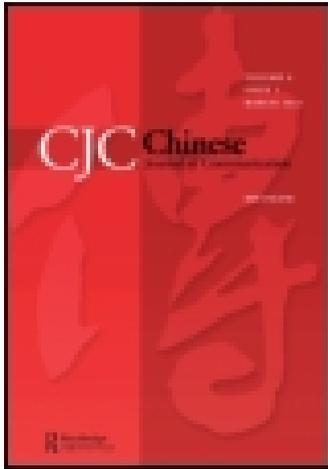


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The moderating effect of imagery ability on perceived vividness: the case of HPV vaccine advertising in China

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This research investigates the effects of the relationship between imagery ability and pictorial appeal on vividness perception, free recall, and attitude. To investigate the potential effects of HPV vaccine advertising in mainland China, we conducted an experiment using a sample of 147 college female students who were randomly assigned to treatment and control groups. The results of the analyses showed that pictorial appeal and imagery ability exerts a joint impact on vividness perception, recall, and attitude. The subjects with high-imagery ability perceived more vividness when pictorial appeal was absent, whereas the cognitive performance of the subjects with low-imagery ability was mainly enhanced by pictorial presence. We found that whether a message was perceived as vivid or not was more a function of imagery ability than an attribute of the message. In addition, the findings indicated that vividness perception mediated this moderating effect. The implications for health communication theory and education are discussed.

Keywords: HPV vaccine advertisement; health communication; health promotion; vividness effect; recall; dual coding theory; imagery ability

Introduction

Advertising and consumer behavior research has shown that pictures accompanied by textual discourse are more conducive to comprehension than texts without pictures because the memory of pictures tends to evoke multiple retrieval routes in the individual's schemata (e.g., Dan & Ihlen, 2011; Lutz & Lutz, 1978; Unnava & Burnkrant, 1991). Visual clues, therefore, are often adopted to improve vividness perception (Keller & Block, 1997). Previous studies showed that subjects with high self-efficacy paid more attention to a message about protection from skin cancer when it was presented in color and accompanied by a photograph. Similarly, subjects gave more donations to charity when the message was pictorially vivid than did those who received text-only stimuli (Keller & Block, 1997; Smith & Shaffer, 2000). However, whether pictorial addition guarantees fulfillment of persuasive goals remains uncertain (Brosius & Bathelt, 1994; Coyle & Thorson, 2001; Small & Loewenstein, 2003). One reason is the lack of research on the theoretical mechanisms that cause the observed effect. Similarly, no consensus exists on the reason that pictorial superiority fails to occur as expected.

However, there is considerable scholarly agreement that the mental processing of incoming messages is heavily dependent on the availability and use of cognitive resources. Hence, the optimal allocation of resources by message recipients and the

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demand for cognitive resources for messages play a central role in determining the ability and indeed the willingness of individuals to engage in mental processing (Lang, 2000). Since total cognitive endeavor is finite and temporally constricted, sub-processes (e.g., those that facilitate comprehension, storage, and retrieval) are often evoked to circumvent problems that stem from resource deficiency. According to this view, pictures have advantages over texts because visual vividness leaves less to the imagination and more to the satisfaction of the viewer than written texts do (e.g., Chien & Chang, 2012; Weert et al., 2011). Resource compensatory devices, such as visual vividness, not only enable assertions of pictorial superiority, but also, and more importantly, draw academic interest toward the microelements in the relationship among vividness perception, imagery ability, and recall.

On the other hand, few studies have focused on issues regarding the promotion of human papillomavirus (HPV) vaccination in China because the official permit for its implementation among the population is still pending. However, in mainland China, about 360 women are diagnosed with HPV-related diseases daily, and 30,000 women die annually from the infections, HPV 16 and 18 (Yu, 2014). Despite its urgency, there is little public awareness about this problem, especially among the population of educated youth. However, the social aspects of HPV in China have been examined from different perspectives. These include, but are not limited to, promotion and education, access to information, public acceptance, genotype distribution (Dempsey, Abraham, & Dalton, 2009; Feng, Xu, Jin, & Yao, 2012; Shen et al., 2013), pro- and anti-vaccination messages in media content (Nan & Madden, 2012), general attitudes (Friedman & Sheppard, 2007), and between-media differences (Nan & Madden, 2012). The aim of this study is to determine if and how messages containing different attributes of vividness influence the perceptions of users regarding health promotion (McGill & Anand, 1989; Taylor & Thompson, 1982).

Literature review, hypotheses, and research questions

Limited capacity and resource matching perspectives

Following the cognitive miser tradition in social psychology research (Fiske & Taylor, 1984), the limited capacity model (LCM) posits that information processing takes place in phases from attention to attrition and systematically connects encoding, storage, and retrieval (Lang, 2000; Shiffrin & Schneider, 1977). Based on the assumption that individuals tend to adopt various information processing strategies with the goal of maximize the efficiency of their otherwise limited mental resources, the model emphasizes the automaticity of processing and a specific route of encoding that allows the minimal consumption of cognition labor. In other words, regardless of whether a message stimulus is vivid or not, cognitive elaboration is likely to take the route that promotes relative ease of mind. When instantaneous processing is a priority (which is most of the time), the attributes of message may accelerate thinking through either effort reduction (e.g., shortcuts, cues, stereotypes, or heuristics), effort enhancement (e.g., vividness, appeal, focus, etc.), or both.

On the other hand, the resource-matching perspective emphasizes elaboration-task correspondence, arguing that insufficient resources lead to impoverished message processing and excessive resources undermine processing (Kisielius & Sternthal, 1984). In the former situation, encoding tends to be clouded by inattention

to the vital features of the message and in the latter case, encoding is likely to be flooded by counterarguments or irrelevant associations (Martin, Sherrard, & Wentzel, 2005). Although both perspectives concern the optimized allocation of resources, neither clearly distinguishes between words and pictures as stimuli and their different effects on perception.

Contrary to findings that images are more easily and spontaneously absorbed than words are, research has shown that pictures could distract attention from verbal items, particularly when they are overabundant (Roelofs, Piaai, & Schriefers, 2012; Unnava & Burnkrant, 1991). Although appealing to intuition, the distraction problem identified by the word-picture mutual interference model has been qualified. Previous studies found that picture-word distraction was significantly mitigated if the two stimuli were highly consistent (Houston, Childers, & Heckler, 1987). This leads to the question of whether distraction or its reduction strategies are purely an objective property of the message or are subject to the reception process. One way to address this question is to investigate how imagery ability at the information processing end and pictorial appeal at the message end are bridged by the vividness of the message. Based on the claim that pictures are a well-established predictor of imagery elicitation (Bugelski, 1983), this study examines and tests relevant sources of imagery arousal and the conditions that promote its effect.

Image vividness

Variance in mental images evoked by verbal or textual information is mainly a function of an individual's predisposition to visualize and the extent to which the information is perceived as vivid – that is, worth visualizing (Jiang & Wyer, 2009). Factors such as consistency and narrative display are often considered in theoretical explanations of the interplay between pictures and verbal information (Adaval & Wyer, 1998; Wyer, Huang, & Jiang, 2008). In that connection, a pictorially presented message is deemed more vivid than one that lacks an “attention-grabbing” visual clue (Keller & Block, 1997; Smith & Shaffer, 2000). In their seminal study, Nisbett and Ross (1980) developed a set of vividness criteria as operational measures of the way recipients disproportionately allocate attention to vivid content during encoding, thus inducing enhanced memorability. Information is typically seen as vivid when it is “(a) emotionally interesting, (b) concrete and imagery-provoking, and (c) proximate in a sensory, temporal, or spatial way” (Nisbett & Ross, 1980, p. 45). However, many studies have demonstrated that merely presenting an image does not necessarily improve recall or change perceptions and attitudes, especially in comparison with purely verbal message (Tukachinsky, Mastro, & King, 2011).

Based on similar findings in health communication and advertising research, a vivid message alone does not achieve the expected persuasion effect unless it occurs in combination with self-efficacy, interactivity, or distinctiveness in pictorial and verbal components or some combination of these conditions (Chang & Lee, 2010; Coyle & Thorson, 2001). Although vivid messages could attract heavier input of cognitive effort, compared with lighter ones, the process might result in lower persuasiveness and memorability if, according to the limited capacity model, the bulk of the mental resources available has been consumed to process the message at the expense of message-relevant items (Frey & Eagly, 1993).

Dual coding theory and imagery ability

A picture is only as good as the visual stimulus that raises the type of picture-like encoding known as the imagery response, which constitutes one, perhaps the initial, stage of the subsequent process of imagery arousal. Previous studies on verbal and visual redundancy tended to distinguish between consonance and dissonance, which were sufficient to warrant separate theorizing. Moreover, little has been said about the moderating mechanisms of imagery processing. Therefore, imagery ability, one of the seven human mental abilities in processing sensory inputs (Neisser & Kerr, 1973), is given an essential place in our conceptual model, as part of the information-processing strategies that individuals adopt when they receive a verbal stimulus that is accompanied by the visual stimulus of pictures.

Following the dual coding theory (DCT), which treats visual and verbal representations as distinct but equal forms of sensory input (Paivio & Csapo 1973), we closely examine the three stages of encoding, storing, and retrieving in dual coding processes to determine the different effects of verbal and visual stimuli. Although a particular code is at risk of being forgotten at the time of verbal recall, the dual coding process works to cement the general relationship among coding, storing, and retrieving in both the referential and the association stages. In keeping with this theoretical approach, we argue that the stronger the ability to build mental connections between visual and verbal representations, the higher the chance of cognitive elaboration. Even in situations where the initial imagery response to sensory input is identical across individuals, it is still conceivable that the ensuing association with the existing verbal/visual schemata could vary from individual to individual. This was confirmed by the results of an experiment that tested imagery ability across tasks, in which researchers found sufficiently distinct clusters of sub-abilities among subjects, concluding that mental imagery ability is not an undifferentiated, general skill.

Vividness perception

Previous studies added pictures to texts in order to induce imagery arousal and enhance vividness (e.g., Nisbett & Ross, 1980; Taylor & Thompson, 1982). However, the results have been mixed, partly because a visual stimulus capable of eliciting an imagery response constitutes only one stage of the subsequent imagery arousal process (Shepard, 1967). Therefore, the effect of a vivid visual message should be seen as the joint outcome of the addition of pictures to the stimulus and the imagery elaboration that it evokes.

The relationship between perceived vividness and its combined source of influence (i.e., imagery ability and pictorial presence) is more complex than the surface logic described above. First, perception is structurally confined within and intimately tied to incoming stimuli (in this case, text with picture). That is, vividness perception cannot be completely free from the target of perception, at least initially (MacInnis & Price, 1987). Second, by free association, subsequent mental representations of the picture could depart from the source image. In other words, imagery involves “a concrete sensory representation of ideas, feelings, and memories and it permits a direct recovery of past experiences” (MacInnis & Price, 1987, p. 474). Third, individual differences in imagery strength also play a role in imagery processing across four dimensions: imagery ability,

imagery content, spatial ability, and imagery versus verbal processing styles. Fourth, imagery ability moderates the relationship between imagery processing and emotional arousal (Swann & Miller, 1982).

If the notion of pictorial superiority is the baseline, then an individual's imagery ability is a contingent condition for perception. Because a main function of vivid messages is to achieve emotional arousal on the part of the decoder, it is possible that the more vivid a message is, the more likely it is that processing is immediate and deep, resulting in a positive interaction effect. A key assumption underlying vividness perception is that individuals with high-imagery ability more easily forge mental pictures in their minds, compared with those whose imagery ability is low, when both are exposed to the same verbal stimulus (Marks, 1973). As the DCT predicts, imagery ability can be pertinent to the effect of visual vividness. Hence, it is possible that high-imagery ability predisposes perceivers to an advantageous elaboration condition, compared with those with low-imagery ability. This condition, in turn, moderates the perceived vividness of visual presentations. Figure 1 shows a flow chart of the cognitive process, with imagery ability as a predictor.

The ease with which verbal and visual codes are formed can increase the likelihood of retrieval via alternative associative routes in memory (Anderson & Reder, 1979). An individual with high-imagery ability may be able to transfer a verbal presentation into visual coding in the absence of visual stimuli or may encode the visual representation into the verbal system more quickly than a low-imagery ability individual could. The latter, in contrast, are only able to construct referential connections when both verbal and visual presentations are presented simultaneously. This means that an individual with low-imagery ability needs to channel a greater number of cognitive resources in building referential connections. When imagery-arousing cues (non-visual vividness) are absent, it is reasonable to infer that those with high-imagery ability will respond with greater perceptions of vividness.

H1: Imagery ability and pictorial addition have an interactive effect on an individual's perception of vividness. Specifically, individuals with high-imagery ability perceive more vividness than those with low-imagery ability after exposure to a message without pictorial appeal, whereas individuals with low-imagery ability perceive greater vividness after exposure to messages with pictorial appeal.

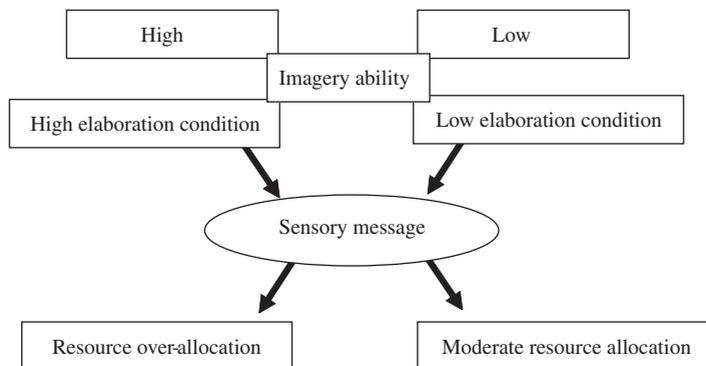


Figure 1. The cognitive process associated with imagery ability.

Recall

Researchers studying vividness and recall have tended to regard pictorially presented messages as more vivid than others are (Bywaters, Andrade, & Turpin, 2004). When stimuli are presented in word-picture pairs, imagery can substantially enhance memory (Bower, 1972). In their marketing research, K. A. Lutz and R. J. Lutz (1978) found that ads equipped with visuals are significantly more conducive to remembering product-related information, including brand name and other attributes of the product, than those without visuals are. However, in situations where pictures are presented with irrelevant verbal items or when pictures are combined with highly imaged verbal information, a vivid message may be difficult to recall because of its potential clash with the individuals existing memory or knowledge (Smith & Shaffer, 2000).

Nonetheless, most empirical results supported the availability hypothesis, which states that vivid messages are more easily located and accessed in cognitive processes, including memory (Kahneman & Tversky, 1972, 1973). As shown in Figure 1, in situations of excessive elaboration, high-imagery ability actually facilitates the retrieval of verbal codes. Hence, focal attention is pivotal in determining whether incoming information enters and resides in short- or long-term memory (Moorman, Willemsen, Neijens, & Smit, 2012).

H2: Imagery ability and pictorial addition have an interactive effect on free recall. Individuals with high-imagery ability will have greater free recall than those with low-imagery ability, after exposure to a message without pictorial appeal, whereas individuals with low-imagery ability have greater free recall after exposure to messages with pictorial appeal.

The results of previous studies suggested that visualizers tend to be preoccupied with the visual elements of messages and pay less attention to textual clues. Even in a highly consistent visual-verbal context, not all elements of the picture are related to the central verbal claim of the message (Joseph & Thompson, 2004). This is one the reason that we divide recall into pictorial and verbal categories with the objective of discovering which part of the message will be remembered best in communications containing both clues.

RQ1: Do imagery ability and pictorial appeal have separate interactive effects on verbal and visual recall when individuals are exposed to pictures?

Favorable attitude

We adopt a set of advertisements as carriers of vivid versus non-vivid messages. First, we examine product/brand attitude, particularly with regard to consumers' evaluations of the ability of the product to satisfy their needs (Percy & Rossiter, 1997). Although vividness may not directly influence attitude, mental associations with visual stimuli and positive evaluations could enhance consumers' favorable attitudes toward the product and the brand (Rossiter & Percy, 1978). Research also found that pictures accompanied by verbal information enhanced both learning and attitude (Rigney & Lutz, 1976).

H3: Imagery ability and pictorial addition have an interactive effect on the individual's favorable attitudes toward a product brand. Individuals with high-imagery ability hold more favorable attitudes toward a product brand than those with low-imagery ability,

after exposure to a message without pictorial appeal, whereas low-imagery ability individuals hold attitudes that are more favorable after exposure to a message with pictorial appeal.

Mediating role of vividness perception

The heuristic processing theory suggests that people tend to make judgments based on what they have stored in memory and its ease of retrieval (Chaiken, 1987). Vivid messages help to evoke a rich associative path in cognitive elaboration, thus producing a disproportionately higher effect on people's judgment. Given the predictive power of imagery ability on vividness perceptions, as well as its connections with attitudes, we expect that it mediate the relationship between individual differences and their favorable attitudes. We deduce that if vividness is perceived by subjects, then the positive affective tendency evoked can be seen as a visual reinforcement that mirrors positive attitudes.

RQ2: Does vividness perception mediate the moderating effect of imagery ability and pictorial appeal on free recall?

RQ3: Does vividness perception mediate the moderating effect of imagery ability and pictorial appeal on favorable attitude?

Method

Research design

A 2 (high vs. low-imagery ability) \times 2 (pictorial vs. non-pictorial) experiment was designed using the case of HPV vaccine promotion advertisements. A total of 147 undergraduate female students from Shenzhen University in southern China were chosen as subjects. They shared similar backgrounds in terms of age, gender, educational level, and socioeconomic status. The relatively small sample is justified because our study is theoretical rather than data-driven (Calder, Lynn, & Tybout, 1981). The subjects had no prior knowledge of HPV vaccine, which excluded potentially confusing and confounding factors, such as preexisting attitudes that could moderate information processing (Krieger & Sarge, 2013). Social norms and perceived severity were designed as covariates to control variables. It is noteworthy that female college students make up the lion's share of the vaccine market (Licht et al., 2010).

Stimuli development

Verbal stimuli

An A4-sized advertisement of HPV vaccine as a remedy for the negative consequences of HPV infection was designed to manipulate message attribute. The information in the pamphlet resembled the actual brochures disseminated by the Cervical Screening Program of the Hong Kong government from the website www.hpv.com.hk¹. The text comprised five short sentences regarding knowledge about HPV and the HPV vaccine, which were presented in either a pictorial or a non-pictorial version (e.g., "cervical cancer is the second most common cancer after breast cancer suffered by females and is mainly caused by HPV infection" and "four HPV types, 6, 11, 16, 18

can cause diseases, such as cervical cancer, vaginal cancer, vulva cancer, and genital warts”). Each item was embedded in text calling for “take action together.” The information was designed to advocate the vaccine brand because the “valence” of the message, which is the level of consistent favorableness of the available information, could affect the persuasive effect of vividness (Kisielius & Sternthal, 1984). All contrary arguments were removed.

Visual stimuli

Based on previous research and the intention to maximize variance, vividness was manipulated by contrasting the pictures and the text, instead of comparing a vivid picture with a less vivid one, to describe the negative impact of HPV infection and the efficacy of vaccines (Keller & Block, 1997). Consistent images were adopted in order to enhance the distinctiveness of vividness because it was established that the facilitative effect of pictures derives from their interactive nature, which improves paired associate learning and free recall (Bower, 1972; Lutz & Lutz, 1978; Neisser & Kerr, 1973). The two pictures in the vivid version were chosen from Hong Kong’s official website (<http://www.hpv.com.hk/chi/index.html>).

To test the imagery-arousing function of an interactive image, a pretest was given, in which the participants were asked to use a 7-point scale (“totally disagree/agree”) to grade the statement that it is easy to picture/imagine the information presented in the ads (for a review of similar manipulations see Keller & Block, 1997). The two items correlated significantly ($r(137) = .782, p < .01$). None of the 20 female sophomore students that participated in the pretest had prior exposure to HPV vaccine or any relevant knowledge of it. They were recruited from the Department of Communication at Shenzhen University with the help of a faculty member of that department. The results showed that the pictorial version had more imagery-arousing/visual vividness than the text-only version did ($M_{low} = 2.45$ vs. $M_{high} = 4.13$), $F(1,142) = 99.26, p < .001$.

Procedures

In addition to the advertisement, two questionnaires concerning imagery ability and dependent variables were distributed. To avoid priming effects, the subjects completed the ability test first. The subjects then were exposed to the advertisement for four minutes before being asked to answer the post-questionnaire. The subjects were randomly assigned to either of the two advertising versions, and each subject only saw one version.

Measures

Imagery ability

The Vividness of Visual Imagery Questionnaire (VVIQ) was used to measure imagery ability (McAvinue & Robertson, 2007). Previous research showed that VVIQ has been widely used to measure imaging capacity (Bensafi & Rouby, 2007; Campos, Chiva, & Moreau, 2000). It was also found that VVIQ is highly reliable and is less affected by social desirability biases (Richardson, 1991). This questionnaire combines 16 separate

items describing different situations and asks the respondents to imagine what has been described, and then use a 5-point scale to rate whether the mental images formed in their minds were clear or not (from 1 “no image at all” to 5 “perfectly clear”) (Marks, 1973). For instance, the first question asks respondents to “think of some relative or friend whom you frequently see (but who is not with you at present) and consider carefully the picture that comes before your mind’s eye” (Marks, 1973, p. 20). The range of possible scores is from 16 to 80, where higher scores indicate higher imagery capacity. An existing Chinese version used by several other researchers in previous studies was modified for application in this study (Chen, Pan, & Cui, 2007).

Vividness perception

Eight frequently utilized items were selected (Chang & Lee, 2010; Joseph & Thompson, 2004): (i) The advertisement caught my attention; (ii) The message contains many details; (iii) The message is specific; (iv) The message is certain; (v) The advertisement could arouse my emotions; (vi) The message is relevant to me; (vii) The message is vivid; and (viii) The message is understandable (Cronbach’s $\alpha = .814$, $M = 30.87$, $SD = 7.517$, $Min = 11$, $Max = 49$).

Favorable attitude

Four dimensions – importance, efficiency, worthwhile, and beneficial – were selected to measure favorable attitudes to accompany the six items on HPV: (i) The vaccine injection is important to me; (ii) The vaccine could reduce risks of affecting HPV; (iii) The injection is worth taking; (iv) It is beneficial for me to get the injection; (v) It is effective in protecting against cervical cancer; and (vi) The vaccine is important in reducing the risks of contracting HPV” (Cronbach’s $\alpha = .917$, $M = 29.09$, $SD = 6.548$, $Min = 11$, $Max = 42$).

Recall

Three types of recall were identified in advertising research: unaided/free recall, product-category-aided recall, and brand/product-aided recall. Free recall was collected because, compared with aided recall, they represented a high level of elaboration (Ritchey, 1980). Unaided recall of the single HPV ad content was examined in the first part of post-test, in which subjects were asked to write down as many claims in the printed ads as possible, whether verbal items or visual pictures. The researcher checked all written answers to derive a coding scheme. Forty random samples from the pictorial group were chosen as two independent coders of inter-coder reliability. The percentage of agreement was calculated: verbal recall ($\alpha = .99$), pictorial recall ($\alpha = .98$), total correct recall ($\alpha = .94$), and total incorrect recall ($\alpha = .99$). The coding scheme then was confirmed, and the same coders re-coded all data to assign one point to each correct answer. The total numbers of correct content items of both verbal statements and interactive pictures were calculated. The calculation of percentage of compliance was as follows: verbal recall .98, pictorial recall .98, and total correct recall .96.

Covariates

In order to control potentially confounding variables, additional information, including previous product experience, preexisting history of HPV, and social norms, responses to questions such as “Have you ever heard of HPV or the vaccine before?” “Have you ever had a HPV vaccine injection or shot?” were collected in the first questionnaire. Eighty-five percent of the subjects responded “No” to the first question, and 100% responded “No” to the second question, “Have you ever had a HPV vaccine injection or shot?”

Results

Because the path analysis in AMOS (Version 22) requires no missing values, only 132 of 147 total questionnaires were included. In preparation for the path analysis, which allows the formulation of a unified model that includes both moderation and mediation effects (Edwards & Lambert, 2007), we first categorized the median split ($M = 58$) of imagery ability ($SD = 8.86$, $Min = 36$, $Max = 76$) into “high” and “low” imagery ability, which resulted in 69 participants in the high-imagery ability group and 63 in the low-imagery ability group, which is consistent with the majority of VVIQ research that adopted the median split (Bensafi & Rouby, 2007; Nouchi, 2011; Piira, Hayes, Goodenough, & von Baeyer, 2006; Schneider, Healy, & Steinhart, 1996).

Five thousand re-samples were selected for bias correction and accelerated bootstrapping as well as maximum likelihood test for discrepancy. Figure 2 shows the model of variables in this moderated mediation effect and the obtained results. In this model, “pictorial appeal” represents the two types of message (words with and without pictures) in advertisements, and “imagery ability” refers to two groups of subjects (high vs. low-imagery ability). “Interaction” is the computed product of “pictorial appeal” multiplied by “imagery ability.” H1 is directly presented in the path “Interaction → Vividness perception,” while H2 and H3 are separated in the regression path “Interaction → Vividness perception → Favorable attitude” and “Interaction → Vividness perception → Recall.” The model highlights the role of

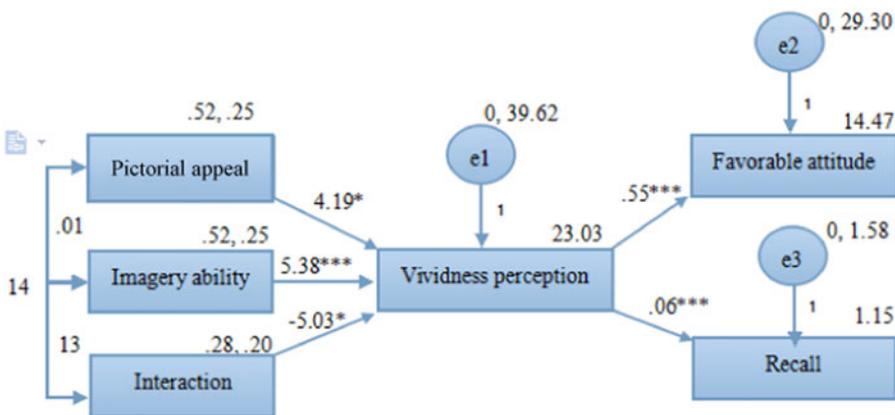


Figure 2. Path analysis of imagery ability and pictorial appeal condition on perceived vividness, favorable attitude and recall (n = 132).

Table 1. Regression weights: default model.

Paths	Estimate	S.E.	C.R.	P
Interaction → vividness perception	-5.033	2.205	-2.283	.022
Imagery ability → vividness perception	5.375	1.580	3.403	***
condition → vividness perception	4.195	1.592	2.634	.008
Vividness perception → recall	.063	.017	3.799	***
Vividness perception → favorable attitude	.550	.071	7.697	***

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

vividness perception in mediating in the moderating effect of pictorial appeal and imagery ability (RQ2 and RQ3).

Table 1 shows the results of unstandardized regression weights (with standard errors in vividness perception, favorable attitude, and recall), including coefficients for significant relations. As shown in Figure 2, vividness perception was negatively associated with the interaction of pictorial appeal and imagery ability. As expected, vividness perception was also positively associated with favorable attitude and recall.

The default model Chi-square was 6.739 ($P = .457$, $df = 7.0$), which suggests that the fit between the proposed model and the data was not significantly worse than the fit between the saturated model and the data. The Normed Fit Index (NFI = .972) was higher than .95, which indicated a good of fit of the proposed model. The root mean square error of approximation (RMSEA) was less than .05, which also indicates a good fit. Standardized root mean-square residual (SRMR) was .029, which shows that the model fits with obtained values less than .05 (Byrne, 1998). The cut-off criterion of comparative fit index (CFI = 1.00) was above .90, which was also an efficient index.

Vividness perception (H1)

The maximum likelihood estimates revealed a significant effect of the interaction between imagery ability and pictorial appeal on vividness perception

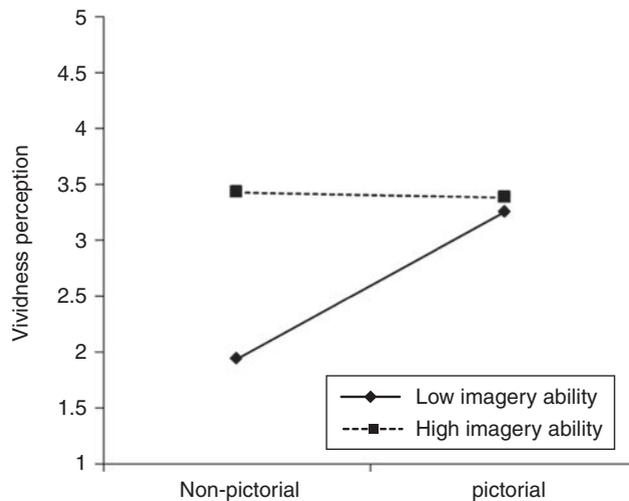


Figure 3. Moderating effect of imagery ability and pictorial appeal on vividness perception.

(Estimate = - 5.033, S.E. = 2.205, C.R. = - 2.283, $p < .05$). Excel worksheets (Aiken & West, 1991; Dawson, 2014) were used to produce a graphic illustration of the effect of interaction on imagery ability and pictorial appeal, as shown in Figure 3.

When the advertisement excluded pictures, the high-imagery ability group perceived vividness more than the low-imagery ability group did (M_{high} = 3.49, vs. M_{low} = 1.92). When the advertisement was a visually vivid (with an additional image), although subjects with high-imagery ability subjects still perceived more vividness than those with low-imagery ability did (M_{high} = 3.45, vs. M_{low} = 3.25), the statistical gap between their disparities was not as large, compared with the less visually vivid advertisement exposure.

Recall (H2)

The maximum likelihood estimates revealed a significant effect of interaction between imagery ability and pictorial appeal on recall (Estimate = - 1.145, S.E. = .449, C.R. = - 2.550, $p < .05$). The data were entered in Excel worksheets, using procedures established in Aiken and West (1991) and Dawson (2014). Figure 4 provides a graphic illustration of the effects of interaction on imagery ability and pictorial appeal.

When the advertisement excluded pictures, subjects with high-imagery ability recalled more than those with low-imagery ability did (M_{high} = 5.48, vs. M_{low} = 1.13). In individuals with low-imagery ability, the recall was greater when exposed to pictorial ads instead of non-pictorial ones (M_{high} = 4.54 vs. M_{low} = 5.29). It is noteworthy that when they read ads with pictures, the subjects with low-imagery ability recalled more than the subjects with high-imagery ability did.

Favorable attitude (H3)

The maximum likelihood estimates revealed a significant effect of the interaction between imagery ability and pictorial appeal on favorable attitude (Estimate = -.546,

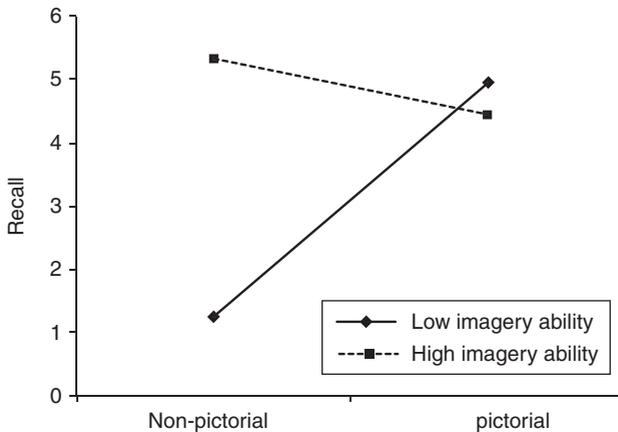


Figure 4. Moderating effect of imagery ability and pictorial appeal on free recall.

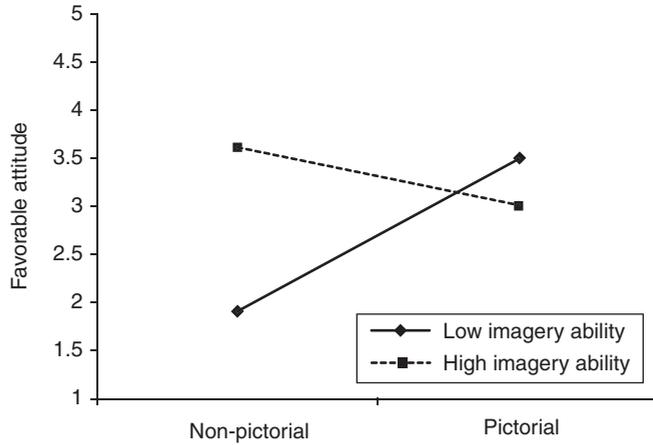


Figure 5. Moderating effect of imagery ability and pictorial appeal on favorable attitude.

S.E. = .158, C.R. = -3.460 , $p < .001$). Figure 5 shows that subjects with low-imagery ability expressed more favorable attitudes to the advertisement when it was visually vivid ($M_{low} = 3.52$ vs. $M_{high} = 3.10$).

Mediating role of vividness perception (RQ2 and RQ3)

The prediction effect of vividness perception as a mediator was supported. The total effect of imagery ability associated with pictorial appeal on both favorable attitude and recall was significant. In response to RQ2 and RQ3, this effect was significantly mediated by vividness perception. Regarding favorable attitude, the indirect effect estimate was .550 ($p < .05$). The point estimate of recall was $-.063$ ($p < .01$). Because zero was excluded from the confidence interval, the indirect effect of imagery ability and pictorial appeal was significant (see Table 2).

Verbal recall (RQ1)

An independent sample t-test was conducted to determine whether verbal and pictorial recall differed across the two groups of imagery ability: high ($M = .41$, $SD = .25$) and low ($M = .31$, $SD = .19$; $t(123) = -2.58$, $p = .04$, two-tailed).

Table 2. Bootstrap: default model.

Paths	Estimate	Lower	Upper	P
Interaction \rightarrow vividness perception	-5.033	-9.528	$-.824$.015
Imagery ability \rightarrow vividness perception	5.375	2.127	8.893	.002
condition \rightarrow vividness perception	4.195	1.186	7.250	.006
Vividness perception \rightarrow recall	.063	.029	.097	.000
Vividness perception \rightarrow favorable attitude	.550	.359	.714	.001

Discussion

Findings and contributions

The results, where significant, supported our primary theoretical claims regarding human information processing systems: limited cognitive commitment leads to economizing processing resources, which in turn causes the sensory message to be distorted and mediated in the mental imagery process. In responses to the same message, individual differences played a central role in the cognitive process, such that instead of message appeal, vividness perception, favorable attitude, and recall had significant effects. Specifically, the message with pictures was more conducive to recall in individuals with low-imagery ability than in individuals with high-imagery ability. Following exposure to visual vividness, the perceptions of subjects with low-imagery ability of vividness, favorable attitudes, and recall were similar to those of high-imagery ability.

We proposed that imagery ability and message attributes are capable of producing joint effects on cognitive performance. This factor could explain why vividness sometimes distracts the formation of images and negatively affects recall and central analysis (Krishnamurthy & Sujana, 1999). The empirical data suggested that vividness was more closely related to individual perception, and its strength was affected more by imagery abilities than by the condition of vividness. Regarding the effect of vividness, the image-arousing process had more to do with the attributes of the subjects than the content of the text. Existing studies that emphasized vividness as a message attribute tended to ignore the role of subjective initiatives, such as imagery ability. Few studies have examined the vividness condition as a dependent variable. Therefore, even if the manipulation check for vividness were successful, it would be difficult to make the case that the experimental results would converge in the same evaluation, which would eventually render the manipulation checks invalid.

This research was inspired by disputes regarding whether vividness affects perception, recall, and other cognitive responses, as part of the broader issue of persuasion. Although Nisbett and Ross (1980) regarded vividness as a kind of availability bias that would lead to accessing message arguments more easily, imagery ability, perceived as a cognitive ability, might modify the retrieval process and thus reduce the vividness effect. Our results indicate that individuals with low-imagery ability are more receptive to vivid messages than individuals with high-imagery ability are.

Future directions

Our study is the first to explore both imagery ability and vividness in the same framework. The results of the data analyses showed that either (a) the presence of a picture or (b) a predisposition to forming visual images was sufficient to produce vivid perception, high recall, and favorable attitudes. Because multimedia have become an increasingly popular platform for promotional campaigns (Stafford & Faber, 2005), future research should explore the relationship among (new) media-use habits, imagery ability, and vividness. Previous studies have shown that individuals use different codes to store what they have been exposed to in the media, relative to their cognitive capacity (Salomon, 1972).

Different media forms contain various sensory modalities. For example, newspaper reading could be regarded as directed verbal literacy, and a long-term-learning process would enhance the viewer's ability to recognize words and reconstruct the narrations of news reports. Videos, the Internet and TV combine more multi-modalities than newspapers do, and in these media, images, animations, word slides, and sound merge into a single synthesized sensory input. Consequently, the use of verbal-oriented media use may promote greater imagery ability than the use of multi-sensory media do. Future research should investigate the effects of different media on imagery abilities to determine whether users are more vulnerable to visual vividness, the demographic hierarchy involved in such segmentation, and so forth. The findings of such studies would be meaningful for both health promotional campaigns and behavioral studies.

Our study proceeds from and extends the traditional picture-word mutual interference paradigm by testing one conceptual model for the effects of moderation and mediation. The significant findings of the path analysis model not only are testimony to the complexity of the phenomena under investigation but also shed light on the theoretical mechanisms underlying the observed relationships.

The present study also has several limitations, most of which are related to our conceptual focus. First, our scrutiny of the imagery-arousal dimension of vividness was done at the expense of other conditions, such as emotional incitement, detailed message, and proximity. Future studies may refine the operational definition of vividness to include the effect of interaction among other criteria, such as mood/knowledge change, which was found closely connected to vividness (Dillard & Main, 2013). Second, we focused on the pictorial effect of imagery arousal strategies, leaving out other stimuli, such as direct imagery instructions (Petrova & Cialdini, 2005) and priming procedures (Jiang & Wyer, 2009). Third, sensory modalities, such as auditory imagery, taste imagery and tactile imagery, which were not a matter of concern in this study, are well worth exploring in future studies. Finally, our pretest revealed that behavioral intentions are not influenced in the same way as attitudes are. A possible explanation is that in the domain that we investigated (disease prevention), high imagery leads to high arousal and a defensive reaction (avoidance). Early research on the effect of fear-arousing communications suggested that when individuals feel "vulnerable," high imagery has a "boomerang" effect (Leventhal, 1971). Thus, although we chose to eliminate behavioral intention in the experiment performed in the present study, future research could include this factor.

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Note

1. Because the HPV vaccine has not yet been legalized in mainland China, official promotional materials do not exist, either online or offline. Therefore, the information about the HPV vaccine in this study was downloaded from the Hong Kong government's website. Although this was done solely for expediency, we have no reasons to expect systematic errors arising from using this source.

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References

- Adaval, R., & Wyer, R. S. (1998). The role of narratives in consumer information processing. *Journal of Consumer Psychology, 7*(2), 207–245.
- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage Publications.
- Anderson, J. R., & Reder, L. M. (1979). *Levels of processing in human memory*. Hillsdale, NJ: Erlbaum.
- Bensafi, M., & Rouby, C. (2007). Individual differences in odor imaging ability reflect differences in olfactory and emotional perception. *Chemical Senses, 32*(3), 237–244. doi: 10.1093/chemse/bjl051.
- Bower, G. (1972). Mental imagery and associative learning. In L. Gregg (Ed.), *Cognition in learning and memory* (pp. 51–88). New York, NY: John Wiley.
- Brosius, H. B., & Bathelt, A. (1994). The utility of exemplars in persuasive communications. *Communication Research, 21*, 48–78. doi: 10.1177/009365094021001004.
- Bugelski, B. R. (1983). Imagery and the thought processes. In A. Sheikh (Ed.), *Imagery: Current theory, research and application* (pp. 72–95). New York, NY: John Wiley.
- Byrne, M. (1998). *Structural equation modeling with LISREL, PRELIS and SIMPLIS: Basic concepts, applications and programming*. Mahwah, NJ: Lawrence Erlbaum.
- Bywaters, M., Andrade, J., & Turpin, G. (2004). Determinants of the vividness of visual imagery: The effects of delayed recall, stimulus affect and individual differences. *Memory (Hove), 12*(4), 479–488.
- Calder, B. J., Lynn, W. P., & Tybout, A. M. (1981). Designing research for application. *Journal of Consumer Research, 8*, 197–217.
- Campos, A., Chiva, M., & Moreau, M. (2000). Alexithymia and mental imagery. *Personality and Individual Differences, 29*, 787–791. doi: 10.1016/S0191-8869(99)00231-7.
- Chaiken, S. (1987). The heuristic model of persuasion. In M. P. Zanna, J. M. Olson, & C. P. Herman (Eds.), *Social influence: The Ontario symposium* (Vol. 5, pp. 3–39). Hillsdale, NJ: Erlbaum.
- Chang, C. T., & Lee, Y. K. (2010). Effects of message framing, vividness congruency and statistical framing on responses to charity advertising. *International Journal of Advertising, 29*(2), 195–220.
- Chen, T. Y., Pan, X. H., & Cui, Z. W. (2007). Examining the influences of telepresence and vividness of visual imagery on online learning efficiency. Retrieved from: <http://nhuir.nhu.edu.tw:8085/ir/retrieve/7800/3095000206.pdf>
- Chien, Y., & Chang, C. (2012). Exploring the impact of animation-based questionnaire on conducting a web-based educational survey and its association with vividness of respondents' visual images. *British Journal of Educational Technology, 43*(3), 81–85. doi: 10.1111/j.1467-8535.2012.01287.x.
- Coyle, J. R., & Thorson, E. (2001). The effects of progressive levels of interactivity and vividness in Web marketing sites. *Journal of Advertising, 30*(3), 65–77.
- Dan, V., & Ihlen, O. (2011, May). *Towards the empirical assessment of complex frames: A method for combining analysis of verbal and visual element*, Paper presented at the annual meeting of the International Communication Association, Boston, MA.

- Dawson, J. F. (2014). Moderation in management research: What, why, when and how. *Journal of Business and Psychology, 29*, 1–19. doi: 10.1007/s10869-013-9308-7.
- Dempsey, A. F., Abraham, L. M., & Dalton, V. (2009). Understanding the reasons why mothers do or do not have their adolescent daughters vaccinated against human papillomavirus. *Annals of Epidemiology, 19*, 531–538. doi: 10.1016/j.annepidem.2009.03.011.
- Dillard, A. J., & Main, J. L. (2013). Using a health message with a testimonial to motivate colon cancer screening: Associations with perceived identification and vividness. *Health Education & Behavior, 40*(6), 673–682. doi: 10.1177/1090198112473111.
- Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: A general analytical framework using moderated path analysis. *Psychological Methods, 12*, 1–22. doi: 10.1037/1082-989X.12.1.1.
- Feng, S. W., Xu, X. F., Jin, Y., & Yao, X. Y. (2012). Women's knowledge of human papillomavirus (HPV) and their attitudes toward HPV vaccine: Preparing for HPV vaccination in China. *Asia-Pacific Journal of Public Health, 24*(3), 522–531. doi: 10.1177/1010539511415838.
- Fiske, S., & Taylor, S. (1984). *Social cognition*. Reading, MA: Addison-Wesley.
- Frey, K. P., & Eagly, A. H. (1993). Vividness can undermine the persuasiveness of messages. *Journal of Personality and Social Psychology, 65*(1), 32–44.
- Friedman, A., & Shepard, H. (2007). Exploring the knowledge, attitudes, beliefs, and communication preferences of the general public regarding HPV: Findings from CDC focus group research and implications for practice. *Health Education & Behavior, 34*(3), 471–485.
- Houston, M. J., Childers, T. L., & Heckler, S. E. (1987). Picture-word consistency and the elaborative processing of advertisements. *Journal of Marketing Research, 24*(2), 359–369.
- Jiang, Y., & Wyer, R. S. (2009). The role of visual perspective in information processing. *Journal of Experimental Social Psychology, 45*, 486–495.
- Joseph, S. A., & Thompson, T. L. (2004). The effect of vividness on the memorability and persuasiveness of a sermon: A test of the elaboration likelihood model. *Journal of Communication and Religion, 27*, 217–244.
- Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication, 50*(1), 46–70. doi: 10.1111/j.1460-2466.2000.tb02833.x.
- Leventhal, H. (1971). Fear appeals and persuasion: The differentiation of a motivational construct. *American Journal of Public Health, 61*(6), 1208–1224.
- Licht, A. S., Murphy, J. M., Hyland, A. J., Fix, B. V., Hawk, L. W., & Mahoney, M. C. (2010). Is use of the human papillomavirus vaccine among female college students related to human papillomavirus knowledge and risk perception? *Sexually Transmitted Infections, 86*(1), 74–78. doi: 10.1136/sti.2009.037705.
- Lutz, K. A., & Lutz, R. J. (1978). Imagery-eliciting strategies: Review and implications of research. *Advances in Consumer Research, 5*, 611–620.
- Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology, 3*, 430–454.
- Kahneman, D., & Tversky, A. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology, 5*(2), 207–232.
- Keller, P. A., & Block, L. G. (1997). Vividness effects: A resource-matching perspective. *Journal of Consumer Research, 24*(3), 295–304.
- Kisielius, J., & Sternthal, B. (1984). Detecting and explaining vividness effects in attitudinal judgments. *Journal of Marketing Research, 21*(1), 54–64.
- Krieger, J. L., & Sarge, M. A. (2013). A serial mediation model of message framing on intentions to receive the human papillomavirus vaccine (HPV): Revisiting the role of threat and efficacy perceptions. *Health Communication, 28*(1), 5–19. doi: 10.1080/10410236.2012.734914.

- Krishnamurthy, P., & Sujan, M. (1999). Retrospection versus anticipation: The role of the ad under retrospective and anticipatory self-referencing. *Journal of Consumer Research*, 26(1), 55–69.
- MacInnis, J. D., & Price, L. L. (1987). The role of imagery in information processing: Review and Extensions. *Journal of Consumer Research*, 13(4), 474–491.
- Marks, D. F. (1973). Visual imagery differences in the recall of pictures. *British Journal of Psychology*, 64, 17–24. doi: 10.1111/j.2044-8295.1973.tb01322.x.
- Martin, B., Sherrard, M., & Wentzel, D. (2005). The role of sensation seeking and need for cognition on Web-site evaluations: A resource-matching perspective. *Psychology & Marketing*, 22(2), 109–126. doi: 10.1002/mar.20050.
- Mcavinue, L. P., & Robertson, I. H. (2007). Measuring visual imagery ability: A review. *Imagination, Cognition and Personality*, 26(3), 191–211. doi: 10.2190/3515-8169-24J8-7157.
- McGill, A. L., & Anand, P. (1989). The effect of vivid attributes on the evaluation of alternatives: The role of differential attention and cognitive elaboration. *Journal of Consumer Research*, 16(2), 188–196.
- Moorman, M., Willemsen, L. M., Neijens, P. C., & Smit, E. G. (2012). Program involvement effects on the processing of embedded and successive advertising. *Journal of Advertising*, 41(2), 25–38.
- Nan, X. L., & Madden, K. (2012). HPV vaccine information in the blogosphere: How positive and negative blogs influence vaccine-related risk perceptions, attitudes, and behavioral Intentions. *Health Communication*, 27(8), 829–836. doi: 10.1080/10410236.2012.661348.
- Neisser, U., & Kerr, N. (1973). Spatial and mnemonic properties of visual images. *Cognitive Psychology*, 5(2), 138–150. doi: 10.1016/0010-0285(73)90030-3.
- Nisbett, R. E., & Ross, L. (1980). *Human inference: Strategies and shortcomings of social judgment*. Englewood Cliffs, NJ: Prentice Hall.
- Nouchi, R. (2011). Individual differences of visual imagery ability in the benefit of a survival judgment task. *Japanese Psychological Research*, 53(3), 319–326. doi: 10.1111/j.1468-5884.2011.00479.x.
- Paivio, A., & Csapo, K. (1973). Picture superiority in free recall: Imagery or dual coding? *Cognitive Psychology*, 5(2), 176–206. doi: 10.1016/0010-0285(73)90032-7.
- Percy, L., & Rossiter, J. R. (1997). A theory-based approach to pretesting advertising. In W. D. Wells (Ed.), *Measuring advertising effectiveness* (pp. 267–385). Mahwah, NJ: Lawrence Erlbaum Associates.
- Petrova, P. K., & Cialdini, R. B. (2005, December). Fluency of consumption imagery and the backfire effects of imagery appeals. *Journal of Consumer Research*, 32, 442–452.
- Piira, T., Hayes, B., Goodenough, B., & von Baeyer, C. L. (2006). Effects of attentional direction, age, and coping style on cold-pressor pain in children. *Behavior Research and Therapy*, 44(6), 835–848. doi: 10.1016/j.brat.2005.03.013.
- Richardson, J. T. E. (1991). Gender differences in imagery, cognition and memory. In R. H. Logie & M. Denis (Eds.), *Mental images in human cognition* (pp. 1329–1362). The Netherlands: Elsevier Science.
- Rigney, J. W., & Lutz, K. A. (1976). Effect of graphic analogies of concepts in chemistry on learning and attitude. *Journal of Educational Psychology*, 68(3), 305–311. doi: 10.1037/0022-0663.68.3.305.
- Ritchey, G. H. (1980). Picture superiority in free recall: The effects of organization and elaboration. *Journal of Experimental Child Psychology*, 29(3), 460–474. doi: 10.1016/0022-0965(80)90107-1.
- Roelofs, A., Piai, V., & Schriefers, H. (2012). Context effects and selective attention in picture naming and word reading: Competition versus response exclusion. *Language and Cognitive Process*, 28(5), 655–671. doi: 10.1080/01690965.2011.615663.

- Rossiter, J. R., & Percy, L. (1978). Visual imaging ability as a mediator of advertising response. *Advances in Consumer Research*, 5, 621–629.
- Salomon, G. (1972). Can we affect cognitive skills through visual media? An hypothesis and initial findings. *AV Communication Review*, 20(4), 401–422.
- Schneider, V. I., Healy, A. F., & Steinhart, D. J. (1996). Searching for target letters in memory: Individual preferences and instructions for text representation. *Psychonomic Bulletin and Review*, 3(3), 352–356.
- Shen, Y., Gong, J. M., Li, Y. Q., Gong, Y. M., Lei, D. M., Cheng, G. M., & Li, X. F. (2013). Epidemiology and genotype distribution of human papillomavirus (HPV) in women of Henan Province, China. *Clinica Chimica Acta*, 415, 297–302.
- Shepard, R. N. (1967). Recognition memory for words, sentences and pictures. *Journal of Verbal Learning and Verbal Behavior*, 6, 156–163. doi: 10.1016/S0022-5371(67)80067-7.
- Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing: Perceptual learning, automatic attending, and a general theory. *Psychological Review*, 84, 127–190. doi: 10.1037/0033-295X.84.2.127.
- Small, D. A., & Loewenstein, G. (2003). Helping a victim or helping the victim: Altruism and identifiability. *Journal of Risk and Uncertainty*, 26, 5–16.
- Smith, S. M., & Shaffer, D. R. (2000). Vividness can undermine or enhance message processing: The moderating role of vividness congruency. *Personality and Social Psychology Bulletin*, 26(7), 769–779. doi: 10.1177/0146167200269003.
- Stafford, M. R., & Faber, R. J. (2005). *Advertising, promotion, and new media*. Armonk, NY: M.E. Sharpe.
- Swann, W. B., & Miller, L. C. (1982). Why never forgetting a face matters: Visual imagery and social memory. *Journal of Personality and Social Psychology*, 41(3), 475–480. doi: 10.1037/0022-3514.43.3.475.
- Taylor, S. E., & Thompson, S. C. (1982). Stalking the elusive “vividness” effect. *Psychological Review*, 89(2), 155–181. doi: 10.1037/0033-295X.89.2.155.
- Tukachinsky, R., Mastro, D., & King, A. (2011). Is a picture worth a thousand words? The effect of race-related visual and verbal exemplars on attitudes and support for social policies. *Mass Communication and Society*, 14(6), 720–742. doi: 10.1080/15205436.2010.530385.
- Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, 5(2), 207–232. doi: 10.1016/0010-0285(73)90033-9.
- Unnava, H. R., & Burnkrant, R. (1991). The effect of repeating varied and same executions on brand name memory. *Journal of Marketing Research*, 28, 406–416.
- Weert, J., Noort, G., Bol, N., van Dijk, L., Tates, K., & Jansen, J. (2011). Tailored information for cancer patients on the Internet: Effects of visual cues and language complexity on information recall and satisfaction. *Patient Education and Counseling*, 84(3), 368–378. doi: 10.1016/j.pec.2011.04.006.
- Wyer, R. S., Huang, I. W., & Jiang, Y. W. (2008). Visual and verbal processing strategies in comprehension and judgment. *Journal of Consumer Psychology*, 18(4), 244–257. doi: 10.1016/j.jcps.2008.09.002.
- Yu, X. L. (2014). Cervical cancer: The last defense line. *Economy and Nation Weekly*. Retrieved from: <http://www.ennweekly.com/2013/0817/11836.html> [In Chinese].