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Accepted Manuscript

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1 **Title of Manuscript:** Does a ‘protective’ message reduce the impact of an advergame
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3

4 **Running Head:** ‘Protective’ message in a food advergame and snack intake

5

6 **Authors:** Frans Folkvord, PhD^{1,2}, Francisco Lupiáñez-Villanueva, PhD², Cristiano
7 Codagnone, PhD^{2,3} Francesco Bogliacino, PhD⁴, Giuseppe Veltri, PhD⁵, George Gaskell,
8 PhD⁶.

9

10 **Affiliations:** ¹ Behavioural Science Institute, Communication Science, Radboud University,
11 Nijmegen, The Netherlands; ² Information and Communication Science, Universitat Oberta de
12 Catalunya, Barcelona, Spain. ³ Dipartimento di Scienze Sociali e Politiche, Università degli
13 Studi di Milano, Milano, Italy. ⁴ Universidad Nacional de Colombia, Facultad de Ciencias
14 Económicas, Bogotá, Colombia. ⁵ University of Trento, Department of Sociology and Social
15 Research, Italy. ⁶ London School of Economics and Political Science, London, United
16 Kingdom.

17

18 **Address correspondence to:** Frans Folkvord, Behavioural Science Institute, Radboud
19 University Nijmegen, Thomas van Aquinostraat 2, 6526 GD Nijmegen, Netherlands. E-mail:
20 f.folkvord@maw.ru.nl. Tel: +31 24 3615896. Fax: +31 24 361 3073.

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Abstract

32 **Abstract**
33 The weight of evidence points to the advertising of food affecting food consumption,
34 especially among children. Such advertising often promotes unhealthy foods. Current policy
35 deliberations focus on developing effective ‘protective’ messages to increase advertising
36 literacy and consequent scepticism about advertising targeting children. This study examined
37 whether incorporating a ‘protective’ message in an advergame promoting energy-dense
38 snacks would reduce children’s snack intake. A randomized between-subject design was
39 conducted in the Netherlands ($N = 215$) and Spain ($N = 382$) with an advergame promoting
40 either energy-dense snacks or nonfood products. The results showed that playing an
41 advergame promoting energy-dense snacks increased caloric intake in both countries,
42 irrespective of whether the ‘protective’ message was present or not. These results point to the
43 limitations of ‘protective’ messages and advertising literacy and provide policy makers with a
44 rationale for extending the current prohibition of food advertising to young children in the
45 terrestrial media to online environments.

46 **Key Words:** food advertisements; protective message; food intake; childhood obesity.
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58 **Introduction**

59 Childhood obesity is a major public health priority worldwide (WHO, 2016). A central issue
60 in understanding the environmental impact on the obesity epidemic is the influence of
61 industry-developed food cues on eating behaviour (Brownell & Gold, 2013). In an
62 “obesogenic” society, characterized by an abundance of highly palatable food items and the
63 presence of food-related cues, children are frequently exposed to attractive food and food-
64 related cues (Wardle, Carnell, Haworth, & Plomin, 2008; Zhong & DeVoe, 2010). More
65 specifically, food advertisements promoting energy-dense snacks that are high in salt, sugar
66 and fat and low in nutritional value are ubiquitous. They are designed to attract attention and
67 influence children’s consumer behaviours (Harris, Speers, Schwartz, & Brownell, 2012).

68 Research shows that children are susceptible to food advertisements (Boyland et al.,
69 2016; Cairns, Angus, Hastings & Caraher, 2013; Folkvord, Anschutz, Boyland, Kelly, &
70 Buijzen, 2016). New forms of advertising such as online digital games, so-called advergames,
71 are designed to advertise a product or a brand, integrating the commercial food cues with
72 media content (Buijzen, Van Reijmersdal, & Owen, 2010). Children process these embedded
73 food cues with a minimal level of cognitive elaboration (Buijzen, Van Reijmersdal, & Owen,
74 2010; Cauberghe & De Pelsmacker, 2010, 2013; Folkvord et al., 2016; Nairn & Hang, 2012;
75 Terlutter & Capella, 2013), making it more difficult to initiate consumer defences such as
76 persuasion knowledge and scepticism (Folkvord et al., 2016).

77 A recent theoretical model, The Reactivity to Embedded Food Cues in Advertising
78 Model (REFCAM), suggests that through classical conditioning, substance-related cues elicit
79 the expectancy of substance availability, and this expectancy causes subjective craving
80 leading to energy-dense snack intake (Folkvord et al., 2016). A main proposition of the
81 REFCAM is that the level of processing of embedded food cues in advertisements influences
82 the effect of the food cues (Folkvord et al., 2016). Several studies have shown that televised

83 food advertisements, which involve relatively high awareness and elaboration, have a relative
84 small effect on food intake (Anschütz et al., 2009; Boyland & Halford, 2013; Halford et al.,
85 2008; Halford et al., 2004). However, recent studies examining the effect of food cues
86 integrated in advergames show a stronger effect on food intake (Folkvord et al., 2013; 2014;
87 2015; Harris et al., 2009; Pempek & Calvert, 2009). The REFCAM suggests that in high
88 elaboration scenarios, there is insufficient available cognitive capacity to activate scepticism
89 regarding the intention of the commercial message, inducing physiological and psychological
90 reactivity that motivates eating behaviour (Folkvord et al., 2016). A message that increases
91 awareness of the advertisement might mitigate the effect of the food advertisements on
92 subsequent intake (Boerman, Van Reijmersdal, & Nijens, 2012, 2015).

93 There is a growing literature examining whether increasing children's advertising
94 literacy increases scepticism about marketing (Ali et al., 2013, Raney et al., 2003, Rozendaal
95 et al, 2010, Rozendaal, Lapierre, Van Reijmersdal, & Buijzen, 2012, Rozendaal, Buijzen, &
96 Valkenburg, 2011). The evidence of a link between advertising literacy and susceptibility to
97 food advertisements is mixed. Some studies have shown no effect of advertising literacy on
98 the susceptibility to food advertising (Rozendaal et al, 2010; Rozendaal, Lapierre, Van
99 Reijmersdal, & Buijzen, 2012). Other studies suggest that literacy levels differ by age and the
100 effects of food advertising might be dependent on advertising literacy (Livingstone &
101 Helsper, 2006). In particular, Rozendaal et al. (2009, 2010, 2012) have shown that 8 year old
102 children start developing cognitive advertising defences. These defences increase
103 progressively to the age of 12 years with a significant increase around the age of 10.
104 Including a message in an advergame promoting energy-dense snacks could encourage
105 children's scepticism about the advertisement and decrease the cue-reactivity to food cues
106 (Livingstone & Helsper, 2006; Rozendaal et al., 2010; Rozendaal, Lapierre, Van Reijmersdal,
107 & Buijzen, 2012). Essentially, this is the main research question of the current study. Would

108 a proposed protective message¹, hereafter ‘protective’ message, reduce the effect of an
109 advergame promoting energy-dense snacks on children’s food consumption?

110 We expect that children who play an advergame promoting energy-dense snacks will
111 eat more snacks than children who play an advergame promoting a nonfood product
112 (hypothesis 1). In addition, we expect an interaction between type of advergame and the
113 ‘protective’ message. Children who play an advergame promoting energy-dense snacks with a
114 ‘protective’ message will eat less snacks than children who play an advergame promoting
115 energy-dense snacks without a ‘protective’ message, while we expect no difference in snack
116 intake among children who play an advergame promoting a nonfood product (hypothesis 2).
117 Finally, we expect that the effect of the ‘protective’ message will be effective among children
118 older than 8 years, and we expect no effect of the ‘protective’ message among children
119 younger than 8 years (hypothesis 3).

120 **Method**

121 **Experimental design and stimulus materials**

122 We used a factorial between-subjects design comprising 2 types of advergame (energy-dense
123 snacks vs. nonfood products) by 2 ‘protective’ messages (present vs. absent). The dependent
124 variable was caloric intake. During the advergame playing, children were presented with two
125 bowls of energy-dense snacks; (1) jelly candy (cola bottles) and (2) milk chocolate candy
126 shells. The jelly candy cola bottles were identical to the food products shown in the
127 advergame promoting energy-dense snacks. Non-advertised milk chocolate candy shells were
128 also presented because previous studies have shown that food advertising has an unintended

¹ A ‘protective’ message is an on-screen sentence informing the game player of the advertising intent of the game. At the policy level in Europe, this type of message has been proposed to fight obesity in children. Since this study is part of a large study for the European Commission, the research questions were framed to inform the policy discussion.

129 spill-over effect to other food products (Folkvord et al., 2013, 2014). Children were told that
130 they could eat freely from the bowls.

131 The children participating in the study were randomly allocated to 1 of 4 conditions.
132 There involved (1) playing the energy-dense snacks advergaming (i.e., promoting a popular
133 candy brand and 8 different gummy and jelly sweets from this popular candy brand) with or
134 (2) without the 'protective' message; (3) playing the nonfood advergaming (i.e., promoting a
135 popular Dutch toy brand and 8 individual toys from this brand) with or (4) without the
136 'protective' message.

137 A professional designer created the advergaming. The two games (promoting energy-
138 dense snacks or nonfood products) were identical, except for the advertised brands and
139 products. The game involved a memory task with 16 cards; the brands appeared on the back
140 of the cards, and the individual products (candy or toys) appeared on the front of the cards. As
141 is typical in advergaming, we integrated two specific features to immerse the children into the
142 game. First, a digital timer appeared on the top-left of the screen, and a time bar appeared in
143 the top-centre of the screen to exert time pressure on the children. Second, the game made an
144 unpleasant sound when the child selected a false pair and a pleasant sound when the child
145 selected a correct pair.

146 The sample size used in this study (respectively 215 children in the Netherlands and
147 382 children in Spain) was appropriate according to a G*power analyses (Faul, Erdfelder,
148 Lang, & Buchner, 2007). With a large-size effect of Cohen's $f = 0.40$ (based on the study
149 from Folkvord et al., 2013, who used identical stimulus materials and procedures as this
150 study), alpha level set at .05 and a power of .80, the total number of participants should be set
151 at a minimum of 112.

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154 Procedure

155 The experimenter collected one child at a time from the classroom listed in alphabetical
156 name order by the school teacher. The experimenter took the child to another classroom or
157 office containing a computer running one of the advergAMES.

158 The session started with a short questionnaire eliciting gender, age, group, and hunger
159 level (masked with filler questions about energy, excitement and thirst levels). Next, children
160 played one of the advergAMES with or without the 'protective' message. The 'protective'
161 message was a line of text that was prominently visible, in the centre in the upper part of the
162 screen, which stated: "*Remember: This game is an advertisement for 'X'.*". Multiple studies
163 (Boerman, Van Reijmersdal, & Neijens, 2012, 2014; Rozendaal, Buijzen, & Valkenburg,
164 2009, 2011) have shown that a message that discloses sponsorship enhances the recognition
165 of sponsored television content, leading to an increase in critical processing of the content
166 among 10-12 year old children and a reduced product desire (Rozendaal et al., 2009, 2011).
167 For the advergAME promoting energy-dense snacks 'X' was a popular candy brand, and for
168 the advergAME promoting nonfood products 'X' was a popular toy brand. The experimenter
169 read the instructions from the screen, which stated that the child would be playing a memory
170 game for five minutes and should attempt to finish as many games as possible (there was no
171 limit). All children played the advergAME for five minutes. Comparable studies (Folkvord et
172 al., 2013; 2014; 2015) used the same amount of time.

173 While playing, children could eat *ad libitum* from two bowls filled with food
174 containing energy-dense snacks. One bowl contained the advertised energy-dense snack and
175 the other contained a new form of energy-dense snack. The experimenter left the room when
176 the children played the advergAME. After each session, the experimenter weighed the bowls to
177 calculate caloric intake. The experimenter refilled and weighed the bowls before the next

178 child entered the room to make sure that the children did not notice how much the previous
179 child had eaten.

180 After the children finished the game they filled in the second part of the questionnaire
181 together with the experimenter, who also measured their weight and height (without shoes).
182 The second part of the questionnaire contained questions on brands, products and on
183 persuasion knowledge (conceptual and attitudinal). Children who played the game with the
184 'protective' message were asked two extra questions to check if they remembered and/or had
185 recognized the 'protective' message.

186 The causal relations between the type of advergame and food intake were analysed
187 using separate univariate analyses of covariance (ANCOVA) for the Dutch and the Spanish
188 children. In addition, univariate analyses of covariance tested for age-group differences. One-
189 tailed were used as the hypotheses specified the direction of the effects. Post hoc Bonferroni
190 tests were conducted to examine the differences between the advergames. To correct for the
191 multiple comparisons, we use Bonferroni adjusted significance levels. The one-sided adjusted
192 p -value that was considered significant was .05. We calculated effect sizes for Cohen's f and
193 Cohen's d .

194 **Results**

195 **Descriptives**

196 Children ($N = 597$) were individually tested in the Netherlands ($n = 215$) and in Spain ($n =$
197 382), at school during regular school hours. We excluded four Dutch children on account of
198 Ramadan, or because they had food in their pockets during the experiment, and one child was
199 excluded from the analyses because of partial non-response. Thirty one Spanish children were
200 excluded from the analyses because they had not finished the session completely, did not
201 understand the experimental procedure, or had outlying scores on snack consumption ($M +$
202 $2.5*SD$). Conducting the separate analyses with or without the outlying scores did not affect

203 the results significantly. The final sample consisted of 211 Dutch children (between 6 and 11
204 years) and 351 Spanish children (between 6 and 12 years old).

205 In the Netherlands, the mean ($\pm SD$) age of the children was 9.0 ± 1.18 years, 49.3%
206 were girls. In Spain, the mean ($\pm SD$) age of the children was 8.9 ± 1.68 years, 52.9 % were
207 girls. Of the Dutch children, 7.1 % were underweight, 74.3% were normal weight, 13.3%
208 were overweight, and 5.2% were obese. Of the Spanish children, 18.5% were underweight,
209 65.5% were normal weight, 11.1% were overweight, and 3.7% were obese. Children liked
210 both advergAMES equally and no differences were found between the children who played the
211 different advergAMES on attitudes to the advertised energy-dense snack brand or advertised
212 snacks products. Furthermore, we found no differences on brand recognition. In Table 1 and 2
213 we show the variables measured by condition, separately for the Dutch and Spanish children.

214 Correlations with total snack intake were calculated to determine possible covariates.
215 Different correlations were found between the two countries, which led us to decide to use
216 separate tests for the two countries. The same covariates were added to the models in both
217 countries, to make possible the comparisons between countries. Covariates that were included
218 in the analyses were gender ($r_{Dutch\ children} = -0.124, p = 0.072, r_{Spanish\ children} = -0.218, p =$
219 0.000) and hunger ($r_{Dutch\ children} = 0.098, p = 0.158, r_{Spanish\ children} = -0.218, p = 0.000$). Body
220 mass index (BMI), game attitude, and advertisement literacy were not correlated with total
221 snack intake in either country ($p < 0.05$).

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228 **Table 1**
 229 Variables measured by the condition: Dutch sample¹

	Energy-dense advergame (n = 52)	Energy-dense advergame with PM ² (n = 55)	Nonfood advergame (n = 52)	Nonfood advergame with PM ² (n = 52)
Sex (boy)	50 %	50.9 %	42.3 %	59.6 %
Hunger (cm on VAS)	4.6 ± 4.2	4.3 ± 4.1	3.3 ± 3.4	4.8 ± 4.8
BMI	17.2 ± 3.0	17.5 ± 2.8	17.9 ± 3.0	17.3 ± 2.8
Age (y)	8.9 ± 0.9	9.2 ± 1.1	9.1 ± 1.2	8.8 ± 1.3
Attitude to the game	9.7 ± 2.4	9.7 ± 2.6	10.1 ± 2.0	9.8 ± 2.3
Attitude to the candy brand	10.7 ± 2.4	10.4 ± 2.4	10.7 ± 2.2	9.8 ± 3.0
Total calorie intake (kcal)	182.4 ± 137.0	206.6 ± 146.9	90.3 ± 129.1	81.0 ± 101.4
Jelly cola bottles intake (kcal)	95.5 ± 83.3	86.3 ± 105.0	35.9 ± 50.8	40.2 ± 59.2
Milk chocolate candy shells intake (kcal)	86.9 ± 100.9	120.2 ± 123.2	54.3 ± 112.9	40.7 ± 68.9
Remembering PM (yes)	n.a.	5 %	n.a.	6 %
Recognizing PM (yes)	n.a.	40 %	n.a.	33 %

230 ¹ n = 211

231 ² PM= Protective message

232
 233 **Table 2**
 234 Variables measured by the condition: Spanish sample¹

	Energy-dense advergame (n = 83)	Energy-dense advergame with PM (n = 90)	Nonfood advergame (n = 88)	Nonfood advergame with PM (n = 90)
Sex (boy)	50.6 %	45.6 %	44.3 %	44.3 %
Hunger (cm on VAS)	7.6 ± 4.5	7.8 ± 4.9	7.4 ± 4.7	7.4 ± 4.8
BMI	16.4 ± 2.4	17.0 ± 3.5	16.7 ± 3.0	16.3 ± 2.8
Age (y)	8.9 ± 1.7	8.8 ± 1.6	8.9 ± 1.7	8.9 ± 1.7
Attitude to the game	12.2 ± 2.2	12.2 ± 2.2	12.1 ± 2.2	11.7 ± 2.5
Attitude to the candy brand	11.7 ± 2.3	11.7 ± 2.5	11.5 ± 2.3	11.4 ± 2.5
Total calorie intake (kcal)	149.5 ± 121.8	166.9 ± 132.0	150.3 ± 124.2	149.9 ± 118.4
Jelly cola bottles intake (kcal)	88.8 ± 87.4	97.8 ± 108.6	90.8 ± 94.9	100.0 ± 94.2
Milk chocolate candy shells intake (kcal)	60.7 ± 73.7	69.2 ± 79.3	59.5 ± 81.8	49.9 ± 62.2
Remembering PM (yes)	n.a.	4 %	n.a.	1%
Recognizing PM (yes)	n.a.	31 %	n.a.	39 %

235 ¹ n = 351

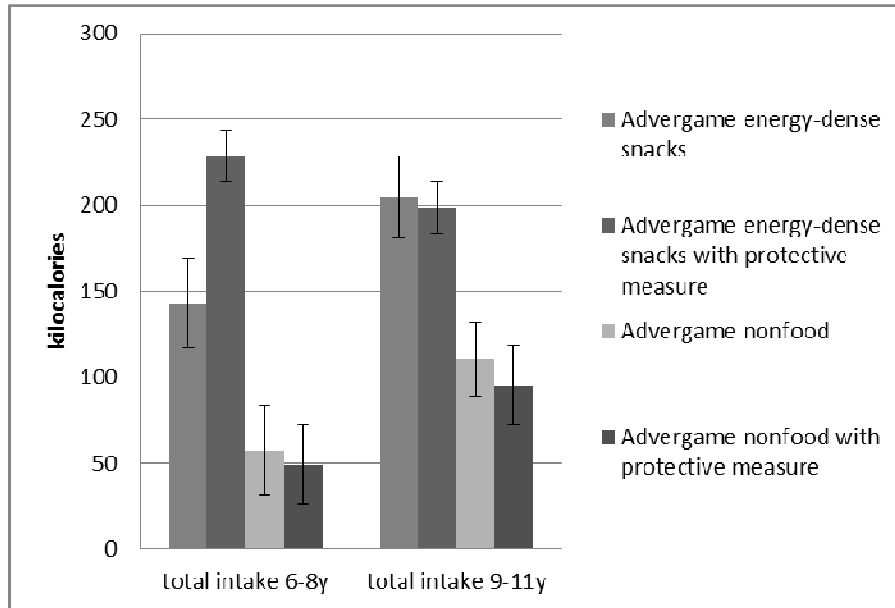
236 Main analyses

237 The results of the first ANCOVA showed that type of advergame influenced total snack
238 intake among Dutch children, $F(1, 103) = 9.847$, $p = 0.001$, Cohen's $d = 0.69$, but not among
239 Spanish children, $F(1, 170) = 0.061$, $p = 0.417$. Dutch children who played the advergame
240 promoting energy-dense snacks ($M = 182.43$, $SD = 137.0$) ate significantly more energy-
241 dense snacks than children who played the advergame promoting nonfood products ($M =$
242 90.27 , $SD = 129.1$). The results from the second ANCOVA showed that the interaction effect
243 between type of advergame and 'protective' message was not significant on total snack intake
244 among children in the Netherlands, $F(1, 210) = 1.556$, $p = 0.107$, and not among children in
245 Spain, $F(1, 346) = 0.439$, $p = 0.254$.

246 In addition, separate ANCOVAs were conducted to examine the effects of advergames
247 between age-groups, see Figure 1. For the Dutch children between 6 and 8 years, we found
248 that type of advergame had an effect on total snack intake, $F(1, 37) = 5.756$, $p = 0.011$,
249 Cohen's $d = 0.79$. The same was found for the children between 9 and 11 years, $F(1, 64) =$
250 3.732 , $p = 0.029$, Cohen's $d = 0.66$. Children in both age groups who played the advergame
251 promoting energy-dense snacks ate more than the children who played the advergame
252 promoting nonfood products (see Figure 1).

253 Additionally, among Dutch children between 6 and 8 years, we found an interaction
254 between type of advergame and the 'protective' message on total snack intake, $F(1, 75) =$
255 3.418 , $p = 0.035$. For the children between 9 and 11 the interaction between type of
256 advergame and the 'protective' message had no significant effect on total snack intake, F
257 $(1, 133) = 0.285$, $p = 0.297$. Post hoc Bonferroni tests showed that Dutch children between 6
258 and 8 years old who played the advergame promoting energy-dense snacks without the
259 'protective' message ate significantly less ($p = 0.015$, Cohen's $d = 0.58$) than the children
260 who played the advergame promoting energy-dense snacks with the 'protective' message. The

261 children who played the advergaming promoting nonfood products without the
 262 'protective' message ate almost the same amount ($p = 0.399$) as children who played the
 263 advergaming promoting nonfood products with the 'protective' message.

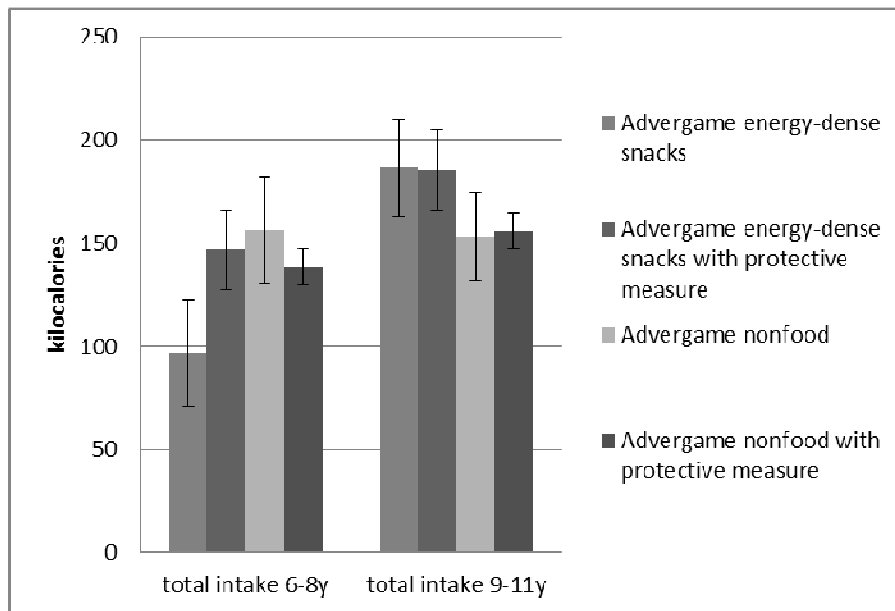


264
 265 **Figure 1.** Mean snack intake in kilocalories of Dutch children as a function of type of advergaming and age
 266 groups. Error bars = *SE*.

267 For the Spanish children between 6 and 8 years, we found that type of advergaming had
 268 no statistically significant effect on total snack intake, $F(1, 94) = 1.998, p > 0.05$. For the
 269 children between 9 and 12 we found that type of advergaming had a significant effect on total
 270 snack intake, $F(1, 75) = 5.297, p = 0.012$, Cohen's $d = 0.51$. Spanish children between 9 and
 271 12 years old who played the advergaming promoting energy-dense snacks ate more of the
 272 energy-dense snacks than children who played the nonfood advergaming (see Figure 2).

273 For the Spanish children between 6 and 8 years, we found that the interaction between
 274 type of advergaming and the 'protective' message on total snack intake was significant, F
 275 $(1, 158) = 3.032, p = 0.042$. For children between 9 and 12 we found that the interaction had
 276 no significant effect on total snack intake, $F(1, 190) = 0.023, p = 0.440$. Post hoc Bonferroni
 277 tests showed that Spanish children between 6 and 8 years old who played the advergaming

278 promoting energy-dense snacks without the ‘protective’ message ate significantly ($p = 0.020$,
 279 Cohen’s $d = 0.43$) less than children who played the advergaming promoting energy-dense
 280 snacks with the ‘protective’ message, while the children who played the advergaming
 281 promoting nonfood products without the ‘protective’ message ate the same amount ($p =$
 282 0.240) than children who played the advergaming promoting nonfood products with the
 283 ‘protective’ message.



284

285 **Figure 2.** Mean snack intake in kilocalories of Spanish children as a function of type of advergaming and age
 286 groups. Error bars = *SE*.

287 Final, we found no significant differences in either country between the four conditions on
 288 attitude to the advergaming ($p > .05$), attitude to the brand ($p > .05$), and attitude to the product
 289 ($p > .05$), or on brand recognition ($p > .05$).

290 Discussion and Conclusions

291 This study examined whether including a ‘protective’ message in an advergaming promoting
 292 energy-dense snacks would reduce the effect of food advertising on children’s snack intake.

293 The results showed that advergaming promoting energy-dense snacks increased the snack
 294 consumption among Dutch and older Spanish children, which supports the first hypothesis

295 and is in line with earlier findings and the REFCAM (Folkvord et al., 2013, 2014, 2015, 2016;
296 Harris et al., 2012; Pempek & Calvert, 2009). More importantly, the results showed that
297 including a ‘protective’ message in an advergame promoting energy-dense snacks was not
298 effective in reducing calorie intake in either the Dutch or Spanish children as a whole or in the
299 younger or older groups of children. These findings refute the second and third hypotheses.
300 Young Dutch and Spanish children ate more of the energy-dense snacks when a ‘protective’
301 message was included in the advergame promoting energy-dense snacks, which contrasts with
302 our expectations.

303 Remarkably, only 5% of the Dutch children and 4% of the Spanish children who
304 played the energy-dense advergame with the ‘protective’ message remembered the text of the
305 ‘protective’ message. In addition, only 40% of the Dutch children and 31% of the Spanish
306 children who played the energy-dense advergame said that they recognized the text of the
307 ‘protective’ message, and only 33 % of the Dutch children and 39 % of the Spanish children
308 who played the non-food advergame said that they recognized the text of the ‘protective’
309 message. Multiple studies (Boerman, Van Reijmersdal, & Neijens, 2012, 2014; Rozendaal,
310 Buijzen, & Valkenburg, 2009, 2011) have shown that a ‘protective’ message that discloses
311 sponsorship enhances the recognition of sponsored television content, leading to an increase
312 in critical processing of the advertised content. Recall and recognition of an advertisement, in
313 this case the ‘protective’ message we used, is an important starting phase for critically
314 processing the advertising content and acting upon it (Boerman et al., 2014; Rozendaal et al.,
315 2009, 2011), which was not found in the current study. The ‘protective’ message was a
316 sentence in the upper centre part of the screen that said: “*Remember: This game is an*
317 *advertisement for X.*”. Children who remembered the message said something like “*This game*
318 *is an advertisement from X*”, or “*This game is made by X*”. Most children, regardless of their
319 age, answered simply “No, I have no idea” to the question. Separate analyses comparing

320 children who remembered the message and the children who did showed no differences on
321 snack intake.

322 In addition, children who played the adverggame promoting energy-dense with the
323 'protective' message did not have a different attitude to the game, brand, or products. Dutch
324 children who recognized the 'protective' message in the adverggame promoting energy-dense
325 snacks reported more knowledge about the persuasive intent of the adverggame than children
326 who did not recognize the 'protective' message. Dutch children who recognized the
327 'protective' message in the adverggame promoting energy-dense snacks reported more often
328 that the game was designed to increase the liking of energy-dense snacks from the advertised
329 brand and that the game was designed so that children would crave for the advertised energy-
330 dense snacks compared to children who did not recognize the 'protective' message in the
331 adverggame promoting energy-dense snacks. This result suggests that some children became
332 more aware of marketers' intentions, but no effects were found on food intake. This is in line
333 with previous studies (Reijmersdal et al 2012; Panic et al. 2013) that concluded awareness of
334 the persuasive attempt has little effect on children's behaviour after playing adverggames and
335 demonstrates the power of this form of advertising on children. For Spanish children we
336 found no differences on advertisement literacy.

337 Remarkably, Dutch and Spanish children between 6 and 8 years ate more energy-
338 dense snacks in total after playing the adverggame promoting energy-dense snacks with the
339 'protective' message compared to children who played the adverggame promoting energy-
340 dense without the 'protective' message. One explanation for this finding is that the children
341 who played the adverggame promoting energy-dense snacks subconsciously processed the
342 'protective' message and reacted as if they were supposed to eat more of the energy-dense
343 snacks after playing the game, because of the marketers intentions. In addition, children from
344 both countries who said they recognized the 'protective' message did not eat less of the

345 energy-dense snacks. Is this an example of an unintended negative impact of a policy framed
346 with the best of good intentions? Because we have not recorded eye-movements we do not
347 know whether the children had seen the message; an issue to pursue in future research.

348 As the REFCAM proposes, children are focused on playing the game, and they may
349 subconsciously and automatically process the food cues; even without noticing the
350 ‘protective’ message (Folkvord et al., 2016). The positive effect that is associated with the
351 entertaining aspect of playing the advergimes is transferred to the brand outside conscious
352 control; influencing children’s food choices in the absence of any deliberation. Adding the
353 ‘protective’ message to the advergence did not affect children’s attitude to the advergence, the
354 advertised brand or products. Children’s cognitive resources are concentrated largely on the
355 game and food cues thus become elaborated on an automatic level (Buijzen et al., 2010),
356 directly leading to physiological and psychological reactions (Carter & Tiffany, 1999).

357 A strength of this study is the large number of children from two countries that
358 participated in the study giving a robust test of the effects of both food promoting advergimes
359 and the inclusion of a ‘protective’ message on actual snack intake. A second strength is the
360 use of a behavioural message – food intake. A third strength is that we assessed a number of
361 possible confounding variables that it transpired did not affect our results, again highlighting
362 the robustness of the findings. One limitation of this study is that children played the
363 advergence for only five minutes. At home children can and do play for a longer periods of
364 time. When children play the game more frequently, this could lead to even stronger effects of
365 the advergence on caloric intake than observed in this study (Harris, Speers, Schwartz, &
366 Brownell, 2012). Furthermore, although the children’s reports of recall and recognition of the
367 ‘protective’ message are consistent with their lack of processing of the message, but in the
368 absence of a record of eye-movements we cannot be certain. Another limitation is that the
369 availability of food that we presented in our study after playing an advergence is not totally

370 comparable with a naturalistic setting. In real life children might not have access to different
371 types of snack foods from which they can freely eat. However, other studies have shown that
372 the effects of playing a game containing food cues spills over to other kinds of foods than
373 those promoted in the game (Folkvord et al., 2013, 2014), which suggests that children would
374 eat more of other foods when available.

375 The current study adds to the wider literature in demonstrating that advergames are
376 effective in stimulating the consumption of unhealthy foods (Folkvord et al., 2013, 2014,
377 2015, 2016; Harris et al., 2009; Pempek & Calvert, 2009). Equally, it has been established
378 that persuasion knowledge alone does not reduce the effects of advergames, because children
379 who played an energy-dense advergame and remembered or recognized the ‘protective’
380 message did not eat fewer snacks. In the light of these findings it is implausible to believe
381 that it would be effective to implement protective messages in food advertisements (An &
382 Stern, 2011; Panic et al., 2013; Rozendaal et al., 2011). Food cues in advergames may curb
383 the effectiveness of this new form of food advertising, irrespective of the fact that children
384 recognize the persuasive intent. Policy makers should take these findings into account in the
385 development of policy options actions to reduce children’s exposure to advertising and
386 consumption of unhealthy foods.

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