Remember the motivationally-relevant appeals? The influence of social and sensory appeals on memory for pronutritional messages promoting healthy foods

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Remember the motivationally-relevant appeals? The influence of social and sensory appeals on memory for pronutritional messages promoting healthy foods

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ABSTRACT
Unhealthy foods advertisements often use motivationally-relevant appeals – i.e., stimuli with survival benefits, linked to hedonic consumption or social eating contexts. These stimuli automatically attract mental resources, resulting in memorable advertisements that can influence consumers’ choices and well-being. Aiming to prevent obesity and encourage healthy lifestyles, we examined the usability of these appeals to promote healthy foods to young consumers. A mixed factorial experiment recorded memory in preteen children and teenagers who watched various depictions of social eating contexts and texts emphasizing hedonic versus utilitarian benefits. The free recall and recognition tests revealed that young people had better memory for food advertisements featuring social eating contexts. Depictions of large groups were remarkably lasting, contributing to 80% of the health messages being recognized and recalled. As hypothesized, these appeals were more effective for teenagers than preteen children. Motivationally-relevant social appeals make pronutritional media more memorable, influencing healthy choices in the long run.

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Pronutritional media messages; motivationally-relevant appeals; social appeals; sensory appeals; memory; young consumers

Obesity is a major health concern, with over 20% of American teens classified as obese (State of Obesity 2018). The high and growing obesity rates among children worldwide (Royne and Levy 2015; World Health Organization [WHO] 2016) can be explained by unhealthy diets containing too many snacks and not enough fruit and vegetables (Bauer et al. 2009; WHO 2005, 2016). Healthy food intake is important not only because it can reduce obesity, but also because it increases well-being, provides vital nutrients and prevents diseases (Blanchflower, Oswald, and Stewart-Brown 2013; O’Dea, 2003; Vaitkeviciute, Ball, and Harris 2015). In order to encourage healthier lifestyles, it is thus vital to promote fruit and vegetables on a large scale and to target vulnerable young consumers. This can be done through persuasive pronutritional media that can influence large audiences in the long run, including the population at risk (Samson and Buijzen 2017).
There is a delay between exposure to persuasive media and its potential influence on behaviour (Kumar and Raju 2013). Hence, persuasive strategies aim to create attention-grabbing, memorable messages that are recalled during decision-making (Buijzen, Van Reijmersdal, and Owen 2010). Memory is regulated through biopsychological mechanisms elicited by motivationally-relevant stimuli, those with beneficial priority processing for evolutionary survival (Cacioppo and Gardner 1999; McSorley and Morriss 2017). Based on theoretical frameworks originating in information processing (Lang 2009), social evolution (Bernard et al. 2005; Cacioppo and Patrick 2008; Wilson 1975), cognitive psychology (Farah et al. 1998; Valentine 1988), and social psychology (Asch 1951; Bandura and Walters 1977), it is expected that motivationally-relevant appeals attract memory to pronutritional media, which influences children’s healthy eating in the long run.

Because taste increases the odds of selecting fresher foods, taste-related hedonic properties regulate the feeding process and immediately trigger food information processing (Breslin 2013; Dominy et al. 2001). Memory and information processing are also automatically activated by social appeals that are essential for human survival (Bernard et al. 2005; Cacioppo and Patrick 2008; Wilson 1975). Motivationally-relevant appeals, such as social and hedonic stimuli, effectively promote unhealthy snacks among underage individuals (Buijzen and Valkenburg 2002; Kelly et al. 2015; Stitt and Kunkel 2008). Their brain maturation makes youngsters especially susceptible to sensory stimuli (Blakemore and Choudhury 2006; Casey, Jones, and Hare 2008). Moreover, social cues increasingly attract teens as they undergo psychosocial development, with the enlargement of their social environment (Valkenburg and Piotrowski 2017).

We investigate whether motivationally-relevant appeals can increase children’s memory for pronutritional still messages. Sensory and social appeals are predicted to increase memory. In addition, we examine whether the appeals interact with viewers’ age. The study contributes to advertising health research by revealing which message appeals create more memorable associations with healthy foods. These insights can guide marketers, governmental organizations, and policy-makers to promote healthy eating more effectively to youngsters. Furthermore, this paper provides a theoretical contribution, as different frameworks originating in advertising, information processing, evolutionary, and cognitive psychology work together in explaining memory for pronutritional messages. Based on a mixed factorial experiment, the effects on two direct memory tests (recognition and free recall) are reported.

Theoretical framework

The time between exposure to persuasive media and purchase decisions, as well as the limited cognitive resources available (Buijzen, Van Reijmersdal, and Owen 2010; Chryssochou 2010; Choi and Reid 2018), influences purchase and consumption decisions. Because information processing is an important precursor of behavioural effects, such as purchase, requests to parents, and consumption (Buijzen, Van Reijmersdal, and Owen, 2010), it is important that consumers process and like the advertising and media content so that they remember it during the decision process later on. Processing the promotional messages is essential for identifying brands in stores or
recalling the brand name when making purchase decisions (Gunter, Oates, and Blades 2005; Valkenburg and Buijzen, 2005). Because messages are better remembered when more resources are allocated to their processing (Lang 2009), it is beneficial to use promotional appeals that attract as many resources as possible. Mental resource allocation is theorized by information-processing frameworks such as the Limited Capacity Model of Motivated Mediated Message Processing (LC4MP, Lang 2009). LC4MP posits that the human capacity to process messages is limited; hence, only some incoming stimuli can be processed, according to their motivational relevance. Preferential processing of the motivationally-relevant stimuli that benefit survival is sculpted into the human processing systems through the basic emotional mechanisms (Cacioppo and Gardner 1999; Taylor and Fragopanagos 2005). Specifically, the activation of the appetitive motivational system sustains life in a relatively safe environment by guiding information processing to approach motivationally-relevant stimuli that may be beneficial. The appetitive motivational system thus orients mental resources towards information intake, being associated with memory for motivationally-relevant stimuli (Lang, Bradley, and Cuthbert 1997).

LC4MP posits that media stimuli engage mental resources for three information-processing subprocesses: encoding, storage, and retrieval (Lang 2009). During encoding, a stimulus attracts mental resources and orients the audience towards the message for information intake. The cognitive dimension of encoding involves attential selection of stimuli for processing and initial memory. This early subprocess is arguably critical for the mental processing of media messages because their processing occurs predominantly at this level. Viewers do not actively consume the visually rich media in order to store them into their working memory nor to integrate them into the networked organization of stored mental information. It is thus critical to investigate how audiences encode the messages they are exposed to.

In order for a message to have an effect, it has to be encoded, but also stored and retrieved. The information has to be moved into storage and integrated into the networked organization of stored mental information so that it is readily available, accessible, and retrievable. Retrieval is the ultimate and fundamental function of memory that allows access to and recall of information which has been previously encoded and stored. As it enables the functional use of processed information for purchase decisions, retrieval is of key importance in advertising and marketing. It is thus essential to examine retrieval processes for promotional effectiveness.

LC4MP is applied in the context of this research to theoretically frame the information processing of motivationally-relevant appeals in pronutritional messages. Automatically capturing mental resources, motivationally-relevant appeals trigger greater information intake and initial memory for the pronutritional messages using them. This study thus examines the effect of motivationally-relevant appeals on the encoding and retrieval subprocesses.

**Remembering motivationally-relevant appeals**

**Social appeals**

Seeing other people engaged in a certain practice (e.g., eating fruit and vegetables) suggests that the practice is desirable, safe, and beneficial to one’s well-being. The
more widespread the practice, the more beneficial, desirable, and safer it is perceived to be (Bernard et al. 2005; Cacioppo and Patrick 2008; Wilson 1975). In matters of eating, the food intake cues during shared meals mould social norms on what is appropriate to eat, which influence the immediate food choices of observers (Higgs 2015). However, in real life, direct intake or immediate choices rarely follow exposure. This is especially relevant in the contemporary advertising and media environment, where audiences are constantly confronted with models of behaviour. Given the ubiquity of potential social norms pervasively displayed by media everywhere which cannot be all modelled immediately, it is important to understand more about memory processing that can influence choices in the long run.

The social modelling of eating has been documented to also impact healthy eating – that is, live models can increase healthy eating behaviours in their surrounding community (e.g., Cruwys, Bevelander, and Hermans 2015). Most studies that support the social modelling of eating examine how live confederates model eating in their immediate environment (Cruwys, Bevelander, and Hermans 2015). Yet, there are few healthy live models in the day-to-day lives of children and adolescents, especially in the marginalized communities at risk (Haughton and Stang 2012; WHO 2010). Pronutritional media depicting social cues offers a viable solution, as mediated messages have a wide reach and are often viewed in disadvantaged communities, which lack models of healthy eating. This is a promising approach as pronutritional media can substantially influence mass audiences in the long run and be especially impactful on those needing it most.

Social activities in large groups or with intimate friends, as opposed to solitary activities – are vital for survival and have an evolutionary advantage (Bernard et al. 2005; Cacioppo and Patrick 2008; Wilson 1975). Playing an important role in evolutionary behaviour, social cues evidence themselves as salient motivationally-relevant stimuli (Cacioppo and Patrick 2008), arguably also triggering priority motivational processing and greater memory. The considerable influence of the social context has been demonstrated by extensive evidence from the fields of psychology, physiology, and sociology (Cacioppo and Patrick 2008). Based on this related literature (Bernard et al. 2005; Cacioppo and Patrick 2008; Wilson 1975), although lacking prior research on the motivational processing of social appeals, we predict that depictions of social gatherings of large groups or with intimate friends automatically attract more mental resources than solitary nonsocial activities. It is therefore expected that promoting healthy foods through social eating contexts rather than eating alone increases memory for the pronutritional images displaying them:

H1: Participants will have (a) greater encoding and (b) greater retrieval of pronutritional images featuring social versus nonsocial appeals.

Another factor that can influence mental resource allocation is the size of the depicted social group. Cognitive and social psychology theories are further used to discuss potential differences between the types of social appeals. Face processing has been strongly documented as an area of immediate and automatic elicitation of mental resources (Farah et al. 1998; Valentine 1988). Social appeals thus attract priority ‘special processing’ through the faces of models displayed (Farah et al. 1998). The motivational mechanisms regulating priority face processing have been evidenced to
successfully influence attention to pronutritional messages in a recent study (Samson and Buijzen 2017, 2018): the higher number of faces depicted in pronutritional images featuring gregarious communities (3+) attracted more attention than those featuring intimate friends (1+1). As depictions of larger groups, compared to more intimate friends, attract more attention, they are expected to subsequently attract more mental resources and greater memory. Moreover, the effects of social modelling are stronger for larger groups. People are inclined to conform to group behaviours, with greater conformity to larger groups (Asch 1951, 1956; Bandura and Walters 1977). This study thus predicts that larger groups would be more effective than intimate friends in increasing memory for the pronutritional images displaying them:

H2: Participants will have (a) greater encoding and (b) greater retrieval of pronutritional images featuring gregarious communities versus intimate friends.

Hedonic versus utilitarian appeals
Advertising uses hedonic and utilitarian strategies to appeal to audiences. Hedonic appeals play into people’s emotions by emphasizing sensory pleasure, whereas utilitarian appeals (Coleman 1986) focus more on instrumental and rational benefits of products (Albers-Miller and Stafford 1999). Cross-cultural research of Albers-Miller and Stafford (1999) documented that utilitarian appeals are often used for functional services. Utilitarian appeals have been frequently used in healthy eating interventions (Feng and Park 2018; French and Stables 2003; Kim, Cheong, and Zheng 2009; Papiès 2016). Although these messages are largely successful in conveying the health-related benefits of eating core healthy foods, limited research reports positive effects of using utilitarian appeals on healthy food (Choi, Paek, and Whitehill-King 2012). Instead, the majority of findings report small, limited, and even contrary effects on food intake (Feng and Park 2018; French and Stables 2003; Harris, Bargh, and Brownell 2009; Papiès 2016; Raghunathan, Naylor, and Hoyer 2006). Utilitarian appeals hence do not seem effective in promoting healthy foods among consumers and information processing of this kind of appeal is argued to be low.

Moreover, utilitarian motives are less influential when hungry (Read and VanLeeuwen 1998). Although future eating intentions generally rely on utilitarian rationales, the actual food choices made while hungry are based on hedonic appeals (Read and VanLeeuwen 1998; Shiv and Fedorikhin 1999). Sensory taste-related appeals are amongst the most basic evolutionary mechanisms for survival (Breslin 2013; Dominy et al., 2001; Hirschman and Holbrook 1982), arguably triggering human attention. They automatically activate the appetitive motivational system, which results in increased processing and memory (Cacioppo and Gardner 1999). This is an automatic biopsychological mechanism that is uniquely triggered by motivationally-relevant stimuli, such as sensory hedonic appeals, not elicited by nonsensory utilitarian appeals. Previous research found that sensory appeals can be effective in the promotion of healthy food (Kim, Cheong, and Zheng 2009; Samson and Buijzen 2020). A recent study (Samson and Buijzen 2020) evidenced that using sensory stimuli in healthy food advertisements increased attention towards the pronutritional messages and towards the foods displayed. Despite these promising results, youngsters’ memory for pronutritional messages promoting healthy foods through sensory hedonic versus utilitarian appeals has not yet
been examined. We predict that promoting healthy foods through hedonic rather than utilitarian textual appeals increases memory:

H3: Participants will have (a) greater encoding and (b) greater retrieval of sensory hedonic as compared to nonsensory utilitarian textual appeals.

**Age-related susceptibility to motivationally-relevant appeals**

Motivationally-relevant factors are often presented in unhealthy food commercials targeting youth. This is not surprising as young consumers are highly susceptible to these, due to their brain maturation – with highly excitatory and slowly developing inhibitory mechanisms (Blakemore and Choudhury 2006; Casey, Jones, and Hare 2008). A quest for identity is central in life during teen years, and adolescents heavily rely on their peers in finding that identity (Brown 2004; Erikson 1994; Valkenburg and Piotrowski 2017). Their developmental stage is characterized by psychosocial growth, manifested in higher susceptibility to social moulding, group influence, and strong adherence to social norms (Stok et al. 2016). This enlargement of social space influences behaviours and decisions, thus making social appeals more memorable for teenagers as compared to preteen children (Stok et al. 2016).

Compared to other age groups, peers of adolescents were found to affect deviant antisocial behaviours (Gardner and Steinberg 2005), which are themselves higher during adolescence. Yet, this robust age difference in the social influence on risk-taking did not extend to prosocial peer influence (Berndt 1979; Wentzel, Filisetti, and Looney 2007). Peer influence on prosocial behaviours has been documented to follow similar patterns across all young ages (Berndt 1979; Wentzel, Filisetti, and Looney 2007). Nonetheless, it is worth mentioning that the above-mentioned results derive from self-reported questionnaire data, with high socially desirable responses, which probably influenced the results. Considering this previous research, we expect that social appeals will be especially effective on older adolescents, and predict interaction effects between age and social appeals, beyond the main effects of memory increase as children grow up (Aktas¸ Arnas, Ta¸s and Gürghah Oğul 2016; Valkenburg and Buijzen 2005).

The age interactions with social appeals will be explored in this study through direct memory measures, which have not been examined to date. Thus, it is expected that pronutritional images featuring social rather than nonsocial appeals will be more memorable for teenagers than for preteen children:

H4: Social appeals will interact with age so that teenagers, as compared to preteen children will have (a) greater encoding and (b) greater retrieval of pronutritional images featuring social versus nonsocial appeals.

Hedonic sensory appeals count among the most predominant strategies in unhealthy snack advertising targeting young consumers (Buijzen and Valkenburg 2002; Page and Brewster 2007; Stitt and Kunkel 2008). Yet, pronutritional messages do not use hedonic stimuli, but promote fruit and vegetable intake through less-effective utilitarian textual appeals (Harris, Bargh, and Brownell 2009; Papies 2016), which might not be processed, nor be able to influence decisions due to the developmental stage of the underage audiences. Processing incoming information is predominantly
regulated by bottom-up mechanisms early in life (Açık et al. 2010). Sensory-related information tends to automatically elicit information processing in children: these stimuli have been shown to attract attention and to increase mental resource allocation (Barr 2008; Buijzen, Van Reijmersdal, and Owen 2010).

Children’s propensity for processing sensory-related stimuli is explained within a Piagetian framework (Piaget 1970; Valkenburg and Piotrowski 2017): according to Piaget, the information processing of children in concrete operational stage is focused on concrete, sensory-related stimuli. Due to their developmental brain maturation, children have lower levels of inhibitory control and are less capable to pursue utilitarian motives (De Luca and Leventer 2008). Instead, their developing neurocognitive functioning predisposes them for the immediate allure of sensory hedonic temptations.

We argue that younger children have higher susceptibility towards the sensory hedonic stimuli appealing to their senses, while responding less intensely to utilitarian appeals. Utilitarian textual appeals are subsequently ineffective tactics, especially for younger preteen children. Upon entering formal operational stages and gaining increased levels of inhibitory brain functioning, teenagers might have more resources to process and pursue utilitarian appeals, attracting higher memory for them. To address the lacking research on this topic, this study will investigate memory for hedonic versus utilitarian appeals in healthy food marketing across the two age categories. It is predicted that pronutritional images featuring hedonic rather than utilitarian appeals will be more memorable for preteen children than for teenagers:

H5: Sensory appeals will interact with age so that preteen children, as compared to teenagers will have (a) greater encoding and (b) greater retrieval of pronutritional images featuring hedonic versus utilitarian appeals.

Method

Design and independent variables

In order to test the formulated hypotheses, an experiment with a 3 (Social Visual Appeal) × 2 (Sensory Textual Appeal) × 2 (Participant Age) × 4 (Message) mixed factorial design was conducted. Social Visual Appeal was a within-subjects factor with three levels varying the display of social contexts: Alone (depicting contexts of solitary nonsocial eating), with Intimate Friends (depicting a small group of two intimate friends sharing a meal) and in Gregarious Community (depicting several young people sharing a meal within a large, friendly group). Sensory Textual Appeal had two levels: Hedonic versus Utilitarian. Hedonic Appeal messages conveyed the enjoyment and pleasure of eating the fruits and vegetables through phrases such as: ‘Finger-licking goodness!’; while Utilitarian Appeal messages emphasized the nutritional value and healthiness of core foods through statements such as: ‘All necessary vitamins!’ The word number in the Sensory Textual Appeals was balanced across the two conditions to control for processing effort and time. The stimuli consisted of messages representing youngsters preparing to consume or consuming common fruits and vegetables. The food types were diverse and matched across conditions. Volunteers rated the
stimuli prior to the experiment (for more details, see Message Selection Pilot Studies). The within-subjects treatment of Appeal has practical advantages over a between-subjects approach in that fewer participants are required to achieve statistical power. More importantly, it has greater internal validity because subjects serve as their own control in comparisons across treatment levels, with more propitious opportunities for comparisons and causal inferences (Reeves and Geiger 1994). The Participant Age was a between-subjects factor consisting of Teenagers (13–18 years old) and Preteen Children (7–12 years old).

Message was a within-subjects repetition factor incorporated as a control. The six levels of the experimental factors (3 Social Visual × 2 Sensory Textual) were expressed through 24 messages, four distinct messages for each level. There were eight different images portraying each social context level. And 12 different texts representing each Sensory Textual manipulation were superimposed on the bottom part of the images. Multiple messages are recommended for realistic experimental presentations, to reduce sensitization to the research topic, to minimize confounding factors associated with single-message manipulations (Reeves and Geiger 1994), and to more validly generalize the findings to the experimental factors and to the greater media landscape (Jackson 1992).

**Dependent variables**

**Encoding**

Visual recognition was used to assess message encoding (Lang 2009). Participants were asked to identify several visual snapshots of images and texts as shown or not shown in the experiment. Participants were encouraged to respond as quickly as possible to the items that were presented on screen for 100 milliseconds and separated by a black screen. Following each snapshot, participants had 3 seconds to respond whether or not they remember seeing them during the experiment by pressing one of the two assigned keyboard keys. Even if no answer was given in this time frame, the next item was shown. This recognition test is in line with previous measures of recognition (Samson 2018). The total of 48 images and 48 text items—formed by combining 24 target-items with 24 corresponding foils—was presented in random order. The corresponding foils were created from items similar but not presented during the experimental session.

**Retrieval**

Retrieval of the visual and textual appeals was operationalized through free recall (Lang 2009). Participants were instructed to list as much as they can remember from the texts and images viewed. The responses were content analysed, according to the recommended analyses of open-ended response data (Samson 2018). The single comments listing texts were considered for the free recall analyses of textual appeals, and those identifying the images were considered for the free recall analyses of visual appeals. These comments were classified by two coders as hits—correct identification of the target (coded as 1 and counted for listings) or misses—failure to identify the target (coded as 0). Prior to the task, the coders discussed the definitions and coded
together 70 responses (25% of the whole data set). A set of 55 responses (25% of the independently-coded data set) were randomly chosen after completing the task to be double-coded for reliability, which was calculated using Krippendorff’s alpha. The reliability coefficients \( \alpha \) ranged from .90 to .99 for the textual appeals and from .96 to .99 for the visual appeals, certifying that coder reliability was achieved.

**Participants and procedure**

The Ethics Committees of the University and of the Science Museum approved the research prior to participant recruitment. Announcements in the Science Museum of Amsterdam, the Netherlands, recruited 288 youngsters (7–18 years old; \( M_{\text{age}} = 11.97, SD_{\text{age}} = 2.56; 154 \text{ Girls} \)) for participation. An *a priori* power analysis, calculated with G-Power v.3 (www.psycho.uni-duesseldorf.de/aap/projects/gpower), was conducted to estimate the necessary sample size. The power analysis indicated a minimum sample size of 277, assuming statistical power level of .80, \( \alpha \)-level of .05, and an expected small-medium effect size of \( f = .20 \).

The information materials invited minors to participate in a study about positive advertising, which was realistic because 20 masking images – resembling the experimental stimuli but displaying positive activities not related to food (e.g. painting, traveling) – were added to the 24 experimental images. We chose this cover story to minimize sensitization to the research topic and to reduce the potential socially desirable responses. It was successful, given that no participants were aware of the research purpose or manipulation.

After parents provided informed consent, the participants were introduced to the Museum Science Live laboratory. The experimental session began with a practice session that familiarized participants with the procedure and controlled for primacy effects. The 44 images (24 experimental stimuli and 20 masking images) were then presented in three orders. Each image was followed by a brief questionnaire, which served to prevent carryover effects between conditions (Reeves and Geiger 1994). There were no significant effects of the presentation orders. After exposure to all images, participants provided demographics, which also served as a short distractor task, before memory data were collected. Free recall was measured next, followed by the speeded, forced-choice visual recognition test. Testing lasted approximately 25 minutes. At the end of the experiment, the participants were debriefed, thanked, and dismissed.

**Message selection pilot studies**

We selected existing pronutritional materials featuring young protagonists. Because the available media were insufficient, stimuli images were created for the purposes of this experiment with several preconditions. The food items (displaying a large variety of fruits and vegetables) had to be central to the image topic. The photos had to follow a similar style, with the main subject(s) in spotlight and realistically portrayed in a cafeteria/lounge background that was blurred so that the focus was entirely on the subject(s). The faces of the models were framed to cover similar image surfaces across
conditions, controlling for the primacy of face processing (Young and Bruce 2011). The biological sex of models was controlled by featuring relatively equal numbers of boys and girls. Context factors, such as luminosity and background colour, were varied and matched across conditions (see Figure 1).

High-school students were recruited to pose in the pronutritional images through fliers distributed in schools and during open-university days. After receiving consent from the youngsters and their parents, approximately 300 images were created by a professional photographer. The created and the existing media pronutritional materials were viewed and rated by colleagues of the authors, all experts in the field of youth and media (N = 7). This initial pilot test revealed that the existing media materials differed significantly in terms of image quality and model attractiveness from the locally-created ones. In order to keep all conditions constant, all the existing media images were excluded.

A second pilot test (N = 19) with student volunteers was conducted with a pool of 96 created stimuli. Based on the ratings provided, stimuli images were selected so that they differed significantly on the Social Appeal condition, yet had similar ratings on all other potentially confounding factors, such as face size and prominence, model attractiveness, and how ‘interesting’ or well done the persuasive message is perceived to be. Those with the highest consistency in ratings were chosen. Efforts were also made to ensure that the images matched in the types of displayed foods across Social Appeal conditions. The pilot test also verified that the selected photos had minimum distracting elements, good photographic quality, clear focus, and clear display of the subject(s), whose faces and facial expressions were visible. Analyses of variance (ANOVAs) were performed and revealed a significant main effect of Social Appeal, $F(2, 17) = 8.54, p < .001$, and no significant effects on the other factors; the ANOVAs revealed similar ratings with $p$ values ranging from .58 to .96. The volunteers also categorized words and phrases as hedonic, expressing the enjoyment and pleasure of eating, versus utilitarian, emphasizing the nutritional value and healthiness of foods. The highest rated ones were used for the Sensory Textual Appeals.

**Data cleaning and analysis**

Analyses were conducted using repeated measures ANOVAs and post hoc t-tests. IBM SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, NY) was used for all analyses. The Greenhouse–Geisser epsilon procedure was applied to the ANOVAs to correct
for the violation of the sphericity assumption in repeated measures designs (Vasey and Thayer 1987).

## Results

All participants were school students of various nationalities (Dutch, German, French, American, British, Israeli, etc.) with overall lean body types ($M = 3.71$, $SD = 1.36$), as reported through the Contour Drawing Rating Scale for youngsters (Wertheim, Paxton, and Tilgner 2004). There were 169 (58%) Preteen 7 to 12 year-old Children and 119 (42%) 13 to 18 year-old Teenagers. Most participants estimated eating healthy foods sometimes ($M = 2.98$, $SD = .86$), reported on a five-point semantic differential scale ranging from never to very often. They self-reported eating an average of 4.57 ($SD = 3.16$) healthy food servings and 2.98 ($SD = 2.36$) unhealthy food servings per day.

### Social appeals

Hypothesis 1 predicted that young consumers would have (a) greater encoding and (b) greater retrieval of pronutritional images featuring social versus nonsocial appeals. All predictions of Hypothesis 1 were supported: pronutritional images using Social Appeals attracted higher memory than those that did not use Social Appeals (see Table 1). In response to the predictions of Hypothesis 2, there are significant differences between the (a) encoding and (b) retrieval of pronutritional images depicting Intimate Friends versus Gregarious Communities. The post hoc tests revealed that images depicting Gregarious Communities were significantly more likely to be (a) encoded and (b) retrieved than those depicting Intimate Friends. Hypothesis 2 was supported.

### Table 1. Analyses of variance (ANOVAs) for main and interaction effects.

<table>
<thead>
<tr>
<th>Social Appeals</th>
<th>$F$ (df)</th>
<th>$\eta^2$</th>
<th>Recognition (A person)</th>
<th>Free recall (A person)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Appeals</td>
<td>$F(2,285)$</td>
<td>.04</td>
<td>.74 (.01)</td>
<td>.52 (.04)</td>
</tr>
<tr>
<td>Social Appeals</td>
<td>$F(2,285)$</td>
<td>.06</td>
<td>.76 (.01)</td>
<td>.44 (.04)</td>
</tr>
<tr>
<td>Social Appeals</td>
<td>$F(2,285)$</td>
<td>.02</td>
<td>.80 (.01)</td>
<td>.82 (.06)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social Appeals*Age on Recognition</th>
<th>ns</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Social Appeals*Age on Free recall</th>
<th>4.86**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>.43 (.05)</td>
</tr>
<tr>
<td>Teenagers</td>
<td>.61 (.07)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensory Appeals</th>
<th>$F(1,286)$</th>
<th>$\eta^2$</th>
<th>Sensory Hedonic</th>
<th>Nonsensory Utilitarian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognition</td>
<td>ns</td>
<td>.09</td>
<td>.46 (.05)</td>
<td>.79 (.06)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social Appeals*Age on Recognition</th>
<th>ns</th>
</tr>
</thead>
</table>

| Social Appeals*Age on Free recall | ns |

Note. ***$p < .001$; **$p < .01$. 

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Hedonic versus utilitarian appeals

Hypothesis 3 predicted that young consumers would have (a) greater encoding and (b) greater retrieval of sensory hedonic as compared to nonsensory utilitarian textual appeals. The results revealed that (a) the encoding of sensory versus nonsensory textual appeals did not differ significantly. Yet, (b) young consumers retrieved the nonsensory utilitarian better than the sensory hedonic textual appeals (see Table 1). Hypothesis 3 was not supported.

Age interactions

Hypothesis 4 predicted Appeal by Age interactions so that Teenagers, as compared to Preteen Children, would have (a) greater encoding and (b) greater retrieval of pronutritional images depicting Social Appeals than those that did not use Social Appeals. The results revealed that (a) Social Appeals did not significantly interact with age on encoding. However, as predicted, (b) Social Appeals significantly interacted with age on retrieval (see Table 1). As seen in Figure 2, Teenagers had higher retrieval of pronutritional images featuring social versus nonsocial appeals as compared to Preteen Children. Hypothesis 5 predicted Appeal by Age interactions so that Preteen Children, as compared to Teenagers, would have (a) greater encoding and (b) greater retrieval of pronutritional images featuring hedonic versus utilitarian appeals. The results revealed that textual appeals did not significantly interact with age on (a) encoding nor on (b) retrieval (see Table 1).

Discussion

In response to calls by the WHO (2005, 2006) and publications (Papies 2016; Royne and Levy 2015), this paper uses snack advertising appeals in pronutritional messages promoting fruit and vegetables to young consumers. The current research examined
the effects of social and sensory motivationally-relevant appeals on youngsters’ memory for pronutritional messages. Memory is important as a precursor of attitudinal and behavioural outcomes, enabling consumers to identify brands in stores and to recall them while making purchase decisions (Gunter, Oates, and Blades 2005; Valkenburg and Buijzen 2005). This study used a combination of psychological, biological, and sociological frameworks to gain insight into how social and sensory evolutionary mechanisms can inform the design of memorable pronutritional messages (Cacioppo and Patrick 2008; Dominy et al. 2001; Wilson 1975). The theoretical background also predicted differences across age groups as a result of cognitive development (Stok et al. 2016). The results provide evidence that pronutritional messages become more memorable when using social appeals. Particularly, the depiction of shared healthy meals in large groups was remarkably lasting. Moreover, these messages have proven more effective for teenagers as compared to preteen children, in line with theoretically-grounded predictions. The high memory improvement rates offer promising recommendations for public health campaigns, PSAs, health institutions, and media policy, as well as an auspicious solution to the concerns raised by the WHO about the growing obesity epidemic.

The findings reveal that advertising can be used to address the obesity problem and help consumer well-being. First of all, popular advertising appeals make pronutritional messages more memorable, subsequently influencing young consumers’ healthy eating in the long run – which is critical because healthy diets are essential for well-being (Blanchflower, Oswald, and Stewart-Brown 2013). This is the case when using motivationally-relevant social cues. Most memorable and most successful were the pronutritional messages with social appeals depicting larger gregarious groups, some of the most popular advertising appeals. Advertising can thus help well-being by inspiring the design of pronutritional messages to use motivationally-relevant social appeals that are often used in advertising. Second, exposure to the motivationally-relevant social appeals can have direct effects on young viewers’ well-being. Seeing other people have fun together in a group can make the viewers feel happy as well, through emotional contagion (Howard and Gengler 2001). Moreover, viewing the large gregarious groups enjoying healthy foods results in positive attitudinal bias towards healthy eating (Howard and Gengler 2001). Remarkably, the motivationally-relevant social appeals were particularly influential for teenagers, who are an age group at high risk and difficult to reach through pronutritional messages.

In sum, promoting healthy eating through motivationally-relevant social appeals can make fruit and vegetables more memorable, leading to healthier diets; it can increase positive feelings in teen viewers and positive attitudinal bias towards healthy eating – all these helping well-being among the vulnerable teen population. It can thus be concluded that the effects of advertising depend upon the appeals used (Samson 2018; Samson and Buijzen 2017, 2020; Papies 2016). However, it needs to be noted that there are also risks involved with using motivationally-relevant social appeals, which might also hinder well-being. It might be the case that social appeals have a different effect on children who experience social anxiety or are not part of social groups, for example because they feel left out. Loneliness is a serious risk for young people’s well-being, and more research is needed to examine individual
differences among youngsters who are more or less socially integrated. Future research should delve deeper into the effects of social appeals, especially during the times of physical distancing and subsequent greater loneliness and media use due to COVID-19.

The current findings recommend using social eating contexts to promote healthy foods to young people, especially depictions of shared meals in large groups. These social appeals could increase processing and memory for other non-mediated communications, from parents, institutions, or consumer welfare advocates. Even beyond advertising and marketing, depictions of teenager groups should be used when communicating to youngsters. The current research focused on pronutritional messages using depictions of social eating contexts, which have the great flexibility to adapt to most media formats. They can be included not only in newspapers, magazines, and leaflets, but also in television and digital media messages, which are popular among children (Pew Research Center 2018). Depictions of shared healthy meals can be easily incorporated in moving images, as part of short films, etc., incorporating beneficial messages on platforms young people frequently use. Future research should examine the effects of these appeals across different media channels.

**Social appeals**

Social appeals proved to be highly memorable – over 75% of the shared meals depicted in the pronutritional images were remembered. This was particularly effective for images of large gregarious groups sharing healthy meals – above 80% of these were recognized and free recalled. These promising results indicate that evolutionary social theories (Cacioppo and Patrick 2008; Higgs 2015; Wilson 1975) have been supported in pronutritional images. Theories on memorable social behaviours seem to have potential to be used in this line of research. This paper is informed and builds upon the social modelling of eating theory (Higgs 2015), showing how this theory can relate to research on information processing and how it can be used in media settings. Hence, these results provide an important step towards more effective designs of mass media health campaigns aimed at vulnerable young consumers.

Moreover, significant differences were found between intimate friends and large groups conditions. The latter was associated with improved memory performance, both in terms of recognition and free recall. Finally, this research revealed significant interaction effects with age, with teenagers remembering pronutritional messages depicting large groups better than preteen children. This supports the psychosocial developmental trajectory of the brain during adolescence (Brown 2004; Erikson 1994; Valkenburg and Piotrowski 2017), showing that it can also be applied to the design of pronutritional media. Teenagers experienced higher susceptibility to group influence, in line with previous research (Stok et al. 2016).

**Hedonic versus utilitarian appeals**

There was an unexpected effect of utilitarian rather than hedonic appeals on memory. Results showed no significant difference in recognition between utilitarian and
hedonic appeals. However, in the case of free recall, utilitarian appeals were remembered better than hedonic appeals, without interaction effects of age. This suggests that both children and teenagers recalled utilitarian messages better than hedonic ones. The current pronutritional media landscape, infused with utilitarian claims, offers a possible explanation for this finding. As utilitarian appeals are the predominant media strategy, young consumers are bombarded with such messages on a daily basis – repeated long-term exposure, which likely forms strong habitual associations between the utilitarian appeals and the healthy food. Accordingly, utilitarian claims developed high memory accessibility and were more easily recalled. This idea is supported by the fact that the increased memory was only found on free recall, not in implicit recognition tasks.

It might also be that participants felt a better match-up (Choi, Paek, and Whitehill-King 2012) between the healthy foods and the utilitarian appeal. Consumers have strong associations of unhealthy food being tasty and of healthy food being not tasty (Raghunathan et al. 2006). Promoting healthy foods through hedonic appeals might have caused a mismatch in the associative networks of consumers (Choi, Paek, and Whitehill-King 2012) because they did not expect healthy-looking food such as fruit and vegetables to be presented as tasty. As they did not expect hedonic appeals to promote healthy foods, these appeals were processed and remembered less. Last but not the least, these results might be attributed to the textual media modality in which they were expressed. Visual primacy research emphasizes the critical role of visual motivationally-relevant stimuli in information processing, specifically in automatically attracting mental resources and triggering priority processing (Samson 2018; Grabe and Bucy 2009). We should thus acknowledge that motivationally-relevant stimuli expressed in textual modality might not have the capacity to trigger the automatic motivational processing and to attract mental resources.

Limitations and future directions

This study took a first step in the integration of various theories into one overarching framework to understand the effectiveness of processing healthy food advertising. Future studies should follow-up on more in-depth interactions between the message appeals and more complex interplay of the theoretical frameworks. The results were found in a controlled experiment, which ensures higher degrees of internal validity and control, which was a focus in this research, but also has some limitations. Participants were invited to provide their opinions on several positive advertising messages and did not view these ads in a real world media setting. Further research studies should examine the effects in ‘real world’ field settings, including a more naturalistic media-viewing environment. The experimental set-up allowed for message exposure in a short period of time. Repeated long-term exposure to such health communication messages might increase the association of healthy food with hedonic appeals and thus influence the results.

More insight into the processes underlying the impact of motivational appeals should be pursued by future studies targeting a wider sample, including more variation across the age range. We did not include the most problematic and vulnerable
audiences. Nonetheless, motivationally-relevant appeals activate strong biological mechanisms, which are universal and activate even more strongly among vulnerable audiences – thus, the power of these appeals and the magnitude of the effect sizes would increase on vulnerable audiences.

This research also pursued psychological realism (Aronson, Wilson, and Brewer 1998). It certified that the relevant psychological mechanisms have been activated and captured, while also ensuring that the participants were not sensitized to the research goal, but diverted through the successful cover story. The novel circumstance of a laboratory setting, especially within the venue of the Science Museum, likely prompts participants to higher levels of emotional excitement, arousal, and, potentially, more cognitive resources. The within-subjects repeated messages in random-order design of this study ensures that message-specific effects do not confound the analyses and are distributed fairly across all experimental conditions. Finally, we should acknowledge that this study focused on information processing stages, examining memory for pronutritional messages in young consumers. For more valid inferences regarding the effectiveness of motivationally-relevant appeals in promoting healthy foods, future studies should explore attitudes towards healthy eating and actual food intake.

To conclude, this research provides insights into the effectiveness of pronutritional messages aimed at youngsters. Results show that young consumers have better memory of food advertisements featuring motivationally-relevant social appeals. Depictions of large social groups were better recalled. The paper presents empirical evidence of successful applications of popular advertising appeals in health-related media promoting healthy food. Using these motivationally-relevant appeals to make pronutritional messages more memorable can arguably promote healthy eating and reduce obesity, thus affecting young consumers’ emotional or physical well-being in the long run (Mond et al. 2011; O'Dea 2003). These findings can be used to design more effective mass media health campaigns remembered by a large number of children and adolescents.

**Disclosure statement**

No potential conflict of interest was reported by the authors.

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**References**


