

The influence of television content on advertisement: a neurophysiological study

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7 **Keywords: halo effect; television content; media context; advertising; neurophysiological**
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9 **Abstract**

10 Emotional and cognitive reactions to the media context prove impactful on advertising effectiveness.
11 However, research on the topic remains lacking and with a profusion of mixed results regarding the
12 role of the context in enhancing or detracting communication effectiveness. This study explores the
13 media context-advertising relationship, by investigating the influence of television content on
14 advertisement in light of media psychophysiology and grounding on the Halo effect theory.
15 Consumers' responses to different television content and advertisements are assessed. Specifically,
16 consumers' arousal, pleasure, attention, and memorization are measured through brain analysis, heart
17 rate, and skin conductance detection. Self-reported methods complement such analysis, by exploring
18 the values associated with the television content and the advertised brands. Results show that
19 television content influences consumer responses to the advertisement and the values associated with
20 the brands, confirming the existence of a halo effect. Responses differ among television content
21 typologies.

22 **1. Introduction**

23 The mixed results coming from television advertising, being more fragmented, and the rising
24 competition amongst brands spurs the advertising industry to get new insights into how customers
25 perceive and react to promotional messages on different television channels and contexts. Gaining
26 consumers' attention, building memory and favourable perceptions of the brand are more and more
27 challenging objectives in the current highly competitive environment (Pieters, Warlop, and Wedel
28 2002; Park et al. 2021). Despite the decrease in television attractiveness as a medium where to
29 display advertisements, in favour of online advertising, recent studies show that TV advertisements
30 elicit more attention and positive emotions compared to online advertisements (Weibel et al. 2019).
31 Hence, understanding the factors that affect consumer perceptions and reactions toward advertising
32 may help in improving commercial placement, and consequently, brand communication
33 effectiveness.

34 Most of the research on the effectiveness of advertising focuses on the quality of the communication
35 itself or the quality of the product promoted (e.g. Malthouse et al., 2007). Different studies focus on

36 advertising creativity, but with results that are hardly generalizable to different settings (Hartnett et
37 al. 2016). Recent evolutions in the media landscape, however, make it necessary to refocus the
38 attention on the context in which the advertising is displayed, as a driver of effectiveness. The failure
39 of the cookie implies that addressable advertising, which has been seen as the new advertising
40 paradigm by companies and media makers, is not likely going to be in place anymore. This implies a
41 return to the classical media placement using context.

42 Research on the context took different directions. A classic view posits that ads well designed for a
43 specific target audience will work potentially in every medium (Rossiter and Percy 1987) and some
44 studies even do not confirm the effect of context. Context power has been mainly associated with the
45 size of the audience it delivers (Graham and Kennedy 2022). On the other side, affect transfer theory
46 (Mattes and Cantor 1982) has been used as a model to explain consumer reactions to advertising in
47 different contexts. Affect refers to the consumer linking of a branded offer. It suggests that television
48 commercials seen after arousing movies are perceived as more effective and enjoyable than the same
49 commercials seen in less arousing television content. However, this effect is limited in time, as the
50 second commercial in a break gets affect transferred from the previous ad (Poncin and Derbaix 2009)
51 as ads elicit affective reactions to ads shown in the same break. This suggests the need to carefully
52 order ads during a commercial break to lower the negative impact of ads with lower customer
53 retention on other ads, to avoid consumers may switch channel. This negative externality may indeed
54 affect the network's revenues (Shi, Kim, and Zhao 2022)

55 Prior studies show that the engagement and the congruency of the media context are factors
56 determining communication effectiveness (Dahlén 2005; Segev, Wang, and Fernandes 2014; Jeong
57 and King 2010; Zeng et al. 2022; Davtyan and Tashchian 2022). Other studies focused on the usage,
58 interactivity, and attitude toward the medium (Kwon et al. 2019). More recent studies focus on online
59 contexts, especially on the role of social media influencers, investigating how the interaction between
60 the typology of social media influencers and the argument quality determine different consumer
61 responses to advertisement, both neurological and self-reported (Pozharliev, Rossi, and De Angelis
62 2022a; R. Sánchez-Fernández and Jiménez-Castillo 2021). Regardless of the area of focus, research
63 agrees on the impactfulness of the emotional and cognitive reactions to the media context on
64 advertising effectiveness (Pozharliev, Verbeke, and Bagozzi 2017; Venkatraman et al. 2015; Pieters,
65 Rosbergen, and Wedel 1999). However, research on the topic remains with a profusion of mixed
66 results regarding the role of media context in enhancing or detracting advertising effectiveness
67 (Kwon et al. 2019). Furthermore, the focus has mainly been on affective responses, where the affect
68 transfer theory mainly contributes, but not on the wide spectrum of cognitive responses and
69 consumer evaluations.

70 This work aims to explore the role of affective and cognitive reactions to television content in
71 influencing reactions toward the advertisement, in light of media psychophysiology. We study the
72 media context-advertising relationship by grounding on the Halo effect (Thorndike 1920), a
73 mechanism that leads consumers to form evaluations of people, products, or brands by
74 overgeneralising and inferring across different attribute dimensions. In the domain of media
75 psychophysiology, our premise is that the Halo Effect becomes apparent within TV consumption,
76 particularly in the way advertisement is connected with TV content. This occurs as individuals make
77 judgments based on contextual information, specifically the TV show in which the advertisement is
78 placed. Instead of assessing the product or brand in isolation, consumers utilize a cognitive shortcut,
79 associating positive or negative aspects of the TV show with the advertised content. This implies that
80 viewers may attribute features of the surrounding TV program to the advertisement, even when the
81 explicit characteristics of the product or brand are not plainly demonstrated.

82 To test such mechanism, consumers' responses are studied through neurophysiological methods,
83 specifically, electroencephalogram (EEG), heart rate (ECG), and skin conductance detection, that
84 offer unbiased access to the consumers' brain and bodily reactions to advertising stimuli (Pozharliev,
85 Verbeke, and Bagozzi 2017). Furthermore, neuroscience-based methods, have demonstrated their
86 effectiveness in detecting consumer processing and reactions to ad messages (Eijlers, Boksem, and
87 Smidts 2020; Vecchiato et al. 2010; Falk, Berkman, and Lieberman 2012; Falk 2010; He, Pelowski,
88 et al. 2021; Zhu et al. 2022). The measurement of the brain reactions and the body responses can shed
89 light on how individuals process messages (Cacioppo, Tassinari, and Berntson 2007). In marketing
90 communication, the neuroscience approach allows higher inferential traction and more reliable
91 measurement than traditional self-reported measures (J. Sánchez-Fernández, Casado-Aranda, and
92 Bastidas-Manzano 2021; Pozharliev, Rossi, and De Angelis 2022b). Moreover, some divergent
93 results in terms of media context-advertising effects have been attributed to measurement issues
94 (Moorman et al., 2012). Prior studies, indeed, assessed advertising responses, in terms of emotions,
95 attention, involvement, and memorisation, through different self-reported methods, which may be
96 subject to biases, such as social desirability bias or common-method variance (MacKenzie and
97 Podsakoff 2012; Randall and Fernandes 1991). Through neurophysiological methods, we attempt to
98 overcome this limit, by providing an unbiased assessment of consumer reactions (He, Freudenreich,
99 et al. 2021). Prior studies demonstrate the potential of biometrics in the measuring of television
100 commercial effectiveness (Bellman et al. 2017; 2019). Above neuroscience-based methods, a survey
101 is adopted to assess consumer evaluations, namely television content perceived quality, and values
102 attached to the television contents and the advertised brands.

103 **2. Halo effect in advertising**

104 Forming accurate impressions about people and things is a very complex and demanding cognitive
105 task, subject to several shortcuts and biases. Since reality is way too complex for a complete
106 understanding, extrapolating from known information to unknown details is one of the most common
107 heuristics people use (Asch and E. 1946; Crano 1977). Thanks to this and other compensating effects,
108 our brain is capable of generating a first impression after only 100-ms exposure to a human face
109 (Willis and Todorov 2006). Defined "Halo" (Thorndike 1920), this instinctive heuristic has been later
110 defined as the excess of correlation over and above the true correlation between attributes (Murphy
111 and Jako 1989). It assimilates the evaluation of different attributes, flattens the overall profile of
112 evaluation, and compresses the differences among attribute evaluations (Murphy, Jako, and Anhalt
113 1993).

114 Despite its importance in the formation of consumer evaluations, few studies have been conducted on
115 the halo effect in the advertisement field. Thanks to the halo effect, commercials placed inside
116 programs judged as interesting and pleasant were better evaluated (Krugman 1983). Further studies
117 addressed the impact of website credibility on Click Through Rate, to account for the number of
118 clicks on a link or banner over all the visualizations (Colbert, Oliver, and Oikonomou 2014). They
119 confirmed the presence of a halo effect where increased credibility improves both Click Through
120 Rate and user experience, working through perceived credibility and greater engagement. In the
121 television field, Babad (2005) explored the halo effect of a television interviewer's preferential
122 behaviour on the viewer's perceptions of the interviewee. In the digital publishing sector, ads on
123 premium publisher sites can deliver substantially greater branding effectiveness for online display
124 ads, being thus able to support a higher Cost Per Mille (Lipsman 2016). These studies provided the
125 first evidence of the existence of a halo effect from the publisher to the advertisement. Further studies
126 explored the relationship between media context and advertisement, mostly concentrating on the
127 medium, in terms of usage, interactivity, or attitude toward it (Stipp 2018; Olney, Holbrook, and

128 Batra 1991; Sreejesh, Ghosh, and Dwivedi 2021). In the context of social media communication, a
129 congruency effect of advertising appeal and advertising channel on advertising effectiveness has been
130 individuated (Zeng et al. 2022). Davtyan & Tashchian (2022) explored the effects of thematically
131 congruent and incongruent brand placements, showing that while incongruent brand placements
132 enhance consumers' brand memory, congruent placements generate positive brand attitudes, but both
133 exert similar effects with a high frequency of brand placement repetition. Other studies investigated
134 more experiential aspects, such as involvement with the media and mood states (Kwon et al. 2019).

135 The health halo effect in food advertising has been the subject of several studies (e.g. Fernández-
136 Escobar et al., 2021). Here, the halo effect emerges in the positive or negative impact of health
137 messages on food choices. For instance, nutritionally lacking foods advertised with implicit and
138 explicit references to health may lead to judgement errors about healthy food choices by misleading
139 the understanding of nutritional characteristics (Whalen et al. 2018). Additional works confirm the
140 halo effect generated by corporate reputation on company products in the context of television
141 choices, where consumers are less likely to purchase products from companies with poorer
142 reputations (Burke, Dowling, and Wei 2018). Hence, placing products in a specific context (e.g. the
143 context of a healthy lifestyle) within television advertising may generate a better evaluation of a
144 product even attaching to it qualities which it does not possess and that were not claimed. Overall,
145 the relationship between the media environment and advertising effectiveness has shown mainly
146 positive with a favourable spill-over from the medium to the commercial (Khouaja and Bouslama
147 2011).

148 Grounding on prior studies, we assume that the halo effect mechanism manifests in TV
149 advertisement, by letting individuals form judgements based on contextual information, i.e. the TV
150 show in which the advertising message is placed. Rather than evaluating the product or the brand
151 advertised independently, viewers apply a cognitive shortcut by attaching positive or negative aspects
152 of a TV show to the advertising, even if the product or brand attributes are not explicitly
153 demonstrated. Thus, the halo effect impacts the cognitive elaboration of the advertisement by letting
154 individuals form quick judgements grounded on limited contextual information. Moreover, we posit
155 that the halo effect can generate implicit associations for specific features of a product or brand
156 which can trigger emotional responses even when individuals are not consciously evaluating the
157 associated product features. We delve more into this aspect in the further discussion about the link
158 between media psychophysiology and the halo effect.

159

160 **3. Halo effect and media psychophysiology**

161 Mental experiences, which include advertising exposure, emerge from the ongoing activity of the
162 brain. As clarified by the Embodied Motivated Cognition (EMC) (Potter and Bolls 2012), the brain
163 produces a continuous stream of mental experiences at different levels of unconsciousness. As the
164 brain is connected with the rest of the body, the peripheral nervous system assessment provides
165 critical insights into the mechanisms underlying individuals' exposure to communication (Potter and
166 Bolls 2020). Psychophysiological measures emerge as powerful indicators in media processes and
167 effects research, being connected with variation in attention, arousal, and positive/negative emotional
168 responses (Bolls et al. 2019). Research in psychophysiology confirms the influence of the media
169 context on the advertisement. Following media psychophysiology, changes constantly occur when
170 individuals interact with media, unfolding through the functioning of dynamic embodied mental
171 processes evoked through media consumption, identified as media effects (Bolls et al. 2019). For
172 instance, some advertising elements or specific moments in TV ads may elicit emotional responses or
173 engagement at the physiological level, contributing to the overall Halo Effect. Such mechanism is

174 confirmed by the Theory of Excitation Transfer, which posits, with specific regards to arousal, that
175 consecutive dependencies exist in emotional reactions, where preceding emotion-arousing situations
176 intensify emotions in present situations, lingering beyond the immediate exposure to that stimulus
177 (Dolf Zillmann 2008; Cummins 2017). The theory treats excitation as the key driver of the emotional
178 experience, coming from the dominance of the sympathetic activity in the autonomic nervous system
179 (D. Zillmann 1996). Following the psychophysiological paradigm, assuming that the human mind is
180 embodied, so that all forms of human mental activity exist in the brain and are observable through
181 neurophysiological manifestations (Bolls et al. 2019), we do assume that manifestations of the halo
182 effect should be evident at the physiological level as well.

183 Prior studies confirmed such a mechanism. Clark et al. (2018) for instance, analyzed how users
184 cognitively process advertisements embedded in mobile content, finding, among others, that users
185 allocate more cognitive resources (assessed through heart rate change) to the ads when these were
186 smoothly placed within the content. Hence, the halo effect manifests at the psychophysiological
187 level, where positive affect, arousal or cognitive engagement toward the television context may lead
188 to positive emotions, arousal, attention or memorization during the advertisement exposure. Thus, the
189 halo effect impacts cognitive mechanisms by simplifying decision-making through heuristic
190 processing. It also influences emotional processes by creating emotional contamination, through
191 implicit associations and neurophysiological reactions.

192 Advertising research suggests three key indicators of message effectiveness: attention, memorization,
193 and emotional engagement (Pozharliev, Verbeke, and Bagozzi 2017; Pieters, Rosbergen, and Wedel
194 1999; Venkatraman et al. 2015; Vecchiato et al. 2010; Langleben et al. 2009; Vecchiato et al. 2012)
195 that may be subject to such halo effect. Emotional engagement, indeed, may produce a halo effect for
196 positive beliefs, while reducing halo for negative beliefs (Bagozzi 1996). Emotional reactions can
197 also create a halo effect which influences the entire memorization process, by allowing a more in-
198 depth analysis of the advertisement's features by the individual (Lombardot 2007). Here, the first
199 reaction to an advertisement can have a positive influence on attention toward the message and
200 facilitate the emergence of a halo effect, a general first impression which is easily accessible in the
201 memory and which allows the individual to remember other advertisement elements (Lombardot
202 2007; Srull and Wyer 1989).

203 The methodological aspect is also worth noticing. Indeed, prior studies tested the halo effect mainly
204 by adopting self-administered surveys, looking for changes in participants' attitudes. However, the
205 halo effect is a mechanism leading to unconscious alteration of judgements (Nisbett and Wilson
206 1977) when an initial positive judgment about an object unconsciously colours the perception of the
207 object as a whole. Thus, neurophysiological methods, by providing an unbiased assessment of
208 consumer reactions (He, Freudenreich, et al. 2021) seem a more desirable method to assess such
209 mechanisms. By depicting peaks in emotional intensity, moments of heightened arousal or brain
210 activity associated with different stages of content processing, such as attention or memorization, it is
211 possible to understand which aspects of a content contribute to a certain cognitive or emotional
212 response which can be transferred to the ad. Plus, neurophysiological methods, being real-time
213 measurements, enable us to assess transitions between positive and negative emotional states and to
214 measure punctual emotions or reactions, depicting how the halo effect transfer evolves over time. For
215 instance, skin conductance, by assessing changes in arousal, reflects the emotional engagement of a
216 consumer. A heightened skin conductance, thus, indicates emotionally impactful moments in the
217 content which can contribute to the overall positive or negative evaluation of the television content
218 and influence subsequent evaluations of the advertisement message attributes. Hence, neuroscience
219 can support in measuring how specific response patterns of nervous system activity are indicators of
220 punctual mental processes (Bolls et al. 2019).

221 Physiological markers help pinpoint specific ad elements or sequences that trigger emotional and
222 cognitive responses in real-time. These methods prove valid to measure television commercial
223 effectiveness (Bellman et al. 2017; 2019) and offer unbiased access to the consumers' brain and
224 bodily reactions to advertising stimuli (Pozharliev, Verbeke, and Bagozzi 2017). Neuroscience-based
225 methods, indeed, have demonstrated their effectiveness in detecting consumer processing and
226 reactions to ad messages (Eijlers, Boksem, and Smidts 2020; Vecchiato et al. 2010; Falk, Berkman,
227 and Lieberman 2012; Falk 2010; He, Pelowski, et al. 2021; Zhu et al. 2022) and allows higher
228 inferential traction and more reliable measurement than traditional self-reported measures (J.
229 Sánchez-Fernández, Casado-Aranda, and Bastidas-Manzano 2021; Pozharliev, Rossi, and De Angelis
230 2022b). To that, we should add that self-reported measures may be subject to biases such as social
231 desirability bias or common-method variance (MacKenzie and Podsakoff 2012; Randall and
232 Fernandes 1991). Some of the divergent results in terms of media context-advertising effects could
233 be indeed attributed to such measurement issues (Moorman et al., 2012). Furthermore, values
234 embedded in programs and advertisements represent the drivers of interest in consumers (Czarnecka
235 et al., 2018; Pollay, 1983) where the selection of a medium that indirectly communicates the brand
236 values may increase ad effectiveness (Dahlén 2005; De Pelsmacker, Geuens, and Anckaert 2002a). In
237 the following, attention, memorization, emotions, and value perceptions are deepened.

238

239 **3.1 Attention**

240 Attentional mechanisms determine which information the individual elaborates on and which he
241 ignores, having a remarkable role in decision-making (Shaw and Bagozzi 2018; Pozharliev et al.
242 2015). Due to the massive amount of incoming commercial information and the limited processing
243 capacity of individuals, the attention a message can gain has become a crucial indicator of advertising
244 effectiveness (Shaw and Bagozzi 2018; Simmonds et al. 2020). Generating attention from consumers
245 is the first fundamental step of the purchasing process, both for new products and for familiar ones,
246 for instance by nudging memory.

247 The attention devoted to television content is likely to spill over to the advertisements, hence
248 resulting in greater effectiveness (Moorman et al., 2012). The transfer hypothesis predicts that
249 context-induced involvement is transferred to the advertisements that follow in the commercial break
250 in a sort of spill-over effect (Krugman 1983). For instance, in magazines, absorbing content can
251 generate positive reactions to advertising messages (Malthouse, Calder, and Tamhane 2007).
252 Similarly, on websites, consumer involvement with the media context positively affects advertising
253 effectiveness (Calder, Malthouse, and Schaedel 2009). In the television context, attention given to a
254 program is been kept active during the subsequent commercial (Krugman 1983). Conversely,
255 negative experiences appear not to damage the advertising effectiveness in magazines, potentially
256 because of the freedom to choose the content, contrary to what happens in linear television
257 (Malthouse, Calder, and Tamhane 2007). Grounding on this evidence, we assume that attention
258 toward the television content may influence attention toward the advertisement, both in positive and
259 negative ways. More formally:

260 *H1: Greater (lower) attention toward the television content will increase (decrease) attention toward*
261 *the commercial*

262 **3.2 Memorization**

263 Memory has been described as “any physical change that carries information about the historical
264 past” (Redish and Mizumori 2015). Memorization is the process of encoding, consolidating, and
265 retrieving information. It plays an essential role in the learning and decision-making process,
266 enabling recall and recognition of brands, which are fundamental indicators of advertising
267 effectiveness (Jun et al. 2003). Prior research demonstrates that the specific context in which the
268 advertisement is placed could strongly impact its memorization. For instance, individuals exposed to
269 the advertisement in a speciality magazine were less able to discriminate the product advertised from
270 other products of the same category than those exposed to a general audience magazine (Jun et al.
271 2003). Memorization shows to increase when consistency between the advertisement and the
272 television context is assured (Simola et al. 2013), both in print (Moorman et al., 2002) and online
273 (Hervet et al. 2011). However, prior studies found divergent results on the relationship between
274 media context and ad memorization, with both positive and negative impacts (Moorman et al., 2012).
275 Such mixed results may be due to the measurement itself of memorization, sometimes
276 operationalized as recall, others as recognition of the stimulus (Moorman et al., 2012). Moving from
277 that, we assume that a transfer mechanism may be in place for television advertisements, where the
278 memorization of the television content could affect the memorization of the commercial. More
279 specifically:

280 *H2: Greater (lower) memorization of a television content will increase (decrease) memorization of*
281 *the commercial*

282 **3.3 Emotions**

283 Emotions, identified in the two dimensions of pleasure and arousal, constitute relevant, predictable,
284 and impactful drivers of decision-making and post-decision appraisal (Lerner et al. 2015; Ekman
285 1992; Bettiga et al. 2020). Pleasure (or valence) reflects happiness and delight while arousal conveys
286 excitement, stimulation, and bodily activation. Arousal is a fundamental component of behaviour
287 (Groeppe-Klein 2005). It indicates an active body reaction to relevant outside stimuli and their
288 processing and is a driver of decision-making processes (Groeppe-Klein 2005; Bettiga, Lamberti,
289 and Noci 2017). Arousal can have a positive or a negative valence: for instance, a subject highly
290 aroused may be both positively excited while watching an action movie or scared by a horror movie.
291 On the opposite, low arousal could indicate both relaxation, such as what may happen when watching
292 a pleasant television program, or boredom, while watching a monotonous one. This view has been
293 widely confirmed through empirical studies (Baker, Levy, and Grewal 1992; Ward and Barnes 2001)
294 that revealed the divergent form of the arousal-relaxed and pleased-unpleased dichotomy.

295 The emotional appeal of the context has been shown to moderate the responses to advertisements
296 (Janssens and De Pelsmacker 2005). Arousal has repeatedly been displayed to influence reactions to
297 advertising messages (Jiang et al. 2020; Eijlers, Boksem, and Smidts 2020). In terms of valence,
298 humorous advertisements are shown to be more effective when placed in positive mood
299 programs and breaks (Khandeparkar and Abhishek 2017). Murry et al. (1992) by manipulating
300 emotions, showed that if an individual likes a program, he would equally like the following
301 commercial, confirming that feelings elicited by television content determine the consumer
302 evaluation of adv. Affect and mood induced by the media content are carried over on advertisement
303 evaluation (Frarice and Park 1997; Krugman 1983). For instance, liking a program puts consumers in
304 a positive mood, which is likely to be transferred to the commercial following the program (De
305 Pelsmacker, Geuens, and Anckaert 2002b). The effects of pleasure and arousal, indeed, decay quite
306 slowly, extending their influence from the program to the commercial (Abeele and MacLachlan
307 1994). More recently, Breuer et al. (2021) showed that low-to-moderate arousal and valence-neutral

308 responses improve the attention toward sponsor messages during a live sports broadcast. Grounding
309 on this discussion, we hypothesize that the emotional appeal of the television content, in terms of
310 valence and arousal, will impact emotional responses toward the commercial. More specifically, we
311 propose that:

312 *H3: Greater (lower) arousal toward a television content will increase (decrease) arousal toward the*
313 *commercial which follows*

314 *H4: Greater (lower) pleasure toward a television content will increase (decrease) pleasure toward*
315 *the commercial which follows*

316 **3.4 Value perceptions**

317 Television programs and advertisements transmit values to the public (Lin 2001; Cheng and
318 Schweitzer 1996). Values represent cultural principles, meanings, and symbols of which national
319 culture is an important determinant (Czarnecka, Brennan, and Keles 2018) and they may impact
320 learning (Samaniego and Pascual 2007). News, for instance, displays frequency, meaningfulness
321 simplicity, and consistency values (Greguš and Mináriková 2016). The usage of mass media on the
322 reverse has been associated with materialistic values (Rai, Chauhan, and Cheng 2020). Such values
323 should align with the values of the target market and represent the drivers of interest in consumers
324 (Pollay 1983; Czarnecka, Brennan, and Keles 2018). Theories on the media-context effect show that
325 creative media choice (i.e. selection of a medium that indirectly communicates the message)
326 increases ad effectiveness, in terms of brand associations, ad credibility, and brand attitudes (Dahlén
327 2005). For instance, advertising messages displayed in appreciated television and print contexts
328 determine a better attitude toward the advertisement (De Pelsmacker, Geuens, and Anckaert 2002b).
329 This does not happen when the commercials are presented in disliked programs (Schumann 1986).
330 Bronner & Neijens (2006) further studied the relationship between media experience and how the
331 advertisements shown in the media are experienced. They found that if a television program is judged
332 as stimulating for the consumer, the advertising within this program is also experienced as
333 stimulating. However, no further correlations were found for the television media. Grounding on this
334 discussion, we assume that a transfer of values, according to the media context-advertisement effect,
335 occurs in the television media. More formally:

336 *H5: The values perceived toward television content will influence the values perceived toward the*
337 *commercial*

338 **4. Materials and methods**

339 **4.1 Sample selection: stratification and pre-screening test**

340 We conducted a laboratory experiment on an experimental base composed of 60 Italian individuals,
341 equally distributed in gender with balanced, but different backgrounds. The subjects were selected
342 and equally distributed in three age ranges: 21 subjects from 18 to 34 years old, 19 subjects from 35
343 to 49 years old, and 20 subjects from 50 to 64 years old. The sample size is in line with prior studies
344 using biometric methods (Vecchiato, Toppi, Astolfi, & Fallani, 2011; Vecchiato et al., 2010, 2012).
345 Participants were selected through a pre-screening survey where we assessed consumer evaluations
346 of the brands that will be displayed during the laboratory experiment and collected demographic
347 information needed to stratify the sample. The pre-screening survey was conducted some days before
348 the laboratory experiment, to further ensure that participants' responses during the laboratory
349 experiment are not biased by prior responses to the pre-screening survey. The pre-screening test

350 presented five additional brands above the six to be used in the study, to avoid distortion in brand
351 recall during the laboratory experiment, as participants would not easily connect the brands displayed
352 in the commercial with the ones evaluated during the pre-screening survey The brand evaluation
353 assessment was conducted by using the 3-item scale proposed by Chandon (2003). This served to
354 verify that the brand's evaluation was not deeply negative, to avoid distortions in experimental
355 results. Familiar, favourable brands, indeed, have been shown to elicit different neural responses than
356 familiar but unfavourable brands (Esch et al. 2012).

357 **4.2 Stimuli selection**

358 Six television advertisements promoting different brands and six different television shows were tested. Such a
359 number ensures from one side the generalizability of our results to a broad range of adv, from the other side
360 picking a limited number allows the experiment to be conducted in a reasonable time, to avoid participants
361 feeling bored or stressed by the length of the testing. The advertising messages were chosen by a team of four
362 experts operating in the advertising field. Each advertisement was 30 seconds long. They displayed consumer
363 good brands, familiar to the population from which participants have been selected, and with a wide target
364 group. Television shows pertain to three common typologies: TV series (a series of episodes created or
365 adapted for television broadcast and related to a subject), entertainment shows (entertained aimed music-
366 recreation, game and quiz shows, talk and variety), and reality shows (television program documenting how
367 people behave in everyday life or in specific situations created by the program maker). This is to ensure
368 that different television contexts are considered, due to their specificities and potential differential
369 impact on the relations under test. For each program typology, one high-quality and one low-quality
370 television content were selected, for a total of six television shows under test. The quality of the
371 television content, indeed, may affect the relationship between media content and advertisement
372 (Gunter, Furnham, and Beeson 1997) where specific editorial quality may impact advertising success
373 (Sommer and Marty 2015). The level of quality was defined by a team of four experts operating in
374 the advertisement field. We further verified the validity of such classification by asking participants
375 to rate each television show's quality through a 5-point Likert scale, outcomes are shown in the
376 results session. Overall, the following television program typologies were displayed: high-quality TV
377 series, low-quality TV series, high-quality entertainment shows, low-quality entertainment shows,
378 high-quality reality shows, and low-quality reality shows.

379 **4.3 Neurophysiological measures**

380 Neurophysiological indicators, indices of bodily responses reflecting changes in physiological
381 responses (Potter and Bolls 2012) of the subjects' reactions, were measured during the experiment
382 using biometric techniques. This choice has been made as both cognitive and affective reactions of
383 consumers are hardly measurable through self-reported methods, being individuals usually not able
384 to correctly assess and report the emotions they experience and their cognitive effort (Chamberlain
385 and Broderick 2007). Three types of biometric measures have been recorded, following
386 physiopsychological research which suggests the need for multiple measures (Cacioppo, Tassinari,
387 and Berntson 2016): electroencephalography (EEG), electrocardiography (ECG), and skin
388 conductance (SC) signal. EEG signal allows the assessment of the brain activity of the participants,
389 while ECG and SC signals permit to measure the autonomic nervous system activation. In the
390 advertising field, heart rate is used as a psychophysiological indicator of cognitive resource allocation
391 (Clark et al. 2018). Skin conductance has been validated as a measure of arousal, as well as anxiety,
392 in response to different media contexts (Bolls et al. 2019). EEG has been adopted to study multiple
393 forms of cognitive and emotional processes in media consumption (Morey 2018). By recording
394 electrical signals generated by the firing of neurons in activated cortical areas, cortical activity can be
395 recorded from both hemispheres allowing inferences about mental processes engaged during various
396 tasks, including media exposure (Bolls et al. 2019). Using different and complementary

397 measurements permits a comprehensive appraisal of the individual reactions to the television show
398 and the advertising message.

399 4.3.1 Electroencephalography (EEG) measures

400 The EEG was acquired using a portable 64-channel system (SD LTM Express and System Plus
401 Evolution software, Micromed, Italy). To guarantee easy and fast use of this measuring system, we
402 employed 27 electrodes over the 64 available, that were uniformly distributed on the scalp to cover
403 all the most relevant activation regions of the brain, that are the frontal, central and occipital regions.
404 Each electrode was filled with a water-based gel to enhance conductivity with the participants' scalp.
405 The EEG activity was collected at a sampling rate of 128 Hz and the impedance level was kept below
406 5 k Ω for all the acquired electrodes. Three indexes were calculated from the brain activity signal:
407 Memorization Index (MI), Attention Index (AI), and Pleasure Index (PI) (Chaouachi et al. 2010;
408 Vecchiato et al. 2012; 2010). Each one of these indexes was obtained by computing the Global Field
409 Power (GFP) of the EEG signal in a specific frequency band. The bands were related to the
410 Individual Alpha Frequency (IAF) of the subject (Vecchiato et al. 2012; 2010; Chaouachi et al.
411 2010). Specifically, MI was calculated from the frontal electrodes (F3, AF3) activation in theta band
412 = [IAF-6, IAF-4]. AI was calculated from the frontal electrodes (F3, AF3, F4, AF4, Fz, FPz)
413 activation in the low alpha band = [IAF-4, IAF]. PI was calculated separately from the left (F3, AF3,
414 F1) and right (F4, AF4, Fp2) electrodes activation in high alpha band = [IAF, IAF+2] and expressed
415 as:

$$416 \quad \text{Pleasure} = \text{Pleasure}_{left} - \text{Pleasure}_{right}; \quad (1)$$

417 All the indexes were obtained by temporarily averaging their values during the vision of each content
418 of the experiment (television program and advertisement). The mean values thus obtained were
419 related to the mean value recorded during the vision of a neutral image (baseline) and reported on a
420 percentage scale using the following formulas:

$$421 \quad \text{Index}_{advertisement} = (\mu_{advertisement} - \mu_{baseline}) / \mu_{baseline} \times 100 \quad (2)$$

$$422 \quad \text{Index}_{TVprogram} = (\mu_{TVprogram} - \mu_{baseline}) / \mu_{baseline} \times 100 \quad (3)$$

423

424 4.3.2 Skin conductance (SC) and Electrocardiography (ECG) measures

425 A galvanic skin response sensor has been used to measure the electrodermal activity (EDA) of the
426 participants, with electrodes placed on the individual's fingers through a band. The SC signal
427 provides a measure of the electrodermal activity that is related to the skin resistance's variation. The
428 EDA is related to the skin resistance's variation due to the sweating that is controlled by the
429 sympathetic nervous system (SNS) and it increases linearly with a person's level of physiological and
430 psychological arousal. Waves have been measured at small intervals up to 10,000 times per second
431 (Morin 2011).

432 ECG measurement has been used to record the subjects' heart activity and to derive the heart rate
433 (HR), that is the speed of the heartbeat measured by the number of contractions of the heart per
434 minute. The link between the heart rate and the emotional state of the individual is confirmed in
435 research (Montano et al. 2009; Fortunato and Giraldi 2014). From the ECG signal, the temporal
436 distance between consecutive R peaks was extracted using the Pan-Tompkins method (Pan and
437 Tompkins 1985) and the heart rate (HR) was then calculated by computing the reciprocal of each R-
438 R interval.

439 Both skin conductance and heart rate were used as some individuals will respond to stimuli with
440 greater changes in heart rate than in skin conductance, while others will have large increases in skin

441 conductance but only small increases in heart rate. Within subjects, changes in SC and HR can
442 correlate positively even though there is zero or a negative correlation between subjects (Revelle &
443 Loftus, 1992). The ECG and SC were both acquired through the ProComp Infiniti system and
444 Biograph Infiniti software (Thought Technology Ltd., Canada). The first signal was recorded at a
445 sampling rate of 2048 Hz, while the other one was collected with a sampling rate of 256 Hz. The
446 mean values of HR and SC were calculated during the vision of each content and their values were
447 related again to the mean value obtained during the vision of the neutral image (baseline) and
448 reported on a percentage scale (Equations 2 and 3). In this way, it was possible to evaluate the
449 variation of the emotional state of the subject, correlated to the autonomic nervous system activation,
450 concerning the steady state (baseline).

451 The value associated with these parameters is a particular index computed as follows:

$$452 \quad \text{Parameter level} = 100 * \frac{(\text{Average parameter measure} - \text{Average baseline measure})}{\text{Average baseline measure}} \quad (4)$$

453 Equation (4) represents the percentage change in the mean evaluation of the parameter for the mean
454 value recorded during the vision of the neutral image before the beginning of each part of the
455 experiment (the baseline).

456 **4.4 Self-reported measures**

457 Above physiological assessment, for each participant we collected (i) demographic information: age,
458 gender, education level, job; (ii) perceived quality of the television content, in terms of
459 trustworthiness, measured on a 5-point Likert scale (iii) values associated with the brand and with the
460 television show, measured on a 5-points Likert scale. Specifically, the following values were
461 assessed: familiar, formative, innovative, intercultural, sustainable, aesthetic, original, dynamic, and
462 funny. These have been identified by the team of experts as the commonly assessed values in
463 television programs and advertising.

464 **4.5 Experimental flow**

465 The experiment was conducted inside a university neuroscience laboratory. The experiment follows a
466 between-subjects design. The experimental flow is depicted in Table 1. One participant per time took
467 part in the experiment, to avoid the interaction with other individuals and further elements of
468 interference. The experimental flow was the following: once the participant has been welcomed to
469 the laboratory, he/she signs a consent form that illustrates the tools used during the experiment and
470 the task required. Subjects have the right to withdraw at any moment from the testing. Each
471 participant then fills out a questionnaire aimed at collecting demographic and psychographic
472 information. Following this, each subject was equipped with an electroencephalography (EEG),
473 electrocardiography (ECG), and a skin conductance (SC) device. All the stimuli were displayed on a
474 computer. The first part of the testing consists of watching a neutral image. This had the objective of
475 making people feel more comfortable and relaxed and allowed researchers to observe which were the
476 subject's base parameters against which to compare the reactions to the stimuli. The assessment of
477 such baseline permits to deurate from individual variations in physiological state, thus enabling a
478 comparison among individuals. Secondly, it deurates from potential variations in individual
479 physiological states due to the wearing of the tools.

480 The 60 participants were then divided into three groups demographically balanced (group 1, group 2,
481 and group 3). Group 1 only watched commercials, to record the reactions generated by the
482 advertisement itself, without contextualization. Exposure of Group 1 to the advertising messages had
483 the objective of evaluating if significant differences existed among the advertising campaigns. This is
484 needed to ensure that potential differences in responses to the advertisement are not due to

485 differences among the commercials themselves. Participants of Group 2 and Group 3 saw three
486 blocks of television content plus advertisement stimuli. Thus, each subject of Group 2 and Group 3
487 saw six advertisements and three television programs (one reality show, one TV series, and one
488 entertainment show). Each block presents 3 minutes of the television show, followed by two
489 commercials, followed again by 1 minute of the same television show. Between the television show
490 and the commercial, a bumper is displayed, as happens in real television consumption. The testing
491 flow, indeed, wants to be as representative as possible of the actual television experience. All stimuli
492 (TV shows and advertising) were randomized: individuals see the commercials along different
493 program typologies in a randomized order. At the end of each block, after a pause of 1 minute,
494 participants were asked to fill out a questionnaire aimed at measuring value perceptions associated
495 with the brands displayed. Groups 2 and 3 in addition reported the values associated with the
496 television shows.

497 [Table 1 about here]

498

499 **5. Results**

500 **5.1 Preliminary checks**

501 First, we evaluated potential differences in terms of physiological responses of pleasure, attention,
502 memorization, and arousal among the commercials displayed. An ANOVA test shows that the six
503 advertisements had an average pleasure of -2,71 (SD 18,64) with $F(5,349) = 0,813$ ($p > 0.05$), an
504 average memorization of 0,32 (SD 17,16) with $F(5,349) = 1,218$ ($p > 0.05$), an average attention of -
505 1,73 (SD 12,6) with $F(5,349) = 1,94$ ($p > 0.05$), an average arousal (HR) of 1,18 (SD 5,60) with
506 $F(5,349) = 0,907$ ($p > 0.05$), and an average arousal (SC) of 8,12 (SD 20,54) with $F(5,349) = 0,848$ (p
507 > 0.05). Hence, all measures show no significant differences among the six advertisements.

508 Secondly, we assessed the congruency between the expert evaluation of the television content quality
509 and the subjects' perceptions. Analysis of variance showed a statistically significant difference at the
510 $p < .01$ level in quality perception scores. Post-hoc comparisons using the Mann-Whitney test
511 confirmed that participants evaluated the low-quality television programs (classified by experts) as
512 significantly less trustworthy compared to the programs classified as high quality, confirming
513 experts' classification. This result holds also when evaluated across program typologies, age, and
514 gender. Table 2 shows the mean values for high-quality and low-quality television programs. Further,
515 we conducted a regression analysis to measure the potential relation among self-reported and
516 biometric data. Results show there is no statistical significance on the coefficients for none of the
517 parameters considered. Table 3 presents the results.

518 [Table 2 about here]

519 [Table 3 about here]

520 **5.2 Hypotheses testing**

521 We evaluated the transfer of consumer neurophysiological reactions (pleasure, arousal, attention,
522 memorization) from the television content to the advertising messages displayed inside the television
523 show. We measured such transfer by regressing the consumer reactions measured while watching the
524 television program with the reactions measured during the commercial, computed by television
525 program typology. Results show a strong linear dependence between these two measurements for all
526 the parameters (Table 3). This suggests that a transfer effect is in act: if individuals are highly

527 aroused during the view of the program, they also are highly aroused during the view of the
528 advertisement; if they feel pleased by the television content they also feel as such during the
529 commercial; the same holds for attention and memorization. The relationship is significant for each
530 program typology. It must be pointed out that observations are distributed above and below zero and
531 intercepts of the linear models are not statistically relevant. This fact is due to the nature of the
532 indexes adopted (see methodology) which account for the percentage variation from the baseline.
533 Hence, negative values must be interpreted as lower than the baseline of that specific percentage and
534 not as negative in absolute value. Overall, the results confirm our H1, H2, H3, and H4 sustaining the
535 relevance of the media content in determining responses toward the advertisement.

536 [Table 4 about here]

537 We further analyzed if differences exist in pleasure, attention, memorization, and arousal among
538 participants who saw the advertisement only (Group 1) compared to the ones who saw it inside a
539 television show (Group 2 and Group 3). Such values are the result of the difference between the
540 parameter values recorded meanwhile the participants were watching the neutral image and while
541 they were seeing the advertisements. Kruskal-Wallis's one-way analysis showed no significant
542 differences in pleasure, attention, and memorization. Conversely, results show that individuals who
543 saw only the advertisements recorded a higher arousal level in comparison to the individuals who
544 saw the advertisements inside a television show. Significant differences among the mean values of
545 the groups are displayed through a Dunn-test (Bonferroni adjusted) where a higher arousal level ($M=-0,05$) is displayed for the group who only watched the advertisements in comparison to the subjects
546 who saw the advertisements inside a television show, either a high-quality one ($M= -10,63$) or a low-
547 quality one ($M= -8,77$).
548

549 Finally, we tested the existence of a transfer effect between the values associated with the television
550 program and the values associated with the advertised brands. We performed a correlation between
551 program evaluation and brand evaluation on each value: familiar, formative, innovative, intercultural,
552 sustainable, aesthetic, original, dynamic, and funny. Both TV series and reality shows scored
553 statistically significant on 7 out of 9 values, meaning that a transfer effect can be found in these
554 values. For entertainment programs instead, we encountered this effect on two values only. Overall,
555 our results partially confirmed H5 as individuals tend to attach to brands advertised an evaluation that
556 is consistent with the one provided for programs, even if this is not consistent among all TV program
557 typologies. Table 4 shows the results.

558 [Table 5 about here]

559 **6. Discussion**

560 The study investigates the media context-advertising relationship, by examining the influence of
561 television content on television advertisement, grounding on the Halo effect theory. A halo effect
562 between consumer reactions toward the television content and the advertisement emerges. Findings
563 show that such an effect is relevant for all the key metrics of advertising effectiveness, namely
564 attention, memorization, pleasure, and arousal, quantified through neurophysiological assessment.
565 Although previous studies found divergent results in terms of media context-advertising relation
566 (Khouaja and Bouslama 2011; Davtyan and Tashchian 2022), findings reveal that a strong positive
567 relationship occurs between the two, confirming the existence of a halo effect from the television
568 content to the commercial. We thus support, through neurophysiological assessment, prior studies
569 which hypothesize a spill-over effect from the media context to the advertisement that follows in the
570 commercial break (Frarice & Park, 1997; Krugman, 1983; Moorman et al., 2012). On the other side,
571 we show that negative experiences, in terms of low attention, memorization, or emotional activation,

572 negatively impact advertisement consumption, by hindering attention, memorization, and emotional
573 experience, contrary to prior findings on the media context-advertisement relationship (Malthouse,
574 Calder, and Tamhane 2007). Hence, the halo effect works both on positive and negative sides.

575 It is interesting to notice that consumers tend to experience higher arousal when they watch
576 commercials without contextualization than when these are placed inside television shows. This is
577 confirmed for both high-quality and low-quality programs. When consumers are highly involved
578 with television content, indeed, they concentrate on the source of their arousal and devote fewer
579 resources to commercials that interrupt the program (Newell, Henderson, and Wu 2001). The
580 advertisement exposure could represent a sort of break from television consumption with a
581 consequential decrease in arousal. Thus, when the advertisement is displayed alone, it can generate
582 greater involvement from the consumer.

583 Further on, findings partially support the hypothesis that value perceptions are transferred from the
584 program to the advertised brands. For instance, brands advertised inside innovative television
585 programs are perceived as more innovative as well. Such effect is confirmed mainly for reality shows
586 and TV series, but only to a reduced extent for entertainment programs. The specific results for
587 entertainment shows may derive from the peculiar characteristics of these programs (Besley 2006).
588 Overall, findings support the assumption that brand evaluation is shaped by the context, above the
589 offering itself. This is true for both low-quality and high-quality content.

590 **7. Academic implications**

591 Findings from this study could help researchers to disclose new insights into the impact of the
592 medium on the affective and cognitive processing of an advertising message. First of all, this work
593 proves the existence of a halo effect from the media content to the advertisement on attention,
594 memorization, pleasure, and arousal which, measured through physiological assessment, shift from
595 the media context to the advertisement. Furthermore, such an effect exists also on value perceptions,
596 with spillovers from the media content to the brand, moderated by the program typology. These
597 findings contribute to research on the media context-advertising relationship by showing the
598 existence of a halo effect between the media content and the advertisement message. Despite the
599 importance of the halo effect in the formation of consumer evaluations, indeed, to the best of our
600 knowledge, such a relationship has not been depicted before. An abundance of diverse results exists
601 regarding the role of media context in enhancing or detracting from advertising effectiveness (Kwon
602 et al. 2019). Our study helps fill this gap in research by investigating the presence of a halo effect, not
603 only in terms of value perceptions but also expressed through physiological responses. We employed
604 neurophysiological methods to assess the transfer of cognitive and affective reactions, specifically
605 electroencephalogram (EEG), heart rate (ECG), and skin conductance detection, differently from
606 prior studies grounded on self-reported measures.

607 Psychophysiological reactions emerged as key indicators of advertising processing, being connected
608 with variation in attention, memorization and emotional responses, supporting prior research (Bolls et
609 al. 2019). The findings of the study confirmed the influence of the media context on the
610 advertisement, supporting prior research on media psychophysiology (Bolls et al. 2019). Thus, we
611 enrich prior research on arousal as a mechanism to induce the halo effect (Bagozzi 1996), by showing
612 that emotional engagement with the consumption context may produce a halo effect on the
613 advertisement. Furthermore, we showed that attention and memorization toward the television
614 context transfer to the advertising messages placed inside that context. Prior research showed that the
615 first reaction to an advertisement can have a positive influence on attention and memorization

616 (Lombardot 2007; Srull and Wyer 1989). We further demonstrate that such a mechanism is in place
617 also between the television context and the advertisement.

618 The value of adopting neurophysiological measures resides also in their ability to assess the cognitive
619 and affective reactions of consumers, which are hardly measurable through self-reported methods, as
620 individuals are usually not able to identify and report emotions or cognitive effort (Chamberlain &
621 Broderick, 2007). Such assessment offers unbiased access to consumers' brain and bodily reactions to
622 advertising stimuli (Pozharliev, Verbeke, and Bagozzi 2017). Furthermore, it helps to overcome the
623 limits of self-reported methods which could explain the divergent results in terms of media context-
624 advertising effects found in prior research (M. Moorman et al. 2012; J. Sánchez-Fernández, Casado-
625 Aranda, and Bastidas-Manzano 2021; Pozharliev, Rossi, and De Angelis 2022b). Hence, this work
626 may represent a methodological reference for further research, providing directions on the use of
627 biometric measures for the evaluation of consumer reactions and feelings toward the advertisement.

628 **8. Managerial Implications**

629 This work provides several insights into how television content may influence consumer reactions
630 toward the advertisement. We confirmed that physiological responses to TV content determine the
631 responses to subsequent advertisements. Hence, marketers seeking new ways for creating arousal,
632 attention, or a sense of pleasure with their advertisement, should focus, above the content itself, on
633 the context in which the commercial is displayed. TV shows that generate attention can make
634 consumers more attentive to the advertisements shown inside such programs. Attention is key when
635 managing brand and product communication, as it has a direct impact on sales. Attention the
636 individual may pay is limited and more difficult to capture, seeing the abundance of branded content
637 available. On this metric, television is still a very powerful media, able to get active attention from
638 consumers, which is more consistent across the ad duration than on digital media. However, the
639 assumption that TV advertising is fully viewable is not true. Even if the full screen is devoted to the
640 advertising message, consumers may mute the device, navigate in another screen or simply be in
641 another room while the commercial is displayed. The same pattern seen for attention holds for
642 memorization of the brand, where memorization toward a TV show increases memorization of the ad
643 message. Memorization is an important lever marketers should consider when investing in
644 advertisement campaigns. Indeed, if the advertisement can capture the individual attention, then
645 memorization of the product or the brand is essential to create a connection with the consumer,
646 induce familiarity and thus, increase the chances of product purchase. Besides cognitive outcomes,
647 affective reactions of pleasure and arousal toward the advertisement are influenced by the media
648 context. Positive emotions may impact the online word-of-mouth about the ads. Hence, advertisers
649 and TV networks should carefully consider the emotions elicited by certain ads. Instead of
650 automatically placing ads in the program breaks, they may allocate ads into different programs or in
651 different positions in a certain program, depending on the cognitive and emotional reactions
652 generated by that program. Clearly, this is applicable in pre-produced programs only, not in live
653 events or reality shows where the content is not defined.

654 We should consider that the level of attention, memorization or affective reactions to be induced may
655 vary among brands and products and depends on the marketing objectives a brand pursues. Certainly,
656 campaigns need to be placed across different mediums and content to reach the target market, which
657 is fundamental to growth (Graham and Kennedy 2022) However, managers should carefully consider
658 the media and the specific context in which they place their campaigns to reinforce (and even more
659 important not undermine) the meanings and feelings they want to transmit with their messages. For
660 instance, sportswear advertising usually wants to transmit energy, excitement, and power. Thus,
661 placing sportswear advertisements inside exciting and arousing TV shows can reinforce the feelings

662 companies want to convey. Above that, marketers should pay attention to the values characterizing
663 television programs, as these are going to be attached to the brand advertised. The context should be
664 chosen accordingly with the brand positioning and the brand image (above the channel target
665 audience) to avoid confusion or a misalignment between the brand identity and the brand image.
666 Investments in editorial content quality may, in this regard, positively affect advertising revenues,
667 through an enhancement of the perceived quality of the brand. This is a key point for media
668 companies, that can enhance their value proposition to brands looking for advertising space, by
669 investing in the quality of their television content. This could be a desirable strategy to relaunch the
670 effectiveness of television advertising as a way to spur a positive brand image. Above that, in light of
671 research on affect transfer, the ad sequence inside the commercial breaks should be carefully
672 managed. This serves to ensure that, above the right television content, the ads are placed along other
673 commercials which do not undermine its value and of course, do not make consumers switch channel
674 during the commercials break. This negative externality may indeed affect the network's revenues.
675 (Shi, Kim, and Zhao 2022).

676 **9. Limitations and directions for future research**

677 The study analyses six advertising messages about six consumer good brands, familiar to the
678 population from which the sample has been selected and with a wide target market. The pre-
679 screening test, assessing the attitude toward the brands, helps in avoiding possible distortions due to
680 the specific brands proposed. However, different brands might potentially generate different reactions
681 in consumers. For instance, new ones may generate a stronger halo effect as consumers do not have a
682 prior well-defined attitude toward the brand. Familiar brands indeed have been associated with
683 different neural activation compared to unfamiliar brands (Schaefer et al. 2006). Thus, further
684 research should extend the study to new brands, unknown to the target market. In the same
685 perspective, future studies may explore the positive versus negative brand contrast as research
686 suggests consumer reactions may differ in the two scenarios.

687 Secondly, we displayed advertising messages of 30 seconds each. Shorter or longer messages (for
688 instance 15 15-second advertisement) might result in a different halo effect. Moreover,
689 communication messages displaying forms of interaction (such as a QR code) may generate different
690 reactions, in terms of attention or engagement. Future research should explore if and how the halo
691 effect manifests in different advertising typologies.

692 Thirdly, our aim is to measure the impact of the TV show exposure on the advertisement, thus all
693 physiological measures were obtained by temporarily averaging their values during the vision of each
694 content of the experiment (television program and advertisement). The mean values thus obtained
695 were related to the mean value recorded during the vision of a neutral image (baseline). In this way, it
696 was possible to evaluate the variation of the emotional state of the subject against the steady state.
697 However, such approach does not allow to track significant variation in cognitive and emotional
698 processing over time, due to context effects of television on advertising. Future research may explore
699 the halo effect over time, for instance by analysing the last 60 or 30 seconds of the television clip.

700 Finally, the current work investigates the effect of television content on advertisement responses. The
701 reverse pattern could be an interesting area of exploration, i.e. the influence exerted by
702 advertisements on television programs. Recent research displays interesting results on this
703 relationship, showing that exposure to advertising messages before a television program increases
704 attention toward product placement and reduces consumption enjoyment (Russell et al. 2017). Hence,
705 further research may delve more into this area.

706

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712

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1099 *Table 1 – Experimental flow*

Experimental phases	1	2	3	4	5	6	7
Group 1	Neutral image	-	Advertisement	Advertisement	-	Pause	Survey compilation
Group 2	Neutral image	TV show	Advertisement	Advertisement	TV show	Pause	Survey compilation
Group 3							
Time needed	30 seconds	3 minutes	30 seconds	30 seconds	1 minute	1 minute	3 minutes

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1115 *Table 2. Television content perceived quality*

	Groups	p-value	Mean perception of high-quality content	Mean perception low-quality content
Television program typology	TV series	< 0.01	4.16	3.48
	Entertainment	<0.001	3.64	2.12
	Reality show	<0.001	2.88	1.72

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1131 *Table 3 – Results of the regression between self-reported and biometric measures of attention,*
1132 *memorization, pleasure and arousal*

Value	B₀	B₁
Pleasure	16.68	- 4,79
Attention	- 9.08	1.50
Arousal (SC)	3.85	- 0.16

Arousal (HR)	-23.26	4.60
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* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001;

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1147 *Table 4 – Results of regression between the television content and advertisement on neurophysiological*

1148 *attention, memorization, pleasure, and arousal*

Television program typology	Value	B₀	B₁
TV series	Pleasure	-0.65	1.00***
	Memorization	1.66	1.13***

	Attention	0.98	0.97***
	Arousal (HR)	1.27*	0.87***
	Arousal (SC)	2.11	1.29***
Entertainment show	Pleasure	-1.57	0.91***
	Memorization	-3.14*	0.56***
	Attention	-3.42***	0.70***
	Arousal (HR)	1.61***	0.84***
	Arousal (SC)	-1.03	1.09***
Reality show	Pleasure	-1.80	1.05***
	Memorization	-0.35	1.08***
	Attention	-2.20***	0.99***
	Arousal (HR)	0.79	0.93***
	Arousal (SC)	2.39	1.51***
* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001;			

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1153 *Table 5 – Correlation between value perceptions of the television content and the advertised brands*

Value	TV series	Entertainment show	Reality show
Familiar	0.12	0.06	0.28**
Educational	0.26**	-0.01	0.23*

Innovative	0.39***	0.20*	0.24*	1154
Intercultural	0.18	-0.07	0.22*	1155
Sustainable	0.28**	0.11	0.38***	1156
Aesthetic	0.26**	0.14	0.26**	1157
Original	0.42***	0.12	0.23*	1158
Dynamic	0.25*	0.07	0.13	1159
Funny	0.35***	0.11	0.19	1160
* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001;				1161
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