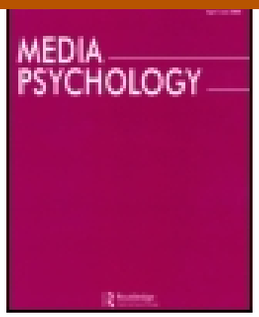

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Inhibitory control moderates the relation between advertising literacy activation and advertising susceptibility

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ABSTRACT

This study aimed to investigate whether children's advertising literacy activation affects their susceptibility to advertising and if this relationship is moderated by inhibitory control. In an experiment among 48 children aged 10–13 years old, we made a distinction between children's conceptual advertising literacy (i.e., knowledge of advertising) and attitudinal advertising literacy (i.e., critical attitude toward advertising). By using a within-subjects design, participants were primed with either television commercials (advertising condition) or a news broadcast (control condition). Advertising literacy activation was assessed with the Advertising Literacy Activation Task (ALAT), inhibitory control with a Go/No Go Task, and susceptibility with both an Approach-Avoidance Task (to assess implicit desire for the advertised products) and a questionnaire measurement (to assess explicit desire for the advertised products). The results showed that the relation between both conceptual and attitudinal advertising literacy activation and implicit desire for the advertised products was moderated by inhibitory control. Inhibitory control not only diminished the direct positive effect of advertising literacy activation on implicit desire, but even reversed it. No effects of advertising literacy activation and inhibitory control were found on explicit advertised product desire. Our results indicate that inhibitory control plays an important role in countering advertising effects.

Introduction

It is widely assumed that children are more susceptible to advertising effects than teenagers and adults due to their immature advertising literacy skills (De Jans, Van de Sompel, Hudders, & Cauberghe, 2019; John, 1999; Kunkel et al., 2004; Livingstone & Helsper, 2006). Advertising literacy is the ability to analyze, create, and evaluate persuasive messages and to hold a critical attitude toward them (Livingstone & Helsper, 2006; Rozendaal, Lapierre, Van Reijmersdal, & Buijzen, 2011). In general, advertising literacy is seen as a defense mechanism, because it is assumed that increased knowledge about advertising's intent and a more general skeptical attitude lead to more critical

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processing of advertising messages (Hudders et al., 2017; Opree & Rozendaal, 2013; Rozendaal, Buijzen, & Valkenburg, 2012). However, in order for children to critically process advertising messages and, thus, use their advertising literacy as a defense mechanism, they first have to *activate* it when they are exposed to these advertising messages. Without this activation, advertising literacy cannot work as a defense mechanism.

Previous studies have shown that a higher level of advertising literacy activation does not unequivocally lead to children being less susceptible to advertising effects (e.g., Livingstone & Helsper, 2006; Rozendaal, Slot, Van Reijmersdal, & Buijzen, 2013; Van Reijmersdal, Rozendaal, & Buijzen, 2012). While some studies have shown that a higher level of advertising literacy activation indeed leads to lower susceptibility (e.g, De Jans, Hudders, & Cauberghe, 2017; Rozendaal, Buijs, & Van Reijmersdal, 2016), other studies have shown the opposite (e.g., De Pauw, Hudders, & Cauberghe, 2017; Vanwesenbeeck, Walrave, & Ponnet, 2016) or did not find any effects at all (e.g., Panic, Cauberghe, & De Pelsmacker, 2013; Van Reijmersdal et al., 2012).

Thus, the question remains whether and how children's advertising literacy activation is related to their advertising susceptibility. There are two important issues that have been overlooked in previous research. First, all previous studies assessed children's advertising literacy activation with a self-report questionnaire measurement (with questions such as *"was the purpose of this commercial to make you buy the advertised product?"*). This has several disadvantages (see Hoek, Rozendaal, Van Schie, & Buijzen, 20202020 for an overview), the most important one being that questionnaires stimulate respondents to consciously and elaborately think about the processing of advertising (Vandeberg, Wennekers, Murre, & Smit, 2013). As a consequence, questionnaires may activate *post hoc* rationalizations (Vandeberg, 2014) that do not reflect the cognitive and affective processes that were actually activated during advertising exposure. Thus, previous studies may not have been able to uncover the actual effect of advertising literacy activation on advertising susceptibility.

The second issue that has been overlooked in previous research is the possible effect of individual differences between children (e.g., differential susceptibility, see Valkenburg & Peter, 2013). The relation between advertising literacy activation and advertising susceptibility is not the same for all children, but may depend on a child's specific characteristics. For instance, as has been suggested by Lapierre (2013, 2019), children's cognitive development plays an important role in understanding advertising messages and using advertising literacy as a defense mechanism. One factor of interest is executive function (Büttner, Florack, & Serfas, 2014; Lapierre, 2019; Lapierre & Rozendaal, 2019; Moses & Baldwin, 2005; Rozendaal et al., 2011) and specifically, inhibitory control. Inhibitory control is part of children's executive function (Diamond, 2013) and refers to the cognitive ability to inhibit and control certain responses (i.e., responses in relation to advertising exposure).

The current study addresses both issues. First, it adopts an innovative measurement approach by assessing both advertising literacy activation and advertising susceptibility with an indirect measurement task. An important advantage of indirect measures is that they do not require people to consciously and elaborately reflect on a past experience (Vandeberg et al., 2013), such as the processing of advertising. Second, this study takes individual differences into account by looking at the moderating role of inhibitory control on the relation between advertising literacy activation and advertising susceptibility, as has been suggested by Lapierre (2019) but has not been studied before.

Children's advertising literacy activation

Advertising literacy is often considered to be dispositional, in the sense that it is part of a child's intellect regardless of advertising exposure (Hudders et al., 2017). Dispositional advertising literacy develops throughout childhood and is considered to consist of two dimensions (Friestad & Wright, 1994; Rozendaal et al., 2011). First, conceptual advertising literacy, which is related to children's acquired knowledge about advertising, for instance with regard to advertising's selling intent (John, 1999) and persuasive intent (Moses & Baldwin, 2005). Second, attitudinal advertising literacy, which is related to children's attitude toward advertising, which can be defined as generally disliking advertising and being skeptical toward it (Rozendaal et al., 2011). An example of attitudinal advertising literacy is, for instance, being skeptical about the truthfulness in advertising messages.

Dispositional advertising literacy is considered to be clustered within children's advertising schema. The advertising schema is a mental structure that includes all information, knowledge and beliefs a person has about advertising in general (Dahlén & Edenius, 2007). It has been suggested that the advertising schema contains a subschema that includes dispositional conceptual and attitudinal advertising literacy (Dahlén & Edenius, 2007; Evans & Park, 2015; Friestad & Wright, 1994). According to information-processing theory, incoming information can serve as a cue that results in the retrieval and activation of related information (Atkinson & Shiffrin, 1968; Roedder, 1981). Exposure to advertising (i.e., incoming information) can serve as a cue to activate related information from the advertising schema, including conceptual and attitudinal advertising literacy.

As children's prefrontal brain is still maturing they may have more difficulty with using retrieval strategies (John, 1999; Roedder, 1981) that can help them to correctly retrieve and apply information about advertising. The prefrontal brain plays a significant role in children's ability to consciously activate and retrieve information from memory (Uytun, 2018) and doesn't mature fully until late adolescence (Casey, Tottenham, Liston, & Durston, 2005). Children

younger than 12 years old are also able to use retrieval strategies to activate and retrieve relevant information from memory, but only when they are prompted or cued (John, 1999; Roedder, 1981). This can, for instance, be done by including a banner to indicate that a television commercial block is starting, making it easier for children to recognize the commercial intent and activate their literacy accordingly.

Advertising literacy activation and susceptibility to advertising

In order for children to use their advertising literacy as a defense mechanism they first have to activate it. The general assumption is that once children activate their dispositional advertising literacy, they will use it to process the advertising message they are exposed to more critically (De Jans, Cauberghe, & Hudders, 2019; Hudders et al., 2017; Opree & Rozendaal, 2013). Subsequently, children's activated knowledge and skeptical attitude are supposed to lead to lower susceptibility to the advertising message (Rozendaal et al., 2011). The assumption that children's conceptual and attitudinal advertising literacy activation leads to lower advertising susceptibility is the central focus of this study, in which advertising susceptibility is defined as having an implicit and explicit desire for the advertised products. Although susceptibility to advertising includes more than only product desire (e.g., product attitude or purchase intention are also indicators of susceptibility), we chose to only include this variable because it is often used as an indicator for susceptibility (e.g., An & Stern, 2011; Boerman & Van Reijmersdal, 2020; Rozendaal, Buijzen, & Valkenburg, 2009; Rozendaal & Figner, 2019) and we are able to assess it on both a direct and an indirect level.

The supposed negative relation between children's advertising literacy activation and their advertising susceptibility has not yet been irrefutably substantiated with empirical evidence. The results of empirical studies for children's *conceptual* advertising literacy activation are mixed. Some studies showed that children who are better at activating their conceptual advertising literacy are less susceptible to advertising effects (e.g., De Jans et al., 2017), while other studies did not yield any effects (e.g., Van Reijmersdal et al., 2012). The majority of studies, however, showed that better conceptual advertising literacy activation leads to more susceptibility (e.g., De Pauw et al., 2017; Van Reijmersdal, Rozendaal, & Buijzen, 2015; Vanwesenbeeck, Ponnet, & Walrave, 2017; Vanwesenbeeck et al., 2016). Previous studies with regard to children's *attitudinal* advertising literacy activation have been more consistent and showed that increased attitudinal advertising literacy activation is related to lower susceptibility (e.g., De Jans et al., 2019; Rozendaal et al., 2016, 2013; Vanwesenbeeck et al., 2017, 2016).

However, the discrepancy in findings is not the only reason why the relation between advertising literacy activation and susceptibility remains unclear. All

studies mentioned above used self-report questionnaires to assess advertising literacy activation and advertising susceptibility. This might be problematic, as asking children questions about their advertising literacy activation and their susceptibility might lead to post hoc realizations about the nature of the message they were just exposed to. For instance, asking children questions about the intent of the advertising message they just saw may make them realize that the purpose of an advertising message is to persuade people to want, like, or buy the advertised product. This realization may trigger post hoc resistance to the advertising message in some children (e.g., because they don't want to be influenced), while it may increase wanting or liking of the advertised product in other children (e.g., because they believe this is expected of them). Thus, the results found in previous studies might not be an actual representation of the process that is going on during advertising exposure, but may only represent more conscious evaluations of the advertising message triggered by the questioning in these studies.

In the current study we circumvent the above-mentioned problems associated with questionnaires by including indirect measures. Indirect measures do not directly ask participants for information, but derive the information unobtrusively (e.g., by investigating task performance; Fazio & Olson, 2003). Therefore, indirect measures are better suitable to assess sub-conscious processes (De Houwer, 2006), such as the activation of dispositional advertising literacy in response to advertising exposure. When using indirect measures, the results may differ from research in which direct (i.e., questionnaire) measures were used. For instance, children are not made aware of the purpose of the advertising message, because there are no questions related to advertising purposes. Nor are there any questions about having a critical attitude (e.g., *"Do you think advertising is unfair?"*), which may trigger social desirable answers. Consequently, when using indirect measures, the relationship between advertising literacy activation and susceptibility to advertising may well turn out different from previous research in which direct (i.e., questionnaire) measures were used.

The moderating role of inhibitory control

Scholars have recently argued for including executive function in advertising literacy research (Büttner et al., 2014; Lapierre, 2013, 2019; Lapierre & Rozendaal, 2019; Rozendaal et al., 2011). Executive function refers to a set of cognitive abilities that are involved in the monitoring and control of both thought and action (Moses & Baldwin, 2005). The cognitive abilities that define executive function can be broken down into three groups: inhibitory control, working memory, and cognitive flexibility (Diamond, 2013; Kassai, Futo, Demetrovics, & Takacs, 2019).

In the current study, we focus on inhibitory control, which is the ability to control one's attention, behavior, thoughts, and emotions, making it possible to suppress unwanted or inappropriate responses (Carlson, Moses, & Breton, 2002; Diamond, 2013). Although inhibitory control is disproportionately difficult for young children, the first major step in attaining inhibitory control already appears before age 4 (Best & Miller, 2010; Diamond, 2013). The development of inhibitory control coincides with brain maturation, specifically the maturation of the prefrontal cortex (Crone & Steinbeis, 2017; Tamm, Menon, & Reiss, 2002). As children grown older (including moving into adolescence) their brain is becoming increasingly efficient at inhibiting responses. This is, for instance, shown by the fact that as children grow older they cannot only inhibit a response prior to its initiation, but also inhibit a response that has already begun (Simpson & Carroll, 2019; Tamm et al., 2002). Additionally, children get increasingly better at suppressing impulsive actions (Diamond, 2013). These abilities improve until young adulthood (Best & Miller, 2010; Tamm et al., 2002; Williams, Ponesse, Schachar, Logan, & Tannock, 1999).

Inhibitory control is especially important when studying children's susceptibility to advertising because it allows children to have a "stop-and-think" response when they are exposed to advertising messages (Büttner et al., 2014; Rozendaal et al., 2011). For instance, children have to be able to control their attention, by shifting it away from the emotionally appealing advertising message (the stop-part of the stop-and-think response) and control their thoughts in order to inhibit their desire to acquire the advertised product (the think-part of the stop-and-think response).

Controlling and inhibiting the automatic reaction that the advertising message evokes is important to counter advertising susceptibility. For instance, when a child is watching television and a (emotionally appealing) television commercial comes on, the initial response would be to follow the narrative of the commercial, probably leading to a positive attitude toward the product or even wanting and asking for the product. Inhibitory control ensures that children can stop this (automatic) reaction by (1) shifting their attention from the commercial and (2) evaluating and adjusting their response to the commercial. Previous research has, for instance, shown that higher levels of inhibitory control are related to lower levels of attention to visually appealing online advertising messages (Holmberg, 2016).

Thus, inhibitory control is especially important for the processing of advertising messages. Even if children possess relatively high levels of conceptual and attitudinal advertising literacy, they still have to be able to engage in the stop-and-think response in order for their advertising literacy to function as a defense mechanism (Lapierre, 2019; Rozendaal et al., 2011). In today's commercial media environment, in which advertisements are filled with emotional cues and are visually and auditorily complex (Buijzen, Van Reijmersdal, & Owen, 2010; Lapierre, 2019;

Rozendaal et al., 2011), children may be easily overwhelmed by the advertising message. Even if children are able to activate their advertising literacy, they still need to use their "cognitive brakes" (i.e., inhibitory control) in order for their advertising literacy activation to work as a defense mechanism and lower advertising susceptibility (Lapierre, 2019). Thus, inhibitory control is expected to play an important role in the relation between children's advertising literacy activation and their susceptibility to advertising.

Given our argumentation that measuring children's advertising literacy activation with an indirect measurement task is very different from measuring children's advertising literacy activation with self-reported questionnaires, we did not have any expectations (hypotheses) at the start of this study. Instead, the research question central to this study is:

RQ: What is the relation between children's (conceptual and attitudinal) advertising literacy activation, as assessed with an indirect measurement task, and their susceptibility to advertising, and to what extent does inhibitory control moderate this relation?

Method

Study design

In order to answer the research question, we conducted an experimental study with a one factor within subjects design. In the experimental condition, children were exposed to television commercials, which were supposed to activate their advertising literacy. In the control condition, children were exposed to clips from a news broadcast for children, which was not supposed to activate their advertising literacy. Children were exposed to both types of stimulus material, with a one week interval. Prior to collecting the data this project received approval from the Ethics Committee of the Radboud University Nijmegen, the Netherlands.

Participants

Children were recruited from two elementary schools in the Netherlands. There were 57 children who participated at measurement time 1 (50.9% boys, Age_{range} = 10–13 years old, M_{age} = 11.14, SD_{age} = 0.81) and 58 children who participated at measurement time 2 (51.7% boys, Age_{range} = 10–13 years old, M_{age} = 11.18, SD_{age} = 0.81). Data were excluded for children who did not participate at both measurement times. This resulted in a drop-out rate of 1.7%, with 57 children remaining in the sample. The data were collected in March and April, 2017.

Procedure

After the school gave permission to conduct the study, parents were informed and asked to sign an active consent form. Only children with active parental consent could participate. Children gave verbal consent at the start of the study. Both schools in which the study took place provided a separate room to conduct the study. In this room, five desks were each equipped with a laptop, a button box, a joystick, a mouse, and a headphone. Children participated in groups of four or five. Before they started, they were told the study was about what they saw on television and that the researcher was interested in their opinion; therefore, there were no right or wrong answers. Children were then asked to put on the headphones.

The procedure was different in the two conditions (see schematic representation in Figure 1). In order to keep the time of participation for children as low as possible, we decided to assess certain variables in only one of the conditions. This was only done for variables we view as trait variables (i.e., variables that would not be dependent on exposure to the stimulus material, such as inhibitory control and dispositional advertising literacy). In the advertising condition, children first performed the Go/NoGo Task, meant to assess children's general level of inhibitory control, which took approximately 5 minutes to complete. Second, they watched the advertising clip, after which they performed the Advertising Literacy Activation Task (ALAT; Hoek et al., 2020), followed by the Approach Avoidance Task (AAT; Klein, Becker, & Rinck, 2011), which both took 5 to 7 minutes to complete. Finally, they filled out a short questionnaire about their age, sex, school, grade and (explicit) product desire. In the news condition, children first watched the news clip, after which they performed the ALAT, followed by the AAT. Finally, they filled out a longer questionnaire. This questionnaire assessed the same variables as in the advertising condition, but also included questions regarding children's dispositional advertising literacy. We chose to assess children's dispositional advertising literacy in the news condition, so that answers on these questions could not be influenced by the preceding stimulus material. Each child's

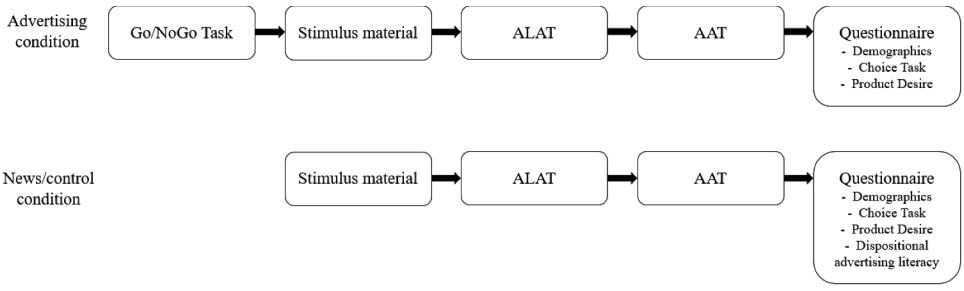

Figure 1. Schematic representation of the procedure. Note: ALAT = Advertising Literacy Activation Task, AAT = Approach-Avoidance Task

participation lasted for approximately 25 minutes. The experiment had a within subjects design with a one week interval, which was chosen based on other studies with similar designs (Boyland, Kavanagh-Safran, & Halford, 2015; Moore & Lutz, 2000). The order in which children were exposed to the stimulus material was randomized and counterbalanced over participants.

Stimulus material

Children were exposed to two types of stimulus material. One was advertising-related, the other news-related. Both were videos containing four short clips, which were either four television commercials (advertising condition) or four clips from a children's news broadcast (control condition). We conducted a pretest in order to select the clips. Sixteen clips were pretested among 24 children aged 10–12 years old. The children rated these sixteen clips on three aspects: video clip identification (Q: is this a commercial?/Q: is this part of a news broadcast?), video clip aim (Q: is the aim of this commercial to make you buy the product?/Q: is the aim of this commercial to make you think positively about the product?), and video clip liking (Q: How much did you like the video?).

We selected the clips that were strongly identified as advertising for the advertising condition and the clips that were strongly identified as news for the control condition (see Appendix A). Furthermore, we selected the clips that scored equally high on liking, to assure that the clips in one condition were not liked significantly more (or less) than the clips in the other condition. For the television commercials we also assessed product liking and product desire for the advertising products, so we could select the products that scored average in order to prevent floor or ceiling effects (i.e., we did not want to select products that were extremely desirable, nor undesirable, to account for some variance on the susceptibility measures). The selected advertising clips contained advertising for toys (2x), food (1x), and sneakers (1x). The selected news clips did not contain any products or brands, apart from the brand name of the broadcasting station.

We added a banner to the final versions of the stimulus material. In the advertising condition, this was a banner identifying the commercial nature of the clips making it look like a real commercial block. Furthermore, this commercial banner was chosen as a cue to help children recognize the commercial intent and activate their advertising literacy (John, 1999; Roedder, 1981). In the control condition, we added the opening and ending tune of the news broadcast from which the clips were taken. Both videos were constructed with Windows Movie Maker and lasted 2 minutes and 16 seconds.

Measurements

Advertising literacy activation

Children's advertising literacy activation was assessed with the Advertising Literacy Activation Task (ALAT; Hoek et al., 2020). This is an indirect measurement task in which children categorize words. These words are either related to advertising (e.g., buy, product) or to news (these are the control words, e.g., anchor, information). The task also includes negative and positive attitudinal words (e.g., boring, annoying, funny). We especially looked at the categorization of *negative* words because dispositional attitudinal advertising literacy is the extent to which one has a negative and skeptical attitude toward advertising (Rozendaal et al., 2011). Positive words are considered to be control words. For a complete list of the words used, see Table 1. In the ALAT, children had to categorize the words presented on the screen as either related to advertising or to news as accurately and as quickly as possible. This was done by pressing a response key that corresponded with one of the two categories. In total, children categorized 60 words: 10 advertising related words, 10 news related words and 10 attitudinal words, which were each presented twice. Each trial started with a fixation point in the middle of the screen, which was shown for 500 ms. Directly after the fixation point disappeared, the target (word) was shown for a maximum duration of 5000 ms (or until one of the two buttons was pushed). In previous research (see Hoek et al., 2020) the ALAT has shown to be a usable, reliable, and valid measurement tool to assess children's advertising literacy activation. The ALAT was made and executed in PsychoPy version 1.84.2 (Peirce et al., 2019). We used a button box instead of a regular keyboard in order to obtain reaction times with millisecond accuracy.

Both accuracy and speed of categorizing words in the ALAT were recorded and both were considered as indicators for advertising literacy activation. Accuracy was recorded as either 0 (incorrect response) or 1 (correct response). The speed of categorization was recorded in seconds with millisecond

Table 1. Words used in the advertising literacy activation task.

Practice	Advertising	News	Attitudinal
Order	Product	Jeugdjournaal[1]	Annoying
Purchase	Advertisement	NOS	Boring
Brand	Discount	Journaal[2]	Fun
Pay	Price	Reporter	Interesting
Journalist	Buy	Event	Funny
Studio	Persuade	Weather	Stupid
Domestic	Offer	Informative	Fake
Foreign	Stuff	Countries	Mislead
	Tempt	Information	Lies
	Store	Anchor	Lying

accuracy. More accurate and faster categorization of the advertising-related words shows a higher level of advertising literacy activation (Fazio & Olson, 2003). We looked separately at the conceptual advertising words (as indication for conceptual advertising literacy activation) and the attitudinal advertising words (as indication for attitudinal advertising literacy activation). Note that for the attitudinal words we did not look at whether children categorized the words accurately, but rather in which category they categorized them (i.e., categorizing more negatively valenced words as advertising-related reflects a more negative attitude toward advertising). In the final dataset, seconds were converted to milliseconds. Outliers in response time were removed via the method described by Leys, Ley, Klein, Bernard, and Licata (2013), where the absolute deviation around the median is used to calculate outliers.

We calculated a difference score for both types of words (conceptual and attitudinal) to control for individual differences in absolute reaction time speed or individual differences in speed-accuracy trade-off that are unspecific to the processing of advertising-related materials. The difference scores were calculated by subtracting the scores on accuracy of categorization and speed of categorization in one condition from the scores on accuracy of categorization and speed of categorization in the other condition. This means that measurements in the two conditions were combined in order to construct a single measure.

For categorization of the words, we subtracted the score of the advertising-related words in the control condition from the score in the advertising condition. This way, a higher score would indicate that the child categorized more advertising-related words as advertising words in the advertising condition than in the control condition. Hence, a higher categorization score is an indication of stronger advertising literacy activation. For speed of categorization, we subtracted the reaction time score to advertising-related words in the advertising condition from the reaction time score to the same words in the control condition. This way, a higher score would indicate that the child was *faster* in categorizing the advertising-related words in the advertising condition as compared to the control condition. Hence, a higher score is an indication of stronger advertising literacy activation. All descriptive statistics (including difference scores) can be found in Table 2.

Inhibitory control

To assess children's general inhibitory control skills, we used a Go/No Go Task (Archibald & Kerns, 1999). In this task, children had to give a behavioral response by pressing a specific button in case of a "go" stimulus and inhibit this response in case of a "no go" stimulus (Newman & Kosson, 2005). The go or no go stimuli in this study were a high tone and a low tone. Children could either get a version in which the high tone was the "go" stimulus and the low tone was the "no go" stimulus, or a version in which the high tone was the "no

Table 2. Descriptive statistics for calculating difference scores.

	Advertising condition	Control (news) condition	Difference score
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Accuracy categorizing conceptual words	1.88 (0.13)	1.83 (0.23)	0.05 (0.21)
Accuracy categorizing negative words	1.70 (0.42)	1.61 (0.41)	0.09 (0.35)
Speed categorizing conceptual words	1173.76 (296.13)	1241.61 (317.56)	67.85 (325.72)
Speed categorizing negative words	1368.51 (451.19)	1522.45 (438.71)	153.94 (395.32)
Approach tendency to advertising stills	−8.15 (271.02)	3.25 (278.52)	−11.41 (349.20)
Product desire	2.32 (0.62)	2.29 (0.55)	0.03 (0.37)

go" stimulus and the low tone was the "go" stimulus. The version was randomly assigned on the participant level.

In the Go/No Go task, children saw the image of a star or a heart on the screen (50–50%). This image was accompanied by a tone. Irrespective of the image (i.e., star or heart), children had to press the "B" button before the image disappeared from the screen when they were presented with the "go" stimulus and they had to inhibit this response (i.e., do nothing) when they were presented with the "no go" stimulus. The stimuli (i.e., combination of image and tone) were presented in one of five stimulus onset asynchronies (100, 200, 300, 400 or 500 ms) in order to keep children's attention to the cues. The image was always presented first, the tone second. After a practice block of eight trials, children received two blocks of 40 trials each. The task had a restricted presentation time (maximum trial duration was 1250 ms) and Go/No-Go stimuli were presented in a ratio of 1:1.

The score on inhibitory control was only calculated on the "no go" trials as these were trials in which children had to inhibit their response. Each correct response inhibition was assigned a score of 1 and each incorrect response inhibition was assigned a score of 0. The mean score was used as an indication of inhibitory control. Responses from three children were removed from the data set because they did not perform above the 50% probability threshold and we therefore concluded that they did not understand the task as instructed. For the remaining children (n = 54) the mean score was 0.96 (SD = 0.04).

Advertising susceptibility

Advertising susceptibility was defined as having a desire for the advertised products (Rozendaal et al., 2009). It was assessed with an indirect measure (the Approach/Avoidance Task) to assess implicit desire and a direct measure (self-report questionnaire) to assess explicit desire.

Approach/Avoidance task. The Approach/Avoidance Task (AAT) in this study was an adaptation of the task used in Klein et al. (2011). The children had to either pull (approach) or push (avoid) a joystick in response to images presented on the screen. The idea behind the task is that children with an implicit

desire for the advertised products (i.e., children with higher susceptibility) will be faster in pulling (i.e., approaching) images related to these advertised products and slower in pushing (i.e., avoiding) images related to these advertised products. On the other hand, children who don't have this implicit desire, or rather have an aversion, for the advertised products (i.e., children with lower susceptibility) will be slower in pulling (i.e., approaching) images related to these advertised products and faster in pushing (i.e., avoiding) images related to these advertised products.

The images that were used in this version of the AAT were stills from the stimulus material (i.e., stills from the commercials or stills from the news clips). We used four stills from each commercial, resulting in a total of sixteen advertising stills. We also used four stills from each news clip, resulting in a total of sixteen control stills. Each still was shown twice in the first block of trials and twice in the second block of trials. The child was instructed to respond as quickly as possible to each still, by either pulling the joystick toward them (approach response) or pushing the joystick away from them (avoid response). Half of the children was instructed to pull the joystick toward them when a still appeared that corresponded to the video they just saw and to push the joystick away when a still appeared that did not correspond to the video they just saw. The other half of the children was instructed to push the joystick away when a still appeared that corresponded to the video they just saw and to pull the joystick toward them when a still appeared that did not correspond to the video they just saw. Halfway during the task, the instructions were reversed.

To start the task, children had to position the joystick in the upright position and press the start button. One of the stills appeared and the child had to decide (based on the instructions) whether to push or pull the joystick. The image of the still became smaller when the child pushed the joystick away and bigger when the child pulled the joystick toward them. The size of the image was, thus, directly linked to the position of the joystick. The image of the still disappeared from the screen when the joystick reached an angle of 30°, but only if the child had moved the joystick in the right direction (i.e., direction as instructed). Moving the joystick to the left or right did not affect the image of the still. A new still only appeared when the joystick was put into the upright position again and the child pressed the start button. The children first received a practice block of eight trials, followed by a block of 32 experimental trials. This was followed by a short break, in which participants received the reversed instructions. Then children again practiced for a block of eight trials, followed by a block of 32 experimental trials.

We recorded the reaction time and whether the first response of the child was correct or incorrect. Only the first responses that were correct were used in the analyses. Furthermore, outliers in reaction time were removed via the method described by Leys et al. (2013). This resulted in the removal of 9.9% of the trials. We calculated a mean reaction time score for the following four types of trials; 1.

Approach reaction for advertising stills, 2. Approach reaction for control stills, 3. Avoid reaction for advertising stills, and 4. Avoid reaction for control stills. We calculated the approach tendency (Klein et al., 2011) by subtracting the score on the approach reactions from the score on the avoid reactions. Thus, a positive score indicated an approach tendency and a negative score an avoidance tendency (i.e., for the advertising stills a higher score indicates higher susceptibility and a lower score indicates lower susceptibility).

For the analysis we used a difference score, which was calculated in a similar way to the calculation of advertising literacy activation. We used a difference score to control for individual differences in the ease with which participants pull or push the joystick (descriptive statistics can be found in Table 2). For the approach tendency variable, we subtracted the approach tendency for the advertising stills in the control condition from the approach tendency for the advertising stills in the advertising condition. Thus, the score was dependent on exposure to the stimulus material. A more positive score indicates a stronger approach tendency in the advertising condition as compared to the control condition ($M = -11.41$, $SD = 349.20$). This difference score was used as the first dependent variable and is called *approach tendency*.

Self-report measure. Product desire was assessed with two questions for each advertised product; "Do you like [name product]?" and "Do you want to have [name product]?". The response scale ranged from 1 (*no, definitely not*) to 4 (*yes, definitely*). We calculated a mean score for product desire in the advertising condition and a mean score for product desire in the control condition (descriptive statistics can be found in Table 2). Then we calculated a difference score by subtracting the product desire score in the control condition from the product desire score in the advertising condition. Thus, a higher score indicates a stronger desire for the advertised products in the advertising condition as compared to the control condition. The mean for the difference score was 0.03 ($SD = 0.37$). This difference score was used as the second dependent variable and is called *product desire*.

Covariates

Children's age, sex, and dispositional advertising literacy were measured as covariates. Dispositional conceptual and attitudinal advertising literacy were assessed with a questionnaire, based validated scales on Rozendaal, Opree, and Buijzen (2016). See Appendix B for all items used. Conceptual advertising literacy was divided into knowledge of persuasive intent (3 items, $\alpha = .61$, $M = 3.31$, $SD = 0.57$) and knowledge of selling intent (2 items, $\alpha = .41$, $M = 3.68$, $SD = 0.49$). The response scale ranged from 1 (*No, not at all*) to 4 (*Yes, very much*), with higher scores indicating a higher level of conceptual advertising literacy. Attitudinal advertising literacy was divided into skepticism (3 items, $\alpha = .90$, $M = 3.76$, $SD = 0.88$) and disliking (7 items, $\alpha = .75$, $M = 3.73$, $SD = 0.62$) The response scale ranged

from 1 (*Never*) to 5 (*Always*), with higher scores indicating a higher level of attitudinal advertising literacy. New scores were calculated by taking the mean score of the items.

Plan of Analyses

All analyses were done in SPSS version 25.0. First, we checked for outliers on the independent variables. The sample size of this study was relatively small, causing outliers to have a strong influence on the results (Field, 2012). Therefore, children who scored 3 standard deviations above or below the mean on at least one of the independent variables were not included in the main analyses (n = 9). The demographics of the sample without the outliers was comparable to the sample including the outliers, now with 50.0% boys and a mean age of 11.19 (SD = 0.79). Furthermore, we checked if any of the covariates was related to the outcome variables in order to determine whether they had to be included in the main analyses.

To answer the research question, we conducted two separate hierarchical linear regression analyses (one for each outcome variable: approach tendency and product desire). The two regression analyses were hierarchical because in the first step we only included the variables for speed of categorization (for both conceptual and attitudinal words), inhibitory control and the interaction terms between speed of categorization and inhibitory control (for both the conceptual and attitudinal words) as the predictor variables. In the second step we also included the variables for accuracy of categorization (for both the conceptual and attitudinal words) and the interaction terms between accuracy of categorization and inhibitory control as the predictor variables (for both the conceptual and attitudinal words). We included speed in the first step and accuracy in the second step because we believed speed to be a stronger predictor and we wanted to know what the effect was of speed before taking accuracy into account. All predictor variables and covariates were standardized.

Results

Covariate analysis

First, we did a covariate analysis to check if any of the covariates had to be included in the main analyses. The covariate matrix can be found in Table 3. Age was the only variable significantly correlated to one of the outcome variables, children's approach tendency, $r(48) = -.33$, $p = .024$, and was included in the main analysis. None of the covariates was significantly correlated to children's product desire.

Conceptual advertising literacy activation

Conceptual advertising literacy activation was assessed as both accuracy of categorization and speed of categorization of conceptual advertising words. As can be seen in Table 4, speed of categorizing the conceptual advertising words had an effect on the approach tendency, $b = 328.10$, $\beta = .93$, $t = 3.51$, $p < .001$, 95% CI [143.48; 512.73]. This was in a positive direction. When children's conceptual advertising literacy activation was higher (i.e., when they were faster in categorizing the conceptual advertising words), their approach tendency was higher in the advertising condition than it was in the news condition. We did not find this relation for product desire (see Table 5). We also did not find any effects for accuracy of categorization of the conceptual advertising words.

Furthermore, we investigated the possible moderating role of inhibitory control. As can be seen in Table 4, there was no direct effect of inhibitory control. We did find an interaction effect between speed of categorizing the conceptual advertising words and inhibitory control on approach tendency, $b = -2.37$, $\beta = -.87$, $t = -3.07$, $p = .004$, 95% CI [−3.93; −0.81]. The interaction effect is plotted in Figure 2, with both variables recoded in two groups based on the median split. Figure 2 shows that for children with low levels of conceptual advertising literacy activation there is only a small difference in approach tendency between children with a low level of inhibitory control and children with a high level of inhibitory control. However, for children with high levels of conceptual advertising literacy activation there is a difference in approach tendency between the two groups. Children with a high level of conceptual advertising literacy activation, but a low level of inhibitory control, show a stronger approach tendency in the advertising condition than in the news condition, meaning they are *more* susceptible to advertising. For children with a high level of conceptual advertising literacy activation, and a high level of inhibitory control, this pattern is reversed: they show a stronger avoidance tendency in the advertising condition than in the control condition (i.e., they are *less* susceptible). This means that the positive direct effect of conceptual

Table 3. Pearson correlation matrix for both outcome variables and covariates.

	2.	3.	4.	5.	6.	7.	8.
(1) 1. Approach tendency	-	−.12	−.33*	.02	.12	.17	.23
(1) 2. Product desire		.19	−.06	.03	.11	.20	.12
(1) 3. Sex			.08	.36*	.03	.14	−.08
(1) 4. Age				.01	−.15	−.40**	−.35*
(1) 5. Persuasive intent					.17	.01	−.22
(1) 6. Selling intent						.10	.28
(1) 7. Skepticism							.33*
(1) 8. Disliking							

* $p < .05$, ** $p < .01$

Table 4. Hierarchical linear regression analysis for the effect of advertising literacy activation and inhibitory control on approach tendency.

	Approach tendency		
Predictor	*b*	β	95% CI
Step 1			
Speed of categorizing conceptual words	314.02	.89**	131.15; 496.89
Speed of categorizing attitudinal words	197.18	.57**	60.75; 333.60
Inhibitory control (IC)	216.67	.18	−173.70; 607.04
Speed conceptual * IC	−2.22	−.82**	−3.75; −0.69
Speed attitudinal * IC	−1.43	−.65**	−2.27; −0.60
Age	−186.03	−.42**	−305.50; −66.56
R2	.41		
R2 adjusted	0.32		
F	4.71***		
Step 2			
Speed of categorizing conceptual words	328.10	.93***	143.48; 512.73
Speed of categorizing attitudinal words	227.93	.66**	77.79; 378.07
Inhibitory control (IC)	126.09	.11	−315.88; 568.06
Speed conceptual * IC	−2.37	−.87**	−3.93; −0.81
Speed attitudinal * IC	−1.57	−.71**	−2.46; −0.68
Categorization of conceptual words	124.46	.25	−147.54; 396.46
Categorization of attitudinal words	75.05	.11	−201.51; 351.60
Categorization conceptual * IC	−176.31	−.03	−2954.78; 2602.17
Categorization attitudinal * IC	379.20	.07	−1790.58; 2548.98
Age	−188.32	−.43**	−311.52; −65.11
Δ R2	.06		
R2 adjusted	0.33		
F	3.62**		

†p <.10, * p <.05, ** p <.01, *** p <.001

advertising literacy activation on susceptibility is not only diminished for children with high levels of inhibitory control, but even reversed. However, we did not find this relation for product desire (see Table 5), nor did we find any effects for accuracy of categorization of the conceptual advertising words.

Attitudinal advertising literacy activation

Attitudinal advertising literacy activation was assessed as both accuracy of categorization and speed of categorization of negatively valenced words. As can be seen in Table 4, speed of categorizing the attitudinal advertising words had an effect on approach tendency, b = 227.93, β = .66, t = 3.08, p = .004, 95% CI [77.79; 378.07]. When children's attitudinal advertising literacy activation was higher (i.e., when they were faster in categorizing the negatively valenced words), their approach tendency was also higher, indicating a higher implicit desire in the advertising condition as compared to the control condition. No effects of attitudinal advertising literacy activation on product desire were

Table 5. Hierarchical linear regression analysis for the effect of advertising literacy activation and inhibitory control on product desire.

	Product desire		
Predictor	*b*	β	95% CI
Step 1			
Speed of categorizing conceptual words	−0.05	−.12	−0.29; 0.19
Speed of categorizing attitudinal words	−0.11	−.27	−0.30; 0.08
Inhibitory control (IC)	0.11	.08	−0.39; 0.60
Speed conceptual * IC	0.00	.31	−0.00; 0.00
Speed attitudinal * IC	0.00	.29	0.00; 0.00
R2	.10		
R2 adjusted	−.01		
F	.95		
Step 2			
Speed of categorizing conceptual words	−0.09	−.22	−0.33; 0.15
Speed of categorizing attitudinal words	−0.11	−.28	−0.32; 0.09
Inhibitory control (IC)	0.01	.01	−0.58; 0.60
Speed conceptual * IC	0.00	.44	−0.00; 0.00
Speed attitudinal * IC	0.00	.27	−0.00; 0.00
Categorization of conceptual words	0.02	.03	−0.35; 0.38
Categorization of attitudinal words	−0.31	−.39†	−0.68; 0.06
Categorization conceptual * IC	−0.93	−.16	−4.65; 2.79
Categorization attitudinal * IC	1.75	.29	−1.18; 4.68
Δ R2	.10		
R2 adjusted	.01		
F	1.06		

†p <.10, * p <.05, ** p <.01, *** p <.001

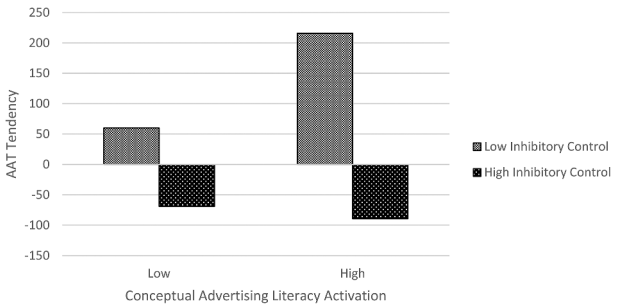

Figure 2. Interaction effect between inhibitory control and conceptual advertising literacy activation (assessed as speed of categorizing conceptual advertising words) on AAT tendency.
Note: a higher AAT tendency indicates a higher approach tendency (i.e., higher susceptibility) for the advertised product in the advertising condition as compared to the control condition. A lower AAT tendency indicates a higher avoidance tendency (i.e., lower susceptibility) for the advertised product in the advertising condition as compared to the control condition.

found (see Table 5), nor for accuracy of categorization of the negatively valenced words.

We also investigated the possible moderating role of inhibitory control. As can be seen in Table 4, there was no direct effect of inhibitory control. We did

find an interaction effect between speed of categorizing the negatively valenced words and inhibitory control on approach tendency, $b = -1.57$, $\beta = -.71$, $t = -3.58$, $p = .001$, 95% CI [−2.46; −0.68]. The interaction effect is plotted in Figure 3, with both variables recoded in two groups based on the median split. Figure 3 shows that for children with low levels of attitudinal advertising literacy activation there is only a small difference in approach tendency between children with a low level of inhibitory control and children with a high level of inhibitory control. However, for children with high levels of attitudinal advertising literacy activation there is a big difference in approach tendency between the two groups. Children with a high level of attitudinal advertising literacy activation, but a low level of inhibitory control, show a stronger approach tendency in the advertising condition than in the control condition (i.e., they are *more* susceptible). For children with a high level of attitudinal advertising literacy activation, and a high level of inhibitory control, this pattern is reversed: they show a stronger avoidance tendency in the advertising condition than in the control condition (i.e., they are *less* susceptible). This means that the positive direct effect of attitudinal advertising literacy activation on susceptibility is not only diminished for children with high levels of inhibitory control, but even reversed. No effects were found for product desire (see Table 5), nor for accuracy of categorization of the negatively valenced words.

Discussion

This study aimed to investigate the relation between children's advertising literacy activation and their advertising susceptibility and whether this relation was moderated by children's inhibitory control. Children's susceptibility to advertising was measured in two ways: via an Approach-Avoidance Task

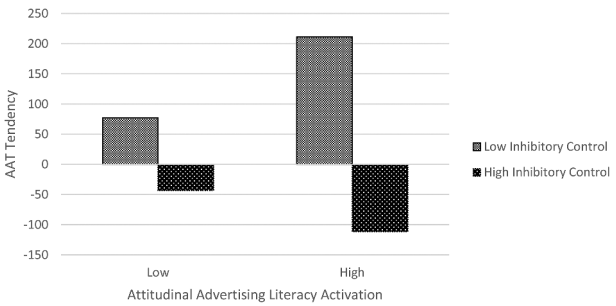

Figure 3. Interaction effect between inhibitory control and attitudinal advertising literacy activation (assessed as speed of categorizing negatively valenced words) on AAT tendency. Note: a higher AAT tendency indicates a higher approach tendency (i.e., higher susceptibility) for the advertised product in the advertising condition as compared to the control condition. A lower AAT tendency indicates a higher avoidance tendency (i.e., lower susceptibility) for the advertised product in the advertising condition as compared to the control condition.

(AAT) assessing implicit desire for the advertised products and via a self-report questionnaire measure assessing explicit desire for the advertised products. With regard to advertising literacy activation, a distinction was made between conceptual and attitudinal advertising literacy activation.

For conceptual advertising literacy activation, the results showed a direct positive effect on children's approach tendency toward advertised products. However, this relation was moderated by inhibitory control in such a way that the positive effect was not only diminished, but reversed. Children who scored higher on conceptual advertising literacy activation *and* inhibitory control showed an avoidance tendency toward the advertised products after being exposed to television commercials (i.e., they were less susceptible). This implies that the relationship between conceptual advertising literacy activation and advertising susceptibility is dependent on children's ability to inhibit their responses.

For attitudinal advertising literacy activation, the results also showed a direct positive effect on children's approach tendency toward advertised products. However, when taking into account children's inhibitory control, this positive effect disappeared. When children scored higher on attitudinal advertising literacy activation *and* higher on inhibitory control, their approach tendency was reversed and even turned into an avoidance tendency. This finding suggests that activation of attitudinal advertising literacy in itself may not be enough to decrease children's susceptibility to advertising, but that children also need to be able to inhibit their responses.

The above-described results suggest that both advertising literacy activation and inhibitory control are important to counter advertising effects, as has been assumed by other scholars (Büttner et al., 2014; Lapierre, 2013, 2019; Rozendaal et al., 2011). An explanation for this finding could be that advertising literacy activation in itself is not enough, but that children also need a "stop-and-think" response (Büttner et al., 2014; Rozendaal et al., 2011). In other words, children can activate their knowledge and critical attitude, but in order for that to work as a defense mechanism, they also have to be able to inhibit their initial positive response toward the advertising message.

In contrast to our findings with regard to children's implicit advertised product desire (as assessed with the AAT), we did not find any effect of children's advertising literacy activation on their explicit advertised product desire (as assessed with a self-reported questionnaire), nor did we find an interaction effect with inhibitory control. An explanation for the absence of effects on explicit advertised product desire could be that advertising literacy activation, implicit desire, and inhibitory control were all assessed with an indirect measure (i.e., with the ALAT, AAT, and Go/No Go Task, respectively), while explicit desire was assessed with a direct measure (i.e., with a self-report questionnaire). It might be that the indirect measures assessed a more

subconscious level of mental processing, while the direct measure assessed a more conscious level of mental processing (Fazio & Olson, 2003).

Although it is possible that these conscious and subconscious mental processes are related, this is not necessarily the case (Nosek, 2007). For instance, in research on racial prejudice and stereotypes, the results on direct and indirect measures differ, presumably due to social desirability effects in the direct measures (e.g., Devine, Plant, Amodio, Harmon-Jones, & Vance, 2002; Dovidio, Kawakami, & Gaertner, 2002). In the current study, the indirect measures all provide an assessment of subconscious mental processing, with tasks focusing on response accuracy and speed. On the other hand, the direct measure provides children the opportunity to evaluate and think about their answers, as they are not under any time pressure. It is plausible that no relation between indirect and direct measures was observed because these measures capture different levels of mental processing. Furthermore, it might be possible that, in order to detect significant relationships between variables assessed on different levels of mental processing, more statistical power is needed. Post hoc power analysis revealed that the power was low for the model with product desire as dependent variable, meaning these null findings need to be interpreted with caution. As this study is a first step in investigating the relation between advertising literacy activation, inhibitory control, and susceptibility to advertising, replication is needed to test the robustness of the results.

To our knowledge, the only other study that focused on the relation between advertising literacy, executive function, and advertising susceptibility was by Lapierre (2019). In his study, Lapierre found a direct effect of executive function on children's advertising susceptibility, but did not find an interaction-effect between conceptual advertising literacy and executive function on advertising susceptibility. Both findings are contradictory to our findings, as we did not find the direct effect, but we did find the interaction-effect of executive function. There are several explanations. First, it is possible that we did not find a direct effect of executive function because we only looked at one dimension of executive control, namely inhibitory control, while Lapierre (2019) used a measure of executive function that included all three dimensions (i.e., inhibitory control, working memory, and cognitive flexibility). It is conceivable that, in order to find any direct effects of executive function, a more comprehensive measurement of this concept is needed. Second, it is possible that Lapierre did find a direct effect of executive function, because Lapierre relied on parental reports for both executive function and susceptibility. It could be that parents over reported their child's executive function and/or under reported their susceptibility to advertising, due to positivity bias (López-Pérez & Wilson, 2015). Finally, a possible explanation for why we did find an interaction-effect in our study, whereas Lapierre (2019) did not, is that we measured advertising literacy activation instead of dispositional advertising literacy. It might be that executive function can only moderate the relation

between advertising literacy and advertising susceptibility when children's advertising literacy is actually *activated*. If children do not activate their literacy, they will not use it as a defense mechanism and, therefore, inhibitory control cannot moderate the relation between dispositional advertising literacy and advertising susceptibility.

Limitations and suggestions for future research

The most important strength of our study lies in the use of both direct and indirect measures. Combining both levels of measurement provides more insights in the mental processes that are ongoing during advertising exposure. Therefore, this study has contributed to the knowledge regarding conscious and subconscious processes that are at play when children are exposed to advertising. However, it would have been better if all three concepts were assessed on both a direct *and* an indirect level in order to obtain a more complete image of the relation between advertising literacy activation, advertising susceptibility and the moderating role of inhibitory control at conscious and subconscious levels. Future research should take this into account and preferably include both direct and indirect measures for all variables in one study.

A limitation of the current study is the limited age range of the participating children (i.e., all children were between 10 and 13 years old). Children gradually develop their conceptual and attitudinal advertising literacy from the age of 7. From this age, advertising literacy evolves from simple to more sophisticated knowledge and belief about the nature and working of advertising (Friestad & Wright, 1994; Hudders et al., 2017; John, 1999; Rozendaal et al., 2011). Although advertising literacy is, in general, relatively well developed among children from the age of 10 (Rozendaal et al., 2011), research has shown that children still not have acquired an adult-like level of advertising literacy at the age of 12 (Rozendaal, Buijzen, & Valkenburg, 2010). Furthermore, executive function also develops throughout childhood and keeps developing well into and even beyond adolescence (Best & Miller, 2010; Diamond, 2013). Replicating this study with children from a broader age range will provide more insights in the relation between different levels of advertising literacy (activation), executive control, and advertising susceptibility from a developmental perspective.

The scope of the current study is limited to television advertising. Television commercials are often very explicit in nature, making it relatively easy for children to recognize the commercial intent of the advertising message (Rozendaal et al., 2010). In the last few years, children are spending less time watching television and more time online (Ofcom, 2019; Pew Research Center, 2018). Advertisers have also noticed this switch and are increasingly targeting children online by, for instance, advertising in online videos (Kids digital

media report, 2019). Advertising in online videos is often embedded, meaning the commercial message is integrated in the entertainment content. This integration makes it difficult for children to recognize the commercial intent of the message (Hoek, Rozendaaal, Van Schie, Van Reijmersdal, & Buijzen, 2020; De Jans et al., 2019; Owen, Lewis, Auty, & Buijzen, 2013). For this reason, children may be less inclined to activate their advertising literacy when they are exposed to this type of advertising. The moderating effect of inhibitory control on the relation between advertising literacy activation and susceptibility to advertising, as was tested in the current study, may therefore be different for embedded advertising. Future research could investigate these relations for new forms of advertising targeting children.

A second suggestion is to include physiological measures in future research, such as visual attention measures (Holmberg, 2016; Samson & Buijzen, 2020; Van Reijmersdal et al., 2020). Previous studies showed that children with increased inhibitory control pay less attention to visually attractive advertising messages (Holmberg, Holmqvist, & Sandberg, 2015; Holmberg, Sandberg, & Holmqvist, 2014). Lower levels of visual attention may lead to lower levels of susceptibility. In future research these two research lines could be combined. By including physiological measures in research on children's susceptibility to advertising the extent to which visual attention can be linked to advertising literacy activation and advertising susceptibility can be investigated.

Another suggestion for future research is to adapt the Go/No Go Task that was used in our study. In the current task, the ratio of Go and No Go trials was 1:1, meaning that children had to give a response in half of the trials and had to inhibit their response in the other half of the trials. Although this ratio is has been used in other studies (e.g., Perner, Lang, & Kloo, 2002), a different ratio, in which the No Go trials are less common, might have been preferable. The Go/No Go Task is commonly used to assess inhibition control. In order to measure inhibition as accurately as possible, inhibiting a response has to become challenging (i.e., it has to be relatively hard to inhibit a response). Response inhibition is more difficult if the participant's default response is to generate a motor action. A more uneven distribution of Go/No Go trials (with many more Go trials than No Go trials) might be more suitable to assess inhibitory control. Although the current version of the Go/No Go Task was effective in determining individual differences in response inhibition, future research could include Go/No Go Tasks in which the ratio of Go/No Go trials is at least 3:1. Additionally, inhibitory control scores may vary considerably between children in the sample, especially when the study is done within a broader age range. The current study did not show significant variation in inhibitory control scores, but future studies may. If that is the case, it is recommended to include the participant as a random variable in the statistical modeling in order to reduce any possible problems with individual variation.

Implications

This study has both scientific and practical implications. First, when looking more specifically at the relation between advertising literacy and susceptibility, this study shows that both advertising literacy activation and inhibitory control are important to counter advertising susceptibility. Scholars who study the effects of children's advertising literacy activation on their susceptibility to advertising should, therefore, include inhibitory control (or executive control) as a possible moderator. This finding is also important for policy makers. Many countries implement media literacy programs in children's school curricula and these programs often include advertising literacy training. Based on our results, it might be advisable to not only include general advertising literacy skills in these programs, but to also teach children how to activate this literacy when they are exposed to advertising *and* to focus more on children's inhibitory control skills.

Second, on a more general note, this study shows that it is important to take individual differences into account when studying the effect of advertising literacy activation on advertising susceptibility. Advertising literacy is often seen as a defense mechanism against (unintended) advertising effects, but the current study shows that this may not be true for all children. Therefore, scholars should consider individual differences (e.g., different levels of advertising literacy and inhibitory control) when researching this subject. From a more practical standpoint, this also has implications. If the relation between advertising literacy (activation) and advertising susceptibility differs for children depending on certain characteristics, than the (typical) "one size fits all" approach of advertising literacy programs may not be the suitable for all children. It might be better to develop programs that can be personalized, depending on a child's characteristics or preferences. Given the current technological developments (e.g., adaptive learning technologies), designing such programs might well be a future possibility.

At this moment, there are simple ways for parents, educators, and other caregivers to assess children's inhibitory control (for examples, see Simpson & Carroll, 2019). Inhibitory control could be improved with training programs in schools (e.g., mindfulness programs, Razza, Bergen-Cico, & Raymond, 2015; Schonert-Reichl et al., 2015), in addition to advertising literacy programs. However, we acknowledge that educators already have a high workload. Therefore, it may be better to use adaptive programs that are integrated in the digital learning environment (e.g., programs that are developed for tablets). By including tests at the start of the program to assess children's level of inhibitory control, advertising literacy, and other relevant characteristics, a tailor-made curriculum can be created for each child, in which the focus lies on improving the skills that are less developed. For instance, a child who scores low on inhibitory control could receive mindfulness exercises while a child

who scores low on advertising literacy could receive exercises to recognize advertising messages.

Finally, this study has implications for the combination of measurement instruments at different functional levels. The results of our study show that it is important to assess theoretically related variables on the same (direct or indirect) measurement level. Not doing so (e.g., measuring the predictor variable on an indirect level and the outcome variable on a direct level) may result in null findings that are the result of the fact that these measurements asses different mental processes. It is important that scholars take this into account when designing their research involving direct and indirect measures.

In conclusion, our study shows that the relation between children's advertising literacy activation and advertising susceptibility is moderated by inhibitory control. Children who had high levels of conceptual and attitudinal advertising literacy activation *and* high levels of inhibitory control showed avoidance reactions to the advertised products. In contrast, children with higher levels of conceptual and attitudinal advertising literacy activation but *low* levels of inhibitory control were found to be attracted to the advertised products. These findings indicate that advertising literacy activation and inhibitory control are important factors that need to be considered in conjunction in order to counter advertising effects.

Notes

1. Jeugdjournaal is the name of a news broadcast especially for children in country of this study.
2. Journaal is the name of a regular news broadcast in the country of this study.

Disclosure statement

All authors declare that they have no conflict of interest.

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Appendix A pretest Results

The stimulus material was chosen based on a pretest. Table A1 shows the mean and standard deviation scores for the selected clips.

Table A1 Means and standard deviations for the selected clips.

	Does the clip contain advertising (0–100)? *M* (*SD*)	Is the clip part of a news broadcast (0–100)? *M* (*SD*)	Clip liking (1–4) *M* (*SD*)	Product liking (1–4)* *M* (*SD*)	Product desire (1–4) * *M* (*SD*)
Advertising_1	91.75 (16.12)	0.67 (0.78)	2.33 (0.78)	2.74 (0.62)	2.39 (0.66)
Advertising_2	83.15 (29.03)	1.62 (4.05)	2.77 (0.60)	2.87 (0.76)	2.74 (0.92)
Advertising_3	92.67 (15.30)	10.91 (28.62)	2.42 (0.79)	2.62 (1.08)	2.43 (1.08)
Advertising_4	92.54 (14.93)	8.38 (27.54)	2.77 (1.01)	2.74 (1.01)	2.70 (1.11)
News_1	2.27 (3.17)	86.64 (29.46)	3.09 (0.54)		
News_2	2.17 (3.10)	72.00 (37.28)	2.50 (0.67)		
News_3	1.80 (3.05)	90.10 (31.31)	2.40 (0.70)		
News_4	2.90 (3.60)	76.00 (40.33)	2.60 (0.52)		

* Product liking and product desire were only assessed for the advertising clips, as the news clips did not contain any products.

Appendix B Dispositional advertising literacy questionnaire

The questionnaire is based on the Conceptual Advertising Literacy Scale for Children and the Attitudinal Advertising Literacy Scale for Children by Rozendaal et al. (2016).

Component	Items	Response categories
Understanding selling intent	(1) Is the goal of advertising to make you buy the advertised products? (2) Is the goal of advertising to make you ask your parents to buy the advertised products?	1 = No, definitely not 2 = No, I don't think so 3 = Yes, I think so 4 = Yes, for sure
Understanding persuasive intent	(1) Is the goal of advertising to make you want to have the advertised products? (2) Is the goal of advertising to make you think positively about the advertised products? (3) Is the goal of advertising to make you feel positively about the advertised products?	1 = No, definitely not 2 = No, I don't think so 3 = Yes, I think so 4 = Yes, for sure
Disliking	(1) How often do you think advertising is fun? (R) (2) How often do you think advertising is funny? (R) (3) How often do you think advertising is beautiful (R) (4) How often do you think advertising is boring? (5) How often do you think advertising is interesting? (R) (6) How often do you think advertising is stupid? (7) How often do you think advertising is annoying?	1 = Never 2 = Almost never 3 = Sometimes 4 = Almost always 5 = Always
Skepticism	(1) How often do you think advertising is honest? (R) (2) How often do you think advertising tells the truth? (R) (3) How often do you think you can believe advertising? (R)	1 = Never 2 = Almost never 3 = Sometimes 4 = Almost always 5 = Always