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Are Specific Parenting Practices and related Parental Self-Efficacy associated with Physical Activity and Screen-time among Primary Schoolchildren?

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Manuscripts

1 **Are Specific Parenting Practices and related Parental Self-**
2 **Efficacy associated with Physical Activity and Screen-time**
3 **among Primary Schoolchildren?**

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2
3 **Abstract**
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5
6 **Objectives:** Which specific parenting practices and related parental self-efficacy are
7
8 associated with children's physical activity (PA) and screen-time. Parental body mass
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10 index, family socio-economic status (SES), and child's age were examined as possible
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12 moderators.
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14 **Design:** Cross-sectional

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17 **Setting:** January 2014, Flanders (Belgium)

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19
20 **Participants:** 207 parents (88.3% female) of 6-to-12-year-old children

21
22 **Outcome measures:** specific parenting practices, related parental self-efficacy, and
23
24 children's PA and screen-time

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26 **Results:** The majority of investigated parenting practices and related parental self-
27
28 efficacy was not significantly associated with children's PA or screen-time. However,
29
30 children were more physically active if sports material were available at home
31
32 ($p < 0.05$) and if parents did not find it difficult to motivate their child to be physically
33
34 active ($p < 0.01$). Children had a lower screen-time if parents limited their own gaming
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36 ($p < 0.01$). When one or both parents had a high BMI, children were more physically
37
38 active when parents motivated their child to be physically active ($p < 0.05$) and
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40 reinforced their child for being physically active ($p < 0.05$). When parents had a normal
41
42 BMI, children had a lower screen-time if parents let their child ask for permission to
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44 play games ($p < 0.001$) and applied rules about TV-time ($p < 0.001$) and gaming
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46 ($p < 0.001$). In medium-high SES families, children had a higher screen-time when
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48 parents were permissive about when their child can play games ($p < 0.001$). In low SES
49
50 families, children had a lower screen-time when parents did not find it difficult to
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52 motivate their child to play less games ($p < 0.01$).
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3 40 **Conclusions:** In contrast to what we expected, the findings of this study show that
4
5 41 only a very few specific parenting practices and related parental self-efficacy were
6
7 42 associated with children's PA and screen-time. It is possible that parents do not
8
9 43 realize how difficult it is to perform certain parenting practices until they are faced
10
11 44 with it in an intervention.
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14 15 16 46 **Strengths and limitations of this study**

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18
19 47 • Combining both specific parenting practices and related parental self-efficacy
20
21 for each specific parenting practice
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23 48
- 24 49 • Self-report questionnaires: social desirability bias
- 25
26 50 • Cross-sectional study: no statements about causality
- 27
28 51 • 88% of participants female + 84% of participants medium-high SES: selection
29
30 bias
31
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33 34 35 54 **Keywords**

36
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38 55 Parenting Practices, Parental Self-Efficacy, Parent, Child, Physical Activity, Screen-
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40 56 time
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42 43 44 58 **Background**

45
46
47 59 The increasing prevalence of childhood overweight and obesity worldwide is an
48
49 60 important health concern [1,2]. Besides an unhealthy diet, insufficient physical
50
51 61 activity (PA) and too much sedentary behavior play a major role in the development
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53 62 of overweight and obesity [3-5]. Worldwide research has indicated that about 40-80%
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55 63 of children do not achieve the guidelines of at least 60 minutes of moderate to
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3 64 vigorous PA on most days of the week [6-8]. The ENERGY-project (conducted in
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5 65 seven European countries) showed that 83.2 % of the European boys and 95.4% of the
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7 66 girls were not sufficiently physically active [9]. For sedentary behaviors, the
8
9
10 67 ENERGY-project showed that European children spent on average more than 2
11
12 68 hours/day in screen time (TV and computer activities combined) [10], despite current
13
14 69 guidelines recommend ≤ 2 h/day of recreational screen time [11]. Therefore, it is
15
16 70 important to develop interventions which stimulate PA as well as limit screen-time in
17
18 71 primary schoolchildren.

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21 72 Results from cross-sectional and longitudinal studies [12-15] over the past decade
22
23 73 illustrate that parents play a major role in the development of health behaviors such as
24
25 74 PA and screen-time behavior of their primary schoolchildren [16]. Parents can
26
27 75 influence their children's personal and behavioral determinants by shaping their
28
29 76 attitudes and social norms and by enhancing their children's self-efficacy in
30
31 77 exhibiting a healthy lifestyle [17-19]. Additionally, specific parenting practices such
32
33 78 as providing material to be physically active [20], being physically active together
34
35 79 with your child [21], parental rules [21] and parental levels of PA and screen-time
36
37 80 (modeling) [22], are influential in their children's development of lifelong habits that
38
39 81 contribute to normal weight or to overweight and obesity. It is therefore important that
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41 82 parents are made aware of their important influencing role. However, sometimes
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43 83 parents are aware of which parenting practices they should apply but experience low
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45 84 feelings of competence to effectively adopt those parenting practices [23]. The
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47 85 expectation parents (or other caregivers) hold about their ability to perform effective
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49 86 parenting practices [24], is defined as parental self-efficacy. Enhancing parental self-
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51 87 efficacy concerning parenting practices is an important step in effectively adopting
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3 88 these parenting practices. Some parents may need help to learn how to increase their
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5 89 use of effective, and decrease their use of ineffective parenting practices [23].
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7 90 Currently, multiple intervention studies incorporate a random mix of parenting
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9 91 practices to promote PA or to decrease screen-time without knowing which parenting
10
11 92 practices are most relevant in changing a particular health behavior of the child [25-
12
13 93 27]. Furthermore, to our knowledge, only one study has examined the association
14
15 94 between parental self-efficacy and children's PA and screen-time and found that
16
17 95 higher parental self-efficacy to limit screen-viewing was associated with a 77%
18
19 96 reduction in the likelihood of the child watching ≥ 2 h of TV per day [28]. However,
20
21 97 this study only investigated parental self-efficacy to limit the screen-viewing and
22
23 98 promote PA of their preschool child and parents own PA self-efficacy, although there
24
25 99 is a broad range of parenting practices.
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29 100 Therefore, since parental self-efficacy seems to be an important concept in parenting
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31 101 but remains an understudied subject, this study investigated for every specific
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33 102 parenting practice also the corresponding parental self-efficacy.
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36 103 For future interventions it is important to know which specific parenting practices and
37
38 104 related parental self-efficacy are significantly and which ones are not significantly
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40 105 associated with children's PA and screen-time. This way, interventions can learn
41
42 106 parents which parenting practices are effective and even more important, they can
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44 107 show parents how to perform those parenting practices.
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47 108 In addition, it has been shown that parenting practices can differ according to a child's
48
49 109 age [29] and family SES [30]. Also, parental BMI has been associated with children's
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51 110 PA and screen-time [31]. Therefore, it is possible that the association between specific
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53 111 parenting practices and related parental self-efficacy and children's PA and screen-
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3 112 time behavior differ for specific subgroups. This information could be important for
4
5 113 future intervention developers to tailor the intervention to a specific subgroup.
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8 114 Thus, the first aim of this study was to examine the association between specific
9
10 115 parenting practices and related parental self-efficacy with PA and screen-time among
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12 116 primary schoolchildren. Secondly, this study investigated the potential moderating
13
14 117 effect of family BMI, SES and child's age on these associations.
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119 **Methods**

120 **Study Design And Setting**

121 An online cross-sectional survey on PA and screen-time, specific parenting practices
122 and parental self-efficacy was conducted in Flanders (i.e., the Dutch speaking part of
123 Belgium). Ethical approval was provided by the Ethics Committee of the Ghent
124 University Hospital.
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126 **Participants And Recruitment**

127 A convenience sample of parents of primary schoolchildren was recruited in different
128 ways. Firstly, principals of 36 primary schools in Flanders were contacted personally
129 by the researchers. In total, 30 schools (83%) agreed to participate. The only reason to
130 decline was 'not enough time' (n=6). In November-December 2013, flyers (n=5077)
131 to invite parents to participate were distributed in the participating schools to all 6- to
132 12-year old children to take home. Furthermore, an appeal to participate was spread
133 by (social) media: two Flemish magazines for parents (Klasse' and 'De Gezinsbond)
134 and the Facebook page of EXPOO (an expertise center for parenting support).
135 Because it is unknown how many parents were reached by the invitation appeals, it is
136 not possible to calculate a reliable response rate. The recruitment of parents was

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3 137 ended by the second week of January 2014. Parents who wanted to participate had to
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5 138 send an e-mail to the researcher. Afterwards, they were sent an information letter and
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7 139 the link to the online questionnaire. A total of 238 parents agreed to participate of
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10 140 which 207 parents (87%) completed the questionnaire.
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142 **Measures**

143 The parental questionnaire assessed demographic variables, specific parenting
144 practices, parental self-efficacy concerning these practices and child's PA and screen-
145 time.
146

147 *Demographic variables.* Age of the child, weight and height of both parents, and
148 number of children living in the house were reported in the questionnaire. The
149 reported educational level of the parent who completed the questionnaire was used as
150 a proxy for SES. Low SES was determined as parents having no higher education and
151 medium to high SES as parents having higher education (vocational college,
152 university or post-academic) [32]. Parental body mass index (weight/height squared)
153 was calculated from the self-reported height and weight of the father and mother.
154 According to the existing WHO cut-off points [33], normal weight was determined as
155 BMI <25 kg/m² and overweight/obesity as BMI ≥25 kg/m².
156

157 *Child's physical activity and screen-time.* Levels of PA and screen-time were assessed
158 by the questionnaire adopted from the validated Flemish Physical Activity
159 Questionnaire (FPAQ) [34]. The FPAQ is a reliable (ICC=0.70) and valid (R=0.78)
160 instrument to measure PA and screen-time [35]. Total PA was assessed by adding up
161 minutes spent in active transportation (to school and in leisure time) and time spent in

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3 162 sports (at school and during leisure time). Screen-time was defined as the total time
4
5 163 spent watching TV, playing computer games and using game consoles for both
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7 164 weekend and weekdays.
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11 166 *Specific parenting practices.* The specific parenting practice items were based on the
12
13 167 validated Parental Support For Physical Activity Scale [16] and Parenting Strategies
14
15 168 for Eating and Activity Scale [36]. Most items were assessed on a two-point scale
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17 169 (disagree-agree) or a five-point Likert scale ranging from ‘never’ to ‘always’. For
18
19 170 most questions, ‘Not Applicable’ was an alternative answer category of which the
20
21 171 results were set as missing values. Availability of TV’s, pc’s and game consoles was
22
23 172 questioned on a six-point scale (ranging from 0 to more than 4) and availability of
24
25 173 sports material on a two-point scale (yes - no). Table 1 shows the exact formulation
26
27 174 and descriptive statistics of the questionnaire items for PA and screen-time.
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34 176 *Parental self-efficacy concerning the specific parenting practices.* The parental self-
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36 177 efficacy questions were created analogous to the questions on the specific parenting
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38 178 practices, and were based on the translation of the GEMS (Girls Health Enrichment
39
40 179 Multisite Study) questionnaire [37], the validated questionnaire of parental self-
41
42 180 efficacy for enhancing healthy lifestyles in their children [38] and Section L of the
43
44 181 Aventuras Para Ninos parent survey [39] (Table 1).
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49 183 **Data Analysis**

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52 184 Preliminary analyses consisted of descriptive statistics of sample characteristics and
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54 185 checking the normality of key variables. Since the variable outcomes of PA and
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3 186 screen-time were skewed, square root transformations (sqrt) were used to obtain
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5 187 variables with a normal distribution.
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7 188 To examine associations between parenting practices related to PA and screen-time or
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9 189 parental self-efficacy concerning these practices, and PA and screen-time, single
10
11 190 linear regressions were conducted in a first step. In case of significance, the parenting-
12
13 191 related factor was included in a multiple linear regression model, preceded by
14
15 192 bivariate correlations to check for intercorrelation among the selected parenting-
16
17 193 related factors. When the correlation coefficient was higher than 0.60, only the
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19 194 parenting-related factor with the highest bivariate correlation with PA or screen-time
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21 195 was included. Moderated multiple regression analyses were conducted to examine
22
23 196 whether family BMI (normal weight families vs. families with at least one parent with
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25 197 overweight/obesity), family SES (low vs. medium/high) or child's age (6-8 and 9-12
26
27 198 year old), moderated the aforementioned associations. To test this moderating effect,
28
29 199 the cross-product terms of the possible moderator (family BMI, family SES or child's
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31 200 age) and parenting-related factor (parenting practices/parental self-efficacy) were
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33 201 entered in a hierarchical regression, after the main effects of the possible moderator
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35 202 and of the parenting-related factor. To avoid high correlations between the main
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37 203 effects and the interaction terms, centered variables were used (raw data minus mean
38
39 204 data). P-values, β -values and adjusted R^2 were used to determine if family BMI,
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41 205 family SES or child's age was a significant moderator in the association between the
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43 206 parenting-related factor and children's PA and screen-time. P-values <0.05 were
44
45 207 considered significant, p-values ≥ 0.05 and <0.10 were considered borderline
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47 208 significant. Standardized b values were reported. All analyses were conducted using
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49 209 SPSS (SPSS version 20.0, IBM corp., Armonk, NY; 2011).
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211 Results

212 Study Characteristics

213 In total, 207 parents with a mean age of 40.2 ± 5.0 years, completed the questionnaire.
214 Parents who completed the survey were predominantly mothers (87.4%). Other
215 relatives who filled out the questionnaire were fathers (10.7%), adoption mothers
216 (1.0%), stepmothers (0.5%) and grandfathers (0.5%). The majority (83.5%) of
217 participating parents had a medium-high SES. The number of children per family
218 ranged from one to five, with a mean of two. The mean age of the children was $9.4 \pm$
219 1.6 years. Overall, children's mean PA level was 51 ± 31 minutes per day and
220 children spent on average 2.2 ± 1.9 hours/day on screen-time.

221

222 Physical Activity

223 For both multiple regression analysis and moderated multiple regression analyses,
224 following parenting-related factors were not associated with children's PA:
225 monitoring your child's PA and related self-efficacy, being physically active as a
226 parent (modeling) and related self-efficacy, giving choice to your child in their
227 physical activities and related self-efficacy, involving your child in your own physical
228 activities and related self-efficacy, self-efficacy concerning having sports material at
229 home, and self-efficacy concerning reinforcing your child for being physically active.

230

231 In the overall sample, as shown in Table 2, children were more physically active when
232 sports material were available at home and when parents did not find it difficult to
233 motivate their child to be physically active. This model of parenting practices
234 explained 12.7% of variance in children's PA.

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3 236 Family BMI was a significant moderator in the associations between children's PA
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5 237 and the parenting practices 'motivating your child to be physically active', and
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7 238 'reinforcing your child for being physically active'. Regression analyses, conducted
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9 239 separately for normal weight families and families with at least one parent with
10
11 240 overweight/obesity, showed that both parenting practices were only significantly
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13 241 positively associated with children's PA in families with one or both parents having a
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15 242 high BMI (Table 3). Family SES and child's age were no significant moderators in
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17 243 the associations between parenting practices or related parental self-efficacy and
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19 244 children's PA (Table 3).
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246 **Screen-time**

247 For both multiple regression analysis and moderated multiple regression analyses, the
248 following parenting-related factors were not significantly related to children's screen-
249 time: The amount of TV's, computers and game consoles available at home,
250 following up your rules about TV-time and gaming (being consistent) and related self-
251 efficacy, explaining your child why there are rules about TV-time and gaming and
252 related self-efficacy, monitoring your child's TV-time and gaming and related self-
253 efficacy, being permissive about how long your child can watch TV or play games,
254 being permissive about when your child can watch TV, motivating your child to
255 watch less TV and related self-efficacy and motivating your child to play less games,
256 letting your child ask for permission to watch TV and related self-efficacy, limiting
257 your own TV-time (modeling) and related self-efficacy, self-efficacy concerning
258 letting your child ask for permission to play games, self-efficacy concerning having
259 rules about TV-time and gaming, and self-efficacy concerning limiting your own
260 gaming (self-efficacy modeling).

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5 262 In the total sample, a significant negative association was found between ‘limiting
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7 263 your own gaming (modeling for games)’ and children’s screen-time (Table 2). When
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9 264 parents limited their own gaming, children had a lower screen-time. This model of
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11 265 parenting practices explained 34.4% of variance in children’s screen-time.
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16 267 Family BMI was a significant moderator in the negative associations between
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18 268 children’s screen-time and ‘letting your child ask for permission to play games’,
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20 269 ‘applying rules for TV-time’ and ‘applying rules for gaming’. In families with both
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22 270 parents having a normal BMI, children had a lower screen-time when parents let their
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24 271 child ask for permission to play games and when parents applied rules for TV-time
25
26 272 and gaming.
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29 273 Family SES was a significant moderator in the associations between ‘permissiveness
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31 274 on when games can be played’, and ‘self-efficacy concerning motivating your child to
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33 275 play less games’, and children’s screen-time. In a medium-high SES family, children
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35 276 had a higher screen-time when parents were permissive on when games could be
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37 277 played. In low SES families, children had a lower screen-time if parents did not find it
38
39 278 difficult to motivate their child to play less games. Also in medium-high SES families
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41 279 this association was significant, but explained only a very low percentage (2.5%) of
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43 280 the variance in children’s screen-time.
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47 281 Child’s age was not a significant moderator in the associations between parenting
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49 282 practices or related parental self-efficacy and children’s screen-time (Table 3).
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284 Discussion

285 This study presents valuable and unique research data since it examined associations
286 of both specific parenting practices and related parental self-efficacy with children's
287 PA and screen-time. For every specific parenting practice, a related parental self-
288 efficacy was defined which was thought to give more insight into parental correlates
289 of children's PA and screen-time compared to the more general formulated parenting
290 practices. Moreover, parental self-efficacy related to specific parenting practices has
291 rarely been investigated in other studies.

292
293 However, results showed that only a very few parenting-related factors were
294 significantly associated with children's PA or screen-time: Children were more
295 physically active when sports material were available at home and when parents had
296 more self-efficacy to motivate their child to be physically active. When parents
297 limited their own gaming, their child had a lower screen-time.

298 It was expected that parental self-efficacy would play a more important role. This can
299 be due to the fact that parental self-efficacy was already high in this group of parents:
300 the mean values of the self-efficacy variables show that in general, parents did not
301 find it difficult to adopt the parenting practices. It is possible that parents do not
302 realize how difficult it is to perform certain parenting practices until they are faced
303 with it in an intervention. A similar finding was found in an intervention study to
304 decrease sedentary time in children, conducted within the framework of the
305 ENERGY-project. It was found that children's self-efficacy regarding TV-time
306 declined after the intervention was conducted, possibly because the intervention
307 triggered greater awareness of e.g. how hard it really is to not watch TV/DVD [40].

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3 309 Regarding specific parenting practices, only availability of sports material and limited
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5 310 parental gaming (modeling), were significantly related to children's PA and screen-
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7 311 time. These results are in line with previous research: in the review of Verloigne et al
8
9 312 (2012) it was found that parental logistic support was one of the most important
10
11 313 positive correlates of PA and that parental sedentary time had a positive association
12
13 314 with screen-time [21]. Furthermore, the study of Jago et al. [28] also found that
14
15 315 parental TV viewing influences children's screen-time. However, it has to be
16
17 316 acknowledged that this study investigated very specific parenting-related factors (e.g.
18
19 317 availability of different sport materials) instead of more general parenting-related
20
21 318 factors (e.g. logistic support). Consequently, future interventions in a general
22
23 319 population of parents may promote availability of sports material at home and limited
24
25 320 gaming of parents. Furthermore, parents might learn how they can motivate their child
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27 321 to be physically active (e.g. by giving positive feedback or by letting him/her choose
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29 322 between different kinds of PA) which might enhance parental self-efficacy concerning
30
31 323 motivating for PA and finally may lead to more PA for their child. However, it must
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33 324 be kept in mind that our study findings are based on cross-sectional results, suggesting
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35 325 that no causal inferences can be made.
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43 327 Although these three parenting-related factors were associated with PA or screen-time
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45 328 in children in the total sample, it has to be acknowledged that many specific parenting
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47 329 practices did not significantly influence children's PA or screen-time behavior when
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49 330 they were entered into the multivariable model. Although this is similar to a previous
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51 331 study of van Sluijs which also found many single, but only a few multivariable
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53 332 associations between correlates and children's behavior, our results were in contrast to
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55 333 what we expected. Dividing more general parenting practices into very concrete
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3 334 specific parenting practices and investigating the parental self-efficacy related to each
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5 335 specific parenting practices were thought to be of extra value in identifying parental
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7 336 correlates of PA and screen-time in children. Nevertheless, moderation analyses
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10 337 revealed that several parenting practices and related self-efficacy were only
11
12 338 significantly related to children's PA or screen-time behavior in specific subgroups.
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14 339 Regarding children's PA, parental motivation and reinforcement to be physically
15
16 340 active were only positively associated with children's PA in families of which at least
17
18 341 one parent was overweight or obese. It could be hypothesized that in those families,
19
20 342 parents are less active since they are overweight or obese and are consequently less
21
22 343 likely to act as a model for their children. Therefore, motivating their children to be
23
24 344 physically active and reinforcing them for being physically active could be important
25
26 345 to increase their children's PA for this specific subgroup. However, this is only a
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28 346 hypothesis and requires further investigation.
29
30 347 Regarding children's screen-time behavior, most evidence was found for an
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32 348 association between specific parenting practices and related self-efficacy and screen-
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34 349 time in normal weight families. In families with both parents having a normal BMI,
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36 350 children had a lower screen-time when parents let their child ask for permission to
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38 351 play games and when parents applied rules for TV-time and gaming. Also SES was a
39
40 352 significant moderator: In medium-high SES families, children had a higher screen-
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42 353 time when parents were permissive on when games could be played whereas
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44 354 children's screen-time was higher in low SES families when parents found it difficult
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46 355 to motivate their child to play less games.
47
48 356 Therefore, these study results could suggest that future interventions might focus on
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50 357 different parenting strategies when targeting different groups of families to increase
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52 358 children's PA and limit children's screen-time. This finding is very important for
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3 359 future intervention developers to not make one general intervention for all parents but
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5 360 to tailor interventions to subgroups [41]. Specifically for screen-time, most parenting
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7 361 practices were only significantly related to children's screen-time in normal weight
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9 362 families, suggesting that more research is needed to discover other parenting-related
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11 363 factors to reduce screen-time in at risk families (high BMI).

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13
14 364 Finally, child's age seemed not to be a significant moderator in the associations
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16 365 between parenting practices or parental self-efficacy and PA and screen-time. This
17
18 366 was again a rather unexpected finding since literature shows that parental control
19
20 367 begins to fade as the child grows up and that older primary schoolchildren (9-12 year)
21
22 368 get more freedom and decision-making power of their parents [42]. Also previous
23
24 369 research examining associations between parenting practices and related self-efficacy
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26 370 and children's diet showed that associations were only significant for younger
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28 371 children (6-8 years old) (De Lepeleere S., Verloigne M., Cardon G., and De
29
30 372 Bourdeaudhuij I.; submitted). Thus, the present study results demonstrate that the
31
32 373 association between the parenting-related factors and children's PA and screen-time is
33
34 374 not different for the younger and older children, implying that the same strategies
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36 375 could be used.

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42 377 **Limitations**

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45 378 This study was subjected to some limitations. First, the self-report questionnaires may
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47 379 have led to inconsistency with actual experiences or social desirability bias. Secondly,
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49 380 because the present study was a cross-sectional study, it was not possible to make
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51 381 statements about the causality. Finally, 88% of participants were female and 84% of
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53 382 participating parents had a medium-high SES, which may have contributed to a
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3 383 certain amount of selection bias. Therefore, we should be cautious about generalizing
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5 384 our findings to all parents of primary schoolchildren.
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9 386 **Conclusions**

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11 387 This study is unique since it investigated the association between very specific
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13 388 parenting practices as well as related parental self-efficacy and primary
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15 389 schoolchildren's PA and screen-time, which is an understudied subject. In contrast to
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17 390 what we expected, the findings of this study showed that only a very few specific
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19 391 parenting practices and related parental self-efficacy were associated with children's
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21 392 PA and screen-time, although more significant associations were found within
22
23 393 specific subgroups. More experimental (i.e. effect evaluation studies of family-
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25 394 focused interventions targeting PA and screen-time of primary schoolchildren) and
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27 395 longitudinal studies are needed to provide evidence for predictive associations
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29 396 between parenting-related factors and children's PA and screen-time.
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37 398 **List of abbreviations used**

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39 399 BMI: Body Mass Index
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42 400 ICC: intraclass correlation coefficient
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44 401 PA: physical activity
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46 402 SB: sedentary behavior
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48 403 SE: self-efficacy
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50 404 SES: social economic status
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410 **Competing interests**

411 The authors declare that they have no competing interests.

413 **Authors' contributions**

414 SDL, MV, GC and IDB developed the information flyers and the online
415 questionnaire. Furthermore, SDL and MV conducted the Single and Multiple Linear
416 Regression and (Moderated) Multiple Regression analyses. SDL drafted the
417 manuscript. All authors revised the article critically for important intellectual content
418 and approved the final manuscript.

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427 **References**

- 428 1. James J, Kerr D: **Prevention of childhood obesity by reducing soft drinks.**
429 *Int J Obes (Lond)* 2005, **29 Suppl 2**: S54-S57.

- 1
2
3 430 2. Moreno LA, Rodriguez G: **Dietary risk factors for development of**
4 431 **childhood obesity.** *Curr Opin Clin Nutr Metab Care* 2007, **10**: 336-341.
- 5
6 432 3. Carrel AL, Clark RR, Peterson SE, Nemeth BA, Sullivan J, Allen DB:
7 433 **Improvement of fitness, body composition, and insulin sensitivity in**
8 434 **overweight children in a school-based exercise program: a randomized,**
9 435 **controlled study.** *Arch Pediatr Adolesc Med* 2005, **159**: 963-968.
- 10
11 436 4. Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK *et al.*:
12 437 **Reducing obesity via a school-based interdisciplinary intervention among**
13 438 **youth: Planet Health.** *Arch Pediatr Adolesc Med* 1999, **153**: 409-418.
- 14
15 439 5. Robinson TN: **Reducing children's television viewing to prevent obesity: a**
16 440 **randomized controlled trial.** *JAMA* 1999, **282**: 1561-1567.
- 17
18 441 6. Riddoch CJ, Bo AL, Wedderkopp N, Harro M, Klasson-Heggebo L, Sardinha
19 442 *LB et al.*: **Physical activity levels and patterns of 9- and 15-yr-old**
20 443 **European children.** *Med Sci Sports Exerc* 2004, **36**: 86-92.
- 21
22 444 7. van Sluijs EM, Skidmore PM, Mwanza K, Jones AP, Callaghan AM, Ekelund
23 445 *U et al.*: **Physical activity and dietary behaviour in a population-based**
24 446 **sample of British 10-year old children: the SPEEDY study (Sport,**
25 447 **Physical activity and Eating behaviour: environmental Determinants in**
26 448 **Young people).** *BMC Public Health* 2008, **8**: 388.
- 27
28 449 8. Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M:
29 450 **Physical activity in the United States measured by accelerometer.** *Med Sci*
30 451 *Sports Exerc* 2008, **40**: 181-188.
- 31
32 452 9. Verloigne M, Van LW, Maes L, Yildirim M, Chinapaw M, Manios Y *et al.*:
33 453 **Levels of physical activity and sedentary time among 10- to 12-year-old**
34 454 **boys and girls across 5 European countries using accelerometers: an**
35 455 **observational study within the ENERGY-project.** *Int J Behav Nutr Phys*
36 456 *Act* 2012, **9**: 34.
- 37
38 457 10. Brug J, van Stralen MM, Te Velde SJ, Chinapaw MJ, De B, I, Lien N *et al.*:
39 458 **Differences in Weight Status and Energy-Balance Related Behaviors**
40 459 **among Schoolchildren across Europe: The ENERGY-Project.** *PLoS One*
41 460 2012, **7**: e34742.
- 42
43 461 11. Tremblay MS, LeBlanc AG, Janssen I, Kho ME, Hicks A, Murumets K *et al.*:
44 462 **Canadian sedentary behaviour guidelines for children and youth.** *Appl*
45 463 *Physiol Nutr Metab* 2011, **36**: 59-64.
- 46
47 464 12. Trost SG, Loprinzi PD: **Parental Influences on Physical Activity Behavior**
48 465 **in Children and Adolescents: A Brief Review.** *Am J Lifestyle Med* 2011, **5**:
49 466 171-181.
- 50
51 467 13. Beets MW, Cardinal BJ, Alderman BL: **Parental social support and the**
52 468 **physical activity-related behaviors of youth: a review.** *Health Educ Behav*
53 469 2010, **37**: 621-644.

- 1
2
3 470 14. Edwardson CL, Gorely T: **Activity-related parenting practices and**
4 471 **children's objectively measured physical activity.** *Pediatr Exerc Sci* 2010,
5 472 **22:** 105-113.
- 7 473 15. Gustafson SL, Rhodes RE: **Parental correlates of physical activity in**
8 474 **children and early adolescents.** *Sports Med* 2006, **36:** 79-97.
- 10 475 16. Trost SG, Sallis JF, Pate RR, Freedson PS, Taylor WC, Dowda M:
11 476 **Evaluating a model of parental influence on youth physical activity.** *Am J*
12 477 *Prev Med* 2003, **25:** 277-282.
- 14 478 17. Lindsay AC, Sussner KM, Kim J, Gortmaker S: **The role of parents in**
15 479 **preventing childhood obesity.** *Future Child* 2006, **16:** 169-186.
- 18 480 18. Campbell K, Hesketh K, Crawford D, Salmon J, Ball K, McCallum Z: **The**
19 481 **Infant Feeding Activity and Nutrition Trial (INFANT) an early**
20 482 **intervention to prevent childhood obesity: cluster-randomised controlled**
21 483 **trial.** *BMC Public Health* 2008, **8:** 103.
- 23 484 19. Gerards SM, Sleddens EF, Dagnelie PC, de Vries NK, Kremers SP:
24 485 **Interventions addressing general parenting to prevent or treat childhood**
25 486 **obesity.** *Int J Pediatr Obes* 2011, **6:** e28-e45.
- 27 487 20. Jago R, Davison KK, Brockman R, Page AS, Thompson JL, Fox KR:
28 488 **Parenting styles, parenting practices, and physical activity in 10- to 11-**
29 489 **year olds.** *Prev Med* 2011, **52:** 44-47.
- 31 490 21. Verloigne M, Van LW, Maes L, Brug J, De B, I: **Family- and school-based**
32 491 **correlates of energy balance-related behaviours in 10-12-year-old**
33 492 **children: a systematic review within the ENERGY (European Energy**
34 493 **balance Research to prevent excessive weight Gain among Youth) project.**
35 494 *Public Health Nutr* 2012, **15:** 1380-1395.
- 37 495 22. Kaplan JP, Liverman CT, Kraak VI: *Preventing Childhood Obesity: Health in*
38 496 *the Balance.* Washington: National Academies Press; 2004.
- 40 497 23. De Lepeleere S., DeSmet A., Verloigne M, Cardon G, De B, I: **What**
41 498 **practices do parents perceive as effective or ineffective in promoting a**
42 499 **healthy diet, physical activity, and less sitting in children: parent focus**
43 500 **groups.** *BMC Public Health* 2013, **13:** 1067.
- 45 501 24. Jones TL, Prinz RJ: **Potential roles of parental self-efficacy in parent and**
46 502 **child adjustment: a review.** *Clin Psychol Rev* 2005, **25:** 341-363.
- 48 503 25. Jago R, Sebire SJ, Turner KM, Bentley GF, Goodred JK, Fox KR *et al.*:
49 504 **Feasibility trial evaluation of a physical activity and screen-viewing**
50 505 **course for parents of 6 to 8 year-old children: Teamplay.** *Int J Behav Nutr*
51 506 *Phys Act* 2013, **10:** 31.
- 53 507 26. Arredondo EM, Morello M, Holub C, Haughton J: **Feasibility and**
54 508 **preliminary findings of a church-based mother-daughter pilot study**

- 1
2
3 509 **promoting physical activity among young Latinas.** *Fam Community Health*
4 510 2014, **37**: 6-18.
- 5
6 511 27. Salmon J, Arundell L, Hume C, Brown H, Hesketh K, Dunstan DW *et al.*: **A**
7 512 **cluster-randomized controlled trial to reduce sedentary behavior and**
8 513 **promote physical activity and health of 8-9 year olds: the Transform-Us!**
9 514 **study.** *BMC Public Health* 2011, **11**: 759.
- 10
11 515 28. Jago R, Sebire SJ, Edwards MJ, Thompson JL: **Parental TV viewing,**
12 516 **parental self-efficacy, media equipment and TV viewing among preschool**
13 517 **children.** *Eur J Pediatr* 2013, **172**: 1543-1545.
- 14
15 518 29. Garcia F, Gracia E: **Is always authoritative the optimum parenting style?**
16 519 **Evidence from Spanish families.** *Adolescence* 2009, **44**: 101-131.
- 17
18 520 30. Papaioannou MA, Cross MB, Power TG, Liu Y, Qu H, Shewchuk RM *et al.*:
19 521 **Feeding Style Differences in Food Parenting Practices Associated With**
20 522 **Fruit and Vegetable Intake in Children From Low-income Families.** *J*
21 523 *Nutr Educ Behav* 2013, **45**: 643-651.
- 22
23 524 31. Wagner A, Klein-Platat C, Arveiler D, Haan MC, Schlienger JL, Simon C:
24 525 **Parent-child physical activity relationships in 12-year old French students**
25 526 **do not depend on family socioeconomic status.** *Diabetes Metab* 2004, **30**:
26 527 359-366.
- 27
28 528 32. Winkleby MA, Jatulis DE, Frank E, Fortmann SP: **Socioeconomic status and**
29 529 **health: how education, income, and occupation contribute to risk factors**
30 530 **for cardiovascular disease.** *Am J Public Health* 1992, **82**: 816-820.
- 31
32 531 33. **Physical status: the use and interpretation of anthropometry. Report of a**
33 532 **WHO Expert Committee.** *World Health Organ Tech Rep Ser* 1995, **854**: 1-
34 533 452.
- 35
36 534 34. Deforche B, De Bourdeaudhuij I, D'hondt E, Cardon G: **Objectively**
37 535 **measured physical activity, physical activity related personality and body**
38 536 **mass index in 6- to 10-yr-old children: a cross-sectional study.** *Int J Behav*
39 537 *Nutr Phys Act* 2009, **6**: 25.
- 40
41 538 35. Philippaerts RM, Matton L, Wijndaele K, Balduck AL, De B, I, Lefevre J:
42 539 **Validity of a physical activity computer questionnaire in 12- to 18-year-**
43 540 **old boys and girls.** *Int J Sports Med* 2006, **27**: 131-136.
- 44
45 541 36. Larios SE, Ayala GX, Arredondo EM, Baquero B, Elder JP: **Development**
46 542 **and validation of a scale to measure Latino parenting strategies related to**
47 543 **children's obesigenic behaviors. The parenting strategies for eating and**
48 544 **activity scale (PEAS).** *Appetite* 2009, **52**: 166-172.
- 49
50 545 37. Sherwood NE, Taylor WC, Treuth M, Klesges LM, Baranowski T, Zhou A *et*
51 546 *al.*: **Measurement characteristics of activity-related psychosocial measures**
52 547 **in 8- to 10-year-old African-American girls in the Girls Health**
53 548 **Enrichment Multisite Study (GEMS).** *Prev Med* 2004, **38 Suppl**: S60-S68.

- 1
2
3 549 38. Decker JW: **Initial development and testing of a questionnaire of parental**
4 550 **self-efficacy for enacting healthy lifestyles in their children.** *J Spec Pediatr*
5 551 *Nurs* 2012, **17**: 147-158.
- 6
7 552 39. Crespo NC, Elder JP, Ayala GX, Slymen DJ, Campbell NR, Sallis JF *et al.*:
8 553 **Results of a Multi-level Intervention to Prevent and Control Childhood**
9 554 **Obesity among Latino Children: The Aventuras Para Ninos Study.** *Ann*
10 555 *Behav Med* 2012, **43**: 84-100.
- 11
12 556 40. ENERGY-project Consortium. A report of the UP4FUN projectto reduce
13 557 sedentary behaviour among children,with recommendations for implementing
14 558 similar projects across Europe. Edited by Lobstein T. 2012.
15 559 Ref Type: Report
- 16
17 560 41. Noar SM, Benac CN, Harris MS: **Does tailoring matter? Meta-analytic**
18 561 **review of tailored print health behavior change interventions.** *Psychol Bull*
19 562 2007, **133**: 673-693.
- 20
21 563 42. Roberts BP, Blinkhorn AS, Duxbury JT: **The power of children over adults**
22 564 **when obtaining sweet snacks.** *Int J Paediatr Dent* 2003, **13**: 76-84.
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26 566 Tables

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28
29 567 **Table 1: Formulations and descriptive statistics of the questionnaire items of the**
30
31 568 **specific parenting-related factors**

34 Behavior	35 Factor	36 Question item	37 Response alternatives	38 % or Mean (SD)
39 PA	40 Availability	41 Do you have following sports materials at home for your child?	42 1 = no 43 2 = yes	44 % of parents who have following sports materials at home: 45 1. 99.5 46 2. 85.4 47 3. 97.0 48 4. 99.0 49 5. 84.8 50 6. 66.3 51 7. 55.1
		52 1. Bike		
		53 2. Tennis or badminton racket		
		54 3. Ball (basketball/volleyball/football)		
		55 4. Sport shoes		
		56 5. Skip rope		
57 Monitoring	58 I monitor the amount of PA of my child	59 1 = never	3.23 (1.25)	
60 Modeling	I am physically active nearby my child	2 = rarely	3.16 (1.17)	
Motivating	I try to motivate my child to be physically active	3 = sometimes 4 = often	3.73 (1.02)	
Reinforcing	I reinforce my child when he/she is physically active	5 = always	3.69 (0.99)	
Giving choice	I let my child choose between different kinds of physical activities he/she wants to		4.12 (0.77)	

		do		
	Involving	1. I am physically active together with my child 2. I involve my child in household chores (e.g. cooking, cleaning, washing the dishes,...)		1. 2.61 (0.94) 2. 3.22 (0.86)
	SE Availability	It is difficult for me to have sports materials at home for my child.	1 = completely disagree 2 = mostly disagree	1.23 (0.50)
	SE Monitoring	It is difficult for me to monitor the amount of PA of my child.	3 = sometimes disagree/sometimes agree	2.07 (1.12)
	SE Modeling	It is difficult for me to be physically active nearby my child.	4 = mostly agree	2.89 (1.40)
	SE Motivating	It is difficult for me to motivate my child to be physically active.	5 = completely agree	2.11 (1.07)
	SE Reinforcing	It is difficult for me to reinforce my child when he/she is physically active.		1.65 (0.95)
	SE Giving choice	It is difficult for me to let my child choose between different kinds of physical activities he/she wants to do.		1.68 (0.85)
	SE Involving	1. It is difficult for me to be physically active together with my child. 2. It is difficult for me to involve my child in household chores (e.g. cooking, cleaning, washing the dishes,...).		1. 2.82 (1.33) 2. 2.33 (1.13)
Screen-time	Availability	1. How many pc's do you have at home (include also laptops and tablets) 2. How many game consoles (e.g. Nintendo, Wii, PlayStation,...) do you have at home? 3. How many TV's do you have at home?	1 = none 2 = one 3 = two 4 = three 5 = four 6 = more than four	1. 3.80 (1.25) 2. 2.26 (1.13) 3. 2.47 (0.80)
	Permission	1. My child has to ask for permission to play videogames, computer games, PlayStation, Nintendo,... 2. My child has to ask for permission to watch TV.	1 = disagree 2 = agree	1. 1.89 (0.31) 2. 1.82 (0.38)
	Rules	1. In our family, there are rules about the moments (when and how long) my child is allowed to play videogames, computer games, PlayStation, Nintendo,... 2. In our family, there are rules about the moments (when and how long) my child is allowed to watch TV.		1. 1.77 (0.42) 2. 1.75 (0.43)
	Being consistent	1. The rules about when and how long my child is allowed to play videogames,	1 = never 2 = rarely	1. 3.93 (0.80)

	computer games, PlayStation, Nintendo,..., are followed up. 2. The rules about when and how long my child is allowed to watch TV are followed up.	3 = sometimes 4 = often 5 = always	2. 3.99 (0.54)
Giving an explanation	1. I explain to my child why there are rules about when he/she is allowed to play videogames, computer games, PlayStation, Nintendo,... 2. I explain to my child why there are rules about when he/she is allowed to watch TV.		1. 4.12 (0.84) 2. 4.04 (0.85)
Monitoring	1. I monitor the time my child plays videogames, computer games, PlayStation, Nintendo,... 2. I monitor the time my child watches TV.		1. 3.47 (1.14) 2. 3.39 (1.09)
Modeling	1. I limit my own playing of videogames, computer games, PlayStation, Nintendo,... nearby my child. 2. I limit my own TV-time nearby my child.		1. 4.07 (1.17) 2. 3.77 (1.13)
Permissive ness	1. My child can choose him/herself when he/she wants to play videogames, computer games, PlayStation, Nintendo,... 2. My child can choose him/herself how long he/she wants to play videogames, computer games, PlayStation, Nintendo,... 3. My child can choose him/herself when he/she wants to watch TV. 4. My child can choose him/herself how long he/she wants to watch TV.		1. 2.12 (0.96) 2. 1.81 (0.82) 3. 2.16 (1.01) 4. 1.94 (0.87)
Motivating	1. I try to motivate my child to play less videogames, computer games, PlayStation, Nintendo,... 2. I try to motivate my child to watch less TV.		1. 3.48 (1.01) 2. 3.41 (0.97)
SE permission	1. It is difficult for me to let my child ask for permission to play videogames, computer games, PlayStation, Nintendo,... 2. It is difficult for me to let my child ask for permission to watch TV.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/somet imes agree 4 = mostly	1. 1.61 (0.94) 2. 1.62 (0.99)
SE rules	1. It is difficult for me to apply rules about the moments my child is allowed		1. 1.93 (1.11)

		to play videogames, computer games, PlayStation, Nintendo,...	agree 5 = completely agree	2. 1.93 (1.11)
	SE Being consistent	1. It is difficult for me to follow up the rules about the moments my child is allowed to play videogames, computer games, PlayStation, Nintendo,...		1. 1.98 (1.08)
		2. It is difficult for me to follow up the rules about the moments my child is allowed to watch TV.		2. 1.84 (0.90)
	SE Giving an explanation	1. It is difficult for me to explain to my child why there are rules about the moments my child is allowed to play videogames, computer games, PlayStation, Nintendo,...		1. 1.67 (0.93)
		2. It is difficult for me to explain to my child why there are rules about the moments my child is allowed to watch TV.		2. 1.63 (0.84)
	SE Monitoring	1. It is difficult for me to monitor the time my child plays videogames, computer games, PlayStation, Nintendo,...		1. 2.16 (1.23)
		2. It is difficult for me to monitor the time my child watches TV.		2. 2.13 (1.18)
	SE Modeling	1. It is difficult for me to limit my own playing of videogames, computer games, PlayStation, Nintendo,...		1. 1.44 (0.76)
		2. It is difficult for me to limit my own TV-time nearby my child.		2. 1.63 (0.87)
	SE Motivating	1. It is difficult for me to motivate my child to play less videogames, computer games, PlayStation, Nintendo,...		1. 2.30 (1.21)
		2. It is difficult for me to motivate my child to watch less TV.		2. 2.17 (1.10)

569 PA = physical activity, SE = self-efficacy

570

571 **Table 2: Associations between parenting practices, related self-efficacy and children's**

572 **PA and screen-time.**

Outcome Variable			
Physical Activity	Full model	Adjusted R ²	F

		.127	5.565 ^{***}
	Explanatory variables	B (StEr)	Standardized β
	Availability of sports material	.629 (.311)	.141*
	SE for monitoring PA	.177 (.360)	.038
	SE for modeling PA	.440 (.316)	.118
	SE for motivating PA	1.149 (.401)	.233**
	SE for giving PA choice	.546 (.448)	.089
	SE for involving PA	.009 (.337)	.002
Screen-time	Full model	Adjusted R²	F
		.344	3.943**
	Explanatory variables	B (StEr)	Standardized β
	Availability of TV's	-.473 (1.545)	-.041
	Availability of game consoles	1.005 (.866)	.136
	Permission to watch TV	-5.935 (3.983)	-.209
	Being consistent about TV	.216 (2.148)	.014
	Being consistent about games	-2.238 (1.831)	-.211
	Monitoring of TV	-1.297 (.978)	-.163
	Modeling for games	-3.159 (1.074)	-.418**
	Permissiveness how long games	-.823 (1.919)	-.064
	SE for monitoring TV	.131 (1.262)	.015
	SE for motivating games	.863 (1.132)	.115

573 SE = self-efficacy
 574 StEr = standard error
 575 * p<.05
 576 **p<.01
 577 ***p<.001

578
 579

580 **Table 3: Moderating effects on the association between parenting practices, related self-**
 581 **efficacy and children's PA and screen-time.**

Outcome Variable	Moderator		Independent variables	F	β	t	p	Adj R ²
PA	BMI family	Both parents with normal BMI	Motivating PA	1.794	-.155	-1.339	ns	.011
		One or both parents with high BMI		5.690	.248	2.385	.019	.051
		Both parents with normal BMI	Reinforcing PA	1.052	-.116	-1,026	ns	.001
		One or both parents with high BMI		4.490	.209	2.119	.037	.034
Screen-time	BMI family	Both parents with normal BMI	Permission games	26.446	-.541	-5.143	<.001	.281
		One or both parents with high BMI		1.438	-.128	-1.199	ns	.005
		Both parents with normal BMI	Rules TV	21.792	-.482	-4.668	<.001	.222
		One or both parents with high BMI		.942	-.100	-.970	ns	-.001
		Both parents with normal BMI	Rules games	14.664	-.437	-3.829	<.001	.178
		One or both parents with high BMI		.544	-.080	-.738	ns	-.005
	Family SES	Low family SES	Permissiveness when games	.000	-.001	-.003	ns	-.033
		Medium-High family SES		22.270	.370	4.719	<.001	.131
Low family SES		SE motivating games	11.817	-.532	-3.438	.002	.259	
Medium-High family SES			4.540	-.178	-2.131	.035	.025	

582 BMI = Body Mass Index

583 SES = socio-economic status

584 SE = self-efficacy

585 ns = not significant

BMJ Open

Do Specific Parenting Practices and related Parental Self-Efficacy associate with Physical Activity and Screen-time among Primary Schoolchildren: a Cross-sectional study in Belgium?

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Secondary Subject Heading:	Sports and exercise medicine, Public health
Keywords:	Parenting, Parenting practices, Parental self-efficacy, children, physical activity, screen-time

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1 **Do Specific Parenting Practices and related Parental Self-**
2 **Efficacy associate with Physical Activity and Screen-time**
3 **among Primary Schoolchildren: a Cross-sectional study in**
4 **Belgium?**

5
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18 Abstract

19 **Objectives:** To assess the association between specific parenting practices and related
20 parental self-efficacy with children's physical activity (PA) and screen-time. Parental
21 body mass index, family socio-economic status (SES), and child's age and gender
22 were examined as possible influencing factors.

23 **Design:** Cross-sectional

24 **Setting:** January 2014, Flanders (Belgium)

25 **Participants:** 207 parents (87.4% mothers) of 6-to-12-year-old children

26 **Outcome measures:** specific parenting practices, related parental self-efficacy, and
27 children's PA and screen-time

28 **Results:** The majority of investigated parenting practices and related parental self-
29 efficacy was not significantly associated with children's PA or screen-time. However,
30 children were more physically active if sports equipment was available at home
31 ($p < 0.10$) and if parents did not find it difficult to motivate their child to be physically
32 active ($p < 0.05$). Children had a lower screen-time if parents limited their own gaming
33 ($p < 0.01$). The associations between parenting practices and related parental self-
34 efficacy with children's PA or screen-time were significant for parents with a normal
35 BMI, for medium-high SES families and for parents of younger children.
36 Furthermore, the association between the parenting relating factors and children's PA
37 and screen-time differed for boys and girls.

38 **Conclusions:** In contrast to what we expected, the findings of the current study show
39 that only a very few specific parenting practices and related parental self-efficacy
40 were associated with children's PA and screen-time. It was expected that parental
41 self-efficacy would play a more important role. This can be due to the fact that
42 parental self-efficacy was already high in this group of parents. Therefore, it is

1
2
3 possible that parents do not realize how difficult it is to perform certain parenting
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5 practices until they are faced with it in an intervention.
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10 **Strengths and limitations of this study**

- 11
- 12
- 13 • Combining both specific parenting practices and related parental self-efficacy
- 14 for each specific parenting practice
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- 16
- 17 • Self-report questionnaires: social desirability bias
- 18
- 19
- 20 • Cross-sectional study: no statements about causality
- 21
- 22 • 88% of participants female + 84% of participants medium-high SES: selection
- 23 bias
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54 **Keywords**

55 Parenting Practices, Parental Self-Efficacy, Parent, Child, Physical Activity, Screen-
56 time
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58 **Background**

59 The increasing prevalence of childhood overweight and obesity worldwide is an
60 important health concern [1,2]. Besides an unhealthy diet, insufficient physical
61 activity (PA) and too much sedentary behavior play a major role in the development
62 of overweight and obesity [3-5]. Worldwide research has indicated that about 40-80%
63 of children do not achieve the guidelines of at least 60 minutes of moderate to
64 vigorous PA on most days of the week [6-8]. The ENERGY-project (conducted in
65 seven European countries among 10- to 12-year-old children) showed that 83.2 % of
66 the European boys and 95.4% of the girls were not sufficiently physically active [9].

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3 67 For sedentary behaviors, Tremblay et al. conducted a systematic review which
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5 68 presented available evidence for minimal and optimal thresholds for daily sedentary
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7 69 time in children and youth. The review included 232 studies from 39 different
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9 70 countries and concluded that daily screen-time (TV and computer activities
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11 71 combined) should be limited to a maximum of two hours/day [10]. However, the
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13 72 ENERGY-project showed that European children spent on average more than two
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15 73 hours/day in screen-time [11]. Therefore, it is important to develop interventions
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17 74 which stimulate PA as well as limit screen-time in primary schoolchildren.

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20 75 Results from cross-sectional and longitudinal studies [12-15] over the past decade
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22 76 illustrate that parents play a major role in the development of health behaviors such as
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24 77 PA and screen-time behavior of their primary schoolchildren [16]. Parents can
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26 78 influence their children's personal and behavioral determinants by shaping their
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28 79 attitudes and social norms and by enhancing their children's self-efficacy in
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30 80 exhibiting a healthy lifestyle [17-19]. Additionally, specific parenting practices such
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32 81 as providing sports equipment to be physically active [20], being physically active
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34 82 together with your child [21], parental rules [21] and parental levels of PA and screen-
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36 83 time (modeling) [22], are influential in their children's development of lifelong habits
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38 84 that contribute to normal weight or to overweight and obesity. It is therefore important
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40 85 that parents are made aware of their important influencing role. However, sometimes
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42 86 parents are aware of which parenting practices they should apply but experience low
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44 87 feelings of competence to effectively adopt those parenting practices [23]. The
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46 88 expectation parents (or other caregivers) hold about their ability to perform effective
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48 89 parenting practices [24], is defined as parental self-efficacy. Enhancing parental self-
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50 90 efficacy concerning parenting practices might be an important step in effectively
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52 91 adopting these parenting practices. Some parents may need help to learn how to
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3 92 increase their use of effective, and decrease their use of ineffective parenting practices
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5 93 [23].
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7 94 Currently, multiple intervention studies incorporate a random mix of parenting
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9 95 practices to promote PA or to decrease screen-time without knowing which parenting
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11 96 practices are most relevant in changing a particular health behavior of the child
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13 97 [25,26]. Furthermore, to our knowledge, only one study has examined the association
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15 98 between parental self-efficacy and children's PA and screen-time and found that
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17 99 higher parental self-efficacy to limit screen-viewing was associated with a 77%
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21 100 reduction in the likelihood of the child watching ≥ 2 h of TV per day [27]. However,
22
23 101 the study of Jago et al. only investigated parental self-efficacy to limit the screen-
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25 102 viewing and promote PA of their preschool child and parents own PA self-efficacy,
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27 103 although there is a broad range of parenting practices.

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29 104 Therefore, since parental self-efficacy seems to be an important concept in parenting
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31 105 but remains an understudied subject, the current study investigated for every specific
32
33 106 parenting practice also the corresponding parental self-efficacy.

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36 107 For future interventions it is important to know which specific parenting practices and
37
38 108 related parental self-efficacy are significantly and which ones are not significantly
39
40 109 associated with children's PA and screen-time. This way, interventions can teach
41
42 110 parents which parenting practices are effective and even more important, they can
43
44 111 show parents how to perform those parenting practices. Thus, the first aim of the
45
46 112 current study was to examine the association between specific parenting practices and
47
48 113 related parental self-efficacy with PA and screen-time among primary schoolchildren.

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50 114 In addition, it is possible that the association between specific parenting practices and
51
52 115 related parental self-efficacy and children's PA and screen-time behavior differ for
53
54 116 specific subgroups. In previous studies it has been shown that parenting practices can

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3 117 differ according to a child's gender [28-31], a child's age [32] and family socio-
4
5 118 economic status (SES) [33]. Furthermore, parental Body Mass Index (BMI) has been
6
7 119 associated with children's PA and screen-time [34]. Therefore, the second aim of the
8
9 120 current study is to investigate the above mentioned associations separately for parents
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11 121 with normal and high BMI, for low and high SES families, for younger and older
12
13 122 children, and for boys and girls. This information could be important for future
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15 123 intervention developers to tailor the intervention to a specific subgroup.
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21 **Methods**

22 **Study Design And Setting**

23
24 126 An online cross-sectional survey on PA and screen-time, specific parenting practices
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26 127 and parental self-efficacy was conducted in Flanders (i.e., the Dutch speaking part of
27
28 128 Belgium). Ethical approval was provided by the Ethics Committee of the Ghent
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30 129 University Hospital.
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36 132 **Participants And Recruitment**

37
38 133 A convenience sample of parents of primary schoolchildren was recruited in different
39
40 134 ways. Firstly, principals of 36 primary schools in Flanders were contacted personally
41
42 135 by the researchers. In total, 30 schools (83%) agreed to participate. The only reason to
43
44 136 decline was 'not enough time' (n=6). In November-December 2013, flyers (n=5077)
45
46 137 to invite parents to participate were distributed in the participating schools to all 6- to
47
48 138 12-year old children to take home. Furthermore, an appeal to participate was spread
49
50 139 by (social) media: two Flemish magazines for parents (Klasse' and 'De Gezinsbond)
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52 140 and the Facebook page of EXPOO (an expertise center for parenting support).
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54 141 Because it is unknown how many parents were reached by the invitation appeals, it is
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3 142 not possible to calculate a reliable response rate. The recruitment of parents was
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5 143 ended by the second week of January 2014. Parents who wanted to participate had to
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7 144 send an e-mail to the researcher. Afterwards, they were sent an information letter
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9 145 which contained information on the goal, the inclusion criteria, the content, the
10
11 146 course, the starting and ending procedure, the risks and advantages, and
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13 147 confidentiality of the study. Furthermore, participants were sent the link to the online
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15 148 questionnaire and provided informed consent by returning this online questionnaire. A
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17 149 total of 238 parents agreed to participate of which 207 parents (87%) completed the
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19 150 questionnaire.
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152 **Measures**

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28 153 At the beginning of the questionnaire, it was mentioned that if parents had more than
29
30 154 one child in primary school, they could choose for which child they wanted to
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32 155 complete the entire questionnaire. The parental questionnaire assessed demographic
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34 156 variables, specific parenting practices, parental self-efficacy concerning these
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36 157 practices and child's PA and screen-time.
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41 159 *Demographic variables.* Age and gender of the child, weight and height of both
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43 160 parents, and number of children living in the house were reported in the questionnaire.
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45 161 The reported educational level of the parent who completed the questionnaire was
46
47 162 used as a proxy for SES. Low SES was determined as parents having no higher
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49 163 education and medium to high SES as parents having higher education (vocational
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51 164 college, university or post-academic) [35]. Parental body mass index (weight/height
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53 165 squared) was calculated from the self-reported height and weight of the father and
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3 166 mother. According to the existing WHO cut-off points [36], normal weight was
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5 167 determined as BMI <25 kg/m² and overweight/obesity as BMI ≥25 kg/m².
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169 *Child's physical activity and screen-time.* Levels of PA and screen-time were assessed
170 by the questionnaire adopted from the validated Flemish Physical Activity
171 Questionnaire (FPAQ) [37]. The FPAQ is a reliable (Intraclass Correlation
172 Coefficient=0.70) and valid (R=0.78) instrument to measure PA and screen-time [38].
173 Total PA was assessed by adding up minutes spent in active transportation (to school
174 and in leisure time on weekdays and weekend days) and time spent in sports (at
175 school and during leisure time on weekdays and weekend days). Screen-time was
176 calculated by adding up minutes spent watching TV (*'In a normal week, how many*
177 *hours a day does your child watch TV or DVD's on weekdays/on weekend days?'*),
178 playing computer games and using game consoles (*'In a normal week, how many hours*
179 *a day does your child play games on the computer, Nintendo, PlayStation, iPad or does*
180 *he/she use chatting facilities such as Facebook, Skype,... on weekdays/on weekend*
181 *days?'*) on weekdays and weekend days. To obtain a total sum score for PA and screen-
182 time, the average number of minutes spent on PA or screen-time on a weekday were
183 multiplied by five and the average day of minutes spent on a weekend day were
184 multiplied by two.

185

186 *Specific parenting practices.* The specific parenting practice items were based on the
187 validated Parental Support For Physical Activity Scale [16] and Parenting Strategies
188 for Eating and Activity Scale [39]. Most items were assessed on a two-point scale
189 (disagree-agree) or a five-point Likert scale ranging from 'never' to 'always' which
190 were treated as interval data. For most questions, 'Not Applicable' was an alternative

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3 191 answer category of which the results were set as missing values. Availability of TV's,
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5 192 pc's and game consoles was questioned on a six-point scale (ranging from 0 to more
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7 193 than 4) and the availability of different kinds of sports equipment (e.g. bike, tennis or
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9 194 badminton racket, ball) on a two-point scale (yes - no). A sum score of the different
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11 195 kinds of sports equipment was made to obtain the total availability of sports
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13 196 equipment. Table 1 shows the exact formulation and descriptive statistics of the
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15 197 questionnaire items for PA and screen-time.
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21 199 *Parental self-efficacy concerning the specific parenting practices.* The parental self-
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23 200 efficacy questions were created analogous to the questions on the specific parenting
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25 201 practices, and were based on the translation of the GEMS (Girls Health Enrichment
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27 202 Multisite Study) questionnaire [40], the validated questionnaire of parental self-
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29 203 efficacy for enhancing healthy lifestyles in their children [41] and Section L of the
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31 204 Aventuras Para Ninos parent survey [42]. The items were assessed by using a five-
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33 205 point answering format ranging from 'completely disagree' to 'completely agree'
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35 206 (Table 1). These items were recoded to obtain a higher score when parents had a
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37 207 higher self-efficacy.
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42 43 209 **Data Analysis**

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45 210 Preliminary analyses consisted of descriptive statistics of sample characteristics and
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47 211 checking the normality of key variables. Since the variable outcomes of PA and
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49 212 screen-time were skewed, square root transformations were used to obtain variables
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51 213 with a normal distribution.
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54 214 To examine associations between parenting practices related to PA and screen-time or
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56 215 parental self-efficacy concerning these practices, and PA and screen-time, single
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3 216 linear regressions were conducted in a first step. In case of significance, the parenting-
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5 217 related factor was included in a multiple linear regression model, preceded by
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7 218 bivariate correlations to check for intercorrelation among the selected parenting-
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9 219 related factors. When the correlation coefficient was higher than 0.60, only the
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11 220 parenting-related factor with the highest bivariate correlation with PA or screen-time
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13 221 was included. Parental BMI, family SES, child's age and child's gender were entered
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15 222 as covariates in this model. To examine the possible influencing role of parental BMI,
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17 223 family SES, child's age and child's gender, the multiple linear regression model was
18
19 224 conducted separately for normal weight families vs. families with at least one parent
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21 225 with overweight/obesity, low SES vs. medium-high SES families, younger children
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23 226 (6-8 year) vs. older children (9-12 year) and girls vs. boys. P-values <0.05 were
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25 227 considered significant, p-values ≥ 0.05 and <0.10 were considered borderline
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27 228 significant. Standardized β -values were reported. All analyses were conducted using
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29 229 SPSS (SPSS version 20.0, IBM corp., Armonk, NY; 2011).
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36 231 **Results**

37 232 **Study Characteristics**

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39 233 An overview of the descriptive characteristics is given in Table 2. In total, 207 parents
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41 234 with a mean age of 40.2 ± 5.0 years, completed the questionnaire. Parents who
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43 235 completed the survey were predominantly mothers (87.4%). The majority (83.5%) of
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45 236 participating parents had a medium-high SES. Normal weight was found in 68.2 % of
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47 237 the mothers and 56.2 % of the fathers. The mean number of children per family was
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49 238 two. Slightly more than half of the questionnaires (51.7%) was filled out for boys and
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51 239 the mean age of the children was 9.4 ± 1.6 years. Overall, children's mean PA level
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3 240 was 51 ± 31 minutes per day and children spent on average 2.2 ± 1.9 hours/day on
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5 241 screen-time.
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9 10 243 **Physical Activity**

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12 244 In the overall sample, as shown in Table 3, children were more physically active when
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14 245 sports equipment was available at home (p=0.06) and when parents did not find it
15
16 246 difficult to motivate their child to be physically active (p=0.04). This model of
17
18 247 parenting practices explained 16.1% of variance in children's PA. When only
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20 248 including the significant variables into the analysis, the model explained 10.8 % of
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22 249 variance in children's PA.
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28 251 When parents had a normal BMI, children were more physically active (borderline)
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30 252 when parents did not find it difficult to be physically active themselves (p=0.07). In
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32 253 medium-high SES families, children were more physically active when sports
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34 254 equipment was available (p=0.02) and when parents did not find it difficult to be
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36 255 physically active themselves (p=0.03). Younger children were more physically active
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38 256 when parents did not find it difficult to motivate their child to be physically active
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40 257 (p=0.02), whereas older children were more physically active (borderline) when
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42 258 sports equipment was available (p=0.09) and when parents did not find it difficult to
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44 259 be physically active themselves (p=0.07). Girls were more physically active when
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46 260 sports equipment was available (p=0.05), when parents did not find it difficult to be
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48 261 physically active themselves (p=0.02) and did not find it difficult to motivate their
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50 262 child to be physically active (p=0.04) (Table 4).
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264 **Screen-time**

265 In the total sample, a significant negative association was found between ‘limiting
266 your own gaming (modeling for games)’ ($p=0.01$) and children’s screen-time (Table
267 3). When parents limited their own gaming, children had a lower screen-time. This
268 model of parenting practices explained 48.3% of variance in children’s screen-time.
269 When only including the significant variable into the analysis, the model explained
270 24.0 % of variance in children’s screen-time.

271
272 When parents had a normal BMI, children had a higher screen-time (borderline) if
273 more TV’s were available at home ($p=0.08$) and a lower screen-time if parents
274 followed up their rules about gaming ($p=0.02$) and limited their own gaming ($p=0.03$).
275 Boys had a lower screen-time if parents let their child ask for permission to watch TV
276 ($p=0.03$), if parents followed up their rules about gaming ($p=0.01$) and if they limited
277 their own gaming ($p=0.01$). Since the number of participants in the analyses for
278 screen-time with family SES and child’s age was too small, the influencing role of
279 these factors could not be investigated (Table 4).

281 **Discussion**

282 The results showed that only a very few parenting-related factors were significantly
283 associated with children’s PA or screen-time: Children were more physically active
284 when sports equipment was available at home and when parents had more self-
285 efficacy to motivate their child to be physically active. When parents limited their
286 own gaming, their child had a lower screen-time. However, it has to be stressed out
287 that the model for screen-time explains a lot of the variation in screen time which

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3 288 might imply that the included parenting practices and parental self-efficacy play an
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5 289 important role in the screen-time of the child.
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7 290 It was expected that parental self-efficacy would play a more important role. This can
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10 291 be due to the high values of self-efficacy in this group of parents which could imply
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12 292 that parents do not find it difficult to perform these parenting practices. It is possible
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14 293 that parents do not realize how difficult it is to perform certain parenting practices
15
16 294 until they are faced with it in an intervention. A similar finding was found in an
17
18 295 intervention study to decrease sedentary time in children, conducted within the
19
20 296 framework of the ENERGY-project. It was found that children's self-efficacy
21
22 297 regarding TV-time declined after the intervention was conducted, possibly because
23
24 298 the intervention triggered greater awareness of e.g. how hard it really is to not watch
25
26 299 TV/DVD [43].
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31 301 Regarding specific parenting practices, only availability of sports equipment and
32
33 302 limited parental gaming (modeling), were significantly related to children's PA and
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35 303 screen-time. These results are in line with previous research: in the review of
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37 304 Verloigne et al (2012) it was found that parental logistic support was one of the most
38
39 305 important positive correlates of PA and that parental sedentary time had a positive
40
41 306 association with screen-time [21]. Furthermore, the study of Jago et al. [27] also
42
43 307 found that parental TV viewing influences children's screen-time. However, it has to
44
45 308 be acknowledged that the study of Jago et al. investigated very specific parenting-
46
47 309 related factors (e.g. availability of different sport equipment) instead of more general
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49 310 parenting-related factors (e.g. logistic support). Consequently, future interventions in
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51 311 a general population of parents may promote availability of sports equipment at home
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53 312 and limited gaming of parents. Furthermore, parents might learn how they can
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3 313 motivate their child to be physically active (e.g. by giving positive feedback or by
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5 314 letting him/her choose between different kinds of PA) which might enhance parental
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7 315 self-efficacy concerning motivating for PA and finally may lead to more PA for their
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10 316 child. However, it must be kept in mind that our study findings are based on cross-
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12 317 sectional results, suggesting that no causal inferences can be made.
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16 319 Although these three parenting-related factors were associated with PA or screen-time
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18 320 in children in the total sample, it has to be acknowledged that many specific parenting
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20 321 practices did not significantly influence children's PA or screen-time behavior when
21
22 322 they were entered into the multivariable model. Although this is similar to a previous
23
24 323 study of van Sluijs et al. [44] which also found many single, but only a few
25
26 324 multivariable associations between correlates and children's behavior, our results
27
28 325 were in contrast to what we expected. Dividing more general parenting practices into
29
30 326 very concrete specific parenting practices and investigating the parental self-efficacy
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32 327 related to each specific parenting practices were thought to be of extra value in
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34 328 identifying parental correlates of PA and screen-time in children. Nevertheless, the
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36 329 stratified analyses revealed that several parenting practices and related self-efficacy
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38 330 were only significantly related to children's physical activity and screen-time
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40 331 behavior in specific subgroups. Regarding parental BMI and family SES, only
41
42 332 significant association between specific parenting practices and related self-efficacy
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44 333 and PA and screen-time were found in normal weight families and families with a
45
46 334 medium-high SES. These findings suggest that more research is needed to discover
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48 335 other parenting-related factors to increase physical activity and reduce screen-time in
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50 336 at risk families (high BMI and low SES).
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3 337 Child's age seemed to be a significant influencing factor in the associations between
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5 338 parental self-efficacy for motivating your child to be physically active and PA in
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7 339 younger children. Only borderline significant effects were found in older children.
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10 340 Also literature shows that parental control begins to fade as the child grows up and
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12 341 that older primary schoolchildren (9-12 year) get more freedom and decision-making
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14 342 power of their parents [45]. Furthermore, previous research examining associations
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16 343 between parenting practices and related self-efficacy and children's diet showed that
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18 344 associations were only significant for younger children (6-8 years old) (De Lepeleere
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21 345 S., Verloigne M., Cardon G., and De Bourdeaudhuij I.; submitted).
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23 346 Finally gender seemed to be an important influencing factor in the relationship
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25 347 between parenting practices and parental self-efficacy with PA and screen-time. For
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27 348 PA, girls were more physically active when parents did not find it difficult to be
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29 349 physically active themselves and did not find it difficult to motivate their child to be
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31 350 physically active whereas for screen-time boys had a lower screen-time if parents let
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33 351 their child ask for permission to watch TV, if parents followed up their rules about
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35 352 gaming and if they limited their own gaming. Therefore, the current study results
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37 353 could suggest that future interventions might focus on different parenting strategies
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39 354 when targeting different groups of families to increase children's PA and limit
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41 355 children's screen-time. This finding is very important for future intervention
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43 356 developers to not make one general intervention for all parents but to tailor
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45 357 interventions to subgroups [46].
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359 **Strengths and limitations**

360 The main strength of the current study is the presentation of valuable and unique
361 research data since it examined associations of both specific parenting practices and

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3 362 related parental self-efficacy with children's PA and screen-time. For every specific
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5 363 parenting practice, a related parental self-efficacy was defined which gives more
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7 364 insight into parental correlates of children's PA and screen-time compared to the more
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10 365 general formulated parenting practices. To our knowledge, parental self-efficacy
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12 366 related to specific parenting practices has only been investigated in one study [27].
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14 367 Furthermore, analyses were conducted to study if associations between specific
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16 368 parenting practices and related parental self-efficacy and children's PA and screen-
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18 369 time behavior differed for specific subgroups. This information could be important for
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21 370 future intervention developers to tailor the intervention to a specific subgroup.
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23 371 However, this study was also subjected to some limitations. First, the self-report
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25 372 questionnaires may have led to inconsistency with actual experiences or social
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27 373 desirability bias. Secondly, both PA and screen-time were assessed by adding up
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29 374 minutes spent in different behaviors (PA: active transportation and time spent in
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31 375 sports; screen-time: time spent watching TV, playing computer games and using game
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33 376 consoles for both weekend and weekdays). Consequently, the association of the parenting
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35 377 related factors with the different behaviors as such were not investigated. Another
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37 378 limitation of the present study is that the screen-time measure did not include
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39 379 smartphone use. Currently, the use of smart phones in primary schoolchildren in
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41 380 Flanders is still limited [47] but the evolving nature of screen-time behaviors suggests
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43 381 that future studies could also include it as part of the screen-time behavior, even in a
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45 382 primary school age group. Fourthly, interval scales were used to measure specific
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47 383 parenting practices and related parental self-efficacy. Therefore, absolute magnitudes
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49 384 of these variables can not be provided. Next, because the present study was a cross-
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51 385 sectional study, it was not possible to make statements about the causality.
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54 386 Furthermore, since the number of participants in the stratified analyses for screen-time
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3 387 with family SES and child's age was too small, it was not relevant to investigate these
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5 388 associations separately. Finally, 88% of participants were female and 84% of
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7 389 participating parents had a medium-high SES, which may have contributed to a
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10 390 certain amount of selection bias. Therefore, we should be cautious about generalizing
11
12 391 our findings to all parents of primary schoolchildren.
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16 393 **Conclusions**

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19 394 This study is unique since it investigated the association between very specific
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21 395 parenting practices as well as related parental self-efficacy and primary
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23 396 schoolchildren's PA and screen-time, which is an understudied subject. In contrast to
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25 397 what we expected, the findings of this study showed that only a very few specific
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27 398 parenting practices and related parental self-efficacy were associated with children's
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29 399 PA and screen-time, although more significant associations were found within
30
31 400 specific subgroups. More experimental (i.e. effect evaluation studies of family-
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33 401 focused interventions targeting PA and screen-time of primary schoolchildren) and
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35 402 longitudinal studies are needed to provide evidence for predictive associations
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37 403 between parenting-related factors and children's PA and screen-time.
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40 405 **List of abbreviations used**

41 406 BMI: Body Mass Index

42 407 PA: physical activity

43 408 SE: self-efficacy

44 409 SES: social economic status

45 410

411 **Acknowledgements**

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414 Family’. The content of this article reflects only the authors’ views and the Flemish
415 government is not liable for any use that may be made of the information contained
416 therein.

418 **Contributorship statement**

419 SDL, MV, GC and IDB developed the information flyers and the online
420 questionnaire. Furthermore, SDL and MV conducted the Single and Multiple Linear
421 Regression and Moderated Regression analyses. SDL drafted the manuscript. All
422 authors revised the article critically for important intellectual content and approved
423 the final manuscript.

425 **Competing interests**

426 The authors declare that they have no competing interests.

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432 **Data sharing statement**

433 No additional data are available.

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References

1. James J, Kerr D: Prevention of childhood obesity by reducing soft drinks. *Int J Obes (Lond)* 2005, **29 Suppl 2**: S54-S57.
2. Moreno LA, Rodriguez G: Dietary risk factors for development of childhood obesity. *Curr Opin Clin Nutr Metab Care* 2007, **10**: 336-341.
3. Carrel AL, Clark RR, Peterson SE, Nemeth BA, Sullivan J, Allen DB: Improvement of fitness, body composition, and insulin sensitivity in overweight children in a school-based exercise program: a randomized, controlled study. *Arch Pediatr Adolesc Med* 2005, **159**: 963-968.
4. Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK *et al.*: Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med* 1999, **153**: 409-418.
5. Robinson TN: Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA* 1999, **282**: 1561-1567.
6. Riddoch CJ, Bo AL, Wedderkopp N, Harro M, Klasson-Heggebo L, Sardinha LB *et al.*: Physical activity levels and patterns of 9- and 15-yr-old European children. *Med Sci Sports Exerc* 2004, **36**: 86-92.
7. van Sluijs EM, Skidmore PM, Mwanza K, Jones AP, Callaghan AM, Ekelund U *et al.*: Physical activity and dietary behaviour in a population-based sample of British 10-year old children: the SPEEDY study (Sport, Physical activity and Eating behaviour: environmental Determinants in Young people). *BMC Public Health* 2008, **8**: 388.
8. Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M: Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc* 2008, **40**: 181-188.
9. Verloigne M, Van LW, Maes L, Yildirim M, Chinapaw M, Manios Y *et al.*: Levels of physical activity and sedentary time among 10- to 12-year-old boys and girls across 5 European countries using accelerometers: an observational study within the ENERGY-project. *Int J Behav Nutr Phys Act* 2012, **9**: 34.
10. Tremblay MS, LeBlanc AG, Kho ME, Saunders TJ, Larouche R, Colley RC *et al.*: Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *Int J Behav Nutr Phys Act* 2011, **8**: 98.
11. Brug J, van Stralen MM, Te Velde SJ, Chinapaw MJ, De B, I, Lien N *et al.*: Differences in Weight Status and Energy-Balance Related Behaviors among Schoolchildren across Europe: The ENERGY-Project. *PLoS One* 2012, **7**: e34742.
12. Trost SG, Loprinzi PD: Parental Influences on Physical Activity Behavior in Children and Adolescents: A Brief Review. *Am J Lifestyle Med* 2011, **5**: 171-181.

- 1
2
3 474 13. Beets MW, Cardinal BJ, Alderman BL: Parental social support and the
4 475 physical activity-related behaviors of youth: a review. *Health Educ Behav*
5 476 2010, **37**: 621-644.
- 7 477 14. Edwardson CL, Gorely T: Activity-related parenting practices and children's
8 478 objectively measured physical activity. *Pediatr Exerc Sci* 2010, **22**: 105-113.
- 10 479 15. Gustafson SL, Rhodes RE: Parental correlates of physical activity in children
11 480 and early adolescents. *Sports Med* 2006, **36**: 79-97.
- 13 481 16. Trost SG, Sallis JF, Pate RR, Freedson PS, Taylor WC, Dowda M: Evaluating
14 482 a model of parental influence on youth physical activity. *Am J Prev Med* 2003,
15 483 **25**: 277-282.
- 17 484 17. Lindsay AC, Sussner KM, Kim J, Gortmaker S: The role of parents in
18 485 preventing childhood obesity. *Future Child* 2006, **16**: 169-186.
- 20 486 18. Campbell K, Hesketh K, Crawford D, Salmon J, Ball K, McCallum Z: The
21 487 Infant Feeding Activity and Nutrition Trial (INFANT) an early intervention to
22 488 prevent childhood obesity: cluster-randomised controlled trial. *BMC Public*
23 489 *Health* 2008, **8**: 103.
- 25 490 19. Gerards SM, Sleddens EF, Dagnelie PC, de Vries NK, Kremers SP:
26 491 Interventions addressing general parenting to prevent or treat childhood
27 492 obesity. *Int J Pediatr Obes* 2011, **6**: e28-e45.
- 29 493 20. Jago R, Davison KK, Brockman R, Page AS, Thompson JL, Fox KR:
30 494 Parenting styles, parenting practices, and physical activity in 10- to 11-year
31 495 olds. *Prev Med* 2011, **52**: 44-47.
- 33 496 21. Verloigne M, Van LW, Maes L, Brug J, De B, I: Family- and school-based
34 497 correlates of energy balance-related behaviours in 10-12-year-old children: a
35 498 systematic review within the ENERGY (European Energy balance Research
36 499 to prevent excessive weight Gain among Youth) project. *Public Health Nutr*
37 500 2012, **15**: 1380-1395.
- 39 501 22. Kaplan JP, Liverman CT, Kraak VI: *Preventing Childhood Obesity: Health in*
40 502 *the Balance*. Washington: National Academies Press; 2004.
- 42 503 23. De Lepeleere S., DeSmet A., Verloigne M, Cardon G, De Bourdeaudhuij I:
43 504 What practices do parents perceive as effective or ineffective in promoting a
44 505 healthy diet, physical activity, and less sitting in children: parent focus groups.
45 506 *BMC Public Health* 2013, **13**: 1067.
- 47 507 24. Jones TL, Prinz RJ: Potential roles of parental self-efficacy in parent and child
48 508 adjustment: a review. *Clin Psychol Rev* 2005, **25**: 341-363.
- 50 509 25. Jago R, Edwards MJ, Urbanski CR, Sebire SJ: General and specific
51 510 approaches to media parenting: a systematic review of current measures,
52 511 associations with screen-viewing, and measurement implications. *Child Obes*
53 512 2013, **9 Suppl**: S51-S72.

- 1
2
3 513 26. Trost SG, McDonald S, Cohen A: Measurement of general and specific
4 514 approaches to physical activity parenting: a systematic review. *Child Obes*
5 515 2013, **9 Suppl**: S40-S50.
- 7 516 27. Jago R, Sebire SJ, Edwards MJ, Thompson JL: Parental TV viewing, parental
8 517 self-efficacy, media equipment and TV viewing among preschool children.
9 518 *Eur J Pediatr* 2013, **172**: 1543-1545.
- 11 519 28. Duke RE, Bryson S, Hammer LD, Agras WS: The relationship between
12 520 parental factors at infancy and parent-reported control over children's eating at
13 521 age 7. *Appetite* 2004, **43**: 247-252.
- 15 522 29. Cullen KW, Baranowski T, Owens E, Marsh T, Rittenberry L, de MC:
16 523 Availability, accessibility, and preferences for fruit, 100% fruit juice, and
17 524 vegetables influence children's dietary behavior. *Health Educ Behav* 2003, **30**:
18 525 615-626.
- 20 526 30. Blissett J, Haycraft E: Are parenting style and controlling feeding practices
21 527 related? *Appetite* 2008, **50**: 477-485.
- 23 528 31. Reynolds KD, Hinton AW, Shewchuk RM, Hickey CA: Social Cognitive
24 529 Model of Fruit and Vegetable Consumption in Elementary School Children.
25 530 *Journal of Nutrition Education* 1999, **31**: 23-30.
- 27 531 32. Garcia F, Gracia E: Is always authoritative the optimum parenting style?
28 532 Evidence from Spanish families. *Adolescence* 2009, **44**: 101-131.
- 30 533 33. Papaioannou MA, Cross MB, Power TG, Liu Y, Qu H, Shewchuk RM *et al.*:
31 534 Feeding Style Differences in Food Parenting Practices Associated With Fruit
32 535 and Vegetable Intake in Children From Low-income Families. *J Nutr Educ*
33 536 *Behav* 2013, **45**: 643-651.
- 35 537 34. Wagner A, Klein-Platat C, Arveiler D, Haan MC, Schlienger JL, Simon C:
36 538 Parent-child physical activity relationships in 12-year old French students do
37 539 not depend on family socioeconomic status. *Diabetes Metab* 2004, **30**: 359-
38 540 366.
- 39 541 35. Winkleby MA, Jatulis DE, Frank E, Fortmann SP: Socioeconomic status and
40 542 health: how education, income, and occupation contribute to risk factors for
41 543 cardiovascular disease. *Am J Public Health* 1992, **82**: 816-820.
- 43 544 36. Physical status: the use and interpretation of anthropometry. Report of a WHO
44 545 Expert Committee. *World Health Organ Tech Rep Ser* 1995, **854**: 1-452.
- 46 546 37. Deforche B, De Bourdeaudhuij I, D'hondt E, Cardon G: Objectively measured
47 547 physical activity, physical activity related personality and body mass index in
48 548 6- to 10-yr-old children: a cross-sectional study. *Int J Behav Nutr Phys Act*
49 549 2009, **6**: 25.
- 51 550 38. Philippaerts RM, Matton L, Wijndaele K, Balduck AL, De B, I, Lefevre J:
52 551 Validity of a physical activity computer questionnaire in 12- to 18-year-old
53 552 boys and girls. *Int J Sports Med* 2006, **27**: 131-136.

- 1
2
3 553 39. Larios SE, Ayala GX, Arredondo EM, Baquero B, Elder JP: Development and
4 554 validation of a scale to measure Latino parenting strategies related to
5 555 children's obesigenic behaviors. The parenting strategies for eating and
6 556 activity scale (PEAS). *Appetite* 2009, **52**: 166-172.
- 8 557 40. Sherwood NE, Taylor WC, Treuth M, Klesges LM, Baranowski T, Zhou A *et al.*:
9 558 Measurement characteristics of activity-related psychosocial measures in
10 559 8- to 10-year-old African-American girls in the Girls Health Enrichment
12 560 Multisite Study (GEMS). *Prev Med* 2004, **38 Suppl**: S60-S68.
- 14 561 41. Decker JW: Initial development and testing of a questionnaire of parental self-
15 562 efficacy for enacting healthy lifestyles in their children. *J Spec Pediatr Nurs*
16 563 2012, **17**: 147-158.
- 18 564 42. Crespo NC, Elder JP, Ayala GX, Slymen DJ, Campbell NR, Sallis JF *et al.*:
19 565 Results of a Multi-level Intervention to Prevent and Control Childhood
20 566 Obesity among Latino Children: The Aventuras Para Ninos Study. *Ann Behav*
22 567 *Med* 2012, **43**: 84-100.
- 24 568 43. Vik FN, Lien N, Berntsen S, De B, I, Grillenberger M, Manios Y *et al.*:
25 569 Evaluation of the UP4FUN intervention: a cluster randomized trial to reduce
26 570 and break up sitting time in European 10-12-year-old children. *PLoS One*
27 571 2015, **10**: e0122612.
- 29 572 44. van Sluijs EM, Page A, Ommundsen Y, Griffin SJ: Behavioural and social
30 573 correlates of sedentary time in young people. *Br J Sports Med* 2010, **44**: 747-
31 574 755.
- 33 575 45. Roberts BP, Blinkhorn AS, Duxbury JT: The power of children over adults
34 576 when obtaining sweet snacks. *Int J Paediatr Dent* 2003, **13**: 76-84.
- 36 577 46. Noar SM, Benac CN, Harris MS: Does tailoring matter? Meta-analytic review
37 578 of tailored print health behavior change interventions. *Psychol Bull* 2007, **133**:
38 579 673-693.
- 41 580 47. Zarouali B, De Pauw P, Walrave M, Poels K, Ponnet K, Panic K *et al.*.
42 581 Mediabezit en -gebruik bij minderjarigen. Een rapport in het kader van het
43 582 AdLit onderzoeksproject. Document beschikbaar op www.AdLit.be. 2015.
44 583 Ref Type: Report
45 584
46 585

586 **Tables**587 **Table 1: Formulations and descriptive statistics of the questionnaire items of the specific parenting-related factors**

Factor	Question item	Response alternatives	N (%)	Mean (SD)
Physical activity				
Availability	Bike	1 = no	N=1 (0.5%)	
		2 = yes	N=197 (95.2%)	
	Tennis or badminton racket	1 = no	N=29 (14.0%)	
		2 = yes	N=169 (81.6%)	
	Ball (basketball/volleyball/football)	1 = no	N=6 (2.9%)	
		2 = yes	N=192 (92.8%)	
	Sport shoes	1 = no	N=2 (1.0%)	
2 = yes		N=196 (94.7%)		
Skip rope	1 = no	N=30 (14.5%)		
	2 = yes	N=168 (81.2%)		
Roller-skates	1 = no	N=66 (31.9%)		
	2 = yes	N=130 (62.8%)		
Skateboard	1 = no	N=88 (42.5%)		
	2 = yes	N=108 (52.2%)		
Monitoring	I monitor the amount of PA of my child	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=20 (9.7%) N=46 (22.2%) N=29 (14.0%) N=72 (34.8%) N=30 (14.5%)	3.23 (1.25)
Modeling	I am physically active nearby my child	1 = never 2 = rarely	N=13 (6.3%) N=49 (23.7%)	3.16 (1.17)

		3 = sometimes 4 = often 5 = always 6 = not applicable	N=55 (26.6%) N=47 (22.7%) N=30 (14.5%) N=3 (1.4%)	
Motivating	I try to motivate my child to be physically active	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always 6 = not applicable	N=6 (2.9%) N=13 (6.3%) N=50 (24.2%) N=67 (32.4%) N=45 (21.7%) N=15 (7.2%)	3.73 (1.02)
Reinforcing	I reinforce my child when he/she is physically active	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=6 (2.9%) N=21 (10.1%) N=38 (18.4%) N=97 (46.9%) N=36 (17.4%)	3.69 (0.99)
Giving choice	I let my child choose between different kinds of physical activities he/she wants to do	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=1 (0.5%) N=4 (1.9%) N=30 (14.5%) N=98 (47.3%) N=64 (30.9%)	4.12 (0.77)
Involving	I am physically active together with my child	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=27 (13.0%) N=54 (26.1%) N=93 (44.9%) N=18 (8.7%) N=6 (2.9%)	2.61 (0.94)
	I involve my child in household chores (e.g. cooking, cleaning, washing the dishes,...)	1 = never 2 = rarely 3 = sometimes	N=6 (2.9%) N=25 (12.1%) N=100 (48.3%)	3.22 (0.86)

		4 = often 5 = always	N=54 (26.1%) N=13 (6.3%)	
SE Availability	It is difficult for me to have sports equipment at home for my child.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=48 (23.2%) N=10 (4.8%) N=2 (1.0%) N=0 (0.0%) N=0 (0.0%)	1.23 (0.50)
SE Monitoring	It is difficult for me to monitor the amount of PA of my child.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=78 (37.7%) N=60 (29.0%) N=30 (14.5%) N=23 (11.1%) N=5 (2.4%)	2.07 (1.12)
SE Modeling	It is difficult for me to be physically active nearby my child.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree 6 = not applicable	N=46 (22.2%) N=29 (14.0%) N=50 (24.2%) N=36 (17.4%) N=32 (15.5%) N=4 (1.9%)	2.89 (1.40)
SE Motivating	It is difficult for me to motivate my child to be physically active.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=70 (33.8%) N=59 (28.5%) N=41 (19.8%) N=21 (10.1%) N=3 (1.4%)	2.11 (1.07)
SE Reinforcing	It is difficult for me to reinforce my child when he/she is physically active.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=119 (57.5%) N=39 (18.8%) N=24 (11.6%) N=12 (5.8%) N=1 (0.5%)	1.65 (0.95)

SE Giving choice	It is difficult for me to let my child choose between different kinds of physical activities he/she wants to do.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=102 (49.3%) N=62 (30.0%) N=24 (11.6%) N=6 (2.9%) N=1 (0.5%)	1.68 (0.85)
SE Involving	It is difficult for me to be physically active together with my child.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=45 (21.7%) N=32 (15.5%) N=56 (27.1%) N=37 (17.9%) N=25 (12.1%)	2.82 (1.33)
	It is difficult for me to involve my child in household chores (e.g. cooking, cleaning, washing the dishes,...).	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=62 (30.0%) N=42 (20.3%) N=61 (29.5%) N=25 (12.1%) N=5 (2.4%)	2.33 (1.13)
Screen-time				
Availability	How many pc's do you have at home (include also laptops and tablets)	1 = none 2 = one		3.80 (1.25)
	How many game consoles (e.g. Nintendo, Wii, PlayStation,...) do you have at home?	3 = two 4 = three 5 = four		2.26 (1.13)
	How many TV's do you have at home?	6 = more than four		2.47 (0.80)
Permission	My child has to ask for permission to play videogames, computer games, PlayStation, Nintendo,...	1 = disagree 2 = agree 3 = not applicable	N=19 (9.2%) N=154 (74.4%) N=20 (9.7%)	1.89 (0.31)
	My child has to ask for permission to watch TV.	1 = disagree 2 = agree	N=34 (16.4%) N=156 (75.4%)	1.82 (0.38)

		3 = not applicable	N=3 (1.4%)	
Rules	In our family, there are rules about the moments (when and how long) my child is allowed to play videogames, computer games, PlayStation, Nintendo,...	1 = disagree 2 = agree 3 = not applicable	N=39 (18.8%) N=131 (63.3%) N=23 (11.1%)	1.77 (0.42)
	In our family, there are rules about the moments (when and how long) my child is allowed to watch TV.	1 = disagree 2 = agree 3 = not applicable	N=47 (22.7%) N=143 (69.1%) N=2 (1.0%)	1.75 (0.43)
Being consistent	The rules about when and how long my child is allowed to play videogames, computer games, PlayStation, Nintendo,...., are followed up.	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=2 (1.0%) N=4 (1.9%) N=22 (10.6%) N=76 (36.7%) N=27 (13.0%)	3.93 (0.80)
	The rules about when and how long my child is allowed to watch TV are followed up.	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=0 (0.0%) N=1 (0.5%) N=18 (8.7%) N=105 (50.7%) N=19 (9.2%)	3.99 (0.54)
Giving an explanation	I explain to my child why there are rules about when he/she is allowed to play videogames, computer games, PlayStation, Nintendo,...	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=0 (0.0%) N=7 (3.4%) N=17 (8.2%) N=59 (28.5%) N=47 (22.7%)	4.12 (0.84)
	I explain to my child why there are rules about when he/she is allowed to watch TV.	1 = never 2 = rarely 3 = sometimes 4 = often	N=0 (0.0%) N=8 (3.9%) N=24 (11.6%) N=65 (31.4%)	4.04 (0.85)

		5 = always	N=46 (22.2%)	
Monitoring	I monitor the time my child plays videogames, computer games, PlayStation, Nintendo,...	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=14 (6.8%) N=24 (11.6%) N=29 (14.0%) N=84 (40.6%) N=26 (12.6%)	3.47 (1.14)
	I monitor the time my child watches TV.	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=14 (6.8%) N=29 (14.0%) N=38 (18.4%) N=93 (44.9%) N=20 (9.7%)	3.39 (1.09)
Modeling	I limit my own playing of videogames, computer games, PlayStation, Nintendo,... nearby my child.	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always 6 = not applicable	N=3 (1.4%) N=10 (4.8%) N=10 (4.8%) N=22 (10.6%) N=45 (21.7%) N=107 (51.7%)	4.07 (1.17)
	I limit my own TV-time nearby my child.	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always 6 = not applicable	N=9 (4.3%) N=19 (9.2%) N=26 (12.6%) N=72 (34.8%) N=50 (24.2%) N=21 (10.1%)	3.77 (1.13)
Permissiveness	My child can choose him/herself when he/she wants to play videogames, computer games, PlayStation, Nintendo,...	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=52 (25.1%) N=68 (32.9%) N=43 (20.8%) N=11 (5.3%) N=3 (1.4%)	2.12 (0.96)

	My child can choose him/herself how long he/she wants to play videogames, computer games, PlayStation, Nintendo,...	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=72 (34.8%) N=72 (34.8%) N=27 (13.0%) N=4 (1.9%) N=1 (0.5%)	1.81 (0.82)
	My child can choose him/herself when he/she wants to watch TV.	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=56 (27.1%) N=76 (36.7%) N=41 (19.8%) N=17 (8.2%) N=4 (1.9%)	2.16 (1.01)
	My child can choose him/herself how long he/she wants to watch TV.	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always	N=68 (32.9%) N=81 (39.1%) N=35 (16.9%) N=9 (4.3%) N=1 (0.5%)	1.94 (0.87)
Motivating	I try to motivate my child to play less videogames, computer games, PlayStation, Nintendo,...	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always 6 = not applicable	N=6 (2.9%) N=21 (10.1%) N=46 (22.2%) N=66 (31.9%) N=22 (10.6%) N=15 (7.2%)	3.48 (1.01)
	I try to motivate my child to watch less TV.	1 = never 2 = rarely 3 = sometimes 4 = often 5 = always 6 = not applicable	N=5 (2.4%) N=25 (12.2%) N=64 (30.9%) N=64 (30.9%) N=22 (10.6%) N=13 (87.0%)	3.41 (0.97)
SE permission	It is difficult for me to let my child	1 = completely disagree	N=110 (53.1%)	1.61 (0.94)

	ask for permission to play videogames, computer games, PlayStation, Nintendo,...	2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree 6 = not applicable	N=38 (18.4%) N=20 (9.7%) N=6 (2.9%) N=3 (1.4%) N=19 (9.2%)	
	It is difficult for me to let my child ask for permission to watch TV.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree 6 = not applicable	N=119 (57.5%) N=44 (21.3%) N=13 (6.3%) N=9 (4.3%) N=5 (2.4%) N=5 (2.4%)	1.62 (0.99)
SE rules	It is difficult for me to apply rules about the moments my child is allowed to play videogames, computer games, PlayStation, Nintendo,...	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree 6 = not applicable	N=83 (40.1%) N=49 (23.7%) N=23 (11.1%) N=16 (7.7%) N=5 (2.4%) N=19 (9.2%)	1.93 (1.11)
	It is difficult for me to apply rules about the moments my child is allowed to watch TV.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree 6 = not applicable	N=88 (42.5%) N=53 (25.6%) N=25 (12.1%) N=16 (7.7%) N=6 (2.9%) N=5 (2.4%)	1.93 (1.11)
SE Being consistent	It is difficult for me to follow up the rules about the moments my child is allowed to play videogames, computer games, PlayStation, Nintendo,...	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=59 (28.5%) N=29 (14.0%) N=28 (13.5%) N=44 (5.3%) N=2 (1.0%)	1.98 (1.08)

	It is difficult for me to follow up the rules about the moments my child is allowed to watch TV.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=63 (30.4%) N=53 (20.8%) N=29 (14.0%) N=6 (2.9%) N=0 (0.0%)	1.84 (0.90)
SE Giving an explanation	It is difficult for me to explain to my child why there are rules about the moments my child is allowed to play videogames, computer games, PlayStation, Nintendo,...	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=75 (36.2%) N=29 (14.0%) N=17 (8.2%) N=8 (3.9%) N=0 (0.0%)	1.67 (0.93)
	It is difficult for me to explain to my child why there are rules about the moments my child is allowed to watch TV.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=78 (37.7%) N=40 (19.3%) N=15 (7.2%) N=6 (2.9%) N=0 (0.0%)	1.63 (0.84)
SE Monitoring	It is difficult for me to monitor the time my child plays videogames, computer games, PlayStation, Nintendo,...	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=78 (37.7%) N=56 (27.1%) N=24 (11.6%) N=29 (14.0%) N=9 (4.3%)	2.16 (1.23)
	It is difficult for me to monitor the time my child watches TV.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=75 (36.2%) N=63 (30.4%) N=24 (11.6%) N=28 (13.5%) N=7 (3.4%)	2.13 (1.18)
SE Modeling	It is difficult for me to limit my own playing of videogames, computer games, PlayStation, Nintendo,...	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree	N=93 (44.9%) N=29 (14.0%) N=10 (4.8%)	1.44 (0.76)

	nearby my child.	4 = mostly agree 5 = completely agree 6 = not applicable	N=2 (1.0%) N=1 (0.5%) N=61 (29.5%)	
	It is difficult for me to limit my own TV-time nearby my child.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree 6 = not applicable	N=104 (50.2%) N=56 (27.1%) N=18 (8.7%) N=6 (2.9%) N=2 (1.0%) N=11 (5.3%)	1.63 (0.87)
SE Motivating	It is difficult for me to motivate my child to play less videogames, computer games, PlayStation, Nintendo,...	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=61 (29.5%) N=42 (20.3%) N=39 (18.8%) N=27 (13.0%) N=7 (3.4%)	2.30 (1.21)
	It is difficult for me to motivate my child to watch less TV.	1 = completely disagree 2 = mostly disagree 3 = sometimes disagree/sometimes agree 4 = mostly agree 5 = completely agree	N=66 (31.9%) N=59 (28.5%) N=38 (18.4%) N=24 (11.6%) N=4 (1.9%)	2.17 (1.10)

588 PA = physical activity; SE = self-efficacy

589 **Table 2: Descriptive characteristics of the sample**

Participants (n=207)	Mean (\pm SD) or Percentage
Age of person who completed the questionnaire	40.2 (\pm 5.0) year
Person who completed the questionnaire:	
- Mother	87.4 %
- Father	10.7 %
- Adoption mother	1.0 %
- Stepmother	0.5 %
- Grandfather	0.5 %
SES family:	
- Low	16.5 %
- Medium-High	83.5 %
BMI class mother:	
- Underweight	2.1 %
- Normal weight	68.2 %
- Overweight	20.5 %
- Obese	9.2 %
BMI class father:	
- Underweight	1.1 %
- Normal weight	56.2 %
- Overweight	37.3 %
- Obese	5.4 %
Number of children per family	2 (range 1-5)
Gender of the child for who the questionnaire was filled out:	
- Boy	51.7 %
- Girl	48.3 %
Age of the child for who the questionnaire was filled out	9.4 (\pm 1.6) year
Physical activity child	51 (\pm 31) minutes/day
Screen-time child	2.2 (\pm 1.9) hour/day

590 SD=standard deviation; SES=Socio-economic status; BMI=Body Mass Index

591

592 **Table 3: Associations between parenting practices, related self-efficacy and children's**

593 **PA and screen-time.**

Outcome Variable: Physical Activity (minutes/day)				
Full model	N	Adjusted R ²	F	p-value
	170	.161	3.942	<.001
Explanatory variables		β	β 95 % CI	p-value
Family SES		-.10	[-.59;.40]	.20
BMI mother		.01	[-.18;.19]	.91
BMI father		-.01	[-.25;.22]	.88
Child's age		.15	[-.33;.63]	.05
Child's gender		.11	[-1.34;1.56]	.14

Availability of sports equipment		.14	[-.50;.78]	.06
SE for monitoring PA		.07	[-.67;.80]	.42
SE for modeling PA		.15	[-.50;.79]	.11
SE for motivating PA		.18	[-.63;-1.00]	.04
SE for giving PA choice		.09	[-.85;1.02]	.27
SE for involving PA		-.00	[-.71;.70]	.97
Outcome Variable: Screen-time (minutes/day)				
Full model	N	Adjusted R²	F	p-value
	50	.483	4.047	<.001
Explanatory variables		β	β 95 % CI	p-value
Family SES		-.16	[-1.40;1.09]	.19
BMI mother		.17	[-.27;.62]	.19
BMI father		.06	[-.56;.69]	.63
Child's age		-.16	[-1.56;1.23]	.21
Child's gender		.04	[-4.37;4.44]	.78
Availability of TV's		-.03	[-2.31;2.27]	.81
Availability of game consoles		.16	[-1.48;1.79]	.17
Permission to watch TV		-.20	[-7.54;7.14]	.15
Being consistent about TV		-.09	[-4.65;4.48]	.57
Being consistent about games		-.27	[-4.06;3.53]	.14
Monitoring of TV		-.18	[-2.15;1.79]	.16
Modeling for games		-.40	[-2.49;1.69]	.01
Permissiveness how long games		.03	[-3.68;3.74]	.83
SE for monitoring TV		.01	[-2.53;2.54]	.96
SE for motivating games		-.01	[-2.38;2.36]	.94

594 PA=physical activity; SE = self-efficacy; β = standardized beta-coefficient; CI = confidence
595 interval

596 **Table 4: Associations between parenting practices, related self-efficacy and children's PA and screen-time stratified for parental BMI, family SES,**
 597 **child's age and child's gender.**

Outcome Variable: Physical Activity (minutes/day)	Normal BMI				One or both parents with high BMI			
Full model	N	Adjusted R²	F	p-value	N	Adjusted R²	F	p-value
	78	.167	2.714	.009	92	.122	2.401	.018
Explanatory variables	β	β 95 % CI	p-value		β	β 95 % CI	p-value	
Family SES	-.08	[-.89;.74]	.47		-.12	[-.75;.51]	.25	
Child's age	.17	[-.63;.92]	.23		.18	[-.49;.84]	.10	
Child's gender	.18	[-2.08;2.43]	.11		.04	[-1.93;2.01]	.70	
Availability of sports equipment	.11	[-1.07;1.29]	.36		.18	[-.77;1.12]	.11	
SE for monitoring PA	.11	[-1.03;1.26]	.35		-.01	[-.98;.97]	.96	
SE for modeling PA	.25	[-0.76;1.25]	.07		.05	[-.85;.95]	.70	
SE for motivating PA	.21	[-1.15;1.57]	.10		.15	[-.90;1.20]	.23	
SE for giving PA choice	.08	[-1.61;1.77]	.51		.07	[-1.10;1.24]	.52	
SE for involving PA	-.06	[-1.10;.99]	.67		.10	[-.91;1.10]	.46	
Outcome Variable: Screen-time (minutes/day)	Normal BMI				One or both parents with high BMI			
Full model	N	Adjusted R²	F	p-value	N	Adjusted R²	F	p-value
	23	.375	2.015	.148	27	.478	2.834	0.036
Explanatory variables	β	β 95 % CI	p-value		β	β 95 % CI	p-value	
Family SES	-.05	[-1.86;1.75]	.79		-.26	[-2.33;1.82]	.18	
Child's age	-.53	[-3.35;2.29]	.20		-.11	[-2.31;2.10]	.55	
Child's gender	-.19	[-8.39;8.01]	.54		-.14	[-8.67;8.39]	.53	
Availability of TV's	-.71	[-8.35;6.93]	.08		.20	[-4.89;5.30]	.37	

Availability of game consoles	.41	[-1.57;2.39]	.12	.08	[-4.55;4.71]	.73 598
Permission to watch TV	-.22	[-10.53;10.09]	.38	-.22	[-12.88;12.44]	.37 599
Being consistent about TV	.50	[-8.66;9.66]	.31	-.08	[-8.19;8.04]	.72 600
Being consistent about games	-1.62	[-11.08;7.83]	.02	-.32	[-5.68;5.04]	.19 601
Monitoring of TV	-.33	[-2.80;2.14]	.21	.04	[-4.42;4.50]	.87 602
Modeling for games	-.70	[-4.66;3.26]	.03	-.33	[-3.75;3.10]	.20 603
Permissiveness how long games	-.51	[-6.21;5.20]	.10	.39	[-6.65;7.42]	.20 604
SE for monitoring TV	-.04	[-4.54;4.46]	.90	.16	[-3.95;4.27]	.48 605
SE for motivating games	.31	[-3.29;3.91]	.40	-.24	[-4.69;4.20]	.37 606

608 PA=physical activity; SE = self-efficacy; β = standardized beta-coefficient; CI = confidence interval
 609

Outcome Variable: Physical Activity (minutes/day)	Low SES				Medium-high SES			
	N	Adjusted R ²	F	p-value	N	Adjusted R ²	F	p-value
Full model	28	.244	.471	.887	141	.206	4.625	<.001
Explanatory variables		β	β 95 % CI	p-value		β	β 95 % CI	p-value
BMI mother		.05	[-.36;.47]	.83		-.01	[-.23;.21]	.93
BMI father		.19	[-.44;.82]	.51		-.01	[-.29;.26]	.88
Child's age		.09	[-1.42;1.60]	.73		.14	[-.39;.67]	.08
Child's gender		.08	[-4.76;4.91]	.77		.10	[-1.50;4.70]	.21
Availability of sports equipment		.03	[-1.77;1.82]	.92		.20	[-.61;1.00]	.02
SE for monitoring PA		-.07	[-2.42;2.28]	.83		.12	[-.69;.93]	.16
SE for modeling PA		-.33	[-2.80;2.15]	.41		.21	[-.49;.91]	.03
SE for motivating PA		.49	[-2.43;3.42]	.15		.15	[-.74;1.03]	.11
SE for giving PA choice		-.06	[-3.54;3.41]	.82		.07	[-.92;1.06]	.39
SE for involving PA		-.03	[-2.05;1.98]	.91		.01	[-.77;.79]	.92

626 PA=physical activity; SE = self-efficacy; β = standardized beta-coefficient; CI = confidence interval

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Outcome Variable: Physical Activity (minutes/day)	Younger children (6-8 year)				Older children (9-12 year)			
	N	Adjusted R ²	F	p-value	N	Adjusted R ²	F	p-value
Full model	57	.189	2.304	.027	111	.060	1.696	.092
Explanatory variables		β	β 95 % CI	p-value		β	β 95 % CI	p-value
Family SES		-.04	[-.85;.78]	.80		-.14	[-.84;.55]	.16
BMI mother		.06	[-.22;.34]	.62		-.04	[-.29;.33]	.74
BMI father		.19	[-.22;.60]	.16		-.08	[-.38;.22]	.43
Child's gender		.08	[-2.34;2.50]	.53		.10	[-1.80;2.00]	.30
Availability of sports equipment		.08	[-1.00;1.15]	.55		.17	[-.67;1.00]	.09
SE for monitoring PA		.09	[-1.05;1.23]	.54		.09	[-.94;1.12]	.39
SE for modeling PA		.08	[-0.93;1.09]	.59		.22	[-.64;1.07]	.07
SE for motivating PA		.40	[-.85;1.65]	.02		.07	[-1.07;1.20]	.56
SE for giving PA choice		.10	[-1.29;1.49]	.49		.06	[-1.29;1.42]	.54
SE for involving PA		.02	[-1.39;1.44]	.90		-.07	[-.96;.83]	.58

644 PA=physical activity; SE = self-efficacy; β = standardized beta-coefficient; CI = confidence interval

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Outcome Variable: Physical Activity (minutes/day)	Girls				Boys			
	N	Adjusted R ²	F	p-value	N	Adjusted R ²	F	p-value
Full model	86	.253	3.880	<0.001	84	.048	1.419	.189
Explanatory variables		β	β 95 % CI	p-value		β	β 95 % CI	p-value
Family SES		-.03	[-.78;.73]	.82		-.11	[-.84;.62]	.35
BMI mother		.06	[-.18;.30]	.58		-.01	[-.30;.28]	.94

BMI father		.14	[-.20;.48]	.19		-.16	[-.50;.19]	.19	646
Child's age		.11	[-.50;.71]	.29		.21	[-.60;1.02]	.09	647
Availability of sports equipment		.20	[-.57;.98]	.05		.04	[-1.12;1.19]	.76	648
SE for monitoring PA		.04	[-1.04;1.12]	.77		.08	[-1.07;1.22]	.54	649
SE for modeling PA		.26	[-0.55;1.07]	.02		-.02	[-1.25;1.22]	.93	650
SE for motivating PA		.27	[-.90;1.43]	.04		.06	[-1.15;1.28]	.62	651
SE for giving PA choice		.07	[-1.16;1.30]	.51		.14	[-1.36;1.63]	.26	652
SE for involving PA		.04	[-.89;.97]	.74		.08	[-1.28;1.45]	.65	653
Outcome Variable: Screen-time (minutes/day)		Girls				Boys			
Full model	N	Adjusted R²	F	p-value	N	Adjusted R²	F	p-value	
	23	.450	2.285	.121	27	.688	5.095	.004	657
Explanatory variables		β	β 95 % CI	p-value		β	β 95 % CI	p-value	
Family SES		-.35	[-2.54;1.83]	.14		-.14	[-1.69;1.42]	.35	659
BMI mother		.38	[-.37;1.13]	.18		-.27	[-1.24;.70]	.25	660
BMI father		-.06	[-1.04;.92]	.79		.16	[-.70;1.02]	.35	661
Child's age		-.02	[-2.19;2.16]	.94		-.35	[-2.54;1.84]	.10	663
Availability of TV's		-.29	[-7.67;7.09]	.23		-.14	[-4.61;4.33]	.54	664
Availability of game consoles		.22	[-2.50;2.94]	.32		.22	[-2.32;2.75]	.21	665
Permission to watch TV		-.21	[-11.77;11.36]	.46		-.60	[-16.35;15.16]	.03	666
Being consistent about TV		.39	[-18.43;19.20]	.47		-.21	[-4.89;4.47]	.19	667
Being consistent about games		-.21	[-10.92;10.50]	.54		-.83	[-5.71;4.05]	.01	668
Monitoring of TV		-.39	[-6.86;6.07]	.43		-.16	[-2.68;2.37]	.30	669
Modeling for games		.10	[-3.51;3.70]	.74		-.45	[-2.83;1.93]	.01	670
Permissiveness how long games		.54	[-5.84;6.98]	.12		-.26	[-5.02;4.50]	.11	671
SE for monitoring TV		.02	[-3.98;3.95]	.93		-.17	[-4.19;3.84]	.32	672
SE for motivating games		-.37	[-3.75;3.00]	.13		.32	[-3.50;4.15]	.26	673

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For peer review only

STROBE Statement (cross-sectional studies) - Checklist of items and their corresponding page number that are included in the manuscript

	Item No	Recommendation	Page number manuscript
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-6
Objectives	3	State specific objectives, including any prespecified hypotheses	5-6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6-7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7-9
Bias	9	Describe any efforts to address potential sources of bias	3,16,17
Study size	10	Explain how the study size was arrived at	10
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9-10
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses	9-10
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage	10-11

		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10-11
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	11-12
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-12
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	/
Discussion			
Key results	18	Summarise key results with reference to study objectives	12-15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16-17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-17
Generalisability	21	Discuss the generalisability (external validity) of the study results	17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.