



Social support influences on eating awareness in children and adolescents: the mediating effect of self-regulatory strategies

Margarida Gaspar de Matos, Antonio L. Palmeira, Tania Gaspar, John B. F. De Wit & Aleksandra Luszczynska

To cite this article: Margarida Gaspar de Matos, Antonio L. Palmeira, Tania Gaspar, John B. F. De Wit & Aleksandra Luszczynska (2016) Social support influences on eating awareness in children and adolescents: the mediating effect of self-regulatory strategies, *Global Public Health*, 11:4, 437-448, DOI: [10.1080/17441692.2015.1094106](https://doi.org/10.1080/17441692.2015.1094106)

To link to this article: <http://dx.doi.org/10.1080/17441692.2015.1094106>



Published online: 13 Nov 2015.



Submit your article to this journal [↗](#)



Article views: 180



View related articles [↗](#)







View Crossmark data [↗](#)



Citing articles: 1 View citing articles [↗](#)

Social support influences on eating awareness in children and adolescents: the mediating effect of self-regulatory strategies

Margarida Gaspar de Matos^{a,b,c} , Antonio L. Palmeira^{d,e} , Tania Gaspar^{b,f,g} ,
John B. F. De Wit^{h,i}  and Aleksandra Luszczynska^{j,k}

^aInstitute for Environmental Health, University of Lisbon, Lisbon, Portugal; ^bFaculty of Human Kinetics, University of Lisbon, Lisbon, Portugal; ^cWilliam James Center for Research, Instituto Superior de Psicologia Aplicada, Lisbon, Portugal; ^dFaculty of Physical Education and Sports, Lusofona University, Lisbon, Portugal; ^eInterdisciplinary Centre for the Study of Human Performance, University of Lisbon, Lisbon, Portugal; ^fSchool of Psychology, Lusiada University, Lisbon, Portugal; ^gInstitute for Environmental Health, University of Lisbon, Lisbon, Portugal; ^hCentre for Social Research in Health, University of New South Wales, Sydney, Australia; ⁱDepartment of Social and Organizational Psychology, Utrecht University, Utrecht, The Netherlands; ^jDepartment in Wrocław, University of Social Sciences and Humanities, Wrocław, Poland; ^kTrauma, Health & Hazards Center, University of Colorado, Colorado Springs, CO, USA

ABSTRACT

The impact of the social environment on healthy eating awareness results from complex interactions among physical, economic, cultural, interpersonal and individual characteristics. This study investigated the impact of social support and social influence on healthy eating awareness, controlling for socio-economic status, gender and age. Additionally, the mediating effect of self-regulation strategies was examined. A total of 2764 children and adolescents aged 10–17 from four European countries completed self-report measures on healthy eating awareness, social influence and the use of self-regulation strategies. Healthy eating awareness and the use of self-regulation strategies were more likely to occur among younger participants. An interaction between gender and age was related to the use of some self-regulation strategies; compared to girls, boys decreased the use of self-regulation strategies more from pre-adolescence to adolescence. Peer social influence was associated with more unhealthy eating in older participants. Results suggest a need to promote self-regulatory competences among young people in order to assist them with regulating their eating behaviours, especially in the presence of peers. Both school-based interventions and family-based interventions, focusing on self-regulation cognitions and social (peer) influence, could help children and adolescents to use self-regulatory strategies which are essential to eat healthier.

ARTICLE HISTORY

Received 23 February 2014
Accepted 17 August 2015

KEYWORDS

Adolescence; self-regulation;
social influence; socio-
economic status; eating
awareness

Introduction

Self-regulation may be defined as a process that involves the pursuit of long-term goals and usually aims at dealing with obstacles and temptations (Carver & Scheier, 1998; De Ridder & De Wit, 2006). The concept of self-regulatory competence (SRC) helps to

understand and improve ways of dealing with challenging situations where weight-related behaviours occur (De Ridder & De Wit, 2006; Tangney, Baumeister, & Luzzo Boone, 2004). SRC encompasses individual skills related to both self-control (i.e. being able to inhibit unwanted and/or impulsive responses to food and inactivity temptations) and the use of strategies to plan and enact behaviour in the perspective of long-term goals (in this case, prevention of weight gain). SRC may be influenced by individual dispositions, but it also includes skills that are developed during childhood and adolescence and may be promoted by intervention programmes, such as problem identification and problem solving, emotion identification and emotion regulation, resisting peer pressure and seeking help from adults (Dirks, Treat, & Weersing, 2007; Matos, Morgan & Social Adventure Team, 2012; Matos, Gasper et al., 2012; Schunk & Zimmerman, 1997). SRC has been found to be associated with a range of desirable behaviours in young people, including interpersonal behaviour and educational attainment (Tangney et al., 2004).

Broad categories of SRCs, such as goal-focused and temptation-focused self-regulation strategies, can be further broken down into either behavioural action (towards the goal or the temptation) or alteration of psychological meaning (of the goal or the temptation) (Carver & Scheier, 1998). Previous research has shown that self-regulatory strategies contribute to the successful control of food intake (Adriaanse, Vinkers, De Ridder, Hox, & De Wit, 2011; Van den Bos & De Ridder, 2006). While most children and adolescents are well aware that eating healthy is important, translating this knowledge into action often fails, suggesting that they experience difficulties in self-regulation, most likely when food is tempting and when they are in the presence of peers who influence or even push them to unhealthy food choices (Matos, Morgan et al., 2012; Matos, Gasper et al., 2012).

Among determinants of child and adolescent eating behaviour, social environment factors have been investigated most extensively. These environmental factors include parental and peer's behaviours and influences, socio-economic and cultural differences. For example, there is solid evidence that peer group influence is significantly related to both healthy and unhealthy eating (Kalavana, Maes, & De Gucht, 2010). For instance, frequently, young individuals use meal companions as models for food quantity and quality and for what they eat (Herman, Roth, & Polivy, 2003). Research has demonstrated the influence of social contexts in health-related behaviours in children and adolescents (Turbin et al., 2006), especially in a social context of peer modelling or pressure (Matos, Morgan et al., 2012) and this includes weight-related behaviours (e.g. Hill, Stephens, & Smith, 2003; Wadden, Womble, Stunkard, & Anderson, 2002).

Eating behaviour in children can be also explained by social influence of parents and friends. Parental and peers' influences may operate in different ways, depending on age and gender of children/adolescents. For example, parents may exert inhibitory influence on unhealthy eating in pre-adolescents; adolescent girls may try to convey a good impression of healthy eating when eating with same-sex friends; adolescent boys' eating behaviours, in turn, seem to be much less influenced by peer's and parental behaviours (Salvy, Elmo, Nitecki, Kluczynski, & Roemmich, 2011). Socio-economic and some socio-cultural differences between countries may help to explain differences in engagement in health behaviour (Turbin et al., 2006; Vazsonyi, Trejos-Catillo, & Huang, 2006; Widhalm & Fussenegger, 2005). Knowing how the social context affects both the food availability, evaluation of tempting foods and the appreciation of SRC may contribute to the development of effective interventions for weight gain prevention across countries,

as it allows the tailoring of interventions to specific country and the factors that drive weight-related problems in different countries.

Children and adolescents growing up in a disadvantaged socio-economic environment are more often exposed to situations of family stress and inadequate social support. In addition to housing and environmental problems, those children and adolescents face social exclusion and risk of social marginalisation (Gaspar, Matos, Ribeiro, Leal, & Ferreira, 2009; Gaspar, Ribeiro, Matos, Leal, & Ferreira, 2009). Socio-economic status (SES) may influence people's lifestyles in several ways that include diet and physical activity. In particular, SES differences affect access to food supplies and health services, and therefore lower SES contributes to nutrient and energy-dense diet, lower energy expenditure and lower leisure time physical activity levels (Jones, Hinkley, Okely, & Salmon, 2013; Wang, 2001; Wang, Monteiro, & Popkin, 2002). Furthermore, living in rural or urban areas may have an impact on food availability and children's and adolescents' food choices (Gaspar, Matos, Luszczyńska, Baban, & Wit, 2014).

The present study is aimed at investigating the impact of social influence of peers and parents on young people's healthy eating awareness. These effects were examined in the context of the role of SES, gender and age. Furthermore, we tested the mediating effect of self-regulation strategies in the relationship between social influence variables and healthy eating awareness among children and adolescents (see Figure 1).

Method

Participants

Data were collected in schools in four European countries, The Netherlands (NL), United Kingdom (UK), Poland (PL) and Portugal (PT), as part of the Temptations to Eat Moderated by Personal and Environmental Self-regulatory Tools (TEMPEST) project, funded by the European Commission's 7th Framework Programme (www.tempestproject.eu). These countries were selected to represent a range of combinations of overweight prevalence and socio-economic development. As indicated by gross domestic product in these countries, the UK and the Netherlands are socio-economically more privileged than Poland and Portugal. Convenience sampling was used to recruit schools. Further schools in rural and urban regions as well as in higher and lower SES areas were included. A total of 24 schools participated (four schools from each country), with 50.9% of these schools being located in rural areas, and 68.6% of these schools being situated in areas with a high SES. In each school, two classes were selected on a voluntary and availability basis, one class from each age group.

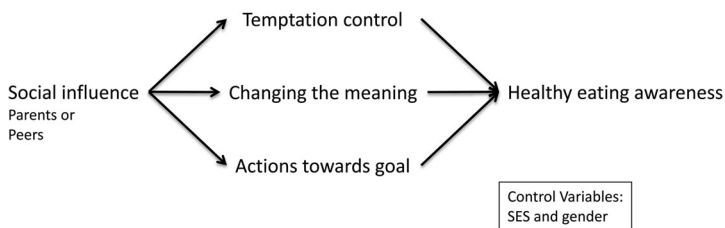


Figure 1. Analytical model.

Procedure

The data collection protocol complied with the specific human research ethics regulations in each country, and passive (i.e. participation unless objection is made by signing the opting-out form) or active (i.e. participation only upon signing the opting-in form) consent was obtained from parents and/or consent or assent was obtained from children and adolescents, depending on country regulations. Participants were asked to complete the questionnaire in one session at school, in the classroom setting. Completing the questionnaire took approximately 30 minutes.

Measures

A self-completion questionnaire was used to assess participants' characteristics, use of self-regulation strategies, healthy eating awareness and social influence (friends' influence). The questionnaire also assessed a variety of other variables, which are beyond the scope of the present study and hence not detailed. An original version of the questionnaire was created in English. Subsequently, Dutch, Portuguese and Polish versions were developed and back-translated into English to ensure equivalence across countries.

Healthy eating awareness

Health eating awareness was measured with eight items, for example 'I would like to eat healthier', 'my parents tell me I should eat healthy', 'I myself pay attention to eating healthy or "the people around me help me to eat more healthy"' (Cronbach's alpha = 0.79).

Self-regulation strategies for eating

The use of eating-related self-regulation strategies was assessed with the TESQ-E (Stok, De Ridder, De Vet, & De Witt, 2013), TESQ-E is a 24-item, validated instrument to assess dietary self-regulation strategies among children and adolescents, aged 9–16 years old. Individuals are asked to rate, on a 5-point Likert scale ranging from 1 (never) to 5 (always), how often they use specific self-regulation strategies, grouped into three categories. Each category, in turn, encompasses two strategies that are assessed with four items.

The first category reflects strategies addressing *the food environment directly* (i.e. actions towards temptation), and includes items describing temptation control (e.g. 'If I want to eat candy, I take a few and put the rest of the bag away') and temptation avoidance (e.g. 'If I am bored, I stay away from the kitchen') (Cronbach's alpha = 0.83). The second category encompasses strategies regarding *changing the meaning of the food environment* (i.e. changing the meaning of temptations), and includes items describing distraction (e.g. 'If I have the urge to eat candy, I find something else to do') and suppression (e.g. 'If I want to eat unhealthy things, I just tell myself 'no') (Cronbach's alpha = 0.86). The third category reflects strategies addressing *the goal to eat healthily* (i.e. actions towards goals), and includes items describing goal and rule setting (e.g. 'I have an agreement with myself about how many candies I can have per day') and goal deliberation (e.g. 'If I think I may be overeating, I think how this may compromise exercising') (Cronbach's alpha = 0.86). The three categories of self-regulation strategies were significantly correlated (range: $r = 0.66$ to 0.73 , p 's < .001).

Social influence

Friends' social influence on reducing unhealthy eating and promoting healthy eating was assessed with four items, based on previous measures of active social influence and social norms (Graham, Marks, & Hansen, 1991): 'My friends discourage me from eating snacks or drinking fizzy drinks,' 'My friends disapprove of my eating snacks or drinking fizzy drinks,' 'My friends encourage me to eat fruits and vegetables' and 'My friends approve of my eating fruits and vegetables' (Cronbach's $\alpha = 0.76$). The response scale ranged from 1 (strongly disagree) to 5 (strongly agree).

Parental social influence on reducing unhealthy food intake and promoting healthy eating was evaluated with four similar items: 'My parents discourage me from eating snacks or drinking fizzy drinks,' 'My parents disapprove of my eating snacks or drinking fizzy drinks,' 'My parents encourage me to eat fruits and vegetables' and 'My parents approve of my eating fruits and vegetables.' This measure was based on active social influence and social norms assessment (Graham et al., 1991): (Cronbach's $\alpha = 0.70$).

Data analysis

Univariate general linear model and chi-square analyses were used to calculate descriptive statistics and compare age groups (children vs. adolescents). Partial correlations, controlling for SES, age and gender were calculated to assess associations between healthy eating awareness, self-regulation strategy use and social influence variables. The mediating role of self-regulation strategies in the relationship between social influence variables and eating awareness was tested with multiple mediation analysis. In particular, we used Preacher and Hayes' (2008) procedures, encompassing multiple regression analysis and accounting for bootstrapped resampling, and evaluating specific indirect effects. The resampling procedure (5000 bootstrap samples) was applied, with the Bias Corrected and Accelerated (BCa) estimates and 95% confidence intervals. The bootstrapping-based analysis providing BCa confidence intervals is considered superior to the normal theory-based Sobel tests as they require no distributional assumptions and are less likely to lead to a Type I error. If the BCa 95% confidence interval does not include zero it may be concluded that the effect was significant (at alpha level of .05). Variance inflation factors (1.33–2.53) and tolerances (.47–.76) indicated that collinearity was not a problem (Cohen et al., 2003). Homoscedasticity and linearity were assessed through the analysis of residual scatterplots, revealing no problems.

The hypothetical model that was developed for the purpose of the present study, representing assumed relationships, is presented in [Figure 1](#).

Results

The questionnaire was completed by 2764 children and adolescents (51% boys). The mean age was 13.2 years ($SD = 1.9$; minimum = 10; maximum = 17), including 1097 children (aged 10–12) and 1665 adolescents (aged 13–17). The countries involved were: the Netherlands ($n = 586$), Poland ($n = 832$), Portugal ($n = 517$) and the United Kingdom ($n = 829$). Participants represented higher (68.6%) and lower (31.4%) SES, according to the geographic location of the school neighbourhood (poorer and wealthier area).

Table 1. Age, gender and socio-economic status of participants by country of recruitment.

	Age Mean (SD)	Gender		SES	
		% boy	% girl	% low	% high
The Netherlands (<i>N</i> = 586)	13.05 (2.03)	50.1	49.9	34.0	66.0
Portugal (<i>N</i> = 517)	12.51 (1.71)	47.2	52.8	17.8	82.2
UK (<i>N</i> = 829)	13.60 (1.60)	56.3	43.7	20.3	79.7
Poland (<i>N</i> = 832)	13.24 (2.14)	48.4	51.6	49.3	50.7
Total (<i>N</i> = 2764)	13.17 (1.92)	50.9	49.1	31.4	68.6

Table 1 shows socio-demographic characteristics and the percentage of participants from each country within higher and lower SES groups, and the distribution by gender and mean values for age. Participants were equally distributed within age groups (children and adolescents), gender and socio-economic status.

Univariate general linear models were used to evaluate the role of the demographic variables and conduct the comparisons between children (aged 10–12 years) and adolescents (13–17 years), boys and girls. Furthermore, the effects of the gender \times age interactions on study variables are presented in Table 2.

Compared to adolescents and girls, children and boys presented higher levels of social influence variables ($p < .001$). No interaction effects were found between age and gender. The self-regulation and healthy eating awareness levels were higher among children, compared to adolescents (all $ps < .001$). Girls presented higher scores than boys in self-regulatory strategies of temptation control ($p = .006$) and action towards goals ($p < .001$), as well as girls reporting higher healthy eating awareness ($p < .001$). An age \times gender interaction had a significant effect on two self-regulation strategies, changing the meaning ($p < .001$) and action towards goals ($p = .029$). In particular, the use of these self-regulatory strategies declined stronger from childhood to adolescence among boys, when compared to the use of self-regulation strategies in girls.

Before the main analysis, we firstly examined partial correlations between the social influence, self-regulations and eating awareness, controlling for SES, age and gender. Self-regulation and social influence variables were positively correlated with healthy eating awareness (all $ps < .001$). Results are presented in Table 3.

The following set of analyses tested for the mediating role of self-regulation strategies in the relationship between social influence variables and eating awareness. Parental and peer social influences were the independent variables analysed in three models: (a) all participants, (b) children only and (c) adolescents only. Six models were therefore analysed for associations between total/parental/peer influences and eating awareness using samples comprising all participants/children only/adolescents only (Table 4).

The models with all participants were significant ($p's < .001$), explaining close to 30% of the variance of the healthy eating awareness (Table 4). Total effects were also significant. The direct effects were reduced yet remained significant when controlling for the proposed mediators. The only significant indirect effect was represented by the positive effect of the action towards goals self-regulation (social influence parents 0.10–0.14, and social influence peers 0.15–0.21 BCa CI 95%), meaning that the higher scores in the measure of social influences were associated with the higher scores of action towards goals, which in turn led to higher scores of healthy eating awareness. Both gender and SES had a

Table 2. Demographics and comparisons for age groups, gender and socio-economic status (SES). Univariate general linear models or chi-squares.

	Total (N = 2316)		Children (n = 1097)		Adolescents (n = 1665)		Age group		Gender		Age group × Gender	
	M	(SD)	M	(SD)	M	SD	F	p	F	p	F	p
<i>Social influence</i>												
Social influence parents	14.02	(3.26)	14.52	(3.32)	13.68	(3.11)						
Girls			14.82	(3.11)	13.97	(3.13)	43.55	< .001	21,01	<.001	0.010	.969
Boys			14.22	(3.51)	13.37	(3.21)						
Social influence peers	10.89	(3.63)	11.28	(3.84)	10.62	(3.47)						
Girls			11.55	(3.53)	10.91	(3.35)	20.81	<.001	14.31	<.001	0.010	.058
Boys			11.02	(4.09)	10.35	(3.56)						
<i>Self-regulation</i>												
Temptation control	2.22	(0.86)	2.52	(0.88)	2.02	(0.79)						
Girls			2.54	(0.87)	2.09	(0.79)	241.21	<.001	7.62	0.006	3550	.060
Boys			2.51	(0.89)	1.95	(0.77)						
Changing the meaning	2.22	(0.88)	2.44	(0.92)	.207	(0.82)						
Girls			2.41	(0.87)	2.16	(0.82)	120.78	<.001	1.67	0.196	13,980	<.001
Boys			2.48	(0.96)	1.99	(0.81)						
Actions towards goal	2.44	(0.95)	2.71	(0.96)	2.26	(0.91)						
Girls			2.87	(0.93)	2.41	(0.92)	149.48	<.001	28.75	<.001	4790	.029
Boys			2.65	(0.99)	2.12	(0.88)						
<i>Eating awareness</i>												
Healthy eating awareness	27.76	(5.31)	29.08	(5.42)	26.91	(5.05)						
Girls			29.61	(5.22)	27.57	(4.71)	105.11	<.001	31.12	<.001	0.32	.572
Boys			28.55	(5.56)	26.26	(5.31)						
<i>Demographics</i>												
Age	13.18	(1.92)	11.21	(0.78)	14.46	(1.25)						
<i>SES</i>												
High	1894	68.60%	740	67.50%	1154	69.30%						
Low	868	31.40%	357	32.50%	511	30.70%	$\chi^2 = 1.05$	$p = .315$				
<i>Gender</i>												
Girls	1356	49.10%	533	48.60%	823	50.60%						
Boys	1406	50.90%	564	51.40%	842	49.40%	$\chi^2 = 0.19$	$p = .669$				

Table 3. Intercorrelations among psychosocial variables controlling for SES age and gender.

Control variables: SES, Age and Gender	1	2	3	4	6
1. Healthy eating awareness					
2. Temptation control	0.26				
3. Changing the meaning	0.27	0.66			
4. Actions towards goal	0.40	0.64	0.71		
5. Social influence parents	0.39	0.29	0.28	0.36	
6. Social influence peers	0.33	0.29	0.29	0.31	0.44

Note: Partial correlations (r). All correlations were significant for $p < .001$.

Table 4. Summary of multiple mediation regression analyses: total, direct and indirect associations of social influence, self-regulations on healthy eating awareness.

Total effect of IV on DV	Healthy eating awareness											
	All sample				Children				Adolescents			
	<i>B</i>	SE	<i>t</i>	<i>p</i>	<i>B</i>	SE	<i>t</i>	<i>p</i>	<i>B</i>	SE	<i>t</i>	<i>p</i>
Social influence parents	0.63	0.03	20.56	<.001	0.63	0.05	12.61	<.001	0.65	0.04	16.79	<.001
Social influence peers	0.47	0.03	16.77	<.001	0.47	0.04	10.66	<.001	0.49	0.04	13.31	<.001

Direct effect of IV on DV	Healthy eating awareness											
	All sample				Children				Adolescents			
	<i>B</i>	SE	<i>T</i>	<i>p</i>	<i>B</i>	SE	<i>t</i>	<i>p</i>	<i>B</i>	SE	<i>t</i>	<i>p</i>
Social influence parents	0.46	0.03	14.58	<.001	0.47	0.05	8.89	<.001	0.46	0.04	11.95	<.001
Social influence peers	0.33	0.03	11.69	<.001	0.34	0.05	7.39	<.001	0.33	0.04	9.41	<.001

Test for indirect effects (Mediators)

	All sample			Children			Adolescents		
	Bca CI 95%	Lower	Upper	Bca CI 95%	Lower	Upper	Bca CI 95%	Lower	Upper
Social influence parents as IV									
Total indirect effect		0.07	0.11*		0.11	0.22*		0.15	0.23*
Temptation control		-0.03	0.01		-0.09	0.02		-0.01	0.04
Changing the meaning		-0.04	0.01		-0.05	0.07		-0.06	0.01
Actions towards goal		0.10	0.14*		0.12	0.25*		0.16	0.26*
r^2 adj for DV model	28.70%	$F(7.2348) = 136.39$, $p < .001$		22.20%	$F(6.921) = 45.02$, $p < .001$		28.10%	$F(6.1421) = 93.87$, $p < .001$	
<i>Partial effect of control variables</i>									
SES	$B = 0.55$; ($t = 2.79$, $p = .006$)			$B = 1.34$; ($t = 4.01$, $p < .001$)			$B = 0.02$; ($t = 0.09$, $p = .992$)		
Gender	$B = 0.64$; ($t = 3.43$, $p < .001$)			$B = 0.67$; ($t = 2.14$, $p = .033$)			$B = 0.60$; ($t = 2.62$, $p = .009$)		
Social influence peers as IV									
Total indirect effect		0.12	0.17*		0.07	0.17*		0.12	0.19*
Temptation control		-0.03	0.02		-0.09	0.01		-0.01	0.04
Changing the meaning		-0.05	0.01		-0.05	0.06		-0.06	-0.08*
Actions toward goal		0.15	0.21*		0.11	0.23*		0.13	0.22*
r^2 adj for DV model	26.50%	$F(7.2334) = 121.56$, $p < .001$		19.90%	$F(6.914) = 39.28$, $p < .001$		25.50%	$F(6.1414) = 82.09$, $p < .001$	
<i>Partial effect of control variables</i>									
SES	$B = 0.73$; ($t = 3.61$, $p < .001$)			$B = 1.41$; ($t = 4.17$, $p < .001$)			$B = 0.26$; ($t = 1.02$, $p = .304$)		

(Continued)

positive partial effect on the healthy eating awareness, meaning that being female and having higher SES were associated with higher scores of the healthy eating awareness.

The mediation analyses conducted in the subsample of children yielded similar results to the ones observed for all participants (Table 4). Between 19.9% and 22.2% of variance of the healthy eating awareness was explained by the variables included in the model (p 's < .001). Again, we have observed that the direct effect of social influence variables decreased (but remained significant) when controlling for mediators. In particular, we found evidence for a mediating effect of action towards goal self-regulation. The indirect effect was positive (social influence parents: 0.12–0.25, and social influence peers 0.11–0.23 BCa CI 95%), so a similar interpretation to the one presented for all participants is warranted. As in the models with all samples, gender and SES had a positive partial effect on the healthy eating awareness.

Finally, the analyses conducted in the subsample of adolescents yielded an important difference. We observed a significant mediation, now with two significant indirect effects: a positive indirect effect was found for the action towards goal variable (0.13–0.22 BCa CI 95%), and a significant negative indirect effect was found for the changing the meaning variable (-0.06 to -0.08 BCa CI 95%). The negative indirect effect implies that higher scores of peer social influence were associated with higher scores of changing the meaning, which in turn led to lower levels of healthy eating awareness. The partial effect of the control variables was significant for gender only, whereas the SES was not associated with the healthy eating awareness scores among adolescents.

Discussion

The present study was aimed at investigating the associations between eating awareness and social influence on eating behaviour (peers and family), controlling for SES, gender and age. Furthermore, we verified the mediating effect of self-regulation strategies in relation between social influence variables and eating awareness among children and adolescents.

Children and boys present higher scores than adolescents in the social influence variables, as was stated repeatedly in previous studies in the area of brain maturity (see Matos, Morgan et al., 2012 for a review). The self-regulation and healthy eating awareness scores were higher among children. These results indicating higher levels of the use of self-regulation strategies in younger age group (children) compared to the older age group (adolescents) is in line with findings showing a steady decline of self-regulation throughout the developmental period of late childhood and adolescence (Bowers et al., 2011). Girls presented higher scores of temptation control, action towards goals and healthy eating awareness. Gender differences where girls appear as more controlled, focused on objectives and concerned with a healthier eating were previously confirmed (Fonseca, Matos, Guerra, & Gomes Pedro, 2009). Our findings contribute to the existing literature indicating a possibility that the effects of gender and age are of interactive nature: An interaction effect was predictive of the use of changing the meaning ($p < .001$) and action towards goal ($p = .029$) self-regulatory strategies, with boys decreasing their use of self-regulatory strategies more than girls.

The most salient self-regulation strategy, used to face temptations, refers to being active towards the healthy goals whereas the least salient self-regulatory strategy seems to be

facing the temptations and (yet) be able to cope. At this age, it seems easier to make alternative plans in order to escape temptations, than to face them and win the challenge, however the obligation of finding alternatives might be the least a preferable strategy if the objective is to be autonomous and keep self-regulated.

Differences between children and adolescents are also interesting because with age, a metacognitive competence grows, allowing young people to 'change the meaning of temptation', which was not the case at a younger age. However, peer influence associated with this new capacity (of metacognition), and coexisting emotional maturity gap, together make older adolescents more at a risk, in this case of unhealthy or careless eating behaviour, once 'changing the meaning' seems to favour the social influence of the peers and indeed is related to less healthy eating behaviour. Although our findings showed that the levels of social influence seem to slightly decrease during adolescence, other research has shown that the actual effect of peer influence increases while the effect of parental influence decreases (Luszczynska et al., 2013). Furthermore, our findings indicate that the decrease of parental influence is larger in size ($d = -0.26$), compared to the decrease of peer influence ($d = -0.18$). In sum, although the levels of perceived social influence of peers slightly decline, their role in predicting the use of self-regulation strategies and (indirectly) eating behaviours is still substantial.

Conclusions

Previous research has demonstrated the influence of social contexts in health-related behaviours in children and adolescents (see Matos, Morgan et al. 2012, for a review). Our findings add a novel insight into knowledge on functioning of children and adolescents, suggesting that the maturity gap between the emotional and the cognitive aspects of adolescents' brain functioning is a strong argument in favour of the need to promote the emotional literacy and individual competences in order to help them to be able to self-regulate in the presence of temptations, especially in the presence of the peer group, and when out of the reach of parental monitoring (Matos, Morgan et al., 2012). Therefore, both school-based interventions and family-based interventions could help children and adolescents to use self-regulatory strategies which are essential to eating healthier. These interventions must also focus on self-regulation cognitions and social (peer) influence (Kalavana et al., 2010).

Acknowledgements

Research was conducted at the University of Lisbon, as part of the Temptations to Eat Moderated by Personal and Environmental Self-regulatory Tools (TEMPEST) project.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

Temptations to Eat Moderated by Personal and Environmental Self-regulatory Tools (TEMPEST) project was funded by the European Commission's 7th Framework Programme (TEMPEST project no. 223488).

ORCID

Margarida Gaspar de Matos  <http://orcid.org/0000-0003-2114-2350>
 Antonio L. Palmeira  <http://orcid.org/0000-0001-6508-0599>
 Tania Gaspar  <http://orcid.org/0000-0002-9616-0441>
 John B. F. De Wit  <http://orcid.org/0000-0002-5895-7935>

References

- Adriaanse, M. A., Vinkers, C. D. W., De Ridder, D. T. D., Hox, J. J., & De Wit, J. B. F. (2011). Do implementation intentions help to eat a healthy diet? A systematic review and meta-analysis of the empirical evidence. *Appetite*, 56, 183–193. doi:10.1016/j.appet.2010.10.012
- Bowers, E. P., Gestsdottir, S., Geldhof, G. J., Nikitin, J., von Eye, A., & Lerner, R. M. (2011). Developmental trajectories of intentional self-regulation in adolescence: The role of parenting and implications for positive and problematic outcomes among diverse youth. *Journal of Adolescence*, 34, 1193–1206. doi:10.1016/j.adolescence.2011.07.006
- Carver, C., & Scheier, M. (1998). *Self-regulation of behaviour*. Cambridge: Cambridge University Press.
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression /correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Laurence Erlbaum Associates.
- De Ridder, D. & De Wit, J. (2006). Self-regulation in health behavior: Concepts, theories and central issues. In De Ridder, D. & De Wit, J. (Eds.), *Self-regulation in health behaviour* (pp. 3–23). Chichester: John Wiley & Sons, Ltd.
- Dirks, M. A., Treat, T. A., & Weersing, V. R. (2007). Integrating theoretical, measurement, and intervention models of youth social competence. *Clinical Psychology Review*, 27, 327–347. doi:10.1016/j.cpr.2006.11.002
- Fonseca, H., Matos, M. G., Guerra, A., & Gomes Pedro, A. (2009). Are overweight and obese adolescents different from their peers? *International Journal of Pediatric Obesity*, 4, 166–174. doi:10.1080/17477160802464495
- Gaspar, T., Matos, M., Ribeiro, J., Leal, I., & Ferreira, A. (2009). Health-related quality of life in children and adolescents and associated factors. *Journal of Cognitive and Behavioral Psychotherapies*, 9, 33–48.
- Gaspar, T., Matos, M. G., Luszczynska, A., Baban, A. & Wit, J. (2014). The impact of a rural or urban context in eating awareness and self-regulation strategies in children and adolescents from eight European countries. *International Journal of Psychology*, 49, 158–166. doi:10.1002/ijop.12046
- Gaspar, T., Ribeiro, J., Matos, M., Leal, I., & Ferreira, A. (2009). Psychometric properties of a brief version of the escala de Satisfação com o suporte social for children and adolescents. *The Spanish Journal of Psychology*, 12, 360–372. doi:10.1017/S113874160000175
- Graham, J. W., Marks, G., & Hansen, W. B. (1991). Social influence processes affecting adolescent substance use. *Journal of Applied Psychology*, 76, 291–298. doi:10.1037/0021-9010.76.2.291
- Herman, C. P., Roth, D. A., & Polivy, J. (2003). Effects of the presence of others in food intake: A normative interpretation. *Psychological Bulletin*, 129, 873–886. doi:10.1037/0033-2909.129.6.873
- Hill, R., Stephens, D., & Smith, I. (2003). Corporate social responsibility: An examination of individual firm behaviour. *Business and Society Review*, 108, 339–364.
- Jones, R. A., Hinkley, T., Okely, A. D., & Salmon, J. (2013). Tracking physical activity and sedentary behavior in childhood: A systematic review. *American Journal of Preventive Medicine*, 44, 651–658. doi:10.1016/j.amepre.2013.03.001
- Kalavana, T., Maes, S., & De Gucht, V. (2010). Interpersonal and self-regulation determinants of healthy and unhealthy eating behavior in adolescents. *Journal of Health Psychology*, 15, 44–52. doi:10.1177/1359105309345168
- Luszczynska, A., de Wit, J. B. F., de Vet, E., Januszewicz, A., Liszewska, N., Johnson, F., ... Stok, F. M. (2013). At-home environment, out-of-home environment, snacks and sweetened beverages

- intake in preadolescence, early and mid-adolescence: The interplay between environment and self-regulation. *Journal of Youth and Adolescence*, 42, 1873–1883. doi:10.1007/s10964-013-9908-6
- Matos, M. G., Gaspar, T., Ferreira, M., Tomé, G., Camacho, I., Reis, M., ... Equipa Aventura Social (2012). Keeping a focus on self-regulation and competence: “find your own style”, A school based program targeting at risk adolescents. *Journal of Cognitive and Behavioral Psychotherapies*, 12, 39–48.
- Matos, M. G., Morgan, A., & Social Adventure Team (2012). Roads to whatever? Or roads to a self-fulfilled future?: Health assets and well-being in children and adolescents. In *Labirintos da Adolescência – Roads to whatever* (pp. 61–85). Lisbon: Fundação Calouste Gulbenkian.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879–891. doi:10.3758/BRM.40.3.879
- Salvy, S. J., Elmo, A., Nitecki, L., Kluczynski, M., & Roemmich, J. (2011). Influence of parents and friends on children’s and adolescents’ food intake and food selection. *The American Journal of Clinical Nutrition*, 93, 87–92. doi:10.3945/ajcn.110.002097
- Schunk, D. H., & Zimmerman, B. J. (1997). Social origins of self-regulatory competence. *Educational Psychologist*, 32, 195–208.
- Stok, M., De Ridder, D., De Vet, E., De Witt, J., & TEMPEST Consortium (2013). *Temptations to eat moderated by personal and environmental self-regulatory tools*. Utrecht: European Commission.
- Tangney, J. P., Baumeister, R. F., & Luzio Boone, A. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, 72, 271–324. doi:10.1111/j.0022-3506.2004.00263.x
- Turbin, M. S., Jessor, R., Costa, F. M., Dong, Q., Zhang, H., & Wang, C. (2006). Protective and risk factors in health-enhancing behaviors among adolescents in China and the United States: Does social context matter? *Health Psychology*, 25, 445–454. doi:10.1037/0278-6133.25.4.445
- Van den Bos, R., & De Ridder, D. (2006). Evolved to satisfy our immediate needs: Self-control and the rewarding properties of food. *Appetite*, 47, 24–29. doi:10.1016/j.appet.2006.02.008
- Vazsonyi, A. T., Trejos-Catillo, E., & Huang, L. (2006). Risky sexual behaviors, alcohol use, and drug use: A comparison of Eastern and Western European adolescents. *Journal of Adolescent Health*, 39, 753.e1–753.e11. doi:10.1016/j.jadohealth.2006.05.008
- Wadden, T. A., Womble, L. G., Stunkard, A. J., & Anderson, D. A. (2002). Psychosocial consequences of obesity and weight loss. In T. A. Wadden & A. J. Stunkard (Eds.), *Handbook of obesity treatment* (pp. 144–169). New York, NY: Guilford Press.
- Wang, Y. (2001). Cross-national comparison of childhood obesity: The epidemic and the relationship between obesity and socioeconomic status. *International Journal of Epidemiology*, 30, 1129–1136. doi:10.1093/ije/30.5.1129
- Wang, Y., Monteiro, C. & Popkin, P. (2002). Trends of obesity and underweight in older children and adolescents in the United States, Brazil, China, and Russia. *American Journal of Clinical Nutrition*, 75, 971–977.
- Widhalm, K., & Fussenegger, D. (2005). Actions and programs of European countries to combat obesity in children and adolescents: A survey. *International Journal of Obesity*, 29, S130–S135. doi:10.1038/sj.ijo.0803103