. For older adults, this analysis revealed a linear effect of arousal on recall and a curvilinear effect on liking, showing that arousal deteriorates recall and that only low levels of arousal increase liking. For younger adults, curvilinear relationships between perceived arousal and both recall and liking demonstrated that arousal – up to a certain point – is beneficial.

For recall, these findings are in line with our expectations, based on a limited capacity information processing approach (e.g., Buijzen et al. 2010; Lang 2000, 2006). The findings for recall among the older group are in agreement with the notion that television commercials with specific audiovisual production features elicit arousal, which causes cognitive overload for older adults. The findings also provide support for the prediction that for younger adults cognitive overload commences at higher levels of arousal compared to older adults. The results for liking supported the expectations about the existence of optimal levels of arousal, as expressed in the activation model of information exposure (Donohew et al. 1980): Indeed, the level of arousal at which liking reaches its maximum (i.e., the optimal level of arousal) was lower for older than for younger adults.

Moreover, the study strongly suggests that it is necessary to take age into account when studying responses to advertising. Age differences in advertising effects, and theoretical models explaining these differences, are not often considered in advertising studies. The present study provides empirical support for such differences, which suggests that advertising effects found in younger samples (e.g., Furnham and Price 2006; Gunter, Tohala and Furnham 2001), are unlikely to be the same for older target groups.

5.2 Practical implications

So what do these results imply for advertisers and advertising agencies who aim to design effective and appealing television commercials? First of all, the study suggests that the age of the target group should be an important consideration when designing commercials because age matters for the effects that commercials with certain production features have on recall and liking of commercials. Subsequently, when targeting older adults, it currently seems wise to

design commercials that are calm and not arousing: A large number of camera changes, sound effects, loud upbeat music or overly excited voices do not seem to be beneficial. Older adults appear to be better able to process calmer commercials, and also appreciate them more. Although advertising clutter is increasing and advertisers may feel they have to attract attention by making fast-paced and arousing commercials, the results of this study show that this may not be effective for older adults.

When targeting younger adults, arousing commercials appear to be more effective than calmer ones: They lead to higher recall scores and more appreciation. This implies that commercials for younger adults should contain more camera changes, sound effects, loud music or fast-speaking voices – compared to commercials aimed at older adults – as this type of commercial fits younger adults' need for arousal and can attract their attention amidst other commercials. However, producers should be cautious in applying this strategy: Too much arousal is not beneficial for young viewers either.

When targeting a broader age group, including both older and younger adults, advertisers may consider creating two versions of the same commercial: A calmer commercial for the older group and a more arousing commercial for the younger group. Effective media planning should make sure that the calmer commercial is placed around programming that reaches older adults, whereas the arousing commercial should be placed around programming popular among younger target groups.

5.3 Limitations and future research

First, this study focused on recall, which is a frequently used measure of memory. In research on the processing of audiovisual media messages, three subprocesses that lead to memory are often discerned: encoding, storage and retrieval, with, respectively, recognition, cued recall and (free) recall as the outcome measures (e.g., Lang 2000). The current study measured (free) recall of brands and products, and thus focused on the end result of the last process. This focus on recall was a logical first step, because recall requires more mental resources than recognition (Craik and McDowd 1987) and therefore particularly for recall age differences were expected. As the clear empirical findings in the present study suggest that this is a fruitful path of research, future studies should also measure recognition and cued recall in order to understand more precisely how cognitive aging impacts the processing of arousing commercials.

Second, the main focus in the present study was on the role of arousal in explaining age differences in recall and liking. As the results were in line with

the expectations, support for the importance of arousal in this regard was provided. However, arousal is not the only factor that may explain differences between older and younger adults in processing and liking of television commercials. In particular, motivation and goal-setting are of interest here (e.g., Carstensen, Isaacowitz and Charles 1999; Castel 2007; Lang 2006). There is a large body of research that shows that older adults clearly have different goals relative to younger adults (e.g., Carstensen et al. 1999; Castel 2007). Importantly, these motivational differences affect which information is important for people and therefore which information they remember and like (Castel 2007; Fung and Carstensen 2003; Van der Goot, van Reijmersdal and Kleemans 2015). Interestingly, it has been put forth that as people age they are increasingly selective: They increasingly prioritize the information that has value to them and remember specifically this information (e.g., Castel 2007). Therefore, future research should delve more into the question how age differences in goal setting and in selecting information affect their recall and liking of television commercials.

Third, the results for liking are in line with predictions derived from Zuckerman's (1994) concept of sensation seeking. However, as sensation seeking as a trait was not measured among the participants, future research is needed to test whether the age differences were indeed caused by this factor.

Fourth, it may be possible that not life-span explanations, specifically cognitive aging and a heightened need for sensation seeking in a certain developmental stage, but generational differences are the major principle behind the reported age differences. In contrast to older adults, the current generation of young people has been raised in a fast-paced, arousing media environment where they encounter rapidly shifting images, absorb visual information quickly and are easily bored (e.g., Oblinger et al. 2005; Tapscott 2008). Longitudinal research is called for to examine whether the differences between age groups that we currently found still hold in the future when there will be cohorts of older adults who will have had decades-long experience with this fast-paced media environment.

Acknowledgments: We would like to thank Bastian Brouwers and Stefan de Waal for their contributions to the main study and the pretest.

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