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RESEARCH PAPER

# Parental Happiness Associates With the Co-occurrence of Preschool-Aged Children's Healthy Energy Balance-Related Behaviors

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**Abstract**
We examined whether parental happiness associate with preschoolers' healthy energy balance-related behaviors (EBRBs) and with the co-occurrence of multiple healthy EBRBs. This cross-sectional study included 647 pairs of parents (88% mothers) and children (mean age 4.7, SD 0.9 years). Parents completed the Subjective Happiness Scale. In addition, ActiGraph accelerometers measured children's physical activity, and parents reported screen time and food consumption on behalf of their children. We defined four healthy EBRBs: meeting physical activity guidelines; meeting screen time guidelines; a higher consumption of vegetables, fruits and berries; and a lower consumption of sugary foods, treats and drinks. Parental happiness scores did not associate with children's healthy EBRBs when each behavior was analyzed separately. However, parents with higher happiness scores were more likely to have a child with 2 or 3–4 healthy EBRBs than a child with 0–1 healthy EBRBs. To conclude, parents who are happier have children with multiple healthy EBRBs. Targeting parental wellbeing should be considered when promoting children's healthy EBRBs.

**Keywords** Happiness · Subjective wellbeing · Physical activity · Screen time · Eating behavior · Children

## 1 Introduction

The alarmingly high prevalence of childhood obesity represents one of the most serious global health challenges with far-reaching consequences (Reilly & Kelly, 2011; NCD-RisC, 2017). Energy balance–related health behaviors (EBRBs) include physical activity, sedentary behaviors, and dietary habits. High amounts of sedentary screen time and the high consumption of sugary sweetened drinks, for example, associate with being overweight

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and obesity already in preschool-aged children (Dubois et al., 2007; Frantsve-Hawley et al., 2017; Gonzalez-Palacios et al., 2019; Poitras et al., 2017). In contrast, children who engage in high levels of physical activity and consume a high number of vegetables carry a lower risk for excess weight during their early years (Te Carson et al., 2017; Velde et al., 2012; Wall et al., 2018). Health behaviors are established in childhood and tend to track into adolescence and adulthood (Biddle et al., 2010; Craigie et al., 2011; Telama et al., 2014). Therefore, early childhood represents a critical time for adopting healthy EBRBs.

Physical activity, screen time and dietary behaviors exert combined effects on children's health, such as a cumulative effect on becoming overweight and obese (Gubbels et al., 2012; Lioret et al., 2018; Sanchez et al., 2007). Determinants of each EBRBs are often examined individually, however, examining the determinants of multiple EBRBs may better address the challenge of the obesity epidemic than focusing on individual EBRBs. The determinants of childhood obesity and related behaviors involve factors from multiple contexts, including family, school, community and society at large (Davison & Birch, 2001). More specific factors related to EBRBs in young children are not well-established and differ across behaviors (Hinkley et al., 2008, 2010; De Craemer et al., 2012, 2020; Duch et al., 2013; Lindsay et al., 2017). It is, therefore, necessary to further identify factors associated with individual healthy EBRBs as well as with the co-occurrence of multiple healthy EBRBs in young children.

Interventions to prevent childhood obesity have mainly focused on children's individual-level behavior change, with limited effects (Brown et al., 2019). Parents and the family as a whole play an important role in children's lives, particularly during their early years. Thus, some interventions designed to modify EBRBs within the families of preschoolers have targeted parental knowledge of those behaviors, role modeling, and parents' own EBRBs (Narzisi & Simons, 2020; Skouteris et al., 2011). Parental subjective wellbeing and its relationship to children's EBRBs has, however, received insufficient attention in these interventions thus far. Maternal stress or depressive symptoms, on the other hand, seem to associate with obesity, lower levels of physical activity, higher levels of sedentary behaviors, and unhealthy dietary behaviors among their young children, but the research evidence is limited and mixed (Duch et al., 2013; Miller & Lumeng, 2018; O'Connor et al., 2017; Parks et al., 2012). Parental stress may contribute to child's EBRBs in complex ways. Parents who exhibit symptoms of stress or depression may, for example, have difficulties with establishing regular schedules for mealtimes, screen time and physical activity for both the parent and the child (Miller & Lumeng, 2018). According to positive psychology, examining not only psychopathology but also positive subjective experience is important (Seligman & Csikszentmihalyi, 2000). Subjective wellbeing takes into account human perception, which is assessed using various questionnaires and questions on feelings, experiences and the evaluation of one's life. Happiness, in turn, stands as an important part of subjective wellbeing (Cummins, 2013; Medvedev & Landhuis, 2018), and, at times, these constructs are used interchangeably (Medvedev & Landhuis, 2018). Happiness associates with better physical, psychological and social wellbeing (Lyubomirsky et al., 2005), which, in turn, may be reflected in resources to encourage and enable healthy behaviors in the entire family. Since targeting parental knowledge of healthy EBRBs and role modeling may not be effective enough (Narzisi & Simons, 2020), further studies examining other family-related determinants of children's healthy EBRBs, such as parental happiness, are needed.

In order to develop effective strategies to tackle the obesity epidemic and improve children's health, we need evidence regarding those factors associated with children engaging in healthy EBRBs, and especially in multiple healthy EBRBs at an early age. Because of the limited scientific evidence so far, it is difficult to draw conclusions on the best factors to

target the interventions and actions aimed at promoting healthy EBRBs in this age group. Therefore, this study examines whether parental happiness associates with preschoolers' individual healthy EBRBs or with the co-occurrence of multiple healthy EBRBs.

## 2 Methods and Materials

### 2.1 Study Design and Participants

This analysis represents a part of the cross-sectional Increased Health and Wellbeing in Preschools (DAGIS) Study, conducted in eight Finnish municipalities between 2015 and 2016. A total of 864 3–6-year-old children (24% of those invited) from 66 preschools (43% of the invited preschools) and one of their guardians participated. In this analysis, we include 647 parent–child pairs for whom data were available on parental happiness, child EBRBs and other relevant variables. The study protocol and a detailed description of the participants and the measurement instruments appear elsewhere (Määttä et al., 2015). The University of Helsinki Ethical Review Board in the Humanities and Social and Behavioral Sciences approved the study protocol (#6/2015), and guardians provided their written informed consent.

### 2.2 Parental Happiness

Parents completed the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999). A composite score of the four-item scale ranges from one to seven, where higher scores indicate higher levels of happiness. An example item: 'Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterization describe you?'. The Subjective Happiness Scale features a good to excellent reliability, and validation studies support its use in assessing the construct of happiness (Lyubomirsky & Lepper, 1999; Mattei & Schaefer, 2005).

### 2.3 Children's Energy Balance-Related Behaviors

#### 2.3.1 Physical Activity

Children were advised to wear ActiGraph wGT3X-BT accelerometer (Pensacola, FL, USA) on their hip for 24 h per day for 7 consecutive days. We chose a 15-s epoch length when downloading the data, and considered periods of $\geq$ 10 min at 0 accelerometer counts as non-wear time. We defined a valid day as $\geq$ 600 min of awake wearing time, and included children with at least 4 days of valid data (consisting of $\geq$ 3 weekdays and $\geq$ 1 weekend days). We used the cut-off points introduced by Evenson et al. to define physical activity intensity levels of light (101–2295 counts), moderate (2296–4011 counts), and vigorous physical activity (> 4012 counts) as minutes per day (Evenson et al., 2008). Minutes per day of total (light + moderate + vigorous) and moderate-to-vigorous physical activity were calculated as weighted means from valid weekday and weekend physical activity: (mean minutes on weekdays × 5 + mean minutes on weekend days × 2)/7.

### 2.3.2 Screen Time

Parents reported children's sedentary behaviors, including screen time, outside preschool hours in a 7-day diary kept simultaneously with the time when children wore an accelerometer. We used a modified version of a previously used sedentary behavior diary, which was validated showing an acceptable correlation between parent-reported and accelerometer-measured sedentary time in preschoolers (Wen et al., 2010). In this study, we used an overall screen time variable including television, DVD and video viewing, as well as computer, tablet and smartphone use. We calculated a weighted mean for overall screen time from weekday and weekend day screen time: (mean minutes on weekdays × 5 + mean minutes on weekend days × 2)/7.

### 2.3.3 Consumption of Vegetables, Fruits and Berries and Sugary Foods, Treats and Drinks

Parents reported their children's food consumption using a 47-item food frequency questionnaire (FFQ), shown to carry an acceptable validity against 3-day food records (Korkalo et al., 2019). Parents reported how many times (per day or week) during the past week their child consumed different foods and drinks outside preschool hours. Parents were instructed to either tick the "not at all" box or to write a number in a "times per week" or "times per day" column. In the FFQ, 25 items concentrated on vegetables, fruit and berries, and sugary foods, treats and drinks. Those 25 items have shown moderate reproducibility in an electronic FFQ (Määttä et al., 2018).

Using the FFQ items, we calculated sum variables describing the daily consumption frequency of vegetables, fruit and berries (fresh vegetables; cooked and canned vegetables; fresh fruit; and fresh and frozen berries), and the daily consumption frequencies of sugary foods (flavored yogurt and quark; pudding; sugar-sweetened cereals and muesli; berry, fruit and chocolate porridge with added sugar; and berry and fruit soups with added sugar), sugary treats (ice cream; chocolate; sweets; cakes, cupcakes, sweet rolls, Danish pastries, pies and other sweet pastries; and sweet biscuits and cereal bars) and sugary drinks (soft drinks; flavored and sweetened milk- and plant-based drinks; and sugar-sweetened juice drinks). We combined the daily consumption frequencies of sugary foods, treats and drinks into a single variable.

### 2.3.4 Healthy Energy Balance-Related Behaviors

We defined four healthy EBRBs for children: (1) meeting physical activity guidelines (WHO, 2019); (2) meeting screen time guidelines (WHO, 2019); (3) a higher consumption frequency of vegetables, fruits and berries; and (4) a lower consumption frequency of sugary foods, treats and drinks.

Children were considered as meeting the physical activity guidelines if they averaged in ≥ 180 min/day in total physical activity, of which at least 60 min was moderate-to-vigorous physical activity (total and moderate-to-vigorous physical activity min/day were calculated as weighted means from valid weekday and weekend values) (WHO, 2019). In addition, children who engaged in ≤ 60 min/day in overall sedentary screen

time (calculated as a weighted mean from weekday and weekend day screen time) were considered meeting the screen time guidelines (WHO, 2019).

The FFQ assessed children's consumption frequency of foods, focusing only on hours outside preschool. Therefore, we were unable to use any specific cut-off points for the total daily consumption of vegetables and sugary foods. Instead, we defined healthy food consumption variables as an above-median consumption frequency (> 2.7 times per day) of vegetables, fruits and berries (higher consumption); and a median or below consumption frequency (≤ 2.1 times per day) of sugary foods, treats and drinks (lower consumption).

### 2.4 Background Information

Families participated in the study during different seasons. Therefore, we divided the research time into three categories: autumn (September–October), winter (November–December) and spring (January–April). Parents reported their parental status (mother, stepmother, father, stepfather or other), and highest educational level completed using six response options, which we categorized into three levels: low (high school or vocational school graduate or lower), middle (Bachelor's degree or equivalent) and high (Master's degree or higher). In addition, parents reported their child's age and gender (girl or boy) and their own weight and height, which we used to calculate parental body mass index (BMI, kg/m$^2$).

### 2.5 Statistical Analysis

We excluded from the analysis those with missing values for the following parental variables: happiness ($N=63$); education ($N=72$); BMI ($N=75$); parental status ($N=60$); and if someone other than the mother, stepmother, father or stepfather completed the questionnaire ($N=4$). We also excluded those with missing values for the following children's variables: physical activity ($N=86$); screen time ($N=85$); the consumption of vegetables, fruits and berries ($N=57$); the consumption of sugary foods, treats and drinks ($N=69$); and gender ($N=1$).

We present the participant characteristics and the main variables as means and standard deviations (SDs), or absolute frequencies ($N$) and percentages (%). We examined the associations between the parental happiness and children's individual healthy EBRBs using binary logistic regression analysis in order to calculate the odds ratios (ORs) with the 95% confidence intervals (CI), in a crude model and adjusting for confounding factors. We compared children engaging in an individual healthy EBRB to children not engaging in that particular healthy EBRB. In addition, we examined the associations between parental happiness and the co-occurrence of children's healthy EBRBs (categorized as 0–1, 2 or 3–4 healthy EBRBs) using multinomial logistic regression analysis in order to calculate the ORs with the 95% CIs, in a crude model and adjusting for confounding factors. We treated the individual or co-occurrence categories of children's healthy EBRBs as dependent variables, and parental happiness score as an independent variable in the analyses. For the co-occurrence analyses, we combined children with 0–1 healthy EBRBs, as well as children with 3–4 healthy EBRBs in order to get three approximately similar sized groups, and because the amounts of children with 0 ($N=27$) or 4 ($N=52$) healthy EBRBs were small. In multinomial logistic regression analysis, children with 2 healthy EBRBs were compared to children with 0–1 healthy EBRB, and children with 3–4 healthy EBRBs were compared to children with 0–1 healthy EBRBs and to children with 2 healthy EBRBs. We adjusted

the analysis for research season (autumn, winter or spring), parental gender (woman or man), education (low, middle or high) and BMI, and children's gender (girl or boy) and age, since these factors may be confounding factors in the relationship between parental wellbeing and children's EBRBs (Lee et al., 2019; Leech et al., 2014; Lehto et al., 2018; Soini et al., 2014). We performed all analyses using IBM's SPSS Statistics software program, version 25 (IBM Corp., Armonk, NY, USA), and considered $p < 0.05$ as statistically significant.

## 3 Results

### 3.1 Parental and Child Characteristics

Table 1 presents the characteristics of the 647 parent–child pairs included in this study. The mean age of the children was 5 years old, and most of the parents (88%) were mothers. Table 2 presents parental happiness scores by children's healthy EBRBs and by the co-occurrence categories of healthy EBRBs. Among children, 71% met physical activity guidelines, 35% met screen time guidelines, 45% exhibited high consumption of vegetables, fruits and berries, and 54% exhibited low consumption of sugary foods, treats, and drinks. Altogether 32% of children engaged in 0–1 healthy EBRBs, 35% in 2 healthy EBRBs and 33% in 3–4 healthy EBRBs.

### 3.2 Parental Happiness and Children's Individual Healthy Behaviors

After adjusting for possible confounders (parental gender, education and BMI, children's gender and age, and research season), parental happiness did not associate with children's individual healthy EBRBs, i.e. meeting physical activity or screen time guidelines, high consumption of vegetables, fruits and berries, or low consumption of sugary foods, treats, and drinks (Table 3).

### 3.3 Parental Happiness and the Co-occurrence of Children's Healthy Behaviors

Parents with higher happiness scores were more likely to have a child with 2 or 3–4 healthy EBRBs than a child with 0–1 healthy EBRBs (adjusted OR 1.25; 95% CI 1.03–1.51 and adjusted OR 1.23; 95% CI 1.02–1.50, respectively) (Table 4). Higher parental happiness scores did not associate with increased odds of having a child with 3–4 healthy EBRBs compared to having a child with 2 healthy EBRBs.

## 4 Discussion

This cross-sectional study examined the associations between parental happiness and preschool-aged children's individual healthy EBRBs (i.e. meeting physical activity guidelines; meeting screen time guidelines; high consumption of vegetables, fruits and berries; and low consumption of sugary foods, treats, and drinks) and the co-occurrence of multiple healthy EBRBs. Parental happiness did not associate with their child

**Table 1** Parental and child characteristics

| Characteristic | |
|---|---|
| Parents ($N=647$) | |
| Parental status, N (%) | |
| *Mother* | 569 (87.9) |
| *Father* | 78 (12.1) |
| Education, N (%) | |
| *Low (high school, vocational school or lower)* | 171 (26.4) |
| *Middle (Bachelor's degree or equivalent)* | 280 (43.3) |
| *High (Master's degree or higher)* | 196 (30.3) |
| Body mass index (kg/m$^2$) | 24.9 (4.5) |
| Happiness score | 5.1 (1.0) |
| Children ($N=647$) | |
| Gender, N (%) | |
| *Girl* | 319 (49.3) |
| *Boy* | 328 (50.7) |
| Age in years | 4.7 (0.9) |
| Total physical activity (min/day) | 400.2 (46.0) |
| Moderate to vigorous physical activity (min/day) | 72.3 (22.2) |
| Screen time (min/day) | 76.0 (37.9) |
| Consumption frequency of vegetables, fruits and berries (times/day) | 2.9 (1.5) |
| Consumption frequency of sugary foods, treats and drinks (times/day) | 2.4 (1.4) |
| Parent–child pairs ($N=647$) | |
| Time of participation, N (%) | |
| *Autumn* | 266 (41.1) |
| *Winter* | 241 (37.2) |
| *Spring* | 140 (21.6) |

Data are mean (standard deviation) unless otherwise stated

[a]The subjective happiness scale (Lyubomirsky & Lepper, 1999). Scale 1 (lowest level of happiness) – 7 (highest level of happiness)

engaging in any of the individual healthy EBRBs separately. However, parents who were happier were more likely to have a child who engaged in multiple healthy EBRBs.

To the best of our knowledge, our study is the first to identify parental wellbeing-related factors associated with the co-occurrence of healthy EBRBs in preschoolers. This is important because multiple healthy EBRBs carry combined effects on children's health (Gubbels et al., 2012; Lioret et al., 2018; Sanchez et al., 2007). Previous studies identified factors such as gender, ethnicity, parental education and EBRBs, and maternal distress or depression as associated with children's individual EBRBs during their early years (De Craemer et al., 2012; Duch et al., 2013; Hinkley et al., 2008, 2010). Interventions designed to modify EBRBs among preschoolers and to prevent obesity have mainly concentrated on children's behavior change, or targeting parental knowledge of EBRBs, role modeling and parental physical activity, as well as feeding practices and

**Table 2** Parental happiness and children's healthy energy balance–related behaviors ($N = 647$)

| Children's healthy behaviors | Children N (%) | Parental happiness[a] (mean, SD) |
|---|---|---|
| Meeting physical activity guidelines[b] | | |
| Yes | 458 (70.8) | 5.2 (1.0) |
| No | 189 (29.2) | 5.1 (1.0) |
| Meeting screen time guidelines[c] | | |
| Yes | 223 (34.5) | 5.2 (1.0) |
| No | 424 (65.5) | 5.1 (1.0) |
| High consumption of vegetables, fruits and berries[d] | | |
| Yes | 293 (45.3) | 5.2 (1.1) |
| No | 354 (54.7) | 5.1 (1.0) |
| Low consumption of sugary foods, treats and drinks[e] | | |
| Yes | 348 (53.8) | 5.2 (1.0) |
| No | 299 (46.2) | 5.1 (1.0) |
| Co-occurrence of healthy behaviors[f] | | |
| 0 healthy behaviors | 27 (4.2) | 5.1 (0.8) |
| 1 healthy behavior | 181 (28.0) | 4.9 (1.1) |
| 2 healthy behaviors | 228 (35.2) | 5.2 (1.0) |
| 3 healthy behaviors | 159 (24.6) | 5.3 (1.0) |
| 4 healthy behaviors | 52 (8.0) | 5.1 (1.1) |
| 1–0 healthy behaviors | 208 (32.1) | 5.0 (1.0) |
| 2 healthy behaviors | 228 (35.2) | 5.2 (1.0) |
| 3–4 healthy behaviors | 211 (32.6) | 5.2 (1.1) |

[a]The subjective happiness scale (Lyubomirsky & Lepper, 1999). Scale 1 (lowest level of happiness) – 7 (highest level of happiness)

[b]At least 180 min per day of any intensity, of which at least 60 min were moderate to vigorous intensity (WHO, 2019)

[c]60 min per day or less (WHO, 2019)

[d]Above the median (2.7 times/day) consumption frequency

[e]The median (2.1 times/day) consumption frequency or below

[f]Healthy behaviors include meeting the physical activity guidelines; meeting screen time guidelines; a higher consumption of vegetables, fruits and berries; and a lower consumption of sugary foods, treats and drinks

eating (Brown et al., 2019; Narzisi & Simons, 2020; Skouteris et al., 2011). Parental happiness and how it relates to children's EBRBs previously received little attention.

Our results indicate that parents who are happier in life have children who engage in multiple healthy EBRBs. Happiness associates with better physical, psychological and social wellbeing (Lyubomirsky et al., 2005), and, therefore, parents who are happier may possess better resources to encourage and enable healthy EBRBs in their families. However, the relationship may be reciprocal. Fundamentally, the relationship between parenthood and happiness is highly complex (Nelson et al., 2014). A child's problems likely affect the interaction between parent and child, which, in turn, may impact a parent's happiness and how they support their child's healthy EBRBs. Furthermore, parents who are unhappier or have major problems in life may be unable to encourage children

**Table 3** Relationship between a higher parental happiness score[a] and children's healthy energy balance–related behaviors ($N = 647$)

| Children's healthy behaviors | Odds ratios for children's healthy behaviors | | | | | |
|---|---|---|---|---|---|---|
| | Crude | | | Adjusted | | |
| | OR | 95% CI | *p* value | OR | 95% CI | *p* value |
| Meeting physical activity guidelines[b] compared to not meeting | 1.10 | 0.93–1.29 | 0.266 | 1.16 | 0.97–1.38 | 0.114 |
| Meeting screen time guidelines[c] compared to not meeting | 1.04 | 0.89–1.22 | 0.598 | 0.99 | 0.84–1.17 | 0.920 |
| High consumption of vegetables, fruits and berries[d] compared to low consumption | **1.17** | **1.00–1.37** | **0.044** | 1.15 | 0.99–1.35 | 0.078 |
| Low consumption of sugary foods, treats and drinks[e] compared to high consumption | 1.06 | 0.91–1.24 | 0.425 | 1.03 | 0.88–1.20 | 0.696 |

Bold values are significant

Main effects from the binary logistic regression

Variables in the adjusted model consisted of research season, parental gender, education and BMI, and the child's gender and age

[a]The subjective happiness scale (Lyubomirsky & Lepper, 1999). Scale 1 (lowest level of happiness) – 7 (highest level of happiness)

[b]At least 180 min per day of any intensity, of which at least 60 min were moderate to vigorous intensity (WHO, 2019)

[c]60 min per day or less (WHO, 2019)

[d]Above the median (2.7 times/day) consumption frequency

[e]The median (2.1 times/day) consumption frequency or below

OR = odds ratio; CI = confidence interval

to engage in healthy EBRBs because other life circumstances require too much effort or seem more pressing.

Maternal mental ill-being seem to be differentially associated with children's individual EBRBs according to some studies. Maternal distress and depressive symptoms previously associated with more screen time in young children (Duch et al., 2013), and a review found maternal stress to be consistently linked with lower levels of physical activity and higher levels of sedentary behavior among children of different ages, but not with dietary intake of healthy or unhealthy foods (O'Connor et al., 2017). Happiness associates with higher amounts of physical activity among adult populations (Zhang & Chen, 2019). Moreover, happiness associated with lower mortality in a prospective 15-year follow-up study, but not after adjusting for physical activity (Koopmans et al., 2010). In fact, physical activity had the strongest impact on the association between happiness and longevity (Koopmans et al., 2010).

Parents own EBRBs and attitudes towards such behaviors associate with children's EBRBs. Parental physical activity and screen time, and whether the mother plays with her child previously associated with children's physical activity and screen time (De Craemer et al., 2012; Xu et al., 2016). Similarly, a previous analysis from the DAGIS Study found largely similar diets among preschoolers and their parents (Vepsäläinen et al., 2018). In addition, parental support for physical activity and their own enjoyment of physical activity

**Table 4** Relationship between a higher parental happiness score[a] and the co-occurrence of children's healthy energy balance–related behaviors ($N = 647$)

| Co-occurrence of children's healthy behaviors[b] | Odds ratios for co-occurrence of children's healthy behaviors | | | | | |
|---|---|---|---|---|---|---|
| | Crude | | | Adjusted | | |
| | OR | 95% CI | *p* value | OR | 95% CI | *p* value |
| Children with 2 healthy behaviors compared to children with 0–1 healthy behaviors | **1.27** | **1.06–1.53** | **0.020** | **1.25** | **1.03–1.51** | **0.025** |
| Children with 3–4 healthy behaviors compared to children with 0 – 1 healthy behaviors | **1.29** | **1.07–1.55** | **0.009** | **1.23** | **1.02–1.50** | **0.033** |
| Children with 3–4 healthy behaviors compared to children with 2 healthy behaviors | 1.01 | 0.84–1.22 | 0.916 | 0.99 | 0.82–1.20 | 0.925 |

Bold values are significant

Main effects from the multinomial logistic regression

Variables in the adjusted model consisted of research season, parental gender, education and BMI, and the child's gender and age

[a]The subjective happiness scale (Lyubomirsky & Lepper, 1999). Scale 1 (lowest level of happiness) – 7 (highest level of happiness)

[b]Healthy behaviors include meeting the physical activity guidelines; meeting screen time guidelines; a higher consumption of vegetables, fruits and berries; and a lower consumption of sugary foods, treats and drinks

OR = odds ratio; CI = confidence interval

previously associated with a child's physical activity (Zecevic et al., 2010). We did not, however, observe parental happiness to be associated with their child engaging in individual healthy EBRBs, not even with meeting the physical activity guidelines. The measurement and data processing methods, and categorization of healthy/unhealthy behaviors may have affected these results. Nevertheless, our results suggest that parental happiness do not associate with their child engaging in any specific healthy EBRB, but instead associates with their child having healthier lifestyle in general. Future studies are needed to examine in more detail how parental happiness associates with different combinations/profiles/clusters of healthy EBRBs among children.

Parental obesity previously associated with lower levels of preschoolers' physical activity (Klesges et al., 1990), whereas lower parental education associated with higher amounts of television viewing and unhealthy behavior patterns (consisting of physical activity, screen time and dietary intake) among preschoolers (Hinkley et al., 2010; Wang et al., 2020). We controlled our analyses for parental BMI and education, with results indicating that parental happiness associates with the co-occurrence of children's healthy EBRBs independently of those parental factors. Moreover, preschoolers' television viewing previously associated with consuming more sweet beverages and snacks, and less fruit and vegetables (De Craemer et al., 2012), indicating that parental happiness may impact children's dietary behavior indirectly by associating with children's other EBRBs.

Our results suggest that parental subjective wellbeing, such as happiness, should be considered when planning interventions and public health actions to promote healthy EBRBs among young children. A meta-analysis showed that positive psychology interventions can be effective in the enhancement of subjective and psychological wellbeing and may help to reduce depressive symptoms among adults (Bolier et al., 2013).

Interventions, such as practicing kindness, setting personal goals, expressing gratitude, using personal strengths, and practicing mindfulness were used for enhancing wellbeing and happiness, and many of these interventions are delivered in a self-help format. Moreover, a recent 12-week randomized controlled trial with the following goals guiding the intervention: to have participants (a) learn about principles of happiness, (b) engage in activities that apply these principles, and (c) develop habits that integrate these principles into daily life, was effective in increasing subjective wellbeing, whether administered in-person or online (Heintzelman et al., 2020). Similar positive psychology interventions for parents could be adapted and included in future studies aiming at promoting healthy EBRBs among preschool-aged children. Improved parental subjective wellbeing and reduced stress or depressive symptoms could have a positive impact on daily routines in the family, and thus promote healthy EBRBs among children and the whole family (Miller & Lumeng, 2018). Mediating factors in the relationship between parental happiness and children's EBRBs also warrant further research.

One limitation to our study consists of its cross-sectional study design, and thus, no actual causal conclusions can be drawn. A further limitation lies in relying on parent reports of the children's screen time and food consumption at home, but not during preschool hours. However, the food offered to children at preschool in Finland is similar for almost all children, and young children probably had no screens available at preschools when the data were collected (2015–2016). Parental reports of children's screen time and food consumption may be somewhat biased due to under- or overreporting, but the FFQ we used carries an acceptable validity against 3-day food records, and the food items used in this analysis have a demonstrable acceptable reproducibility (Korkalo et al., 2019; Määttä et al., 2018). Moreover, we used a modified version of a previously validated sedentary behavior diary (Wen et al., 2010). Sedentary behavior diaries appear unaffected by memory, and we assessed the use of multiple screens rather than only TV viewing. Furthermore, the Subjective Happiness Scale we used is a commonly used measurement tool for happiness (Lyubomirsky & Lepper, 1999; Mattei & Schaefer, 2005). Additional strengths of our study include the accelerometer-based assessment of children's physical activity. Finally, our study features a relatively large sample of parent–child pairs. Yet, we excluded several parent–child pairs from our analysis due to missing values in the relevant variables. The included and excluded children did not differ in age or gender, but parental educational level was somewhat lower among the excluded pairs. Therefore, this sample may not be representative of all families with preschool-aged children.

## 5 Conclusion

In order to develop effective strategies to tackle the obesity epidemic and to improve children's health, we need evidence on those factors associated with individual healthy EBRBS and with the co-occurrence of healthy EBRBs during early childhood. Our study found that happier parents are more likely to have preschoolers who engage in multiple healthy EBRBs. These results suggest that targeting the wellbeing of the parents should be considered when promoting young children's healthy EBRBs.

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