

Article

The Role of Child-Family-Peer Relationships on Children's Healthy Eating Behavior: A Path Model Study

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ABSTRACT

Background/Aim: Child-to-parent violence is an increasingly frequent problem in which children assume the role of aggressors, causing serious consequences for family dynamics. The objectives of this study were to systematise studies of child-parent violence in Latin America and to analyse their frequency by means of a meta-analysis of proportions. **Methods:** This study followed The PRISMA 2020 criteria for systematic review and meta-analysis. A meta-analysis of proportions was performed according to the criteria of reiterated violence and zero-tolerance, and publication bias and heterogeneity were analysed. **Results:** Sixteen primary studies were included. Most of the studies have been conducted in México and Chile. Psychological violence showed a greater magnitude toward the mother, whereas physical violence showed very similar magnitudes for both parents. **Discussion:** The findings confirm the scarce evidence on child-parent violence in Latin American countries, but this does not mean that it is a non-existent problem. In fact, reiterated psychological violence could be exercised between 23% and 25%, and reiterated physical violence between 6% and 5% towards the father and mother, respectively.

El Papel de las Relaciones Niño-Familia-Compañeros en el Comportamiento Alimentario Saludable de los Niños: Un Estudio del Modelo de Path Analysis

RESUMEN

Antecedentes/Objetivo: La violencia filio-parental es una problemática cada vez más frecuente en la que los hijos asumen el rol de agresores, causando graves consecuencias en la dinámica familiar. Los objetivos de este estudio fueron sistematizar los estudios de violencia filio-parental realizados en América Latina y analizar su frecuencia mediante un meta-análisis de proporciones. **Método:** Se siguieron los criterios PRISMA 2020 para revisiones sistemáticas y meta-análisis. Se realizó un meta-análisis de proporciones según los criterios de violencia repetida y tolerancia cero. Se analizó el sesgo de publicación y la heterogeneidad. **Resultados:** Se incluyeron dieciséis estudios primarios. La mayoría se realizaron en México y Chile. La violencia psicológica mostró una magnitud mayor hacia la madre, y la violencia física mostró magnitudes muy similares hacia ambos progenitores. **Discusión:** Los hallazgos confirman la escasa evidencia sobre violencia filio-parental en los países de América Latina, pero esto no quiere decir que sea un problema inexistente. De hecho, la violencia psicológica reiterada podría haber sido ejercida entre el 23% y el 25% y la violencia física reiterada entre el 6% y el 5% hacia el padre y madre, respectivamente.

Palabras clave:

Conducta alimentaria saludable,

Autorregulación

Niños

Díadas

Análisis de ruta

Introduction

Eating behavior influences children's health and development (Burrows et al., 2017; Nyaradi et al., 2016). Prior research indicates that promoting healthy eating (HE) early in life is vital to prevent chronic diseases (e.g., obesity, cancer, heart disease) and promote good cognitive functioning throughout the entire lifespan (Chan, 2017; Sahoo et al., 2015). Early promotion of HE is relevant since research suggests children are likely to maintain their eating behaviors into adulthood (Mikkilä et al., 2005). Despite the benefits of HE and the efforts by researchers, educators, and governmental bodies to promote it, evidence indicates that many children do not meet the daily food consumption recommendations, such as eating at least five portions of fruit and vegetables (F/V) per day (Pereira et al., 2021c; Kim et al., 2014; World Health Organization [WHO], 2020). For example, Portuguese data shows that children and adolescents are the cohort consuming the least amount of F/V (Lopes et al., 2017), with 72% not meeting the daily recommendations. Thus, a better understanding of the factors contributing to children's HE is still a research priority.

Literature emphasizes children's eating behavior as a highly complex phenomenon, resulting from multiple factors (e.g., de Ridder et al., 2017). The Social Cognitive Theory (SCT) (Bandura, 1991) theoretically grounds the present study while helping to understand this complexity. Bandura's triadic model explains that human behavior is influenced by bidirectional interactions between personal (e.g., gender, knowledge), behavioral (e.g., skills, competence), and environmental (e.g., family, influence of others) factors (Bandura, 2001, 2018). Literature has been reporting the role played by personal and behavioral factors, such as self-regulation (SR), in children's eating behavior (Kalavana et al., 2010). However, individual change is more likely to be facilitated and sustained when the surrounding environment supports healthy food choices (Pereira et al., 2021c; Swinburn et al., 2011; WHO & FAO, 2003). Accordingly, we extended a previous model of the effects of personal and behavioral factors on children's eating behavior (Pereira et al., 2021b) by adding environmental factors, i.e., variables from the family and peers (see 'the present study' section).

Personal and Behavioral Factors, and Children's Eating Behavior

Prior research focused on personal and behavioral factors explaining children's eating behaviors indicates a growing interest in the role played by SR (Gaspar de Matos et al., 2016; Pereira et al., 2019; Rollins et al., 2016). SR comprises processes allowing individuals to proactively control the personal, behavioral, and environmental influences impacting behavior, including eating (Rosário et al., 2017). Accordingly, there are a set of strategies that can be helpful to self-regulate behavior, such as establishing goals, planning, or structuring the environment (Pereira et al., 2019; Zimmerman & Martinez-Pons, 1986, 1988). Generally, research indicates a positive relationship between SR strategy use and HE behavior across age groups (Pereira et al., 2021b; de Ridder et al., 2017; Luszczynska et al., 2016; Stadler et al., 2010; van Osch et al., 2009).

Recently, Pereira et al. (2021b) investigated the role of elementary-school children SR towards HE in the relationship

between personal and behavioral factors (i.e., declarative knowledge, gender, self-efficacy, and attitudes towards HE) and eating behavior using a path model. Findings showed that girls reported using more SR strategies and healthier eating than boys. Moreover, data indicated that attitudes and self-efficacy were positively associated with SR (i.e., children who think positively about HE and feel capable of making healthy food choices are likely to self-regulate their eating behaviors and, consequently, eat healthily). However, data indicated that SR had a small effect on children's eating behavior, suggesting the need to explore other factors (e.g., children's proximal environments) that may help explain this relationship.

Environmental Factors and Children's Eating Behavior

According to SCT, individuals' behavior influences and is influenced by their social systems (Bandura, 2001, 2018). Parents/caregivers and peers are key influencers in children's social systems. For example, parents' eating behavior, use of SR strategies, and feeding styles influence children's eating behavior through role modeling (Bauer et al., 2005; Larson & Story, 2009; Lu et al., 2022; Niermann et al., 2015; Pearson et al., 2012; Yee et al., 2017). Sleddens et al. (2010) reported that parents who regularly eat various F/V influence their children to eat healthily while exposing them to a large variety of healthy foods. Additionally, Johnson (2000) found that children whose mothers self-reported high levels of dieting or impulsive eating developed fewer SR strategies toward eating behavior. Literature reports that parents can be role models for their children not only through their eating behavior but also through their use of SR strategies. For example, Germann et al. (2007) found that children whose parents use SR strategies for weight control (e.g., monitoring) are likely to use the same strategies to control their weight. However, little is known regarding the role of parents' SR on children's use of SR strategy for eating behavior and, consequently, on HE. Extant research shows an association between parent behavioral and emotional SR and child SR (Bridgett et al., 2015). These findings raise the possibility of a similar intergenerational communication of SR occurring in the HE domain.

Prior research also highlights that parental feeding styles – parents' general approach to socializing the child towards food and eating – may shape children's eating behavior. Parents efforts to control, such as restriction and pressure to eat (e.g., limiting access to desserts, forcing to eat vegetables), are generally associated with poor SR development and overeating during meals (Faith et al., 2004; Savage et al., 2007). Moreover, parental instrumental (e.g., using food as a reward) and emotional (e.g., using food to temper children's emotions) feeding practices are positively associated with children's consumption of unhealthy snacks and negatively with the consumption of fruit (Rodenburg et al., 2014). These parental practices may provide children with few opportunities to develop SR skills and practice food choices autonomously (Karreman et al., 2006). Conversely, prompting and encouraging feeding practices (e.g., conveying clear standards without being intrusive) are likely to promote children's ability to self-regulate food consumption and are associated with HE (Larson & Story, 2009; Scaglioni et al., 2018).

Another key source of social influence regarding eating behavior is peer influence. From an early developmental stage, peer pressure

plays a significant role in children’s eating behavior, particularly regarding children’s concerns about social status and acceptance at school (Roberts & Pettigrew, 2013; Stead et al., 2011). Prior research shows that children tend to choose food their peers appreciate as a strategy to be accepted. For example, choosing healthy foods is associated with an unpopular status and often marginalization; moreover, there is the perception that children from the dominant social status in school eat “big brand” junk food (Roberts & Pettigrew, 2013). Importantly, peer pressure may prevent children from eating healthily, which supports the need to promote SR strategies among children and adolescents to enable them to follow HE behaviors, especially in the presence of peers (Gaspar de Matos et al., 2016).

The Present Study

Most of the previous findings have indicated SR as essential for children’s HE, with high SR values predicting high consumption of F/V (Luszczynska et al., 2016; Stok et al., 2012). However, Pereira et al. (2021b) study examining personal and behavioral factors found that children’s SR plays a statistically significant, but limited, role in their HE. Drawing on this evidence, and by grounding the study on Bandura’s (2001, 2018) triadic reciprocal causation model, we acknowledge the influence that the factors from the environment play in the interrelation between personal and behavioral factors. Considering that the previous model was focused on the child, in this model we aimed to extend to factors outside the child but still close and direct contact in terms of level of influence. Thus, in the current study, we aim to understand whether including environmental factors (i.e., family and peers) will increase the explained variance of children HE. The current study extended the original model of Pereira et al. (2021b) by following a multi-reporter approach through parent/caregiver-child dyads and adding environmental factors (i.e., parents’ HE behavior, parents’ SR toward HE, parental feeding styles, and peer pressure to eat healthy or unhealthy food).

Children’s health is a complex phenomenon, and family and peers play an essential role in shaping children’s eating behaviors (e.g., de Ridder et al., 2017). Based on these premises, we investigated the potential mediator role played by SR in the relationship between personal factors (i.e., declarative knowledge about HE, self-efficacy for HE, attitudes and perceptions towards HE), environmental factors (i.e., parent’s HE behavior, parent’s SR toward HE, parental feeding styles, peer pressure to eat healthy or unhealthy food), and children’s eating behavior.

Prior research has been focused on the personal (e.g., knowledge), behavioral (e.g., self-regulation), and environmental (e.g., family and peers) predictors of children’s eating behavior independently. Informed by Bandura’s model (2001, 2018), which highlights the interconnected nature of the net of influences among the personal, behavioral, and environmental factors, this paper also adds to the literature by investigating the extent to which data support a complex net of relationships among multiple factors within the same model. To the best of our knowledge, no study has simultaneously examined how environmental factors interact with each other and with individual factors (e.g., SR) (Pereira et al., 2021b; Sleddens et al., 2010). Analyzing the unique role of each variable may prevent understanding the weight of the contribution of each

factor against the other (Scaglioni et al., 2018). Finally, a few investigations examined the relationship between family factors and children’s eating behavior (Andaya et al., 2011; de Wit et al., 2015); however, studies using a multi-reporter approach (i.e., parents and children reports) are limited. The use of parent-child dyads is a powerful approach to studying the reciprocal influences between parents and children (Reed, et al., 2013). In our study, this approach enhanced the validity of the findings and allowed to identify patterns, but provided a more nuanced understanding of children’s HE behavior by framing the context in which it has developed, through the inclusion of parents’ own HE behavior, their SR towards HE, and feeding styles.

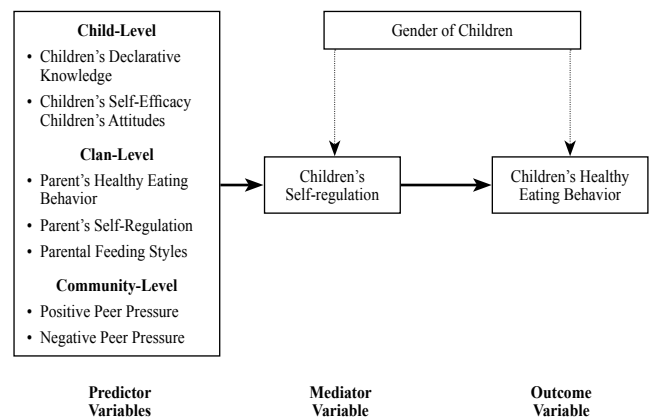
All considered, learning the relationships between child, family, and peer factors using a path model is expected to provide valuable information on the phenomenon and help design multidimensional preventive interventions to promote children’s HE. A mediation model (see Figure 1) was devised with the following hypothesis:

H1: Personal and behavioral factors and children’s HE behavior have a statistically significant and positive relationship. The higher the children’s knowledge and self-efficacy about, and the more positive their attitudes toward, HE, the more likely children are to eat healthily (Pereira et al., 2021b). This relationship is totally mediated by children’s SR: the more positive the personal and behavioral factors toward HE, the more likely children are to use SR strategies toward HE and to eat healthily.

H2: Family factors and children’s HE behavior have a statistically significant and positive relationship. The healthier the parents’ eating behavior, the more their use of SR strategies, and the more the parental feeding style is focused on prompting and encouraging HE, the more likely children are to eat healthily (Bridgett et al., 2015; Scaglioni et al., 2018; Yee et al., 2017). This relationship is totally mediated by children’s SR: the more positive the family factors toward HE, the more likely children are to use SR strategies toward HE and to eat healthily (Niermann et al., 2015).

H3: There is a statistically significant relationship between peer factors and children’s eating behavior; this relationship is totally mediated by children’s SR. Specifically, the greater the peer pressure for HE, the greater the use of SR strategies, and the more likely children are to eat healthily (Gaspar de Matos et al., 2016;

Figure 1
Explanatory Model of Children’s HE Behavior



Roberts & Pettigrew, 2013). Contrarily, the greater the peer pressure for unhealthy eating, the less SR strategies are used, and the less likely children are to eat healthy.

Materials and Methods

Study Context

The current study took place in four public schools (both rural and urban) in the North of Portugal. These public schools were selected from a large pool of schools that declared their willingness to enroll in educational research. The study comprises a non-clinical sample from the school community due to the importance of promoting HE in all children. This methodological option follows Mikkilä et al. (2005) who reported that habits developed during childhood are likely to persist throughout adulthood. Participants were children from the fifth and sixth grades (typically nine-12 years old). Children who finish the first education cycle in Portugal (i.e., first to the fourth grades; typically, six to nine years old) transit to the second cycle and to a new school (i.e., usually comprising students from the fifth to ninth grades, second and third cycles of basic education) (Ministério da Educação, 2007). Portuguese children in the fifth and sixth grades are expected to develop autonomy and responsibility to cope with the new school challenges (e.g., interaction with a team of 10 to 12 teachers delivering distinct subjects instead of one head teacher, access to a school bar/cafeteria).

Participants and Procedure

The study followed a multi-reporter (i.e., children and parents/caregivers) approach. We invited 544 dyads (i.e., children and the parent/caregiver responsible for family meals) to participate. Before data collection, dyads were informed about the study aims and assured of the confidentiality of the data. Written informed assents and consents from children and parents/caregivers, respectively, were requested. All accepted to participate. From these, 271 (49.82%) were excluded due to the following reasons: i) the parent, the child, or both did not complete the assessment protocol (e.g., left questionnaires blank); ii) one of the elements of the dyad did not attend the data collection session. The final sample consisted of 273 children and 273 parents/caregivers (see 'Participants characterization' section).

Children took approximately 20 minutes to complete the questionnaires in-person in regular classes. Parents/caregivers took approximately 20 minutes to complete an online self-reported questionnaire constructed on Qualtrics Survey Software[®] 2021 (Qualtrics, 2020), which was shared via e-mail or WhatsApp. To protect the confidentiality and anonymity of the data, codes were assigned to match the dyads (e.g., pair the child's questionnaire with the parent/caregiver's).

Measures and Instruments

Children were asked about their gender, age, and school grade, while parents were asked about their gender, age, kinship, and educational level.

The consumption of F/V is one of the most used indicators worldwide to assess the quality of diets (Lopes et al., 2017). To

evaluate children's HE behavior, children answered three items about their F/V consumption from the *Healthy Eating and Physical Activity Behavior Recall Questionnaire for Children* (HEPABRQ-C) (Lassetter et al., 2018) (see Annex 1). Responses were summed to create a composite score ranging from 0 to 10, with higher scores implying healthier eating behaviors. The reliability data of the current study was $\alpha = .645$ and $\omega = .691$.

Children completed the *Self-Regulation Processes towards Healthy Eating Questionnaire* (Pereira et al., 2019). The scale consisted of nine items regarding the participants' use of SR strategies toward HE (e.g., I plan my meals. I think about what I am going to eat and what it takes to prepare my meal - for example, after waking up, I think about what I will eat for breakfast and what I need to prepare it) (see Annex 1). Responses followed a 5-point Likert-type scale from 1 (*never*) to 5 (*always*). Responses were summed to create a composite score ranging from 9 to 45, with higher scores implying more SR. The current study's reliability data was $\alpha = .843$ and $\omega = .834$.

An adapted version of the *Knowledge of Healthy Eating Questionnaire* (Pereira et al., 2018) was used to evaluate children's declarative knowledge about HE. The present scale consisted of 10 statements and participants rated their agreement regarding each one (e.g., "our meal should contain varied and colorful foods") (see Annex 1). Responses to the individual items were scored as true or false, and the correct answers were summed to create a composite score ranging from 0 to 10, with higher scores implying more declarative knowledge about HE. Current reliability data was $\alpha = .678$.

An adapted version of the *Students' Attitudes and Perceptions on Healthy Eating Questionnaire* (Pereira et al., 2021b) was used to evaluate children's attitudes and perceptions toward healthy eating. The present scale comprises 16 statements about students' attitudes and perceptions on the importance of HE (e.g., eating fruit and vegetables will help me to grow up) (see Annex 1). Participants answered following a 5-point Likert-type scale from 1 (*totally disagree*) to 5 (*totally agree*). Responses were summed to create a composite score ranging from 16 to 80, with higher scores implying more positive attitudes and perceptions toward healthy eating. Current reliability data was $\alpha = .856$ and $\omega = .843$.

An adapted version of the *Healthy Eating and Physical Activity Self-Efficacy Questionnaire for Children* (Lassetter et al., 2018) assessed children's self-efficacy beliefs regarding HE behavior. The present scale comprises seven statements regarding the degree to which children believe that they can eat healthy or handle a situation in which eating healthy is difficult (e.g., I will say no when my friends offer me junk food or food that is not healthy) (see Annex 1). Responses followed a 5-point Likert-type scale from 1 (*I am sure I cannot do this*) to 5 (*I am sure I can do this*). Responses were summed to create a composite score ranging from 7 to 35, with higher scores implying higher self-efficacy beliefs toward HE behavior. Current reliability data was $\alpha = .725$ and $\omega = .719$.

Parents/caregivers filled out the same scale as children, i.e., the three items from the *Healthy Eating and Physical Activity Behavior Recall Questionnaire for Children* (HEPABRQ-C) (Lassetter et al., 2018). Current reliability data for parents was $\alpha = .512$ and $\omega = .532$.

Parents/caregivers filled out the same scale as children, i.e., the *Self-Regulation Processes towards Healthy Eating Questionnaire*

(Pereira et al., 2019). The current reliability data for parents was $\alpha = .830$ and $\omega = .760$.

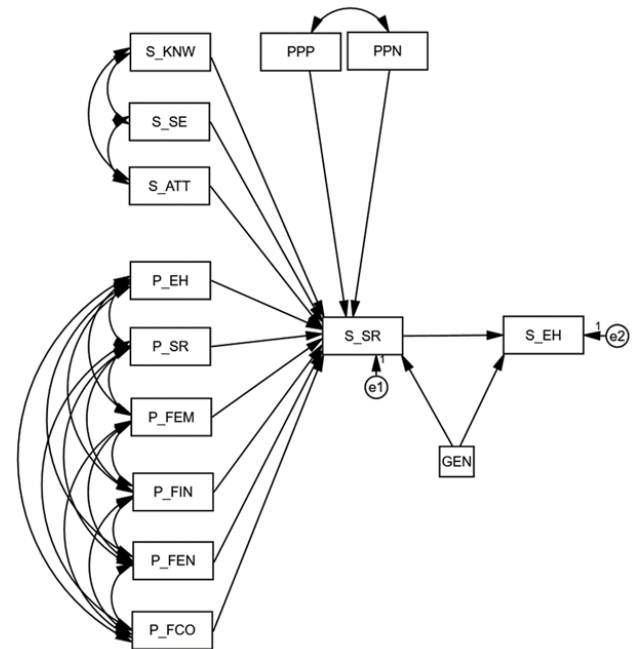
Parents completed an adapted version of the *Portuguese Parental Feeding Style Questionnaire* (Pimenta et al., 2019; Wardle et al., 2002) with four scales: emotional, instrumental, prompting and encouragement, and control feeding style. Parents' responses followed a 5-point Likert-type scale from 1 (*I never do*) to 5 (*I always do*). Note, for each scale, higher scores reflect better the corresponding parental feeding style. The emotional feeding scale comprises five items (e.g., I give my child something to eat to make him feel better when upset). Responses were summed to create a composite score ranging from five to 25. The current reliability data was $\alpha = .880$ and $\omega = .887$. The instrumental feeding scale comprises four items (e.g., I reward my child with something to eat when she is well-behaved). The composite score of the parent's responses ranged from four to 20, and the current reliability data was $\alpha = 0.684$ and $\omega = .676$. The prompting and encouragement to eat scale comprises six items (e.g., I praise my child if she tries a new food). The composite score ranged from six to 30, and the current reliability data was $\alpha = .750$ and $\omega = .729$). Finally, the control towards eating scale comprises four items (e.g., I decide how many snacks my child should have). The composite score ranged from four to 20, and the current reliability was $\alpha = .684$ and $\omega = .695$).

The food peer pressure was assessed with an open-ended question: "The last time I had money to eat, what did I buy?". The codification into healthy or unhealthy followed the guidelines for healthy school snacks from the Portuguese health and education office (Gregório et al., 2021). Responses mentioning healthy food items (e.g., fruit, yogurt) were coded as "1" for positive peer pressure, and responses including unhealthy food items (e.g., lollipops and pastry cake) were coded as "1" for negative peer pressure. The percentage of responses coded as "1" (positive and negative peer pressure separately) was calculated for each class, with higher scores reflecting more positive or negative food peer pressure to eat healthy or unhealthily, respectively.

Data Analysis

Data was analyzed in several stages. First, we calculated the descriptive statistics and the correlations between the variables to decide the analytical approach best suited to the study goals. We followed Finney and DiStefano's (2006) criteria of statistical normality, which sets ± 2 and ± 7 as the limits for skewness and kurtosis, respectively. Second, the missing values were dealt with using the multiple imputation procedure. Third, the path model corresponding to the prediction of HE behavior was adjusted using the statistical program AMOS 24 version (Arbuckle, 2013). The path model (see Figure 2) was fit. Results were evaluated according to the following criteria: Chi-square, Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Expected Cross-Validation Index (ECVI). While the first six provide us with information on the goodness of fit of the theoretical model to the data, ECVI informs us on the extent to which these results could be replicated in an independent sample. There is evidence of a good fit when chi-square has a $p > .05$, GFI, AGFI and TLI $\geq .90$, CFI $\geq .95$, and RMSEA $\leq .06$. Conversely, data are robust when the ECVI of the

Figure 2
Path Model of Personal, Behavioral, and Environmental Factors Predicting Healthy Eating of Fifth and Sixth Grade Children (Age: $M = 10.48$; $SD = 0.70$)



Note. Personal and behavioral factors: Gender (GEN), Declarative Knowledge about Healthy Eating (S_KNW), Self-Efficacy for Healthy Eating (S_SE), Attitude and Perceptions towards Healthy Eating (S_ATT), Self-Regulation Processes towards Healthy Eating (S_SR), Healthy Eating behavior (S_EH); Environmental factors: Parent's Healthy Eating Behavior (P_EH), Parent's Self-Regulation Processes towards Healthy Eating (P_SR), Parental Feeding Style/Emotional (P_FEM), Parental Feeding Style/Instrumental (P_FIN), Parental Feeding Style/Prompting and Encouragement (P_FEN), Parental Feeding Style/Control (P_FCO), Positive Peer Pressure (PPP), Negative Peer Pressure (PPN)

selected model is lower than that of the saturated model. Lastly, to estimate the size of the observed effects, we used the software provided by Lenhard & Lenhard (2016). In the present study, the effect size "d" was calculated from the CR test provided by AMOS (CR shows a distribution similar to that of the z test statistic). Then, using Cohen's (Cohen, 1988) d statistic: $d = 0.20$ small; $d = 0.50$ medium; $d = 0.80$ large.

Results

Participants Characterization

The final sample consisted of 273 children aged between nine and 13 ($M = 10.48$; $SD = .69$) and 273 parents/caregivers aged between 20 and 57 ($M = 40.84$; $SD = 5.63$). Table 1 presents details about the participant's sociodemographic characterization.

Preliminary Analyses

Table 2 shows the descriptive statistics for the variables included in the path model (mean, standard deviation, skewness, and kurtosis) and the Spearman correlation matrix. All the variables presented a normal distribution (except declarative knowledge, which comprised values

Table 1
Participants' Characterization

Characteristic	Children (n = 273)		Parents/Caregivers (n = 273)	
	n	(%)	n	(%)
Gender				
Male	134	49.1	34	12.5
Female	139	50.9	239	87.5
Grade				
Fifth	176	64.5	-	-
Sixth	97	35.5	-	-
Kinship				
Mother	-	-	235	86.1
Father	-	-	33	12.1
Sister	-	-	3	1.1
Grandmother	-	-	2	.7
Education level				
Basic education	-	-	108	39.6
Secondary education	-	-	106	38.8
Undergraduate degree	-	-	48	17.6
Graduate degree	-	-	10	3.7
Without information	-	-	1	.4

of asymmetry and kurtosis in the limit). Data show both positive and negative relationships between variables. HE behavior was positively correlated with self-efficacy for HE, attitudes and perceptions towards HE, self-regulation processes towards HE, and one of the parental feeding styles (i.e., prompting and encouragement).

Assessment of Path Model

The fully mediated model fit was not entirely acceptable, $\chi^2(58) = 133.613; p < .001; \chi^2/df = 2.304; GFI = .937; AGFI = .887; TLI = .812; CFI = .880; RMSEA = .069 (.054 - .085)$. The modification indices and the residuals suggested the inclusion of the direct effect of the variable attitudes towards HE on children's eating behavior. This led to a significant improvement in model fit, $\chi^2(57) = 98.214; p = .001; \chi^2/df = 1.723; GFI = .952; AGFI = .912; TLI = .896; CFI = .935; RMSEA = .052 (.034 - .068)$. Finally, after estimating the relationship between the measurement errors of two variables of different levels, the model fit was satisfactory, $\chi^2(55) = 82.806; p = .009; \chi^2/df = 1.506; GFI = .959; AGFI = .922; TLI = .927; CFI = .956; RMSEA = .043 (.022 - .061)$. Likewise, as the Expected Cross Validation Index (ECVI) value of our model (default model) was lower than the ECVI value of the saturated model (ECVI = 0.672 and ECVI = 0.772, respectively), data suggest that the model cross-validates across similar-sized samples from the same population. Table 3 indicates the estimation of the regression coefficients corresponding to the effects included in the predictive model of children's HE behavior.

Table 2
Spearman Correlations, Mean, Standard Deviation, Skewness, and Kurtosis of Observed Measures (N = 273)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. S_GEN	1.000													
2. S_KNW	-.139*	1.000												
3. S_SE	-.192**	.235**	1.000											
4. S_ATT	-.100	.198**	.588**	1.000										
5. S_SR	-.110	.138*	.529**	.496**	1.000									
6. S_EH	.000	.104	.387**	.423**	.316**	1.000								
7. P_EH	.047	.028	.111	-.003	.030	.043	1.000							
8. P_SR	-.060	.100	.173**	.105	.212**	.059	.221**	1.000						
9. P_FEM	-.051	.059	-.011	.013	.008	-.042	.052	-.081	1.000					
10. P_FIN	-.044	.012	.030	.030	-.028	-.018	-.100	-.114	.577**	1.000				
11. P_FEN	-.072	.118	.281**	.215**	.146*	.119*	.106	.427**	-.081	-.084	1.000			
12. P_FCO	-.083	.110	.244**	.128*	.112	.097	-.020	.213**	-.114	.027	.342**	1.000		
13. G_PPP	-.016	-.046	-.030	-.050	-.141*	-.096	.061	-.088	.073	-.038	.009	-.062	1.000	
14. G_PPN	-.069	.003	-.178**	-.222**	-.213**	-.067	.005	-.029	.010	-.071	-.052	-.038	-.171**	1.000
M	1.49	8.95	24.78	62.99	32.90	6.02	6.09	33.09	7.97	6.22	24.70	15.21	53.11	45.13
SD	0.50	1.49	5.33	9.47	6.59	2.45	1.96	5.24	3.32	2.36	3.42	2.77	20.22	17.22
SKEW	0.03	-2.31	-0.56	-0.86	-0.54	-0.39	-0.07	-0.41	1.50	1.54	-0.59	-0.36	0.46	-0.01
KURT	-2.01	6.79	0.15	2.07	0.11	-0.50	-0.06	0.18	3.02	3.93	0.01	-0.06	-0.48	-0.25

Note. Personal and behavioral variables: 1. Gender (S_GEN), 2. Declarative Knowledge about Healthy Eating (S_KNW), 3. Self-Efficacy for Healthy Eating (S_SE), 4. Attitude and Perceptions towards Healthy Eating (S_ATT), 5. Self-Regulation Processes towards Healthy Eating (S_SR), 6. Healthy Eating behavior (S_EH); Environmental variables: 7. Parent's Healthy Eating Behavior (P_EH), 8. Parent's Self-Regulation Processes towards Healthy Eating (P_SR), 9. Parental Feeding Style/Emotional (P_FEM), 10. Parental Feeding Style/Instrumental (P_FIN), 11. Parental Feeding Style/Prompting and Encouragement (P_FEN), 12. Parental Feeding Style/Control (P_FCO), 13. Positive Peer Pressure (G_PPP), 14. Negative Peer Pressure (G_PPN).

* $p < .05$; ** $p < .01$

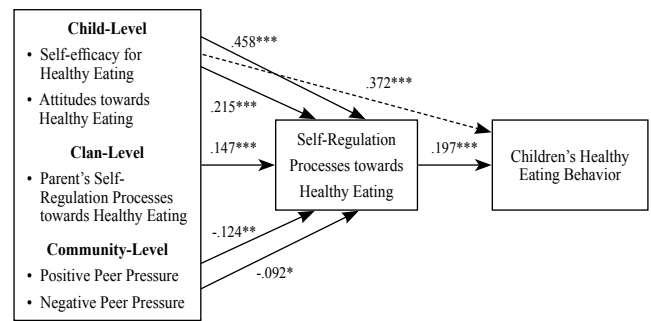
Table 3
Regression Coefficients of the Path Model (Direct Effects)

	RW	SE	SRW	t	p	d
S_KNW → S_RS	-.347	.212	-.081	-1.635	.102	—
S_SE → S_RS	.563	.076	.458	7.416	<.001	1.005
S_ATT → S_RS	.146	.041	.215	3.572	<.001	0.443
S_ATT → S_EH	.096	.015	.372	6.253	<.001	0.818
S_SR → S_EH	.075	.023	.197	3.305	<.001	0.408
P_EH → S_SR	-.214	.164	-.065	-1.308	.191	—
P_SR → S_SR	.181	.066	.147	2.732	.006	0.335
P_FEM → S_SR	.64	.116	.085	1.408	.159	—
P_FIN → S_SR	-.224	.164	-.082	-1.365	.172	—
P_FEN → S_SR	-.159	.103	-.084	-1.540	.123	—
P_FCO → S_SR	-.098	.122	-.042	-0.805	.421	—
PPP → S_SR	-.039	.015	-.124	-2.557	.011	0.313
PPN → S_SR	-.035	.018	-.092	-1.905	.050	0.232
GEN → S_SR	-.389	.611	-.030	-0.637	.524	—
GEN → S_EH	.341	.257	.070	1.325	.185	—

Note. RW (regression weights), SE (standardized errors), SRW (standardized regression weights). Personal and behavioral variables: Gender (GEN), Declarative Knowledge about Healthy Eating (S_KNW), Self-Efficacy for Healthy Eating (S_SE), Attitude and Perceptions towards Healthy Eating (S_ATT), Self-Regulation Processes towards Healthy Eating (S_SR), Healthy Eating behavior (S_EH); Environmental variables: Parent's Healthy Eating Behavior (P_EH), Parent's Self-Regulation Processes towards Healthy Eating (P_SR), Parental Feeding Style/Emotional (P_FEM), Parental Feeding Style/Instrumental (P_FIN), Parental Feeding Style/Prompting and Encouragement (P_FEN), Parental Feeding Style/Control (P_FCO), Positive Peer Pressure (PPP), Negative Peer Pressure (PPN).

Data indicated the following in relation to the hypotheses set (see Figure 3 for the most relevant relationships found). First, we hypothesized a fully mediated model (through SR strategies); however, current data support a partially mediated model. Second, the personal factors, self-efficacy, and attitudes toward HE were significantly, positively, and strongly related to the use of SR strategies (self-efficacy with a large direct size effect: $d = 1.005$; attitudes with a moderate direct size effect: $d = 0.443$), and indirectly to children's HE behavior (indirect effects: self-efficacy = $.090$, $p < .001$; attitude = $.042$, $p < .01$). The variable attitudes and perceptions towards HE was directly and strongly related to children's HE behavior ($d = 0.818$). However, the level of declarative knowledge about HE was not related to children's HE behavior. Third, the indirect relationship between peer pressure and children's HE behavior was partially confirmed. The relationship was negative both for positive and negative peer pressure: The greater the peer pressure, the lower the self-regulation (indirect effects: positive peer pressure = $-.024$, $p < .01$; negative peer pressure = $-.018$, $p < .05$). Fourth, the relationship between family variables and children's use of SR strategies towards HE was not confirmed, except for parent's SR towards HE. Only this variable was directly, significantly, and positively related to the use of SR strategies by children ($d = 0.335$) and indirectly ($.029$, $p < .01$) to children's HE behavior. In addition, a considerable amount of the variance (39%) of SR towards HE was explained by the predictor variables, while the variables in the model explained 25% of the variance of children's HE behavior. Finally, the children's gender was not related to any of the two dependent variables.

Figure 3
Statistically Significant Relationships. Solid Lines Represent the Indirect Effects of the Predictors on Children's HE Through SR; the Dashed Line Represents the Direct Effect of Attitudes on Children's HE



Discussion

The present study aimed to further investigate the role of SR on children's HE. The triadic model of the SCT (Bandura, 1991) grounded the study and helped expand a previous model on the effects of motivational factors (i.e., personal and behavioral) on children's HE (Pereira et al., 2021b). The new model followed a multi-reporter approach through parent-child dyads, and included environmental factors (i.e., family and peer variables). A path model was fit, exploring how children's SR toward HE mediates the effect of personal factors (i.e., knowledge, self-efficacy, and attitudes toward HE) and environmental factors (i.e., parent's HE, parent's SR toward HE, parental feeding styles, peer pressure to eat healthy or unhealthy food) on children's HE behavior. Overall, the hypothesized mediation model was partially confirmed.

Some of the variables in the model are related to children's HE through SR strategies related to eating behavior. Results for personal and behavioral factors echo the original model (see Pereira et al., 2021b) but present novel findings. Children's SR toward HE mediates the relationship between attitudes and self-efficacy (not declarative knowledge) and children's HE. However, while SR towards HE totally mediated the relationship between attitudes towards HE and eating behavior in the latter model, present results show a direct effect of the children's attitudes towards HE on eating behavior. Data indicated that children with more positive attitudes towards HE are more likely to eat healthily than their counterparts. This relationship occurs directly through SR strategies for HE. Therefore, factors other than SR explain the relationship between attitudes and HE behavior. For example, research shows that the neighborhood environment (e.g., proximity to food outlets) may thwart children's intentions to eat healthily (Rawlins et al., 2013). Thus, the relationship between attitudes toward HE and eating behavior is likely to be influenced by the use of SR strategies and environmental factors (Charry, 2014). Current data showed that the effect of the environmental factors included added predictive value to HE behavior (i.e., 5% to the explained variance of children's SR and 18% to that of HE behavior). This finding emphasizes the need to consider diverse factors from the triadic model when studying and intervening in children's eating behavior.

Regarding family influence, results show that parents who prepare meals using SR strategies (e.g., planning meals) are more

likely to influence their children's SR strategy use and, ultimately, HE. This finding is congruent with prior studies (not HE-focused) showing a positive association between parents and children's SR (Bridgett et al., 2015). Contrary to expectations, no direct or indirect effects were found between parents' eating behavior/feeding style and children's HE behavior. Current findings do not match those of previous research showing parents' consumption of F/V and feeding practices focused on prompting and encouraging HE shape children's HE behavior (e.g., Scaglioni et al., 2018; Sleddens et al., 2010). This mismatch may be due to the participants' age group. Most previous research examined the effects of variables from the family in younger children (up to eight years old) (e.g., Scaglioni et al., 2018). For older children, who display increasing autonomy towards eating behavior, parents' influence through feeding practices and eating behavior may become less prominent (te Velde et al., 2014). In fact, literature suggests that this age group is increasingly susceptible to peers' influence, because as children age, the time spent with peers increases, group identity starts to develop concurrently with the need to feel accepted, and this is the age cohort (10-12) with the least resistance to peer influence (Steinberg & Monahan, 2007). All these aspects suggest a decreasing influence of family on children's behavior. Current data aligns with the systematic review by Yee et al. (2017) reporting that the effects of parent-related factors on HE were unique to younger children. Current data support and is supported by data from a qualitative study by Magalhães et al. (2022) analyzing children's perceived barriers to HE. These authors investigated children from the same age group as the present study and found that the family factors (e.g., parent dietary intake) had less impact on eating behavior, and, surprisingly, the peer factors (e.g., peer food choices) had the greatest influence on children's eating behavior.

Consistent with the aforementioned finding, present results indicate that peer pressure is related to children's HE behavior through SR. Positive (i.e., peers' influence to eat healthily) and negative (i.e., peers' influence to eat unhealthily) peer pressure is negatively related to SR. This result is consistent with literature; for instance, data by Ragelienė & Grønhoj (2020) shows that children socializing with peers eating unhealthy foods are likely to follow similar unhealthy food choices. Peers may exert a greater influence on children's behavior when there is a perceived shared group membership (e.g., school class) (Cruwys et al., 2015). The modeling effect is strongest when there is a desire for affiliation and perceived similarity with the model (Reicks et al., 2015). Importantly, the reproduction of their peers' behaviors translates to few opportunities for developing SR strategies (i.e., proactively controlling the influences on their behavior) (Karreman et al., 2006; Salvy et al., 2012). Finally, data suggest that, for children from the fifth and sixth grades, peers' influence becomes more important than that of parents. The fact that children are more susceptible to peer than parental influence can be explained by the increase in children's autonomy over time, combined with an increased time spent with peers (te Velde et al., 2014).

Regarding practical implications, this study reinforces the premise that actions aiming to promote children's HE should follow a multidimensional approach. For example, research drawing on the triadic model (Bandura, 2001, 2018) should include personal, behavioral, and environmental factors (i.e., family and peers) (de Ridder et al., 2017). Moreover, the design of interventions for

HE should consider including activities to foster children's use of SR strategies, beliefs of self-efficacy, and positive attitudes toward HE (Magalhães et al., 2020). Attitudes toward HE showed a direct impact on children's eating behavior. Educators could consider working with children to address possible wrongful beliefs affecting their attitudes towards HE (e.g., believing that only unhealthy food is tasty) and promote positive ones (e.g., benefits of HE) (Verstraeten et al., 2014). Prior research shows that videos could be a powerful tool to change children's attitudes (Pereira et al., 2021a; Schultz & Danford, 2016), for example, towards HE (e.g., healthy food advertisements could be embedded within popular television programs for families).

Our results also support the idea that HE outcomes can be strengthened when environmental influences are considered. Therefore, interventions should include social support, i.e. family and peers, in their design. By doing so, we acknowledge the fact that this age group is susceptible to peers' influence (Steinberg & Monahan, 2007), and create opportunities to sustain family influence for longer. For example, there are many reports of interventions promoting children's HE through SR, but only a few are family-based (Miller et al., 2018; Nix et al., 2021). By promoting simultaneously SR strategies to children and their parents, interventions may lessen the unfavorable effects of negative peer pressure on children's eating behavior (te Velde et al., 2014), and increase the impact of family variables. Additionally, interventions following a class-based approach may help overcome peer pressure's negative effects by equipping children from the same group with strategies to attain HE behavior. Salvy et al. (2012) argue that the involvement of the child's peer networks in the intervention efforts is critical for promoting and maintaining positive behavioral health trajectories. To conclude, conducting promotional interventions that simultaneously target the child, the parents, and the peers may have lasting effects on children's eating behavior.

This study has some limitations that need to be acknowledged. First, data are cross-sectional, which prevents inferring about causal relationships. Future research could follow a longitudinal design to examine whether changes in predicting variables lead to actual changes in children's SR or their eating behavior. Second, it is not possible to guarantee the generalization of the present findings. In fact, 48% of the sample did not complete all the questionnaires; this is a relevant limitation since we do not know if these participants were in some aspect distinct in their characteristics or practices (e.g., (un)healthier food consumption) that could have shaped the results in another direction. Thus, this should be considered while analyzing current data. Research with dyads has additional challenges in terms of participant retention and inclusion in the study, as it increases the difficulty of reaching both elements of the dyad, resulting in a high exclusion rate of participants for various reasons. Despite this limitation, current data were collected in four public schools from different contexts (e.g., rural and urban), ensuring a wide range of socioeconomic and cultural backgrounds, which we hope may have minimized any potential sampling bias. Future research should take measures to promote participants' involvement in data collection (e.g., offering a workshop for schools where participants completed all instruments). Additionally, the present model should be examined in distinct age groups (e.g., preschool, "early" elementary school, middle school), where the relationships between child, family, and peer

factors and HE behavior may differ from Wray-Lake et al. (2010) those reported presently (te Velde et al., 2014; Yee et al., 2017). We endeavored to account for factors from distinct dimensions of children's life, namely individual, clan, and community. Future research could consider including other factors from these and other life dimensions of children. To illustrate, the interaction between parents/siblings and perceived social support to maintain a healthy diet may impact children's eating behavior. In addition, another relevant variable from the children environment that may impact HE is the accessibility to, and affordability of, (un) healthy food outlets in the school or home surroundings. We believe this is a key variable in nudging individuals' (un)healthy eating behavior. Thus, future studies could consider measuring the distance/density and affordability of the (un)healthy food outlets and examine the impact of this variable on children's food choices. Finally, the self-reported nature of the measures could have led to biased responses, preventing capturing the diversity of children's perspectives on the variables examined. For example, the positive role played by the personal and behavioral factors in the present study suggests the potential value of using qualitative research to grasp the perspectives and experiences of children and their implicit theories about the SR-HE relationship.

To conclude, the present study extended extant literature on the influence of motivation-related factors on children's HE behavior. The use of dyads to achieve information triangulation is a major strength of current research. Present results showed relationships between personal and environmental factors (i.e., children's attitudes and self-efficacy towards HE, parent's SR, and positive and negative peer pressure) and HE through SR. The central finding that personal variables are associated with HE through SR lends empirical support to the relevance of the motivation-related factors on children's HE. Another key conclusion points to the need to acknowledge the relevance of simultaneously considering factors from the triadic model (Bandura, 1991) when studying children's eating behavior. Some of the new variables are related to the target outcome, and their inclusion improved the explained variance of the original model. This highlights the complexity of influences on children's eating behavior (de Ridder et al., 2017). Finally, although parents and peers could influence children's eating behavior, for children over eight years of age, peers may have a greater impact than parents.

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