



Promoting Healthy Eating Practices through Persuasion Processes

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ABSTRACT

The successful impact of healthy eating campaigns often depends on the extent to which messages are effective in changing attitudes and behaviors over time. The present work proposes that healthy eating campaigns can be designed taking into consideration elaboration and validation processes so that the degree of attitude change is maximally influenced and is consequential. The first set of studies described in this review demonstrates the importance of considering elaboration in determining initial attitudes toward healthy foods as well as the subsequent attitude strength consequences (e.g., stability, prediction of behavior, spreading). The second set of studies focuses on the role of perceived validity of one's thoughts in the domain of eating as a potential mediator of the persuasion process. These studies include campaigns promoting positive attitudes toward healthy eating (e.g., eating of vegetables and fruits), and interventions oriented to decreasing the intake of unhealthy food (e.g., taxing junk food). We also discuss the role of modality of information presentation (e.g., verbal and visual information vs. direct physical experience) in those studies. Finally, the review offers a tutorial with concrete recommendations that researchers, practitioners and public policy makers can follow in order to predict both short and long-term attitude and behavior changes.

The success of healthy eating campaigns depends largely on the fact that the campaigns are effective in modifying the attitudes (e.g., toward the consumption of fruits and vegetables) and preferences of the audience as expected, and that these changes are consequential and lasting (McDermott et al., 2015; McEachan et al., 2016; Riebl et al., 2015). Not all changes in attitudes are consequential (Krosnick & Petty, 1995). Thus, in the present review, we explain and provide evidence for the role that two psychological mechanisms play in producing consequential attitude change in the domain of healthy eating consumption: elaboration of the information presented and validation of people's thoughts to that information.

The process of elaboration emphasizes the distinction between mechanisms of attitude change that require a relatively large versus small amount of thinking, and the content of the audience's cognitions to a health campaign as determinants of that attitude change (Petty & Cacioppo, 1986). The process of validation distinguishes between primary and secondary cognition, and focuses on the evaluation that people make of the cognitive responses they have generated regarding the communication (Briñol & Petty, 2009).

Taking into account these mechanisms and the most relevant research on healthy eating consumption and food preference, we also include a number of practical recommendations for interventions and applications based on these two processes of change.

Outline of the review

The review is structured as follows. First, it briefly introduces the Elaboration Likelihood Model (ELM) of attitude change (Petty & Briñol, 2012; Petty & Cacioppo, 1986), as a conceptual framework to understand how attitudes and preferences are formed and modified. This initial section covers two key variables that affect the amount of thinking as illustrations – attitudinal ambivalence and inconsistencies between actual and desired attitudes –, and also addresses the consequences of elaboration (e.g., for attitudes to guide behavior in the long-term; Petty & Briñol, 2020). Next, this review highlights that the evaluations people have of the thoughts that result from elaboration are also relevant in determining attitude change. Special attention is paid to the perceived origin and destination of the thoughts, and the role that emotions play in influencing thought evaluation. Finally,

the review offers practical recommendations and raises some key questions that practitioners and public policy makers can ask themselves when crafting a health campaign designed to be persuasive.

Scope of the review

This review is unique in focusing on the core psychological *mechanisms* that can lead to attitude and behavior change. Previous reviews in the domain of persuasive campaigns promoting healthy food preference have focused on other relevant topics such as social categories (Tarrant & Butler, 2011), self-efficacy (Brug, 2008; Conner & Armitage, 2002), motivational factors (Ajzen & Fishbein, 2005; Bandura, 2001), or goal setting and goal pursuit (Schwarzer et al., 2011). Indeed, making healthy food choices is a complex phenomenon shaped by multiple factors (Mata et al., 2018; Spiteri-Cornish, 2016; Wilson et al., 2016). In order to contribute to this domain, the present review offers the science of persuasion as a foundation so that practitioners and public policy makers can understand and improve the efficacy of their persuasive attempts before any efforts have been undertaken. Health behavior change represents a complicated process with many challenges and understanding the core principles of the psychology of attitude change represents a promising starting point.

Finally, it should be noted that the research papers that comprise this review were selected based on whether (1) the attitude object belonged to the healthy eating domain, (2) a persuasive attempt or treatment was attempted, (3) the process underlying attitude change was related to one of the two main mechanisms of change highlighted here, elaboration or validation, and (4) whether there was any consequence associated with those psychological processes in terms of attitude change or strength (e.g., impact on behavior; Petty & Krosnick, 1995). The aim was not to be exhaustive in our coverage of all the studies pertinent to attitude change in the domain of healthy eating consumption, but rather to offer an illustrative selection of studies that show the importance of considering two of the fundamental processes of attitude change – elaboration and validation.

Promoting positive attitudes toward healthy food

Unhealthy eating habits are associated with the main causes of diseases and death in many societies (Micha et al., 2017; Pearson-Stuttard et al., 2017; World Health Organization [WHO], 2009). Most of the

resources allocated to preventing and eradicating these causes such as obesity (and its health-related problems) are spent on designing health campaigns to promote well-being by creating favorable attitudes and behaviors toward eating a healthy diet (Mayne et al., 2015). However, the data about the success of healthy eating interventions have shown mixed results (Bonell et al., 2015; Rekhy & McConchie, 2014). The results of previous studies of the health campaigns and interventions are diverse, producing positive effects, null effects, and even adverse effects. But, there is some room for optimism.

First, it is notable that some health campaigns have produced the intended results. Importantly, even when some of the effect sizes have been small, these small effects can accumulate over time to be consequential and meaningful (Abelson, 1985; Loyka et al., 2020). For instance, Talvia et al. (2011) designed a longitudinal intervention in which parents received nutritional education about a specific dietary topic (saturated and unsaturated fat, visible and invisible fat, and the role of fruits and vegetables and whole-grain products in healthy eating) along with counseling dealing with the child's and family's diet. After the intervention, parents' attitudes toward general health maintenance improved ($d_{\text{mother}} = 0.39$ and $d_{\text{father}} = 0.53$, small and medium effect respectively; Cohen, 1988) and these attitudes were associated with a decrease in saturated fat intake ($d = 0.32$, small effect; for other examples of the importance of food attitudes of parents, see Lwin et al., 2017; Pettigrew et al., 2016; Romanos-Nanclares et al., 2018).

Beyond parents, schools have also become the scene of interventions aimed at improving the attitudes and healthy food intake of students (Dudley et al., 2015; Kulik et al., 2019). For example, Francis et al. (2010) examined the impact of a nutritional education program on attitudes related to healthy dietary habits. Results showed improvements in students' attitudes toward a better diet ($d = 0.20$, small effect), and also improvements in healthy dietary choices ($d = 0.21$, small effect; for additional examples of educational programs in schools, see Céspedes et al., 2013; Koo et al., 2019; Mikkelsen et al., 2014; Yoder et al., 2014).

Another way to expose people to persuasive messages can be through cooking classes or workshops (Brown & Hermann 2005; Condrasky & Hegler, 2010; Larson et al. 2006; see also, Hersch et al., 2014 for a review). For example, after attending a 10-week program with practical and educational sessions, participants showed an increase in vegetable preference

($d = 0.35$, small effect), and more favorable food and healthy cooking attitudes ($d = 0.29$, small effect; Cunningham-Sabo & Lohse, 2013; see also, Burton et al., 2017; Wolfson et al., 2020). As another illustration, Winham et al. (2014) tested an interesting program integrating theater elements into interactive cooking workshops. After several weeks, these researchers observed that participating in these experiences prompted more positive attitudes toward healthy eating ($d = 0.41$, medium effect). In fact, another way to work with persuasive proposals is through role-playing or interpretation games (see Cheadle et al., 2012; Joronen et al., 2008; Perry et al., 2002). Bush et al. (2018) examined the impact of a school program that included a 60-min live theater performance addressing nutrition content areas. Results showed that the theater performance improved children's healthy eating attitudes ($d = 0.62$, medium effect).

As another example, an Intuitive Eating program encouraged individuals to focus on internal body signals (i.e., hunger, satiety, and appetite) as a guide for attitudes relevant to eating (Warren et al., 2017). This intervention focused on the idea that awareness of internal hunger and satiety cues serve as a guide about *when* and *how* much to eat. Education programs based on intuitive eating have demonstrated positive changes in eating attitudes ($d = 0.63$, medium effect; Healy et al., 2015; see also, Cole & Horacek, 2010; Humphrey et al., 2015). For example, patients in an eating disorder center who participated in an intuitive eating program showed healthier attitudes toward food and eating ($d = 0.91$, large effect) and also applied these attitudes to make healthier choices in their eating behavior ($d = 0.31$, small effect; Richards et al., 2017). These interventions often involve a mindfulness component in which people are encouraged to mentally separate from their own thoughts (Bernstein et al., 2015; Luttrell et al., 2014). In the current review, we will describe studies using this meta-cognitive approach to encourage healthy eating by getting people to separate from their negative thoughts.

Although there are many examples of successful healthy eating campaigns, there are also examples of interventions that have not been successful. That is, some work has found that certain intervention strategies are not effective, leading to no changes in relevant outcomes (e.g., Gill et al., 2005; Noar, 2006; Snyder & Hamilton, 2002). Finally, unexpected negative effects of some health campaigns have been observed. That is, some health interventions have produced a boomerang effect and *increased* the number

of non-desirable healthy food evaluations and behaviors (Lorenc & Oliver, 2013; Salmon et al., 2013). Several factors can explain these ironic reverse effects of health campaigns such as the social pressure to look thin (Myers & Biocca, 1992) or the psychological reactance motivating people to maintain a sense of personal freedom (e.g., Kim & So, 2018; Lewis et al., 2010; Puhl et al., 2013).

Taking into consideration these contradictory results and the lack of satisfactory explanations, it can be challenging to predict when health campaigns will produce the intended effects, no effects at all, or boomerang effects. Even when health campaigns are effective in producing positive results immediately, it still seems complicated to predict if those changes will be lasting over time, which is key to achieving an adequate level of well-being. As explained further shortly, the study of the fundamental psychological mechanisms of attitude change allows researchers to predict future changes in people's behavior and improve the effectiveness of health campaigns (Lowe et al., 2015; Petty et al., 2009; Rees et al., 2018; Salovey & Wegener, 2003).

Summary

Because attitudes are one of the most important (though not only) determinants of behavior, exploring the mechanisms of attitude change should be useful for those interested in bringing about healthy lifestyle habits. We focus on two critical psychological mechanisms that have been responsible for attitude change in the domain of healthy eating – elaboration and validation. These two processes have also been critical for understanding how attitudes change or resist change over time in other domains (Petty & Briñol, 2020; Teeny et al., 2017).

Another relevant feature of this review is the consideration of implicit measures of attitude change. Some recent work has included assessments of attitudes with measures that tap into automatic rather than deliberative evaluations (Petty et al., 2009; Wittenbrink & Schwarz, 2007; for reviews). An assessment of a person's automatic evaluative response in the domain of healthy eating consumption can be important because deliberative self-reports can be contaminated by social desirability concerns, and automatic evaluations have been shown to determine judgments and behaviors engaged in spontaneously (e.g., Dimofte, 2010; Gawronski & Payne, 2011; Sheeran, Bosch, et al., 2016; Trendel & Werle, 2016).

Although measures of automatic evaluation often produce the same results that explicit self-reports do (e.g., both revealing that people like fast food), they can also show different responses. Previous work has shown that explicit and implicit measures of attitudes are capable of impacting behavior individually (e.g., Greenwald et al., 2015) and in combination (e.g., Johnson et al., 2017). Thus, in the present review we show how these measures can be modified using different persuasion procedures. Furthermore, we review previous research showing how the basic mechanisms of persuasion are critical for predicting both short and long-term changes in deliberative and automatic attitudes.

Elaboration

Elaboration, how much thinking people engage in regarding a persuasive treatment, is a fundamental element in the ELM (Petty & Cacioppo, 1986). This theory proposes that judgments can be influenced by mechanisms that require different degrees of information processing, with some persuasion processes requiring more cognitive effort than others. The processes involved in changing attitudes, however, and the consequences that occur differ depending on the degree of thinking in which the person is engaged (Petty & Briñol, 2020). Specifically, because high elaboration persuasion processes produce more consequential attitudes, we focus on high elaboration rather than cue-based change in this review (see Table 1). We also highlight that the ELM explains that high elaboration can produce changes to both deliberative as well as automatic attitudes.

The ELM is just one example of dual-process theories that deal with both deliberative and automatic processes. There are other relevant frameworks, but we focus on the ELM because most of the persuasion studies addressing elaboration processes have been guided by that theory. Other models like the Associative Propositional Evaluation model (APE; Gawronski & Bodenhausen, 2006) posit that individuals react positively or negatively to attitude objects as a function of the feelings or the propositions that come to mind when confronted with the attitude object or issue. These responses are then evaluated for their validity by examining whether the responses are compatible with the person's knowledge. There are still other relevant models that deal with how attitudes are stored and structured in memory, such as the MODE (Motivation and Opportunity as DEterminants of attitude to behavior processes, Fazio & Olson,

2014) model, the dual attitudes approach (e.g., Wilson et al., 2000), and the meta-cognitive model (MCM) of attitude structure (Petty & Briñol, 2006; Petty et al., 2007). We return to the MCM later in the review when we discuss some determinants of elaboration. Before getting to that, we discuss the role of elaboration in producing health-related persuasion and some important consequences of high elaboration attitude change.

Elaboration of healthy-eating messages: promoting attitudes toward vegetable consumption

As an illustration of the role of elaboration in promoting healthy food attitudes, Cancela et al. (2016) conducted a study where participants read a health message favorable to vegetable consumption comprised of compelling or specious arguments. Varying the quality of the arguments in a message is a common technique in the persuasion literature to examine whether some variable affects the degree of message elaboration (Petty et al., 1976). In particular, if some variable increases thinking about a message, then this variable should increase the extent to which people's attitudes following the message are contingent on the quality of the message. If thinking is low, however, then attitudes should not be affected much by the cogency of the message (see Carpenter, 2015). Variables external to the message are most likely to affect the amount of elaboration when it is not already constrained to be very high or very low (e.g., the message is on a topic of moderate rather than very high or low importance). In the Cancela et al. (2016) study, following exposure to the strong or weak message, participants reported their evaluations of vegetable consumption. Importantly, participants also completed a measure of perceived elaboration consisting of one question regarding the amount of attention they paid to the message.

The results showed that the degree of processing of the message influenced attitude change toward vegetable consumption. Under relatively high reported elaboration, more argument quality discrimination was obtained. However, at relatively low elaboration, attitude change was similar for both messages. Viewed differently, increased processing enhanced the influence of strong arguments (making attitudes toward vegetables more positive) but reduced the influence of weak arguments (making attitudes less positive). Beyond the intake of vegetables, elaboration processes have been found to be relevant in changing attitudes

Table 1. Elaboration of persuasive messages about healthy and unhealthy eating.

Study	Health Intervention	Independent Variable/Predictor	Dependent Variable	Results	Effect Size	Practical Implication	Questions (from Tutorial)
Cancela et al. (2016)	Promotion of eating vegetables.	1. Argument quality: Message composed of strong or weak arguments. 2. Extent of elaboration: High vs. low manipulated through a matching induction.	1. Attitudes toward eating vegetables. 2. Behavioral intentions: Behavioral intentions regarding vegetable consumption.	Greater elaboration led to enhanced argument quality effect on attitudes. $d = 0.40$. Elaboration enhanced attitude-behavioral intention correspondence.	2-way interaction for attitudes: $d = 0.40$. Main effect on behavioral intentions: $d = 0.40$.	Attitudes toward vegetables are more likely to guide food choices when elaboration is manipulated to be high rather than low.	What is the amount of thinking about the proposal?
Cancela et al. (2021)	Promotion of eating vegetables.	1. Argument quality: Message composed of strong or weak arguments. 2. Perceived extent of elaboration.	1. Attitudes toward eating vegetables. 2. Attitude strength: Measures of the perceived stability and resistance to change.	Greater elaboration led to enhanced argument quality effect on attitudes. $d = 1.3$. Elaboration enhanced attitude strength. $d = 1.7$.	2-way interaction for attitudes: $d = 1.3$. Main effect on perceived attitude strength: $d = 1.7$.	Not only short-term persuasion but also expected long-term consequences depend on the extent of elaboration.	Is the attitude perceived to be stable and resistant to change?
Horcajo et al. (2010) (study 3 & 4).	Promotion of eating vegetables.	1. Thought direction: List positive or negative aspects of eating vegetables. 2. Implicit measures (IAT) assessing self-esteem.	1. Implicit measures (IAT) assessing automatic attitudes toward eating vegetables. 2. Implicit measures (IAT) assessing the automatic link between vegetables and the self.	Elaboration led to changes in automatic attitudes. Greater automatic self-vegetable associations after listing positive aspects of eating vegetables and when implicit self-esteem was positive.	Main effect on automatic attitude toward eating vegetables: $d = 0.58$. 2-way interaction for automatic self-vegetable association: $d = 0.48$.	Merely thinking about eating vegetables (without a message) can lead to attitude change and attitude strength as assessed with implicit measures.	Is the attitude change generalized to other related attitudes?
Horcajo et al. (2010) (study 4).	Promotion of eating vegetables.	1. False feedback to increase or decrease the perceived linkage between the self and vegetables. 2. Implicit measures (IAT) assessing the self-esteem.	1. Implicit measures (IAT) assessing automatic attitudes toward eating vegetables. 2. Implicit measures (IAT) assessing the self-esteem.	More favorable implicit attitudes toward eating vegetables when the false feedback increased self-vegetables linkage and when implicit self-esteem was positive.	2-way interaction for automatic attitude: $d = 0.72$.	Increasing the perceived linkage between self and vegetables can lead to more favorable attitudes toward eating vegetables.	
Brinöl et al. (2004)	Promotion of eating vegetables	1. Argument quality: Message composed of strong or weak arguments. 2. Extent of unpleasantness associated with ambivalence.	Attitudes toward eating vegetables.	A greater extent of unpleasantness led to enhanced argument quality.		Elaboration can increase when people feel bad.	In which emotional state is the individual before processing information?
Clark et al. (2008)	Promotion of taxing foods with high levels of saturated fat.	1. Measures of the previous attitudes toward taxing food proposal. 2. Measures of explicit ambivalence toward taxing food proposal. 3. Argument quality: Message composed of strong or weak arguments.	Attitudes toward taxing food proposal.	When the message was initially relatively agreeable, greater ambivalence led to enhanced argument quality effects on attitudes.	3-way interaction for attitudes: $d = 0.46$.	Ambivalence is an antecedent of elaboration: ambivalence increases information processing of messages that are consistent with the dominant evaluative reaction.	Does the person experience evaluative conflict toward the attitudinal object?
Brinöl, Petty, and Wheeler (2006) (study 4).	Promotion of eating vegetables.	1. Self-esteem discrepancy calculated through the difference between the automatic and	Attitudes toward eating vegetables.	When the message was framed as self-relevant, greater explicit-implicit self-esteem discrepancy		Explicit-implicit discrepancies are an antecedent of elaboration increasing motivation to process	

(Continued)

Table 1. Continued.

Study	Health Intervention	Independent Variable/Predictor	Dependent Variable	Results	Effect Size	Practical Implication	Questions (from Tutorial)
DeMarree et al. (2017) (study 1).	Fast food restaurants.	deliberative self-esteem measure.	Behavioral intentions regarding eating in a fast food restaurant.	Desired attitudes predicted participants' likelihood of eating in a fast food restaurant over and above that predicted by actual attitudes.	Main effect on behavioral intentions predicted by desired attitudes: $d = 0.56$; and by actual attitudes: $d = 0.44$	information that is relevant to the object for which the discrepancy exists.	Would the individual like to have different attitudes?
		2. Argument quality: Message composed of strong or weak arguments.					
		3. Message framed as self-relevant or not.					
		1. Measures of actual attitudes toward a fast food restaurant.					
		2. Measures of desired attitudes toward a fast food restaurant.					

toward other health-related outcomes and services, including ecological food consumption (Royne et al., 2011), nutrition counseling (Kerssens & van Yperen, 1996; Ko et al., 2014; Wilson, 2007), interventions to prevent eating disorders (Unikel-Santoncini et al., 2019; Withers & Wertheim, 2004), and even attitudes toward energy bars and other food-relevant products (Cancela et al., 2021).

Elaboration and consequences of change: consequential attitudes toward vegetable consumption

Although many studies have demonstrated the benefits of enhancing elaboration of strong communications for producing attitude change (Petty & Wegener, 1998), elaboration is important not only because it determines the extent of attitude change, but also because persuasion under high degrees of thinking is usually more consequential in the long-term (Brinol & Petty, 2006; Petty et al., 2009; Petty & Brinol, 2020; Petty & Krosnick, 1995). For example, recent research by Cancela et al. (2021) revealed that attitudes toward vegetables were more likely to guide food choices when elaboration was manipulated to be high rather than low.

Beyond actual elaboration, the mere perception of thinking is also important in moderating the consequences of attitudes. For example, consider the study by Cancela et al. (2016) described earlier. In that research, participants not only reported their level of elaboration and their attitudes toward eating more vegetables, but also reported the extent to which they considered their attitudes to be consequential. In accord with the elaboration-strength principle, results showed that participants perceived that their attitudes were stronger (more stable and resistant to change) when they believed they had engaged in a high degree of processing of the ad. Importantly, prior research had shown that when people think their attitudes are based on thinking, they in fact become stronger (e.g., having a greater impact on behavior even when controlling for objective levels of thinking; Barden & Petty, 2008; see also Rucker et al., 2014). Similarly, a recent study about a proposal to tax junk food showed that the greater the perceived elaboration, the more attitudes guided behavioral intentions related to the proposal (Requero et al., 2020). The results of these studies may help provide understanding of the lack of effectiveness of some persuasive campaigns and interventions. For example, if attitudes toward the intervention message were based on responses to simple

cues rather than elaborative processing, the attitudes would not be expected to result in behavior change.

Elaboration and generalization of change: spreading from vegetable consumption to a new identity

Beyond stability, resistance to change, and prediction of intentions and behavior, another consequence of elaboration related to attitude strength is that attitude change that occurs under high elaboration conditions for the targeted attitude can lead to change in a related attitude by a process of spreading activation between associated cognitions (Glaser et al., 2015; Petty et al., 2012). It is highly feasible that attitude change mechanisms that involve high elaboration about an object produce an activation of the concepts (e.g., beliefs, values) with which it is closely related (McGuire, 1981). Thus, if attitudes toward vegetable consumption change through a high elaboration process, this change could generalize and transfer to other associated healthy consumption attitudes (e.g., toward fast food) creating a consistent and holistic relationship with a healthy diet (Bui & Fazio, 2016).

In research relevant to this idea of attitudinal spreading as a consequence of high elaboration, Horcajo, Briñol, and Petty (2010, experiment 3) showed that when participants thought about eating vegetables, associated changes on related automatic measurements were observed. Extensive thinking was explicitly encouraged in this study to ensure that conditions fostered high elaboration processes. Specifically, participants were instructed to generate positive or negative thoughts about increasing the consumption of vegetables in their diet. This was designed to link vegetables more generally to either good or bad. After generating their thoughts, participants completed implicit association tests (IATs) that assessed the automatic link between vegetables and the self (i.e., a measure of how well vegetables were associated with the self) as well as between the self and the concepts of good and bad (i.e., a measure of implicit self-esteem; Greenwald et al., 2002).

In accord with balanced identity theory (Greenwald et al., 2002; see also, Gawronski et al., 2007; Langer et al., 2009; Walther & Trasselli, 2003), when participants were engaged in high elaboration about the positive aspects of vegetable consumption, they reported stronger associations between the self and vegetables compared to those who thought about the negative aspects. However, this impact only occurred when participants strongly associated the self with

positivity. That is, when high implicit self-esteem individuals (self-good) came to like vegetables more, the 'vegetables-self' automatic link was strengthened. In contrast, for low implicit self-esteem participants (self-bad), the 'vegetables-self' link tended to strengthen when they thought about negative features of vegetable consumption. Another study in this line of research (Horcajo et al., 2010, experiment 4) showed that false feedback enhancing (vs. decreasing) the perceived linkage between the self and vegetables created more positive automatic evaluations about vegetables, but only for those with relatively high implicit self-esteem.

As noted, our proposal is that attitude change leads to more spreading consequences when the attitudes are changed through high elaboration mechanisms. As another illustration, Moreno et al. (2021) examined to what extent changing attitudes toward a healthy (or unhealthy) diet through high elaboration processes would increase (or reduce) prejudiced attitudes toward a related attitude issue – overweight people. Participants were first asked to generate positive thoughts either about a healthy or an unhealthy diet (see also Rudolph & Hilbert, 2017). After the thought-generation task, participants responded to a series of items regarding their attitudes toward the assigned diet as the focal attitude measure. Elaboration was measured in this study merely by counting the number of thoughts listed by each participant. In addition to manipulating attitudes toward diets and measuring elaboration, participants were also asked to rate a number of social groups as part of an ostensibly unrelated study. The key group of interest embedded in this list was people who were overweight. Thus, attitudes toward obese people were the distal (indirect) attitudes of this study.

The results showed that the manipulation of attitudes toward diets was successful. That is, participants asked to generate positive thoughts toward healthy diets reported higher liking for eating healthier than those assigned to generate positive thoughts toward unhealthy diets. Most importantly, those focal attitudes (toward diets) were more related to distal attitudes (toward overweight people) among participants who showed higher levels of thinking. Specifically, high thinking participants who wrote positive thoughts about healthy eating produced significantly more negative attitudes toward obese people than low thinking individuals. Also, high thinking individuals induced to like unhealthy foods produced more favorable attitudes toward obese people than low thinking participants. These findings were replicated in other

studies in which elaboration was measured differently (e.g., by assessing reading time) and when elaboration was manipulated rather than measured.

To summarize, this set of studies revealed that attitudes unrelated to healthy eating can be generalized to other important domains (e.g., prejudiced attitudes toward obese people). As noted, this indirect change is facilitated, at least in part, by high elaboration processes with respect to the focal attitudes. Importantly, there was some spreading also in the low thinking conditions, but it was not as pronounced as observed under high thinking. Furthermore, there are other factors that can contribute to spreading of attitude change beyond elaboration, such as processes relying on mere association, attitude accessibility, and moral conviction (e.g., Blankenship et al., 2015; Brannon et al., 2019; Cvencek et al., 2021; Glaser et al., 2015; Leippe & Eisenstadt, 1994; Maio et al., 2009; Walther, 2002). We focused on elaboration as a mechanism of change because it has received relatively less attention regarding its role in producing indirect change. In the next section, we turn to another important determinant of elaboration: attitudinal ambivalence. This factor is especially relevant in the health domain given the contradictory reactions that a person can have toward healthy and unhealthy foods (Norris et al., 2019; Yan, 2015).

Elaboration as a mechanism to cope with ambivalence

There are many factors that can motivate (e.g., personal relevance) or enable (e.g., message repetition) people to elaborate on a message when it is not already constrained by other factors to be high or low (Petty & Cacioppo, 1986). However, to illustrate the importance of elaboration in persuasion, we focus on a variable – ambivalence – that is particularly relevant in a health context. One of the more interesting and useful aspects of the MCM (Petty & Briñol, 2006), mentioned earlier, is that it points to two different kinds of ambivalence that a person can experience about a health topic. One type, called explicit ambivalence, occurs when people have an attitude object linked in memory to both positivity and negativity and they further believe that both of these reactions are valid (e.g., “Hamburgers taste good, but they are also unhealthy”). A second type, called implicit ambivalence, occurs where there are discrepancies between people’s automatic and deliberative attitudes (e.g., some automatic positivity comes to mind when a person sees cigarettes, but the person consciously

believes cigarettes are bad). That is, with implicit ambivalence an individual also has an attitude object linked to both positivity and negativity in memory (the same as explicit ambivalence), but one of these reactions is endorsed (the explicit attitude) but the other is tagged as invalid (the implicit attitude). This individual does not recognize being ambivalent because the individual does not consider both reactions to be valid. An individual’s evaluative reaction to an attitude object might be seen as invalid for a variety of reasons including that (a) the individual believes the reaction is a mere cultural association (e.g., from the media) and does not represent what he or she truly believes (e.g., “I have a negative reaction towards vegetables because they are portrayed as not tasty on TV, but I know that is not true”) and (b) the reaction represents a prior attitude (e.g., “I used to like smoking cigarettes, but now I no longer do”; Petty et al., 2006; see also Wilson et al., 2000). Next, we describe two examples illustrating how explicit and implicit ambivalence are consequential by affecting elaboration in the domain of healthy eating consumption.

Explicit ambivalence: taxing junk food

Previous work has shown that explicit discrepancies are seen as negative experiences (e.g., produce feelings of conflict; Priester & Petty, 1996), and therefore individuals try to handle the discrepancy in some way. For example, by paying attention to information relevant to the object of discrepancy people often hope to find a solution to alleviate the general unpleasantness that comes from psychological conflicts (e.g., Abelson, et al., 1968; Festinger, 1957; Nordgren et al., 2006). Taking into account further information, they expect to know more details of the positive or negative aspects so that the discrepancy and the subjective discomfort decrease (Durso et al., in press; Hänzle, 2001; Jonas et al., 1997). Some studies have revealed that people reporting relatively high (vs. low) levels of felt ambivalence toward healthy food consumption usually pay more attention to relevant details to disinhibited eating such as food size and calories (Cornil et al., 2014; Goldstein et al., 2014).

In one study illustrating ambivalence affecting elaboration (Briñol et al., 2004), individuals feeling high evaluative conflict showed greater processing of a persuasive communication related to vegetable consumption compared to those feeling low evaluative conflict. The unpleasantness associated with psychological conflict led to an increase in elaboration as indicated by

enhanced argument quality discrimination in attitudes toward vegetable consumption.

In another illustrative example, Clark et al. (2008) first asked participants to report their attitudes and the degree of explicit ambivalence toward a proposal of taxing foods with high levels of saturated fat. Then, individuals received an advertising message comprised either of compelling or specious arguments about the benefits of the tax proposal. Next, participants reported their attitudes about the proposal. When people were relatively ambivalent before they read the ad, they showed a greater degree of information processing than when relatively unambivalent. Therefore, ambivalence enhanced persuasion for the strong ad but decreased it for the weak ad. Importantly, the effects of ambivalence on amount of processing were present especially for participants who had a relatively agreeable previous opinion. Pro-attitudinal messages were perceived as potentially more relevant to reduce ambivalence since it would bolster their existing attitude. In other words, participants in this paradigm were more interested in processing an ad that was consistent with their dominant evaluative reaction rather than a conflicting one since the former message might more easily resolve the ambivalence. When ambivalence increases the extent of processing, it is likely to result in attitudes that are consequential.

Implicit ambivalence: unrecognized conflict toward vegetable consumption

Although there are a number of studies that have examined the consequences of ambivalence, some studies have shown the potential presence of and consequences of implicit ambivalence. For example, Briñol, Petty and Wheeler (2006, experiment 4) found that increases in the extent of discrepancy between explicitly and implicitly measured attitudes was associated with enhanced processing of a communication about healthy eating consumption. In this research, participants' self-evaluations were first assessed with an automatic measure (IAT, Greenwald & Farnham, 2000) as well as a self-report measure (Rosenberg, 1965). Then the difference between both indicators was estimated and an index of implicit-explicit self-esteem discrepancy was calculated. Then, participants read either a strong or a weak advertising message about vegetable consumption framed as important for the self or not.

The results showed that when the advertising message was framed as important to the self, the greater the discrepancy between a person's explicit and implicit self-esteem, the more the participant discriminated

the merits contained in the arguments. However, when the advertising message was framed as not important to the self, discrepancy did not lead to discrimination based on argument quality. That means that discrepancies may not always increase information processing – only when the object for which the discrepancy exists is relevant for the self. Moreover, the direction of the created discrepancy index (i.e., was explicit self-esteem greater or less than implicit), did not influence the outcome. Just as inconsistencies would lead to more processing of an advertising message about vegetable consumption when the ad is said to be self-relevant, if the implicit-explicit discrepancy was about vegetables per se (e.g., positive explicit attitude but negative implicit), this discrepancy would generally lead to more processing of ads about vegetables because such messages would be directly relevant to the attitudinal discrepancy.

Previous work has shown that explicit attitudinal ambivalence is related to low certainty in one's attitude (Bargh et al., 1992; Jonas et al., 1997). As a result, ambivalent attitudes can reduce action readiness (van Harreveld et al., 2009) and encourage greater message elaboration to enhance certainty about the object (Hodson et al., 2001). Similarly, implicit ambivalence is related to implicit uncertainty about the attitude object (Petty & Briñol, 2009) as well as a general feeling of discomfort that is not directly attributed to the attitude object (Rydell & Durso, 2012). An attempt to reduce this discomfort is likely behind the increased information processing observed from implicit ambivalence as it is from explicit ambivalence (Johnson et al., 2017).

Elaboration and other forms of ambivalence: Implications for fast food consumption

Another source of evaluative conflict has recently been identified: the attitudes people actually have toward different objects (e.g., cake, genetically modified foods, individuals with obesity, etc.) can be different from the attitudes they would like to have (DeMarree et al., 2014). These divergent attitudes can influence the behavior and thoughts of an individual in different ways. For example, the actual attitude might encourage the person to eat fast food whereas the desired attitude might encourage the person not to eat it. These competing evaluative tendencies, like that resulting from implicit-explicit attitude discrepancies, can produce feelings of conflict about the attitude object.

Prior research has shown that inconsistencies between desired and actual evaluations lead to subjective ambivalence with all of the various consequences previously mentioned. This type of ambivalence has been shown for many health topics such as taxing junk food and engaging in exercise (DeMarree et al., 2014). In some cases, when actual attitudes are not congruent with desired attitudes, the latter can motivate behavioral repertoires designed to achieve behaviors related to the desired attitudes independently of actual attitudes. For instance, in one study (DeMarree et al., 2017, study 1), participants completed a measure about their attitudes toward the McDonald's restaurant chain (both desired and actual) and then reported their behavioral intentions (e.g., "Over the next month, how likely is it that you will eat at least one meal at McDonald's?"). Results showed that the behavioral intentions were predicted by the desired attitudes toward this restaurant above and beyond the actual attitudes. As is the case with any form of evaluative conflict, one could expect that the greater the discrepancy between people's actual and desired attitudes the greater the interest in receiving more information pertinent to the topics for which the discrepancy exists (DeMarree et al., 2014, 2017).

Validation

Having described the importance of elaboration processes in persuasion, the second persuasion process that is a key component of the ELM has been more recently described and involves thought validation, a meta-cognitive process that refers to thinking about one's own thinking. Importantly, according to the ELM, any persuasion variable (e.g., ambivalence) can not only affect the extent of elaboration (i.e., how much individuals think), the valence of that thinking (i.e., whether individuals are largely favorable or unfavorable in their thoughts), but can also influence how individuals perceive or feel about their thoughts. When people consider their thoughts as valid or feel good about them, they use them when evaluating. When people have doubt about or do not like their cognitive responses, they do not rely on them to form their evaluations. When people are highly doubtful of their thoughts, they can even make judgments opposite to the valence of the thoughts generated. This mechanism of self-validation is based on secondary or meta-cognition because it involves a reflection on primary cognition, and it takes relatively high thinking conditions to operate (Briñol & Petty, 2009). In the next sections, we illustrate how thought validation

processes stemming from variables ranging from the ease with which thoughts are produced to the perceived origin of the thoughts are also relevant to influencing health attitudes (see Table 2).

Validation through ease: promoting healthy-eating

One of the most studied variables affecting validation processes is the ease with which one's thoughts are generated (Schwarz et al., 1991). Specifically, the easier it is to generate a thought, the more confidence people have in it (Tormala et al., 2002). This effect occurs especially under high elaboration conditions when people are not only motivated and able to generate thoughts but also to evaluate them. In one study relevant to healthy food campaigns, students from a course on preventing eating disorders listed the benefits or detrimental aspects about a healthy diet (Requero et al., 2015). Following the thought listing task, all participants completed the attitude measure regarding the diet and reported the ease with which they generated their thoughts. Results showed that for people who rated it relatively easy to generate thoughts, those writing positive aspects of the diet showed more favorable attitudes toward that diet than did those writing negative aspects. However, for individuals who perceived it was relatively difficult to generate thoughts, those who wrote positive aspects tended to be less favorable toward the diet than did those who wrote detrimental aspects.

This study suggested that the meta-cognitive experience of ease can be an important determinant of attitudinal outcomes in the domain of food-related health persuasion. That is, individuals showed more favorable evaluations regarding the diet when they were asked to think in a positive direction and less favorable attitudes when they were required to think in a negative direction at high but not at low levels of perceived ease. Interestingly, individuals who were relatively low in perceived ease of thought generation showed a non-significant opposite trend. Indeed, as noted earlier, when people have strong doubts associated with the validity of their thoughts in one direction they might infer that the opposite direction might be more likely to be true. It is important to note that fluency is operating through a validation process in this study because it has an opposite effect on persuasion depending on whether the validated thoughts are positive or negative. Beyond ease, recent research has shown that other experiences such as the mere feeling of readiness and preparation can increase

Table 2. Validation of thoughts polarizes attitudes toward healthy and unhealthy eating.

Study	Health Intervention	Independent Variable/Predictor	Dependent Variable	Results	Effect Size	Practical Implication	Questions (from Tutorial)
Requero et al. (2015)	Eating Mediterranean diet.	1. Thought direction: List positive or negative aspects of eating a Mediterranean diet. 2. Thought validity: Measure of the ease of thought generation.	Attitudes toward eating a Mediterranean diet.	Greater experience of ease in generating thoughts produces greater impact of those thoughts in forming attitudes: ease increased persuasion for positive thoughts but decreased persuasion for negative thoughts. People relied on their thoughts more in forming attitudes when the thoughts were internally rather than externally originated.	2-way interaction for attitudes: $d = 0.42$	Meta-cognitive experiences of ease polarize attitudes by validating thoughts.	Do the individual's thoughts about the health issue come to mind easily?
Gasó et al. (2018)	Eating Mediterranean diet. Eating fast food.	1. Thought direction: List positive or negative aspects of eating a Mediterranean diet or fast food. 2. Thought validity: Thought origin with internal (high validity) vs. external (low) perceived validity.	Attitudes toward eating a Mediterranean diet or fast food.	People relied on their thoughts more in forming attitudes when the thoughts were internally rather than externally originated.	2-way interaction for attitudes toward eating a Mediterranean diet or fast food: $d = 0.50$	People consider the origin of their thoughts as to whether they are valid or invalid. Origin affects thought usage and polarizes attitudes.	Is the origin of the thought perceived as a valid or reliable source?
	Eating fast food.	1. Thought direction: List positive or negative aspects of eating fast food. 2. Thought validity: Thought origin with internal (high validity) vs. external (low) perceived validity.	1. Index of attitudes and behavioral intentions regarding eating fast food. 2. Measures of thought validity.	People relied on their thoughts more in forming attitudes when the thoughts were internally rather than externally originated This effect was mediated by thought-validation.	2-way interaction for index of attitudes and behavioral intentions: $d = 0.36$ Thought validity as a mediator: Indirect effect 95% CI = [0.01, 0.10]	People consider the origin of their thoughts as to whether they are valid or invalid. Origin affects thought usage and polarizes attitudes and behavioral intentions.	
Brinöl et al. (2013)	Eating Mediterranean diet.	1. Thought direction: List positive or negative aspects of eating a Mediterranean diet 2. Destination of thoughts: Placing in one's pocket (high validity) vs. the trash (low validity).	Index of attitudes and behavioral intentions regarding eating a Mediterranean diet.	When thoughts were placed in one's pocket participants used their thoughts more in forming attitudes and behavioral intentions than when placed in the trash.	2-way interaction for index of attitudes and behavioral intentions: $d = 1.08$	People evaluate the destination of their thoughts as whether it implies validity or invalidity. Invalidity reduces thought usage and attenuates attitudes and behavioral intentions.	What does the person do with those thoughts after generating them?
Kim et al. (in press)	Eating fast food.	1. Thought direction: List positive or negative aspects of eating fast food. 2. Meaning of the destination of thoughts: Moving to save (high validity) vs. moving to delete (low validity).	1. Behavioral intentions regarding eating fast food. 2. Measures of thought confidence.	When the meaning of the destination implied validity, participants used their thoughts more in forming behavioral intentions. This effect was mediated by thought confidence.	2-way interaction for behavioral intentions: $d = 0.48$ Thought confidence as a mediator: Indirect effect 95% CI = [0.07, 0.52]	Meaning of the destination that is associated with validity affects thought confidence and this effect polarizes behavioral intentions.	Is the meaning of the key variable (ease, origin, destination) associated with validity?

confidence in thoughts affecting food-relevant attitudes even when those thoughts are unrelated to the domain in which the person was prepared (Carroll et al., 2020).

Validation depending on perceived origin of thoughts: changing attitudes toward the Mediterranean diet, and fast food

Research on thought validation has found that there are many individual factors (e.g., extent of happiness) and situational variables (e.g., being in a confident posture) that are associated with perceived validity in addition to ease that can interact with thought valence to impact judgments (see Briñol & Petty, 2009, for a review). For example, the perceived origin of one's thoughts can impact attitude change by affecting the validity of people's thoughts. The origin of thoughts denotes the perceived source of a particular primary cognition (e.g., "Where did this thought come from?" and "Did I think of this myself, or did I hear somebody else say it?"). The perceived origin of thoughts is relevant because if it is related to validity, then it can impact thought use and the extent of attitude change.

In one relevant study (Gascó et al., 2018), adolescents who participated in a workshop on preventing eating disorders were asked to list either the benefits or detrimental aspects of different diets – a fast food diet or the Mediterranean diet. After that, individuals were assigned to the thought origin induction. In this manipulation, individuals were required to choose an origin for their thoughts among possibilities that listed exclusively external options (i.e., from one's peer group or the media) or internal options (e.g., from one's personality or experience). The options presented to the participants required them to consider and select only external or internal sources of their thoughts. Results showed that the thought valence manipulation had a larger impact on judgments when the participants were assigned to the internal origin condition compared to the external origin condition. Furthermore, this result was obtained regardless of the type of diet they had to think about. Thus, this experiment suggested that when people perceive that their thoughts are internally originated, they consider those thought to be more valid by default compared to when they perceive that their thoughts are externally originated.

A final experiment in this line of research tested the psychological mechanism of the effect using a mediational approach. Participants first thought about

the benefits or detrimental aspects of eating a fast food diet. After that, individuals were assigned to the thought origin manipulation. Then, individuals completed measures of attitudes and behavioral intentions regarding fast food. Importantly, perceived thought validity was also assessed as a potential mediating process. Results showed that individuals in the internal origin condition used their thoughts to guide evaluation to a greater extent than those in the external origin condition, and this result was mediated by the perceived validity of their thoughts.

Validation as a function of subjective destination of thoughts: healthy food

In addition to considering the origin of their thoughts, people can also consider their destination. For example, in one experiment, Briñol et al. (2013), as part of a course on dietary habits, had participants write the benefits or the detrimental aspects of a particular diet on a sheet of paper. After that, they were asked to either throw that paper in the garbage (an invalid destination), move it to inside their pockets (a destination associated with high validity), or just leave it on a table (control condition). It was shown that placing one's thoughts in a high validity location led to greater use of the thoughts in forming evaluative judgments and behavioral intentions regarding the diet than placing the thoughts in a low validity location. In fact, individuals in the invalid location condition not only used their thoughts less but they even used them in a reverse way. In sum, perceptions about the origin and destination of thoughts can have an impact on thought usage thereby affecting attitudes and behavioral intentions toward healthy and unhealthy foods.

Validation is meaning dependent: choosing between healthy and unhealthy options

Experiments have shown that sometimes the very same response with respect to one's thoughts can be interpreted differently, and the meaning is critical for the outcome. For example, Kim et al. (in press) asked individuals to type out the benefits or the detrimental aspects of McDonald's food using a computer keyboard. Then, they had to save or delete their thoughts. That is, in the high validity condition, individuals were told to save their thought list on the computer whereas in the invalidity condition they were told to delete the thought list from the computer before the

next phase of the study could begin. In order to save or delete their thoughts, participants used a slider that emerged on the computer screen. Participants were asked to move the slider all the way to one side or the other to implement the action (i.e., saving or deleting). To further ensure that the meaning of this action was clear to participants, either the word 'save' or 'delete' was displayed next to the slider as a function of the assigned condition. Therefore, all participants conducted the same physical action, but the meaning of this action varied depending on participants' experimental condition. Next, participants were informed about a \$5 discount coupon redeemable at McDonald's as a participating gift and they rated their intention to use the coupon in the next few days. Participants also reported the confidence with which they held the thoughts they had listed.

Results showed that the same action produced distinct effects on thought validation and use depending on the meaning associated with the action. In particular, participants used their thoughts when the meaning of their actions implied validity (i.e., 'save') rather than invalidity (i.e., 'delete'). Furthermore, the thought meaning effect was mediated by thought confidence. Thus, in the validity condition, individuals who listed positive thoughts about McDonald's reported a stronger intention to redeem the coupon compared to those who generated negative thoughts. In the invalidity condition, whether participants generated positive or negative thoughts did not influence their intention to use the coupon (for a similar example on healthy eating see, Santos et al., 2019).

Taking into account the results of this and other work on different meaning that variables can have in different situations (Briñol et al., 2017), we argue that health-promotion practitioners and public policy makers not only need to understand the default meaning that individuals impart to the many contextual aspects that surround health campaigns, but also to the fact that different people can interpret the same contextual features differently and that the various features of a persuasion campaign are potentially malleable in their meaning. The differential meanings of the same feature of a campaign could imply that sometimes when a variable is expected to produce a beneficial impact, it actually can produce a detrimental impact. Moreover, because meaning is personal and can be different depending on consumers and situations, we suggest that health promotion professionals and other persuasive agents evaluate the psychological meaning of each element of their persuasive treatment.

Emotions in elaboration and validation

Although so far we have focused on elaboration and validation processes separately, it is important to realize that it is possible for any one variable to influence both processes. Next, we provide an example of how to analyze one persuasion variable that considerable research has shown affects both processes (Petty & Briñol, 2015; see Table 3). Specifically, we will focus on people's experience of different emotions. Moreover, previous research has shown that emotions are especially important in understanding food preference (Samant & Seo, 2019).

Emotions influence elaboration

Emotions and other feeling states can determine persuasion by influencing the amount of thinking about a proposal when people are trying to decide whether to think or not such as when the emotion is experienced just before presentation of the message (Bless et al., 1990). Although it seems clear that unpleasant states can increase information processing, scholars of emotion have noted that under certain circumstances positive emotions can also increase processing. For example, happiness can lead to an increase in elaboration if the individual considers that elaborating the proposal will allow him or her to keep a pleasant state or lead them to feel even better (e.g., when the message is likely to be fun to think about; Wegener et al., 1995).

Emotions are generally associated with either pleasantness or unpleasantness, although these are not the only appraisals associated with emotions (Moors et al., 2013). For example, according to the appraisal theory of emotion (Ellsworth & Smith, 1988; Keltner & Lerner 2010; Roseman, 1984) another dimension of appraisal is certainty versus doubt. Importantly, emotions can be appraised independently along the valence and certainty dimensions. For example, although anger and disgust are generally unpleasant emotions, they are associated with feeling certain. In contrast, although surprise and hope are generally positive emotions, they are associated with uncertainty.

Recent research on emotion and judgment has demonstrated that a particular emotion can be associated with inducing either more or less elaboration of a message depending on its appraisal (Briñol et al., 2018). For example, if disgusted or angry people pay more attention to the feeling of confidence related to these emotions, they may feel more sure of their own views and show reduced elaboration. In contrast, if

Table 3. The impact of emotions on attitudes toward healthy eating.

Study	Health Intervention	Independent Variable/Predictor	Dependent Variable	Results	Effect Size	Practical Implication	Questions (from Tutorial)
Stavraki et al. (2021)	Promotion of eating vegetables	<ol style="list-style-type: none"> 1. Emotion of disgust or curiosity. 2. Appraisal of confidence or pleasantness. 3. Argument quality: Strong or weak arguments. 	Attitudes toward eating vegetables.	When the confidence appraisal was salient, disgust produced less elaboration than curiosity. In contrast, when the pleasantness appraisal was salient, disgust produced more elaboration than curiosity. Greater elaboration led to enhanced argument quality effects on attitudes.	3-way interaction for attitudes: $d = 0.30$	Elaboration can emerge not only from unpleasantness but also from uncertainty associated with the emotion.	<i>In which emotional state is the individual before processing information? What appraisal is salient for that emotion?</i>
Brinöl et al. (2018)	Promotion of eating vegetables	<ol style="list-style-type: none"> 1. Argument quality: Message composed of strong or weak arguments. 2. Emotion of anger or surprise. 3. Appraisal of confidence or pleasantness. 	Attitudes toward eating vegetables.	When the confidence appraisal was salient, anger produced greater use of thoughts compared to surprise. When the pleasantness appraisal was salient, anger produced less thought usage compared to surprise. Greater use of thoughts led to attitude polarization.	3-way interaction for attitudes: $d = 0.54$	Emotions not only influence elaboration but also thought validity. The validation or invalidation of thoughts depends on the appraisal that is salient for the emotion.	<i>In which emotional state is the individual after generating thoughts? What appraisal is salient for the emotion?</i>
Requero et al. (in press)	Eating Mediterranean diet. Eating fast food.	<ol style="list-style-type: none"> 1. Thought direction: List positive or negative aspects about eating a Mediterranean diet or a fast food diet. 2. Emotion of hope or hopelessness. 3. Appraisal of confidence or pleasantness. 	Attitudes toward the diet.	When the confidence appraisal was salient, hopelessness produced greater use of thoughts compared to hope. When the pleasantness appraisal was salient, hope produced more thought usage compared to hopelessness. Greater use of thoughts led to attitude polarization.	3-way interaction for attitudes: $d = 0.34$	Emotions not only influence elaboration but also thought validity. The validation or invalidation of thoughts depends on the appraisal that is salient for the emotion.	<i>In which emotional state is the individual after generating thoughts? What appraisal is salient for the emotion?</i>

disgusted and angry people pay more attention to the unpleasantness from these emotions and infer that they are uncomfortable with their current views, this could result in increased information processing. To test this differential appraisals approach in the domain of healthy eating, Stavradi et al. (2021) compared disgust (unpleasant but confident appraisal) to curiosity (relatively more pleasant and associated with uncertainty; Loewenstein, 1994). Specifically, participants were induced to feel disgust or curiosity prior to exposure to a persuasive message. Next, an appraisal manipulation was induced to vary the appraisal of the emotion that participants were likely to make. Then, everyone read messages about vegetable consumption that varied in their quality and subsequently reported their evaluations toward the proposal. The outcome showed that when a confidence appraisal of the emotion was likely, disgust (confident appraisal) led to less elaboration than curiosity (as revealed by a reduced argument quality discrimination on attitudes toward vegetables). However, when a pleasantness appraisal was likely disgust (unpleasant appraisal) led to more elaboration than curiosity (as indicated by increased argument quality discrimination).

Emotions influence validation

Emotions not only can influence elaboration processes when the emotion comes before a persuasive message, but also can influence validation processes when the emotion comes after a persuasive message has been processed (Briñol et al., 2007). Just as was the case for emotions that preceded message processing, emotions that follow message processing can have different effects depending on the appraisal of the emotion that is made. Two broad kinds of thought validation operations can occur (Petty et al., 2002). One, called *cognitive validation*, refers to when people perceive their thoughts as correct. People make inferences of correctness when they are making a confidence appraisal of the emotion. The second type is called *affective validation* and refers to using one's thoughts because people feel good about them or like them. This occurs when people are making a pleasantness appraisal of their emotions (see Huntsinger, 2013; Huntsinger et al., 2014; Petty & Briñol, 2015, for conceptual reviews).

In one study related to healthy eating (Briñol et al., 2018), participants read a proposal about increasing vegetable consumption composed of strong or weak arguments. Then, participants were induced to feel either anger or surprise. Following that, they answered

some questions using words either associated with a confidence or a pleasantness appraisal. Finally, participants rated their preferences regarding vegetable consumption. The findings showed that when a confidence appraisal was made salient, angry individuals used their thoughts to form preferences about vegetables more than surprised participants because anger is more associated with certainty than is surprise (cognitive validation). However, in the pleasantness appraisal condition, angry individuals used their thoughts less compared to those who were surprised because anger is a less pleasant emotion than is surprise (affective invalidation). Recently, these findings were conceptually replicated in additional research showing that hope (a pleasant but uncertain emotion) and helplessness (an unpleasant but certain emotion) can moderate the impact of thoughts on attitudes toward healthy and unhealthy foods as a function of the appraisal that is made salient for each emotion (Requero et al., *in press*).

Re-Interpreting past findings

The high prevalence of unhealthy eating habits and obesity along with the associated problems that they produce is one of the largest public health concerns of both developed and developing countries (Marques et al., 2018; Morgen & Sørensen, 2014; Ogden et al., 2014). It is therefore important to know how to design health campaigns and interventions that will be effective in promoting positive attitudes toward healthy food such as vegetables. Indeed, communication research and public health experts have been interested in understanding the basic mechanisms underlying persuasion because this has been considered the key to producing favorable healthy preferences and behaviors aimed at enhancing well-being (Sheeran, Maki, et al., 2016). As described in this review, elaboration and validation are two of those key persuasion processes.

Some of the studies described in this review were designed to promote positive attitudes toward healthy diets (i.e., the Mediterranean diet) and healthy food intake (e.g., consuming more vegetables) while other studies included interventions oriented to decreasing unhealthy food consumption (i.e., taxing junk food, the disadvantages of McDonalds). In all cases, understanding the effects of these health messages depended on the consideration of elaboration and validation processes.

Moreover, these processes might serve to explain the disparate results found in the previous literature,

which could have profited from the inclusion of measures of elaboration and validation. For instance, some authors have speculated that the attention devoted to the health campaign played an important role in determining its efficacy (Pettigrew, 2016). Drawing on the ELM (Petty & Cacioppo, 1986), the amount of thinking is a key factor for determining persuasion. In studies that found a positive outcome of the campaign in the long-term (Wijayarathne et al., 2018), one could think that participants were carefully processing the advertising message, and that the arguments included in the message were mainly strong. Greater knowledge can also be beneficial to processing the relevant information that generates a favorable attitude (e.g., see Talvia et al., 2011). In addition, validation processes might be applied to explain these positive results. One could argue that the strong messages produced mostly positive thoughts and participants relied more on these positive responses in forming favorable evaluations toward the healthy food proposal to the extent that confidence in thoughts was high (Burton et al., 2017). Also speculatively, it could be that these studies with positive results worked in the short but not in the long-term because of the operation of a simple cue that was in the intervention rather than due to elaboration or validation processes. Given that there are very different possible outcomes depending on the process of persuasion that was involved, we have argued throughout this review that it is useful to know why a given intervention produced positive attitudes so that the strength (and long-term consequences) of those attitudes could be estimated.

In studies that found a null effect of the campaign (e.g., Gill et al., 2005; Noar, 2006; Snyder & Hamilton, 2002), validation and elaboration might also work to produce these outcomes. When people do not pay much attention to the health proposal, they are insensitive to argument quality. As a result, strong arguments produce virtually the same outcome as weak arguments, usually leading to null effects (for an example of interventions with participants who were not motivated to process the information, see Engbers et al., 2006; Lillico et al., 2015; Lone et al., 2009; Robertson, 2008, and for an example of interventions with participants who were not able to process the information, see Hendrie et al., 2008; Keenan et al., 2002). Of course, these null effects are more likely to the extent to which other positive cues (e.g., an attractive proposal endorser) are not present. Similarly, people who do not rely on their thoughts will not use them to form their subsequent preferences. Or, people may have relied on their thoughts, but

the thoughts were both positive and negative (e.g., Dorey & McCool, 2009; O'Key & Hugh-Jones, 2010).

Finally, in the case of studies that found a negative outcome or a boomerang effect of the campaign (Lorenc & Oliver, 2013; Salmon et al., 2013), elaboration might explain the detrimental effects of the campaign if the arguments contained in these advertisements were relatively weak, making people able to counterargue the points presented in the message (e.g., Lewis et al., 2010; Patterson et al., 2001). Similarly, validation might account for these outcomes if the arguments in the message produced mostly negative thoughts and people relied on those negative thoughts in forming their preferences. The same negative outcomes could occur if the thoughts to the campaign were mostly positive but people had high doubt in the validity of their thoughts because, for example, the source was perceived to have ulterior motives (or some other factor induced high levels of doubt). Prior reverse effects of healthy eating interventions can be reinterpreted using validation processes. For example, Treasure (2019) found that interventions can backfire because of the unpleasant feelings (e.g., guilt, regret) unintentionally generated in some participants. These unpleasant feelings can affectively invalidate the positive thoughts generated during the intervention, especially if the feelings are activated after generating the thoughts and a pleasantness appraisal of the emotion is made (Briñol et al., 2007).

Practical recommendations

The core argument of our review is that maximizing the chances of designing effective procedures to promote healthy eating attitudes depends in part on understanding the psychological processes that are likely to underlie the impact of any practical interventions (see Figure 1). Therefore, a natural concern is how researchers, practitioners, and institutions can explain and test the effectiveness of potential interventions in promoting healthy eating attitudes. Fortunately, as argued throughout our review, the effects of variables (such as ambivalence, discrepancy between actual and desired eating attitudes, emotion, origin or destination of thoughts, etc.) can be predicted *a priori* based on contextual factors, such as the general levels of elaboration in the persuasion context (e.g., validation processes occur when thinking is relatively high; variables affect elaboration when thinking is unconstrained), as well as the order in which events occur (i.e., variables are more likely to affect elaboration processes when they precede a

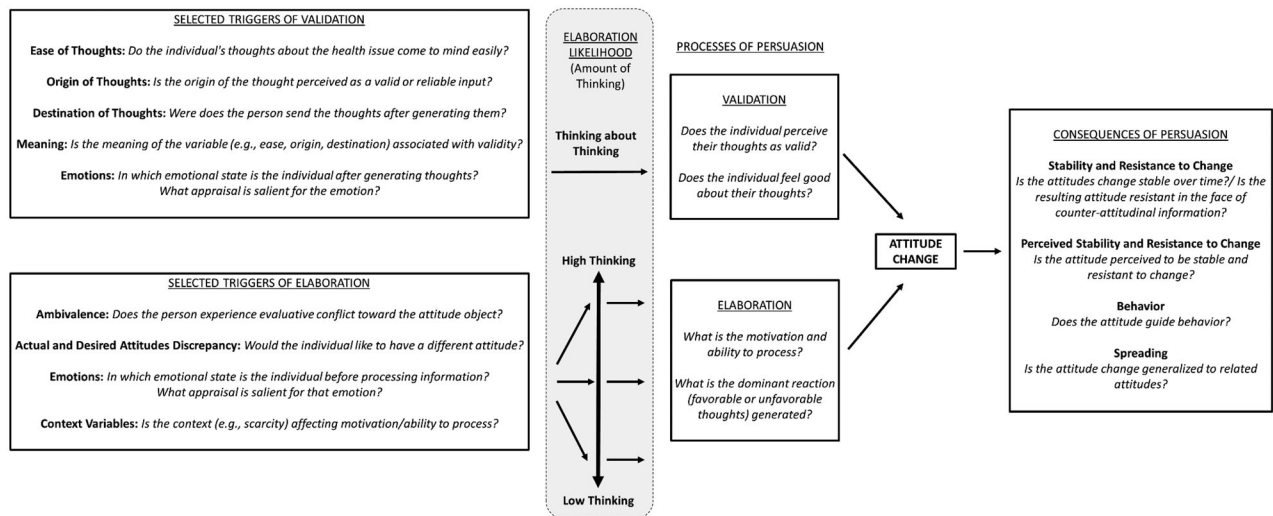


Figure 1. Tutorial with key questions for designing food-relevant campaigns attending to elaboration and validation processes.

message but affect validation processes when they follow a message). Therefore, agents of influence can deliberately target a particular process (elaboration, validation) by manipulating the amount of thinking, and by varying the time at which variables are made salient.

In addition to intentionally managing the situation, a number of different diagnostic measurements can be useful to take in order to determine how variables affect persuasion in this context of any given healthy eating campaign. As noted earlier, measuring both the type (favorability) and the number of thoughts that participants generate can help assess the role of elaboration processes that could be involved in changing attitudes. Furthermore, manipulating argument quality is another procedure that can help determine the importance of elaboration processes (i.e., as noted, larger argument quality effects on attitudes suggest greater elaboration). Beyond including methods of assessing how much actual thought participants are engaged in (e.g., Cancela et al., 2021), it is also important to assess how much participants in the interventions perceive they have thought about the message (subjective elaboration; e.g., “How much attention did you pay during the educational program?” see Cancela et al., 2016) because perceptions of thinking can have effects in addition to actual thinking (Barden & Petty, 2008). That is, assessing subjective elaboration can be helpful in predicting who is more likely to use their eating-related attitudes to guide relevant behaviors.

Furthermore, it is important to consider some elements that serve as elaboration triggers. In the case of ambivalence, one key question is whether having

mixed reactions to the attitude object (Priester & Petty, 1996) or to a message is sufficient to trigger the experience of evaluative conflict (Clark et al., 2008). Responding positively to a question about experienced conflict would indicate that the person is likely processing the message contained in the educational program or intervention. Regarding the discrepancy between actual and desired attitudes, it might be important to ask if the individual would like to have a different attitude about the relevant object (DeMarree et al., 2017). Moreover, the emotional state at the time of message exposure and the likely appraisal made about the emotion can also be key elements in determining the extent of elaboration or thought validation that occur. For example, highlighting the pleasant appraisal of emotions like surprise and awe can reduce information processing if the emotions and appraisal are salient before the message (Stavraki et al., 2021), but can also increase reliance on thoughts if made salient after the message (Briñol et al., 2018; Requero et al., in press).

Another tip related to elaboration processes involves assessing both objective indicators of attitude strength in order to understand the long-term consequences of induced changes (e.g., attitude stability, attitude-behavior correspondence) but also subjective indicators of strength (e.g., perceived stability and resistance to change). Relatively simple questions such as to what extent the attitude is perceived to be stable in the future (Cancela et al., 2016) can be useful to predict the long-term consequences of induced attitude changes. We have also noted that taking into consideration the generalization of change from one topic to another by assessing health-related attitudes

in related domains (even attitudes only indirectly or distally related to the domain of healthy eating evaluations) can provide researchers with a subtle, practical tool (Horcajo et al., 2010).

With respect to validation processes, assessing participants' confidence and liking for their thoughts can have practical value. Thus, as another step, we recommend the use of these measures (e.g., judgmental confidence; *"To what extent do you believe your thoughts are valid?"*/*To what extent do you feel good about your thoughts?"*) as potential moderators of the effect of any mental content (thoughts, attitudes, goals, traits) on behavior (e.g., food intake) because of the ease of use and efficiency of these two simple measures, and because they can increase the predictive validity of any mental construct. Furthermore, using these two questions can be enough to capture the various mentioned sources of thought validation such as ease, origin and destination of one's thoughts, and emotion.

Finally, we recommended assessing the psychological meaning of variables (e.g., *Do you think that having thoughts come to mind easily is good or bad?*; Kim et al., *in press*). First, we argue that practitioners and institutions can benefit by considering the meanings that people associate with the presumably positive variables introduced in various interventions. For instance, one could expect that a variable like ease of retrieval, self-affirmation, or a happy mood will produce a beneficial impact when, actually, it can produce a detrimental impact if interpreted in a negative way (e.g., Briñol et al., 2017). Moreover, because the meaning of the subjective states used in various interventions is personal and can be different depending on the person, the situations, and the culture, we suggest that persuasive agents evaluate the meaning of the core variables used by asking a simple question regarding what people think key aspects of a treatment mean. Of course, beyond assessing its natural variations, it is possible to manipulate the meaning of common inductions such as ease to produce the desired levels of validity (e.g., Briñol, Petty, & Tormala 2006).

Modality and context

The present review includes several examples of persuasive treatments based on written messages (e.g., composed of persuasive arguments) and a few examples based on visual inductions (e.g., seeing your thoughts being saved in a computer folder or deleted in the computer trash; Kim et al., *in press*). It also included selected illustrations of conditions in which

some participants were required to perform a physical action (e.g., throwing written thoughts away) while others were asked to only imagine doing that same action (Briñol et al., 2013). It is true that all these inductions are treated as relatively equivalent to emphasize that they all can operate through the same underlying processes. Having said that, it is also true that there can be differences between these modalities and contexts.

Therefore, the type of intervention (reading arguments, semantic priming, recalling past behavior, imagining a behavior, observing a behavior in others, or a message written on a soda bottle label, etc.) might affect the outcome of the intervention. Consider, for instance, research on bodily responses, where people have to perform an action in order to change their attitudes (e.g., physically throwing away your thoughts about food to decrease the impact of those thoughts, Briñol et al., 2013; eating with the non-dominant hand, Briñol & Petty, 2003; Van Dessel et al., 2018; holding a heavy plate of warm food, Ijzerman & Semin, 2009; Jostmann et al., 2009; chewing gum, Park et al., 2016; holding packages of different sizes, Marchiori et al., 2014; Versluis et al., 2015; Versluis & Papies, 2016). Although most of the studies on embodiment do not compare the effects of physical actions with other forms of priming, we think that there are several reasons why the effects can be stronger in conditions in which physical actions are involved relative to conditions in which only observation or imagination are involved.

First, it is possible that performing an action or embodying an object (e.g., touching and feeling a piece of fruit) allows for more precise associations than mere observation of the same object (e.g., seeing a piece of fruit). Consider as an example the research on reading leaflets about unhealthy food or seeing food on plates of different sizes (Engbers et al. 2006; Haws & Liu, 2016; Hollands et al., 2015). In these cases, the food may prime multiple constructs including calories, weight, flavor, but also fashion, advertising schemas, places of origin, etc. However, touching the plate and feeling its weight, eating with the dominant or the non-dominant hand or eating more slowly may disambiguate the meaning associated with that item and more clearly prime the idea of whether it is healthy or not (Briñol & Petty, 2003; Jostmann et al., 2009). For example, previous research has shown that chewing gum right after each meal can make people lose weight by enhancing the durability of perceptions of satiety (Park et al., 2016). Furthermore, it is possible that performing an action or embodying an

object (e.g., touching a plate, feeling its weight, holding a glass of wine) leads to more complex representations (with more associations of different kinds, including experiential memory) than merely thinking about the action or looking at the object (Barsalou, 2008; Niethental et al., 2005; for a recent example using food attitudes see, Chen et al., 2019).

A second way in which mere observation and embodied actions can differ is in the way they influence one's self-concept. The Active-Self Account of prime-to-behavior effects suggests that primes can change the content of one's self-concept and linking the prime to the self-concept increases the impact of primes on judgments and behavior (DeMarree et al., 2005). Perhaps performing physical actions or touching an external object such as a piece of fruit makes one feel healthier compared to merely seeing the fruit on a plate. That is, although touching the piece of fruit and seeing it might both prime the concept of healthy, it would be mostly those physically touching the piece of fruit who come to view themselves as healthy people. To the extent that people feel healthier, they are more likely to act in a healthy way by processing a persuasive message more carefully if it is related to healthy food. If healthy food is primed but people do not incorporate this trait into the self-concept, the prime is less likely to affect behavior and judgments. This is consistent with research showing that perceived agency is an important contributor to embodiment effects (Taylor et al., 2009). This is also consistent with research by Peck and Shu (2009) who found that merely touching an object can increase the perceived ownership of that object (see Papies et al., 2017, for a review on grounded cognition).

A third way in which observation and embodiment might differ from other forms of priming is that performing physical actions could function as a stronger prime. Research on priming suggests that stronger primes show larger effects (Dijksterhuis & Van Knippenberg, 1998; Papies & Hamstra, 2010; Papies & Veling, 2013; Papies et al., 2007, 2014, 2020; Veling et al., 2011). It is possible that although the time of exposure to the plate or the piece of fruit was held constant in embodiment research, physically acting (e.g., savoring the piece of fruit) or physically touching the object (e.g., holding the plate, touching the fruit) could increase the strength or salience of the prime compared to mere observation/imagination and therefore produces stronger effects.

These three possibilities provide some reasons for why actual behavior could produce stronger effects than imagined behavior. In addition to mentioning

these arguments, we also note that although there is little research that directly compares these possibilities, in some research, at least, actual behavior has been shown to produce stronger effects than imagined behavior (e.g., Briñol et al., 2013; Papies & Hamstra, 2010; Papies & Veling, 2013; Papies et al., 2007, 2014; Veling et al., 2011).

Conclusion

Individual preferences regarding healthy eating are a key part of most psychological models that aim to predict health behaviors. As recent meta-analyses suggest, the causal influence of attitudes on intentions and behavior is undeniable (McDermott et al., 2015; McEachan et al., 2016; Riebl et al., 2015; Sheeran, Maki, et al., 2016). In Figure 1 we have summarized some of the key points of this review. Most importantly, the figure recognizes that consequential persuasion depends on the two core processes of elaboration and validation highlighted in this review that both occur when thinking is relatively high. If a practitioner has strong arguments to present, one's goal should be to induce high levels of elaboration. The figure identifies several key variables discussed in this review that can serve as triggers to elaboration (e.g., emotions), though there are many others that could have been named (e.g., source credibility). The figure also demonstrates that when elaboration is high, it then becomes important to consider the various triggers of validation since simply generating thoughts is insufficient for them to influence attitudes. Figure 1 also identifies several variables highlighted in this review that affect validation processes, though again, many others have also been identified (e.g., see Briñol & Petty, 2009). Finally, the figure outlines the important consequences that can flow from attitude changes induced when elaboration and validation are high.

Although understanding the attitude change processes outlined in Figure 1 is critical for understanding behavior change, it is worth mentioning that behavior can be determined by many aspects in addition to people's evaluations even if those evaluations are formed by high elaboration and validity. These additional factors include subjective norms, perceived control over the action, and personal goals (Ajzen & Kruglanski, 2019; Forscher et al., 2019; Finlay et al., 2002; Sheeran, 2002). For example, the likelihood that people will engage in healthy eating is greatest when they have the will to act in a healthy way, when they have the ability to do so and when their social and physical environment offer the right opportunities for

engaging in the healthy behavior (Ajzen & Fishbein, 2005; Brug, 2008).

Furthermore, prior behavioral habits are also relevant in guiding current behavior as individuals tend to do what they have done in the past and it is sometimes difficult for a new preference to overcome this (Itzhakov et al., 2018; Wood, 2017). In fact, individuals' daily eating behavior is often habitual and guided by default choices (Roberto & Kawachi, 2014). In addition to these determinants, other factors make an important contribution in the prediction of eating behavior. That is, social factors such as eating with others and the modeling effect (Herman, 2015), or environmental factors such as the consumption of snacks to the detriment of meals (Bellisle, 2014) and the accessibility of energy-dense and highly palatable foods (Hill & Peters, 1998), and even nonconscious motivational processes (Papies, 2016) all play important roles.

In sum, although all these other factors are relevant in this domain, our review has highlighted the importance of attitudes as a primary element of interest because of its great impact on predicting healthy eating consumption, in addition to the role of changing attitudes in health campaigns. As noted, maximizing the chances of creating effective programs depends in part on the psychological mechanisms underlying attitude change. The unique feature of this review is its focus on two fundamental mechanisms of change, elaboration and validation, which are critical for predicting persuasion in the expected direction, and are also relevant in specifying how consequential the changed attitudes will be in guiding behavior over time.

The success of public policies encouraging healthier behavior (e.g., eating more vegetables, avoiding fast food diets), depends in part on the extent to which public service campaigns have the desired impact on influencing evaluations and subsequent behavior. Developments in the science of persuasion over the past few decades have provided guidance on these matters. For instance, this review clearly shows that people's idiosyncratic reactions (valenced thoughts) to an information campaign are more important than learning its content. Furthermore, how much recipients think about a healthy proposal (elaboration) plays a critical role in determining whether attitude changes translate into new behaviors (e.g., starting a new diet). Research shows that thinking is most useful when it is self-relevant and integrated into a coherent structure in which automatic and deliberative reactions converge. The most recent wave of persuasion research

described in this review has also demonstrated that in order for thoughts to influence healthy preferences, individuals must maintain those thoughts with confidence or feel good about them (validation). In this review, we have presented some illustrative examples of new advances in health interventions that would be useful to those interested in influencing attitudes toward healthy food. Unlike some other psychological approaches that deal exclusively with one societal problem, understanding fundamental persuasive processes such as elaboration and validation is equally useful for addressing many specific societal concerns.

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