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Content and person effects in media research: Studying differences in cognitive, emotional, and arousal responses to media content

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ABSTRACT

Cognitive, emotional, and arousal responses to media content stem from two sources of variation: differences in content and differences between individuals. Although the first source of variation (content effects) has been well-studied, individual differences (person effects) in responses to media are investigated much less within communication science. To help build this comparatively thin area of scholarship, this study investigated how four theoretically relevant variables (need for cognition, affective empathy, sensation seeking, and sensory processing sensitivity) affected responses to positively and negatively valenced media entertainment. In a within-subjects design, 243 youth aged 7–15 years (49.4% female) responded to a positive and negative film clip using both self-reported and physiological measures (heart rate and skin conductance), while parents reported on individual differences. Multilevel analysis was used to distinguish between media content effects and individual differences in responses. Results showed that more variation in responses was due to differences between participants than to differences between stimuli. However, need for cognition, affective empathy, sensation seeking, and sensory processing sensitivity did not significantly explain this between-participant variation in responses. Several conceptual and methodological take-aways are offered to advance our understanding of the relationships between stable individual differences and state responses to media.

Most media researchers acknowledge that individual differences exist in media users' selection of, responses to, and effects of media content (Krcmar, 2009; Oliver & Krakowiak, 2009). Inspired by Uses and Gratifications (Katz, Blumler, & Gurevitch, 1973) and Selective Exposure theory (Knobloch-Westerwick, 2015), decades of research have shown that media users have different needs which result in differential patterns of

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Author Note

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media preferences and selection (Rentfrow, Goldberg, & Zilca, 2011; Rubin, 1979). Similarly, media effects theories such as the Reinforcing Spirals model (Slater, 2014) and the Differential Susceptibility to Media effects Model (Valkenburg & Peter, 2013) have brought forth studies investigating how the effects of media on users differ by various developmental, social, and dispositional characteristics (for an overview, see Valkenburg & Piotrowski, 2017). Collectively, this work has contributed to a more nuanced understanding of the selection and consequences of media.

Although individual differences in media *use* and *effects* are now part and parcel of the empirical literature, comparatively fewer studies have focused on individual differences in *responses* to media content (e.g., Ravaja, Turpeinen, Saari, Puttonen, & Keltikangas-Järvinen, 2008; Samson & Potter, 2016; Sparks & Spirek, 1988). Here, we define responses to media content as the cognitive, emotional, and arousal states of the media user that occur *during* media use, such as cognitive effort, happiness or sadness, and physiological arousal (Valkenburg & Peter, 2013). These response states are theoretically positioned at the heart of media effects as mediators between media use and those ensuing effects that last beyond the media situation, such as beliefs, attitudes, or behavior (e.g., Lang, 2000; Potter & Bolls, 2012; Potter, 2008; Valkenburg & Peter, 2013). Cognitive, emotional, and arousal responses are expected to vary both as a result of media content (i.e., a content effect) and as a result of media users' individual characteristics (i.e., a person effect), with enhanced responses expected when the two align (Lang, Shin, & Lee, 2005; Valkenburg & Peter, 2013).

Thus far, the main focus of existing work has been on content as the key source of variation in users' responses by showing, for example, that manipulations of the valence of media content (positive versus negative) result in different patterns of cognitions, emotions, and arousal (e.g., Lang, Dhillon, & Dong, 1995; Saleem, Anderson, & Gentile, 2012). Fewer studies have investigated person effects, that is, asking *which* individuals are more likely to experience cognitive, emotional, and arousal responses to media content (Piotrowski & Valkenburg, 2015). Instead, person-to-person differences are often treated as noise by controlling for them in survey research or using random assignment in between-subjects designs in order to cancel out individual differences (Oliver & Krakowiak, 2009; Potter & Tomasello, 2003). In psychophysiological work, within-subjects designs with multiple messages are more common (Potter & Bolls, 2012), but these designs are also mainly used to eliminate noise associated with specific individual messages or individuals, instead of to investigate the effects of individual differences on responses (but see, e.g., Wang, Vang, Lookadoo, Tchernev, & Cooper, 2015). In this study, we posit that, in addition to the classic focus on content effects, individual differences in responses to media content should be more formally (and a priori) included in media research.

A better understanding of how both content and person contribute to differences in cognitive, emotional, and arousal responses can help us understand why some media users experience more long-lasting media effects while others seem relatively unaffected (Valkenburg & Peter, 2013). After all, looking at average cognitive, emotional, or arousal responses to particular media content tells us nothing about respondents who experience much stronger (or weaker) responses – which may be exactly those media users whom scholars should be studying more closely. This study takes a first step in that direction by studying both content and person effects on responses to media entertainment in a sample of children and adolescents.

Content effects on cognitive, emotional, and arousal responses

Responses to media content are conceptualized in many media effects models as a route between media exposure and more long-lasting outcomes such as beliefs, attitudes, or behavior. In this article, we follow the conceptualization of responses made by the Differential Susceptibility to Media effects Model (Valkenburg & Peter, 2013), which distinguishes between three co-occurring response states that take place during media use. Cognitive response states refer to “the extent to which media users selectively attend to and invest cognitive effort to comprehend media content” (Valkenburg & Peter, 2013, p. 228) which are operationalized here as self-reported concentration and cognitive effort as well as physiological heart rate. Emotional response states are conceptualized as “all affectively valenced reactions to media content” (ibid.) which are operationalized in this study as positive and negative self-reported emotions. Excitative response states refer to “the degree of physiological arousal in response to media” (ibid.), which we operationalize as self-reported and physiological arousal. Including psychophysiological measures of responses addresses limitations commonly associated with self-report measures (e.g., social desirability, the difficulty associated with reporting on subtle responses; Ravaja, 2004).

Given that responses to media are affected by differences in both content and individuals, the first step in this study is to understand how differences in media *content* affect these responses (i.e., the more “classic” content effect). Although media content can differ in numerous ways, here, we operationalize media content as positive versus negative entertainment for two reasons – one related to content effects, the other to person effects (discussed in the next section).

Related to content effects, positive versus negative valence has been identified as a primary factor that affects the processing of content (with arousal level as a second important dimension, Lang et al., 2005). Lang and colleagues (Lang, Bradley, Sparks, and Lee, 2007; Lang, Sanders-Jackson, Wang, and Rubenking, 2013), working in the context of the Limited Capacity Model of Motivated Mediated Message Processing (LC4MP) and motivated cognition,

posit that the valence of stimuli serves to activate media users' motivational systems in different ways. Positive stimuli are theorized to activate the appetitive (approach) system, which is associated with processes of paying attention and intake of information, and response indicators such as heart rate deceleration and self-reported positive emotional experience (Lang, Sanders-Jackson, Wang, & Rubenking, 2013). Negative stimuli are proposed to activate the aversive (avoidance) system, which is associated with, among other things, self-reported negative emotional experience (Lang et al., 2013). Both systems are activated more when the stimuli are more arousing (Lang et al., 2007). In this study, we focus on differences in responses as a result of content valence, and posit the following content-based hypothesis:

Hypothesis 1 (H1): Compared to negative entertainment content, positive entertainment content will result in (a) higher attention and cognitive effort (operationalized as self-reported attention and cognitive effort and physiological heart rate), and (b) higher positive and lower negative emotional responses (operationalized as self-reported emotions).

Person effects on cognitive, emotional, and arousal responses

Apart from the opportunity to test theorized valence effects on responses, a second reason for focusing on positive versus negative media content is that this distinction fits into a "true" differential susceptibility perspective of media effects (Piotrowski & Valkenburg, 2015). Such a perspective posits that some individuals may be susceptible in negative ways to negative environments *but also* in positive ways to positive environments. While most effects studies investigate either negative or positive media content, it is likely that some media users are responsive to *both* types of content. However, there is a clear lack of studies which include positive and negative content within the same study. By doing so, we are better able to understand which individuals are generally more responsive to both types of media content.

In this article, we focus on dispositional characteristics that affect people's selection of and responses to media use (Valkenburg & Peter, 2013). Although there are numerous dispositional characteristics that would be reasonable to investigate, we argue that the most meaningful starting point is to investigate those dispositional characteristics that are clearly related to cognitive, emotional, or arousal response tendencies. To that end, for each category of responses, we selected the individual difference variable that is most commonly studied in the communication literature related to that category (i.e., need for cognition, affective empathy, and sensation seeking; Oliver & Krakowiak, 2009). In addition, we include the concept of sensory processing sensitivity, which may explain general reactivity in all these three

domains (Aron, Aron, & Jagiellowicz, 2012). Together, the literature suggests that these variables are the most likely first candidates to help explain who is more or less responsive to media content.

Need for cognition and cognitive responses

Need for cognition (NfC) is defined as “an individual’s tendency to engage in and enjoy effortful cognitive endeavors” (Cacioppo, Petty, Feinstein, Blair, & Jarvis, 1996, p. 197). NfC plays a central role in the Elaboration Likelihood Model (Petty, Cacioppo, Strathman, & Priester, 2005), where it is seen as a determinant of the type of message processing. Media users high in NfC are likely to be more motivated to pay attention to and engage in central or thorough processing of message content, whereas media users low in NfC will be less motivated to do so, instead relying on superficial processing based on heuristic cues (Krcmar, 2009; Petty et al., 2005). As a result of central processing, individuals high in NfC may hold attitudes that are more persistent, resistant, and predictive of behavior.

In communication research, NfC is most commonly studied as moderator of message effects (e.g., Nettelhorst & Brannon, 2012; Zhang, 1996). A handful of studies have asked whether individuals high in NfC also pay more attention and cognitive effort to media messages (Enge, Fleischhauer, Brocke, & Strobel, 2008; Hawkins et al., 2001; Nettelhorst & Brannon, 2012; Perse, 1992), but with mixed results. Some studies do find that individuals high in NfC show higher attention allocation compared to low NfC individuals (Enge et al., 2008; Perse, 1992), whereas others do not find such differences (Nettelhorst & Brannon, 2012). In the entertainment domain, Hawkins et al. (2001) found that NfC correlated negatively with self-reported attention to dramas and sitcoms but was not significantly related to self-reported attention for news magazines. Given the mixed nature of the empirical literature, we pose the following research question:

Research Question 1 (RQ1): Is need for cognition related to increased or decreased cognitive responses (operationalized as self-reported attention and cognitive effort and physiological heart rate) during media entertainment?

Affective empathy and emotional responses

Empathy is a multidimensional construct that is often decomposed into two forms: Cognitive empathy refers to *understanding* another person’s emotions (also called perspective-taking), whereas affective empathy refers to the ability to vicariously *share* another person’s emotions (e.g., feeling sad yourself when you see someone else feeling sad, Vossen, Piotrowski, & Valkenburg, 2015). Although the two are related, this study focuses on affective empathy since it specifically conceptualizes the experience of

emotions consonant with those that others experience (Maibom, 2012). Individuals high in trait affective empathy are more likely to experience state emotional responses (Van der Graaff et al., 2016), indicating that affective empathy is a relevant variable to consider when explaining differences in emotional responding to entertainment.

To our knowledge, no studies have explored the relationship between responses to audiovisual media content and affective empathy specifically. One study using written narratives and facial electromyography to measure emotional valence found that people higher in affective empathy frowned more in response to unfair events (‘t Hart, Struiksma, van Boxtel, & van Berkum, 2018). Although trait empathy has been studied in the entertainment literature (e.g., Hoffner, 1995; Mrug, Madan, Cook, & Wright, 2015; Samson & Potter, 2016; Tamborini, Stiff, & Heidel, 1990), the available research has used a wide variety of conceptualizations and operationalizations. That said, in general, studies investigating empathy-related responses find that this individual characteristic is associated with “more intense emotional responses to media portrayals that feature others’ misfortunes or suffering” (Oliver & Krakowiak, 2009, p. 518). Therefore, we pose the following hypothesis:

Hypothesis 2 (H2): Affective empathy is positively related to increased emotional responses (operationalized as self-reported positive and negative emotions) to media entertainment.

Sensation seeking and arousal responses

Sensation seeking is defined as “the seeking of varied, novel, complex and intense sensations and experiences, and the willingness to take physical, social, legal and financial risk for the sake of such experience” (Zuckerman, 1994, p. 27). High sensation seekers are thought to experience the unpleasant state of physiological underarousal, which drives them to increase arousal levels by engaging in risky, stimulating activities (Wilson & Scarpa, 2011). Media use can be one such activity, as evidenced by research showing that high sensation seekers prefer violence, action, and horror (Lee & Shin, 2011) and enjoy it more (Hoffner & Levine, 2005).

To understand whether high sensation seekers experience different arousal responses to media content, several authors have investigated sensation seekers’ responses in the context of anti-substance abuse campaigns (e.g., Lang et al., 2005; Lee & Shin, 2011; Wang et al., 2015). In these studies, the concept of sensation seeking is extended as “an overactive appetitive [approach] motivational system and weakly active aversive [avoidance] motivational system” (Lang et al., 2005, p. 1). Lang et al. posit that high sensation seekers (HSSs) may be quicker to approach novel and intense stimuli and slower to withdraw from negative stimuli compared to low sensation seekers

(LSSs; Lang et al., 2005; Wang et al., 2015). Lee and Shin (2011) tested this argumentation in the context of audiovisual stimuli by hypothesizing that HSSs would experience more arousal in response to humorous anti-alcohol PSAs, and that LSSs would show greater arousal in response to fear appeal PSAs. In contrast to their expectations, LSSs reported greater arousal during both messages compared to HSSs, and no differences were found in physiological arousal. Wang et al. (2015) similarly report a pattern of lower arousal for HSSs, such that with increasing message complexity, HSSs experienced lower physiological arousal whereas arousal increased for LSSs. These empirical findings suggests that, although we may intuitively expect HSSs to experience stronger arousal in response to media content, it may be the LSSs that are likely to show this pattern. General media use (unless novel and exciting) may not be stimulating enough for HSSs to result in strong responses (Krcmar, 2009; Lee & Shin, 2011). Therefore, we pose the following hypothesis:

Hypothesis 3 (H3): Sensation seeking is related to decreased arousal responses (operationalized as self-reported and physiological arousal) during media entertainment.

Sensory processing sensitivity and all response types

Sensory processing sensitivity (SPS) is a personality characteristic that has recently received empirical attention in relation to people's general sensitivity or responsiveness to the environment (Aron et al., 2012; Slagt, Dubas, van Aken, Ellis, & Deković, 2018). SPS is conceptualized as a trait that reflects an increased sensitivity of the central nervous system to environmental stimuli (Boterberg & Warreyn, 2016). High SPS individuals are believed to experience "higher emotional and physiological reactivity" (Pluess et al., 2018, p. 54) and "deeper processing of stimuli across a very wide variety of situations, supported by a greater response to both positive and negative stimuli" (Aron et al., 2012, p. 276). SPS researchers argue that such increased responsivity may offer individuals an evolutionary advantage by being more aware of opportunities and threats, and more ready to respond to situations (Acevedo et al., 2014).

Although no research has been conducted that relates sensory processing sensitivity to processing of audiovisual media, an fMRI study by Acevedo et al. (2014) found that higher SPS scores "were associated with stronger activations of brain regions involved in awareness, integration of sensory information, empathy, and preparation for action" in response to a partner's or stranger's positive, negative, or neutral facial expressions (Acevedo et al., 2014, p. 589). A study by Jagiellowicz, Aron, and Aron (2016) similarly showed that high SPS individuals had more strongly valenced (though not

more strongly aroused) responses to pictures from the International Affect Picture System compared to low SPS individuals. Although audiovisual media content is more complex than static pictures, the underlying theory and these few empirical findings suggest that SPS may be related to the strength of responses when exposed to emotional stimuli. We, therefore, pose the following hypothesis:

Hypothesis 4 (H4): Sensory processing sensitivity is related to increased (a) cognitive responses, (b) emotional responses, and (c) arousal during media entertainment.

Interactions between content and person

In addition to the main effects of content and person on cognitive, emotional, and arousal responses, it is reasonable to ask whether and how the two may interact with each other. For example, media users with specific characteristics (e.g., low sensation seeking) may respond more strongly to some (e.g., negative) but not all media content. Several theoretical models propose such interactions between content and person either on a general media effects level (Slater, 2014; Valkenburg & Peter, 2013) or specific media-processing level (Lang et al., 2013). These models expect that content that closely matches or is even tailored to a media user's personal characteristics will result in stronger responses and subsequent effects.

In this study, we do not test the effects of media content explicitly tailored to one specific disposition, but rather aim to understand more generally the contributions of content and person to cognitive, emotional, and arousal responses. To achieve this, we have cast a relatively wide net by manipulating one general message dimension (positive versus negative valence) and including four theoretically relevant person variables. As a result of this approach, we are faced with a situation where it may be possible to posit directional hypotheses for some content by person interactions (e.g., for the combination of high sensation seeking and negatively valenced media content on arousal; Lang et al., 2005) but not for others. Moreover, in the case of any directional hypotheses, these would largely be extrapolated based on the findings of one or two empirical studies – not guided by theory. As such, we felt that positing a research question as to the interaction between content and individual differences was the more conservative approach:

Research Question 2 (RQ2): Is there an interaction between valence of entertainment content and the four individual differences in explaining cognitive, emotional, and arousal responses to entertainment?

Method

Procedure and participants

Ethical approval for this study was obtained by the ethical review board of the University of Amsterdam. This study used a within-subjects design and was conducted in August 2016 in a science museum in Amsterdam, the Netherlands. The total sample consisted of 243 children and adolescents between 7 and 15 years (49.4% female; mean age = 10.18 years; $SD = 1.80$ years; 58% sibling pairs) and 207 parents (60.9% female, mean age = 43.8 years, $SD = 5.74$ years). Parents reported having completed the following education levels: 8.2% preparatory secondary education; 35.2% senior secondary education; and 55.1% higher education.

Upon coming to a separate study space in the museum, participating parents and children received a short explanation about the study procedure and were able to ask questions. Parents provided written informed consent for themselves as well as for their participating child(ren). Each child then received a further explanation about the physiological measurement. After setting up the physiological equipment with the child (see section Child Physiological Responses), instructions were given about the stimuli and the questionnaire. While children were watching the stimuli and completing their questions, parents filled out a questionnaire on children's individual differences. Upon completion, parents and children were thanked and children received a certificate for their contribution to science.

Stimuli

Two 3-min clips were selected from the movie *Spy Kids* (Avellan, Rodriguez, & Rodriguez, 2001), which was chosen because it was both fun and appropriate for our age group. Selecting two clips from the same movie kept constant message features such as the characters and setting. Since we aimed to only manipulate valence and not arousal in this study, we selected two clips that did not diverge too much in arousal level. To select a positive and a negative clip, we followed guidelines by Lang and Ewoldsen (2011, p. 81). Thus, the negative clip featured expressions of negative emotions and negative events and actions (a sequence from the beginning of the movie showing the main characters involved in conflict, unkindness, bullying, anger, and sadness). The positive clip featured expressions of positive emotions and positive events and actions (a sequence from the end of the movie that showed the main characters involved in cooperation, prosocial behavior, and happiness). The two clips were pilot tested prior to the actual data collection. A manipulation check during the pilot study and actual study showed that the positive clip was indeed perceived as more positive, whereas the negative clip was perceived as more negative.

Before the children watched the stimuli, they were first familiarized with the characters by showing them pictures and explaining their role in the movie. The order of clips was counter-balanced and viewing order was randomly assigned. The clips were shown on a desktop computer and presented using Presentation® stimulus delivery software (Version 18.0, Neurobehavioral Systems, Inc., Berkeley, CA, www.neurobs.com). This software was programmed to send time markers at the beginning and end of each video clip to the physiological apparatus and software in order to track which physiological responses occurred while watching the two clips.

Child self-reported responses

Self-reported responses to the clips were measured directly after each of the two clips. All self-report questions were pilot tested prior to the actual data collection and were found to be understood and reliable with children in this age range. The means and standard deviations of all responses to the positive and negative clip are reported in Table 1.

Cognitive responses

Self-reported cognitive responses to both clips were measured using two items based on Salomon (1984), which measured cognitive effort (“How hard did you try to understand the clip?”) and concentration (“How much did you concentrate while watching the clip?”). These items ranged from 1 (not at all) to 5 (a lot). These items have been used previously in research with children (Bordeaux & Lange, 1991); in addition, these items correlated significantly and in the expected direction with heart rate (Potter & Bolls,

Table 1 Means (SDs) and Zero-order Pearson Correlations between Children’s Self-Reported and Physiological Responses to the Positive Clip (Below Diagonal) and Negative Clip (Above Diagonal)

Response	Positive clip ^a	Negative clip ^a	1	2	3	4	5	6	7
1. Concentration	3.20 (1.21)	3.31 (1.16)	-	.29*	-.01	.10	.06	.01	-.17*
2. Cognitive effort	1.87 (1.08)	1.93 (1.17)	.21*	-	-.06	.27*	.16*	-.12 [†]	-.20*
3. Positive emotional response	3.80 (0.77)	3.30 (0.98)	.10	-.04	-	-.53*	.13*	-.03	.03
4. Negative emotional response	1.08 (0.22)	1.28 (0.46)	.09	.15*	-.15*	-	.16*	.01	-.03
5. Arousal (self-report)	2.26 (1.06)	2.08 (1.00)	.16*	.13*	.14*	.16*	-	.01	-.05
6. Skin conductance level (μS)	18.95 (8.28)	19.69 (8.02)	.01	-.07	.02	.10	.11	-	.01
7. Heart rate (BPM)	79.15 (9.14)	77.87 (9.18)	-.14*	-.20*	-.01	.03	-.08	.03	-

^a $n = 243$ for self-reported responses, $n = 213/211$ for SCL during positive/negative clip, $n = 224/223$ for HR during positive/negative clip.

Note. All self-reported responses were measured on a scale from 1 (low) to 5 (high). Correlations between responses for the positive clip are below the diagonal; for the negative clip are presented above the diagonal.

* $p < .05$, [†] $p < .10$.

2012), which we interpret as supporting the validity of those two items (see Table 1).

Emotional responses

Six items were used to measure children's emotional responses to the video clips. The first of these consisted of the Valence dimension of the Self-Assessment Manikin (Bradley & Lang, 1994), a scale with five pictures ranging from a sad manikin ("1") to happy manikin ("5"). This scale was accompanied by the question: "How sad or happy did you feel while watching the clip"? The SAM has been validated and used in samples aged 7 and older (McManis, Bradley, Berg, Cuthbert, & Lang, 2001). We chose to use a 5 point (rather than the standard 9 point) scale to accommodate the developmental level of our youngest participants (in line with other studies using the SAM in child samples, cf. Leventon, Stevens, & Bauer, 2014; Vasa, Carlino, London, & Min, 2006).

The SAM item was complemented by five items from the Positive and Negative Affect Scale (PANAS, Ebesutani et al., 2012; Watson, Clark, & Tellegen, 1988), of which two were positive ("Happy"; "Joyful") and three were negative ("Scared", "Angry"; "Sad"). Children were asked how they felt while watching the clip, and indicated the extent to which they felt this on a 5-point scale ranging from 1 ("Not at all") to 5 ("Very much").

In order to reduce the number of individual emotional items for the analyses, we used principal components analysis with orthogonal rotation (Varimax). For both the positive and the negative clip, the analyses resulted in two factors with an eigenvalue larger than 1. The two factors clearly showed a breakdown in valence of the items: The two positive PANAS items and the SAM valence item clustered together ($\alpha = .89$ and $.93$ for the positive and negative clip), and the three negative PANAS items clustered together ($\alpha = .71$ and $.77$ for the positive and negative clip). We therefore decided to average these items and make two scales of the emotional responses to the clips – one for positive emotional responses and one for negative emotional responses.

Arousal responses

Children indicated how calm or aroused they felt while watching the clip, using the Arousal dimension of the Self-Assessment Manikin, a scale with five pictures ranging from a calm manikin ("1") to a very aroused/excited manikin ("5"). This measure is one of the most widely used self-report measures of arousal (Lang & Ewoldsen, 2011).

Child physiological responses

Children's tonic heart rate (HR) and skin conductance level (SCL) were measured throughout the entire experimental session as a physiological measure of their cognitive effort and arousal, respectively (Potter & Bolls, 2012).

HR and SCL were recorded and analyzed using VSRRP98 software (VSRRP98 v10.4, University of Amsterdam, 1998–2017) on a separate laptop computer. The electrocardiogram (ECG) was recorded from three disposable pre-gelled Ag/AgCl 3M Red Dot electrodes in a modified Lead-II configuration. Electrodermal activity was recorded using two curved Ag/AgCl electrodes (20x16mm) that were attached to the middle phalanx surfaces of the index and ring fingers of the child's non-dominant hand. ECG and SCL were measured with a custom-made portable amplifier (University of Amsterdam, 2014) which contains a National Instruments NI-USB6210 A/D converter to digitize the data at a rate of 1000S/s.

Twelve children preferred not to take part in the physiological part of the study; these children did not differ significantly from the remaining children in any of the individual difference variables. The physiological data of the remaining 231 children were visually inspected for any movement artifacts and non-responders. Any unreliable data were recorded into missing data. Excluding these data resulted in the following sample sizes: For SCL, 213 children had reliable data during the positive clip and 211 children had reliable data during the negative clip. For HR, 224 children had reliable data during the positive clip and 223 children had reliable data during the negative clip. After checking and cleaning the data, we calculated the average (tonic) HR per clip in beats per minute (BPM) based on the interbeat interval, or the time in milliseconds between R spikes in the QRS complex of the ECG waveform. For SCL, we calculated the average (tonic) skin conductance level in micro-Siemens per clip. Means and standard deviations are reported in [Table 1](#).

Individual differences

Need for cognition

Children completed a Need for Cognition scale before watching the stimuli, using 11 items that have been developed for children and adolescents (Preckel, 2014; Zarouali, Walrave, Poels, Ponnet, & Vanwesenbeeck, 2016). Items were answered on a 5-point scale ranging from 1 (completely disagree) to 5 (completely agree) and were averaged to create a scale ($M = 3.25$, $SD = 0.67$, Cronbach's $\alpha = .86$), which higher scores indicating a higher need for cognition.

Sensation seeking

Sensation seeking was measured using the 9-item Surgency subscale from the Dutch parent-report Early Adolescent Temperament Questionnaire-Revised (Hartman & Rothbart, 2001). Items were answered on a 5-point scale ranging from 1 (almost always untrue) to 5 (almost always true) and were averaged to create a scale ($M = 3.30$, $SD = 0.69$, $\alpha = .74$). Higher scores indicate higher sensation seeking levels.

Affective empathy

Affective empathy was measured using the 4-item Sympathy subscale of the Adolescent Measure of Empathy and Sympathy (Vossen et al., 2015). Parents answered the items on a 5-point scale ranging from 1 (never) to 5 (always). Items were averaged to create a scale ($M = 2.72$, $SD = 0.64$, $\alpha = .73$) with higher scores indicating higher affective empathy.

Sensory processing sensitivity

Sensory processing sensitivity was measured using a parent-report version of the Highly Sensitive Person Scale – short form (Pluess & Boniwell, 2015). This scale consists of 12 items answered on a 7-point scale ranging from 1 (not at all) to 7 (completely), which were averaged to create a scale ($M = 4.85$, $SD = 0.88$, $\alpha = .81$). Higher scores indicate a higher sensitivity to the environment.

Covariates

We inspected whether several child-level control variables were related to responses to the clips: biological sex, age, order of the film clips, child-reported familiarity with the movie *Spy Kids* (0 = no, 1 = yes), and parent-reported general and violent TV exposure of the child (Fikkers, Piotrowski, & Valkenburg, 2017). Sex, age, and familiarity with the stimuli were significantly related to (some of) the dependent variables, and were therefore retained in all level-2 analytic models.

Analytic approach

To test the relationship between individual differences and responses to the two clips, we used multilevel regression models in Mplus 7.31 (Muthén & Muthén, 2014) with responses to the clips (level 1) nested within children (level 2). The advantage of this analytic approach is that it conceptually matches with our theoretical expectations as it decomposes the total variance in responses into variance due to differences in clip content (positive versus negative; level 1) and variance due to differences between children (level 2). We followed guidelines for multilevel model-building in which random intercepts, random slopes, level-1 predictors, level-2 predictors, and cross-level interactions are added in a stepwise fashion (Heck & Thomas, 2015). Although we had multiple response variables, we opted to run univariate models (with one response variable as outcome at a time) for two reasons. First, the stepwise model building process results in complex models with random intercepts, slopes, and cross-level interactions, and having seven dependent variables in one model would decrease the statistical parsimony of our analyses (i.e., by adding a third level for the different response

variables). Second, in this study, we were not substantively interested in comparing effects on different response variables to each other – as is typically a primary goal of multivariate models. Given these factors, we felt that univariate multilevel models were most appropriate for this study (see Snijders & Bosker, 2012, for considerations in choosing univariate versus multivariate multilevel models).

Given that 58% of the sample consisted of sibling pairs, we inspected whether running a three-level model (with family as level 3) was necessary. Intraclass correlations indicated that there was little variance in responses to the two clips due to the family level; furthermore, random variance components attributed to the family level were non-significant for all dependent variables except HR. Running the final model as a three-level model for HR showed no differences in the relationship between children's individual differences and HR. We therefore report two-level models for all analyses.

Multivariate outliers were inspected by plotting Cook's distance in Mplus, which identified one case as an outlier in the final models. Because excluding this case did not lead to a different pattern of results, we report the findings based on the full sample. Multivariate normality was assessed by inspecting histograms of the residuals and Q-Q plots in Mplus, which indicated somewhat larger deviations from normality for the dependent variables cognitive effort and negative emotions. To that end, we used a robust maximum likelihood (MLR) estimator, which is robust to departures from multivariate normality and homoscedasticity (Hox, Maas, & Brinkhuis, 2010). Statistical output can be found at the authors' websites. The data used for this article can be requested from the first author.

Results

Correlations between and variance in responses

Table 2 presents the intraclass correlations (ICCs) and level-1 and level-2 variances for the dependent variables (based on an empty model including a random intercept but no predictors; Heck & Thomas, 2015). ICCs ranged from .18 for negative emotions in response to the two clips to .96 for average heart rate in response to the two clips, indicating that between 18% and 96% of the total variance in responses is associated with children (level 2). For most responses, more variance was found between children (level 2) than within children (and between the two stimuli; level 1). In fact, it was only for positive and negative emotions where the variance within children was larger than the variance between children. Overall, the empty models show that it is meaningful to explain variation in responses to the two clips *both within and between* children.

Table 2 Intraclass Correlations and Unstandardized Level-1 and Level-2 Variances for each Response Variable (Based on Empty Univariate Models)

Response	Intraclass Correlation	Initial level-1 variance (within children)	Initial level-2 variance (between children)
Concentration	.60	0.56*	0.84*
Cognitive effort	.73	0.34*	0.93*
Positive emotional response (scale)	.34	0.55*	0.29*
Negative emotional response (scale)	.18	0.12*	0.02*
Arousal (self-report)	.65	0.38*	0.69*
Skin conductance level (μ S)	.94	3.66*	62.26*
Heart rate (BPM)	.96	3.38*	80.36*

* $p < .05$.

Content effects on children's responses (H1)

To evaluate hypothesis 1, we added clip content as a fixed level-1 predictor (dummy-coded: 0 = positive, 1 = negative), which tests whether responses *within* children varied as a function of positive versus negative clip content. Clip content was not significantly related to the self-reported cognitive responses of concentration (unstandardized $b = .11$, $SE = .07$, $p = .10$) and cognitive effort ($b = .07$, $SE = .05$, $p = .21$). Clip content was related to tonic heart rate (a physiological indicator of cognitive effort, $b = -1.30$, $SE = .15$, $p < .001$). Lower heart rate indicates higher cognitive effort (Potter & Bolls, 2012), indicating that the negative clip resulted in significantly higher physiological cognitive effort compared to the positive clip (rejecting H1a). Clip content was also significantly related in the expected direction to self-reported positive emotions ($b = -.50$, $SE = .06$, $p < .001$) and negative emotions ($b = .20$, $SE = .03$, $p < .001$). Participants' positive emotions were significantly higher during the positive clip and their negative emotions were higher during the negative clip (supporting H1b).

Although we did not posit a hypothesis or research question for the effect of clip content on arousal level, we did want to account for potential content effects on arousal in subsequent models testing person effects. We therefore also included clip content as a level-1 predictor in the models with arousal as the dependent variable. Clip content was significantly related to both self-reported arousal ($b = -.17$, $SE = .06$, $p = .002$) and average skin conductance level or physiological arousal ($b = .78$, $SE = .18$, $p < .001$), but in different directions. Self-reported arousal was higher during the positive clip, whereas physiological arousal was higher during the negative clip.

Person effects on children's responses (RQ1, H2-4)

To evaluate person effects on (i.e., individual differences in) children's responses, we first inspected the variance in the level-1 slopes. Specifically,

we allowed the relationship between clip content and children's responses (a level-1 slope) to vary between children (level-2 units). Of the seven slopes, three showed significant variance between children: the slope for self-reported cognitive effort ($b = .21$, $SE = .10$, $p = .03$), the slope for positive emotions ($b = .38$, $SE = .08$, $p < .001$), and the slope for the relationship between clip content and negative emotions ($b = .17$, $SE = .04$, $p < .001$). This indicates that the effect of clip content on cognitive effort, positive emotions, and negative emotions varied between children. All other slopes did not have significant level-2 variance ($ps > .71$). We therefore retained only the three significant random slopes in subsequent models.

Following this, to directly test RQ1 and H2-4, we added level-2 (between-child) control variables (i.e. sex, age, and familiarity with the stimuli) and the four individual differences to the models as predictors of the random intercept (the average response within children). Continuous predictors were grand-mean centered. Results of the models including the three control variables and the four individual differences are reported in [Table 3](#).

After accounting for the effects of clip content and the control variables, none of the four individual difference variables significantly explained variation in responses between children. Only one marginally significant relationship was found: Need for cognition was related to lower heart rate (which is indicative of higher cognitive effort during the clips, $b = -1.64$, $SE = 0.98$, $p = .093$). Although this relationship makes sense conceptually, this marginally significant result should be interpreted with caution given the many relationships that are tested in this study. Thus, need for cognition was not significantly related to children's cognitive responses during media entertainment (RQ1) and H2-4 were not supported.

As [Table 3](#) shows, there still remained significant residual variance both within and between children. In comparison to the null model ([Table 2](#)), the model with the individual difference variables did show a smaller within-child variance for all responses except concentration, and between-child variance were smaller for concentration, cognitive effort, arousal, SCL, and HR.

Interactions between content and person (RQ2)

Lastly, to address RQ2, cross-level interactions tested whether the relationship between clip content and children's cognitive effort, positive emotional responses, and negative emotional responses to the clips (the three level-1 slopes with significant level-2 variance) were moderated by level-2 control variables and individual differences. There was no evidence for cross-level interactions: None of the control variables or individual difference variables significantly explained any variance in the level-1 slopes of the relationship between clip content and these three responses.

Table 3 Unstandardized Parameter Estimates (SE's) for the Univariate Models with Level-2 Control and Individual Difference Variables

Parameters	Dependent variables						
	Concentration	Cognitive effort	Positive emotions	Negative emotions	Arousal	SCL	HR
<i>Fixed components</i>							
Intercept							
Effect of clip content	3.46 (0.12)*	2.16 (0.12)*	3.70 (0.09)*	1.12 (0.02)*	2.28 (0.10)*	18.89 (0.99)*	78.55 (0.98)*
<i>Coefficients of level-2 predictors</i>	0.13 (0.07) [†]	–	–	–	–0.18 (0.06)*	0.77 (0.18)*	–1.31 (0.16)*
Sex ^a	–0.22 (0.14)	–0.12 (0.13)	0.02 (0.10)	–0.06 (0.03)*	–0.08 (0.12)	0.87 (1.09)	–0.68 (1.22)
Spy Kids familiarity ^b	–0.34 (0.14)*	–0.51 (0.13)*	0.19 (0.09)*	–0.04 (0.03) [†]	–0.01 (0.13)	–0.84 (1.11)	1.44 (1.17)
Age	0.01 (0.04)	0.13 (0.04)*	–0.02 (0.03)	–0.01 (0.01)	0.02 (0.03)	–1.08 (0.32)*	–0.28 (0.31)
Need for cognition	0.13 (0.12)	0.00 (0.10)	0.12 (0.08)	–0.01 (0.02)	0.12 (0.10)	0.40 (0.72)	–1.64 (0.98) [†]
Affective empathy	–0.06 (0.12)	–0.04 (0.11)	0.02 (0.08)	–0.02 (0.02)	–0.02 (0.12)	–0.88 (0.85)	1.58 (0.98)
Sensation seeking	0.10 (0.09)	0.06 (0.10)	0.06 (0.07)	–0.01 (0.02)	–0.07 (0.09)	0.49 (0.74)	–0.98 (0.85)
Sensory processing sensitivity	–0.01 (0.09)	–0.03 (0.08)	0.07 (0.06)	0.01 (0.02)	0.04 (0.08)	0.86 (0.76)	–0.64 (0.91)
<i>Random components</i>							
Mean of random slope (effect of clip content)	–	0.05 (0.05)	–0.51 (0.06)*	0.20 (0.03)*	–	–	–
Variance of random slope (effect of clip content)	–	0.17 (0.09) [†]	0.37 (0.08)*	0.18 (0.04)*	–	–	–
Within-level residual variance	0.56 (0.09)*	0.22 (0.05)*	0.24 (0.06)*	0.00 (0.01)	0.36 (0.05)*	3.42 (0.45)*	2.59 (0.32)*
Between-level residual variance	0.82 (0.11)*	0.81 (0.10)*	0.33 (0.05)*	0.03 (0.01)*	0.67 (0.07)*	59.42 (6.86)*	76.30 (7.59)*

* $p < .05$, [†] $p < .10$.

^a Dummy-coded: 0 = female, 1 = male. ^b Dummy-coded: 0 = had not seen Spy Kids before, 1 = has seen Spy Kids before.

Discussion

This study aimed to advance research into content and person effects on children's and adolescents' cognitive, emotional, and arousal responses to positively and negatively valenced media entertainment content. To that end, we selected four theoretically motivated variables with *a priori* expectations that these may explain differences in responding to media entertainment. We employed a within-subjects design in which youth aged 7 to 15 years responded to a positive and a negative entertainment clip through self-reported and physiological measures. The relationship between clip content, individual differences, and children's responses were then tested using multi-level modeling, an analytic approach that mirrored our expectations for (within-person) content effects and (between-person) person effects.

Results for the classic "content effect" showed that positive versus negative message content led to varied cognitive, emotional, and arousal responses (H1). Importantly, the multilevel analyses also offered clear evidence of significant variation in responses that was not only due to differences in content (within-child variation) but also due to differences between children. Clearly, some youth experienced more cognitive, emotional, and/or arousal responses to media content than others, which supports propositions put forward by the Differential Susceptibility to Media effects model (Valkenburg & Peter, 2013). However, need for cognition, affective empathy, sensation seeking, and sensory processing sensitivity did not explain these person effects, neither as predictor nor as moderator (H2-4, RQ1-2).

Taken together, these results make clear the criticality of not only investigating content effects but also focusing on theoretically meaningful person effects in media research. Working with a sample of young people, our study is among the first to examine four specific individual differences in relation to responses to entertainment. Although this study was conducted with children and adolescents, we do not believe that the null findings found here are a result of the age range of our sample. The conceptual idea that differences between people result in differences in responses to media content should hold across the lifespan. Of course, the form and expression of individual differences can change with maturation, which is why we used developmentally appropriate measures and further included age as an additional control variable. As for the individual differences that we investigated, although we relied on theoretical and empirical work to guide our research question and hypotheses, previous work was either mixed (for need for cognition), did not investigate the specific person variable (for affective empathy), or did not study audiovisual stimuli (for sensory processing sensitivity). In other words, although our expectations were theoretically reasonable, the current evidence base was neither clear nor consistent. In that sense, we see our null findings as a call for further development of our

collective thinking about (and empirical testing of) the way individual differences can explain variation in responses to media content. Such work will help us better understand *for whom* entertainment use may be relatively more influential. We offer a first step towards this in the next section.

Studying content and person effects on responses to media

Given this study's theoretical basis and methodological strengths, the null findings in this study offer relatively unsatisfying answers. This invites critical consideration of the underlying idea that individual differences are related to responses to media in consistent, predictable ways. Our study was guided by general propositions put forth by differential susceptibility approaches to media effects (Piotrowski & Valkenburg, 2015; Valkenburg & Peter, 2013) and more specific expectations related to media processing (Lang et al., 2013, 2005). These models posit that particular individuals will be more likely to experience stronger cognitive, emotional, and/or arousal responses to particular media content, especially when that content is congruent with or even tailored to a media user's characteristics. Although the notion of such a congruency is intuitively logical, we offer three conceptual issues related to the idea of a "match" between person and content that future research should keep in mind.

Match content and person characteristics

First, theorizing about the congruency between content and person refers to situations where there is a clear match between a *specific* individual difference variable and *specific* media content (Lang et al., 2005; Valkenburg & Peter, 2013). Guided by differential susceptibility thinking (Piotrowski & Valkenburg, 2015), the goal of this study was to identify media users who may be susceptible to media effects by studying traits that may predispose people to respond stronger to both positive and negative media content. Dispositions and content were therefore not specifically matched. Previous work (Bushman, 1995; Saleem et al., 2012; Wang et al., 2015) has been more successful in showing individual differences in responses to media content, potentially due to a more direct match between the individual difference and a content characteristic under study (e.g., sensation seeking and message sensation value). This suggests that individual differences in responses to media content might only be found when there is a very explicit match between content and a disposition that is expected to align with *that content*. This also means that instead of expecting general susceptibility to media effects (as we did here), we may need to take a more personalized approach to understand not only *who* is susceptible but also *to which media content*.

Consider the role of selection

Second, individual differences are not only expected to result in stronger responses to certain content, but also influence the *selection* of media content (Valkenburg & Peter, 2013). This means that individual differences can spill over to responses to media in two ways: first by influencing the type of media content that is selected and second by increasing or decreasing effects of that content on responses (Valkenburg & Peter, 2013). A large body of empirical work supports the first step by showing that media users' individual differences are related to seeking out matching content (for a review, see Oliver & Krakowiak, 2009). This study aimed to investigate the understudied second step by keeping the media content constant in favor of studying the role of individual differences in *response* to that content. The null effects found here raise the question as to whether more pronounced individual differences may exist in media users' responses to *self-selected* versus experimentally prescribed content. Individual differences in media selection are guided by different needs and motivations for media use (Katz et al., 1973). In turn, these different needs and motivations (e.g., media use for distraction, information, or escape) will likely result in different *responses* (e.g., superficially, attentively, or completely transported, Potter, 2008). In other words, differences in *responding* to media content as a result of individual differences may come (perhaps to a large extent) from differences in users' needs for *selecting* that media content in the first place (Knobloch-Westerwick, 2015). Clearly, forced-exposure studies such as ours do not allow for individual needs and selection, and may therefore potentially result in more homogenous responses compared to media use that is self-selected. Thus, a second conceptual takeaway from this study is that individual differences in responses to media content may need to be considered in conjunction with individual differences in the selection of media content.

Be mindful of situational variation

Third, theorizing on the congruency between content and person points to a relationship between stable individual differences and momentary (selection of and) responses to media content. However, individual differences represent general *tendencies* of responding in a particular way and are not rigid blueprints for behavior. Indeed, there is within-person and cross-context variability in a person's affect and behavior (Geukes, Nestler, Hutteman, Küfner, & Back, 2017), which may be due to differences in which traits are *salient* to an individual. Saliency can change dynamically depending on experimental manipulation (e.g., Krakowiak & Tsay-Vogel, 2015) and a person's mood or situation (Knobloch-Westerwick, 2015). Media selection and responses, therefore, are also dependent on a person's *dynamic* self-concept, or "those self-representations that are accessible in a given moment" (Knobloch-Westerwick, 2015, p. 966). Thus, the third

conceptual take-away of this study is that researchers must carefully consider which elements of a research design and situation may increase or decrease the salience of individual differences.

Together, these three conceptual issues give rise to a methodological next step for research into individual differences in responses to media use. Questions related to the congruency between media content and person characteristics may be best studied in a set-up that captures participants' exposure and responses to generic *and* dispositionally congruent content that is self-selected *and* prescribed in multiple settings. To do this, a combination of experience sampling and experimental exposure seems the most suitable approach to tease apart between- and within-person processes. Experience sampling allows for tracking participants over the course of several natural media use situations, tapping into the dispositionally congruent and self-selected components, and the addition of experimental exposure to generic, prescribed content would provide a clean comparison to the more individualized ("noisy") experience-sampling data.

Methodological limitations and suggestions for future research

In addition to these conceptual considerations, several methodological explanations may be offered for the lack of significant relationships between the individual difference variables and the response variables.

Manipulate valence and arousal using multiple stimuli

First, design choices related to our number of stimuli warrant critical self-reflection. In a decision not to overburden our younger sample during their outing to a science museum (the place of data collection), we necessarily focused on one key content feature (valence) and operationalized this with one clip for each valence level. It is important to acknowledge that arousal level, a second key dimension of message content, may interact with valence to produce unique patterns of cognitive and emotional processing in specific individuals (Lang et al., 2013). Future research that manipulates not only valence but also arousal will be able to make more fine-grained expectations about how, for example, sensation seeking is related to differences in processing such content. Such research should ideally include multiple stimuli for each valence and arousal level to overcome issues with confounding variables unique to a single stimulus.

Use stimuli that evoke sufficient response variation

Second, it is possible that our naturalistic stimuli were not powerful enough to obtain sufficient variation in responses and detect meaningful individual differences. As a basis for our stimulus selection and in line with ethical guidelines, we chose a movie that was suitable and entertaining for a general audience of

youth between 7 and 15 years. Potentially, this resulted in stimuli that, while entertaining for our sample, were too homogeneous to evoke idiosyncratic responses. As for differences between the two clips, following guidelines by Lang and Ewoldsen (2011), the positive clip featured positive emotions, events, and actions, whereas the negative clip featured negative emotions, events, and actions. Although our manipulation check indicated that participants noticed these differences, the negative clip was not *extremely* negative, since this is not common in entertainment suitable for youth samples nor would ethical guidelines permit the use of such content. Consequently, it is possible that the manipulation of positive versus negative valence was relatively soft. Future research should consider including more strongly diverging media content as a way of obtaining more divergent response patterns. And finally, related to our stimuli decisions, the clips extracted from this movie were relatively short (3 min each). Although this length is not uncommon in the literature, we cannot rule out the possibility that longer exposure may have resulted in stronger responses and more variation.

Consider single versus combined responses

Beyond design and stimulus decisions, it is important to recognize that our analyses treated cognitive, emotional, and arousal responses as separate categories, whereas they are conceptually likely to be interlinked (Valkenburg & Peter, 2013; Vorderer, Klimmt, & Ritterfeld, 2004). For example, not only may stronger emotional responses evoke differential patterns of cognitive responses, but a particular *combination* of cognitive, emotional, and/or arousal responses may even designate a qualitatively different response state (e.g., attentional, automatic, or transported, Potter, 2008) that our individual response outcomes did not tap into. More work is needed to understand how combinations of responses may reflect a theoretically relevant “higher-order” response states (e.g., enjoyment or engagement, Sukalla, Bilandzic, Bolls, & Busselle, 2016), which could then be investigated in relation to relevant individual differences.

Capitalize on dynamic responses

Along with the previous analytic point, it is important to note that the physiological responses in this study were treated as average (tonic) scores during the positive versus negative clip. This was informed by our interest in broad-based content effects on responses, that is, the difference in responses to a positive versus a negative clip. Our stimuli were designed to reflect these broad-based differences and were not selected to include, for example, specific changes in stimulus valence where we would expect momentary (phasic) changes in physiological responses. For this reason, we did not explore phasic or moment-to-moment changes in heart rate and skin conductance. However, physiological measures offer unique opportunities to

conceptualize and study such momentary changes. Recent work by Wang et al. (2015) has shown that linking dynamic differences in content to in-the-moment physiological responses can be a powerful approach, especially when person characteristics (e.g., sensation seeking) are closely matched with content characteristics (e.g., message sensation value) not only across but also within stimuli. Such work would offer relevant additions to theorizing on differential susceptibility (e.g., Valkenburg & Peter, 2013) and emotional flow (Nabi, 2015) by not only testing which media users have heightened responses to an entire stimulus, but also who responds more strongly to specific points within a larger entertainment product – and which response pattern may predict more distal effects on beliefs or behavior. Thus, as a follow-up to our first conceptual take-away (matching content and disposition more closely), future work might consider testing such questions using dynamic approaches, which may be better suited to detect relevant individual differences in responses.

Conclusion

Individual differences in cognitive, emotional, and arousal responses to media have been identified as a key “unsolved issue” in media effects research (Valkenburg & Peter, 2013). Given their central mediating role in many theoretical models, empirical insight into *who* is more likely to experience *which responses* to media content is necessary to better understand differential susceptibility to media effects. This study took a first step in this direction by showcasing a theoretically, methodologically, and analytically appropriate way of approaching this question. Although significant variation in cognitive, emotional, and arousal responses to positive and negative entertainment content existed, these patterns were not explained by need for cognition, affective empathy, sensation seeking, and sensory processing sensitivity. While the null results are somewhat disappointing, we see them as a call for conceptual and methodological refinement when studying individual differences in media responses. We hope that, through this refinement, scholars will move closer towards solving an issue which, as of this writing, remains “unsolved”.

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