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“I should remember I don’t want to become fat”: Adolescents’ views on self-regulatory strategies for healthy eating

F. Marijn Stok^{a,*}, Emely de Vet^a, Denise T.D. de Ridder^a, John B.F. de Wit^{b,c}

^a Utrecht University, Department of Clinical and Health Psychology, Post Box 80140, 3508 TC Utrecht, The Netherlands

^b Utrecht University, Department of Social and Organizational Psychology, The Netherlands

^c University of New South Wales, National Centre in HIV Social Research, Australia

A B S T R A C T

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Few studies have investigated the strategies adolescents identify to self-regulate eating behavior. Aiming to address this gap in the literature, the current article describes a bottom-up investigation of strategies adolescents identify for the successful self-regulation of eating behavior. Sixty-two adolescents generated statements about self-regulation strategies for eating and rated the utility of each statement. From an initial pool of 357 statements, thirteen overarching self-regulatory strategies were distilled (e.g. preparation; stimulus control). Significant differences were found between the strategies with regard to perceived utility. Findings indicate that, in apparent contradiction to growing obesity rates, adolescents have knowledge of various self-regulatory strategies. Possible explanations for this contradiction are discussed.

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Adolescents today are confronted with powerful environmental forces that promote a calorie-rich diet and a sedentary lifestyle (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). This type of environment has been labeled obesogenic (Swinburn & Egger, 2004) or even ‘toxic’ (Brownell & Battle Horgen, 2004). For adolescents, living in such a food environment entails having to cope with an unprecedented exposure to energy-dense foods wherever they are. Handling this omnipresence of unhealthy food is troublesome for many adolescents, as is indicated by skyrocketing obesity figures (Wang & Lobstein, 2006) as well as increases in unhealthy eating habits over the past decades (Bauer, Larson, Nelson, Story, & Neumark-Sztainer, 2009).

Croll, Neumark-Stainer, and Story (2001) indicate that the problem does not seem to lie in a lack of knowledge of what constitutes healthy eating (i.e. which types of foods one should eat and in what amounts). The authors suggest that, instead, “there must be other constraints on adolescent action to engage in healthy eating” (p. 197). We suggest that the problem may be that while adolescents know quite well *what* they should do, they have less knowledge available regarding *how* they should achieve this. In other words, we suggest that the problem may lie in the strategies that are available to adolescents to self-regulate their eating behavior. The current study addresses how adolescents attempt to navigate the obesogenic food environment, investigating which strategies they identify for the self-regulation of their eating behavior.

Self-regulation

Self-regulation refers to all efforts by human beings to alter inner states, processes, and responses in the service of attaining personally relevant goals (Baumeister & Vohs, 2004). Self-regulation thus pertains to the ability to adapt and alter

* Corresponding author. Tel.: +31 30 253 9265; fax: +31 30 253 4718.

E-mail address: F.M.Stok@uu.nl (F.M. Stok).

one's behavior in order to achieve certain desired outcomes. Those desired outcomes, however, are usually more rewarding in the long-term than in the short-term. In order to achieve one's long-term goal of eating healthily, then, one must find ways to resist short-term temptation.

While a substantial amount of research has been conducted under the label of self-regulation, including the self-regulation of eating behavior, the array of strategies that people have available for self-regulation remains somewhat elusive, especially in adolescents. Some strategies for the self-regulation of health behavior have been proposed, such as seeking help, social comparison, planning and self-reward (Maes, Karoly, De Gucht, Ruehlman, & Heiser, 2005). However, whether these strategies are also inherently (spontaneously) available to people – in other words, whether lay people themselves are aware of these strategies – still remains an open question. Moreover, whether the strategies proposed for adults are similar to the strategies that are available to adolescents remains subject of investigation.

A recent study by Kalavana, Maes and De Gucht (2010) pointed to the importance of self-regulatory competence for adolescent eating behavior. This study indicated that what the authors refer to as 'self-regulation cognitions' (the extent to which adolescents believe they are able to eat healthily, the extent to which they intend to eat healthily, and the extent to which they find eating healthily important) are related to adolescents' eating behavior. What does not yet become clear from this study however, is how these self-regulation cognitions are translated into actual self-regulatory strategies for eating behavior. This is what the current study aims to investigate.

Adolescent self-regulation of eating behavior

Focusing on adolescent self-regulation is especially important because adolescents constitute an important target group for interventions aimed at increasing the use of self-regulatory strategies for eating behavior. Eating behaviors that are established during this period often will become eating habits for life (Story, Neumark-Sztainer, & French, 2002). Adolescents should thus acquire effective self-regulatory strategies early on, when habits are still in the formation process. That way, successful self-regulation strategies can become part of the adolescent's eating behavior, which should lead to better outcomes both during adolescence as well as when reaching adulthood (Wang & Lobstein, 2006). If, on the other hand, effective self-regulation strategies are not acquired in this period in life, this may be hard to remedy later on (Dietz, 2004).

Improving adolescents' self-regulatory strategies could be an effective way to help them navigate the obesogenic food environment successfully. This becomes especially important when taking into account that, while adolescents have somewhat lower self-control scores than adults, the effects of self-control on behavior are much larger in adolescents (De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, *in press*). In other words, *if* one acquires good self-regulatory strategies as an adolescent, this will truly be of great benefit. In order to develop interventions to promote the self-regulation of eating behaviors, however, we must gain insight into the self-regulatory strategies adolescents are already aware of to ensure their healthy eating, and which strategies they generally do not yet know. Only once we achieve such insight will we be able to begin to effectively tailor self-regulation-based interventions.

Present research

In the present research we aim to provide a first insight into adolescents' awareness of self-regulatory strategies for their eating behavior. Using a guided item-generation procedure, an inventory is made of self-regulatory strategies that adolescents themselves identify to ensure their own healthy eating. A Q-sort task is then carried out to determine which of these strategies adolescents believe to be most instrumental for ensuring their healthy eating.

Method

Participants

Two Dutch high schools were approached for participation. In selecting the two high schools, care was taken that the two schools differed in the level of education and the average socio-economic status of the attending students. One was a lower vocational (the lowest of three high-school levels) inner-city school attended mostly by students of Turkish or Moroccan heritage, while the other was a higher vocational and university preparatory (the two higher levels of high-school) suburban school attended almost exclusively by white students. As indicated by the Netherlands Institute for Social Research, the 2006 socio-economic status ranking of the neighborhoods in which the schools lie were 2776 and 961, respectively (range 1–3965 from highest to lowest ranking). The first school was thus below average socio-economic status, and the second above average. Two classes per school participated with a total of 62 students participating in all parts of the study (age range = 13–18, *M* age = 15.13, *SD* = 1.30). There were 23 male and 39 female participants.

Procedure

Parents or caregivers of all participants were informed of the purpose of the study and given the option to opt out of participation, which none of the parents used. Two research sessions were conducted in each class, with an interval of exactly one week between the two sessions. Some adolescents ($n = 6$) were only present at one of the sessions. They were allowed to

normally participate in that session but their data were not included in the analyses. Two researchers as well as the regular teacher were present in the classroom at all times.

The first session started with an introduction about what healthy eating actually entails (according to Dutch Nutrition Center guidelines, e.g. sufficient variation, little saturated fat, etc.; Dutch Nutrition Center, 2010). The researchers made sure that all participants had a good understanding of what 'healthy eating' entailed. Subsequently, each participant brainstormed individually to create a set of statements regarding the self-regulation of eating. Participants were instructed to complete the sentence "Things I can do myself to ensure my healthy eating, are..." as many times as they could, keeping in mind that they should try not to report actual healthy eating behaviors but rather should focus on *how* they thought they could achieve performing this behavior.¹ After completing this phase, participants filled out a questionnaire assessing demographic characteristics and eating habits.

After this first session, a selection was made from all generated statements (see analyses section for details). In the second session, perceived instrumentality of the selected statements was measured through a Q-sort task (Block, 1978). Participants were presented with the statements selected by the researchers from the statement pool generated in the first session. They received these statements printed individually on A7-size (74 × 105 mm) flash cards to facilitate the sorting process. Participants were instructed to make five piles of cards representing the statements they considered (1) relatively least useful, (2) not so useful, (3) neither not useful, nor useful, (4) useful, and (5) relatively most useful. The word 'relatively' was included to make sure participants would not simply rate the utility of all statements as very high or very low. For that same reason, participants were instructed that they should indeed make five piles and place at least two cards in each pile. Participants were prompted to base this rating only the utility of each strategy for ensuring *their own* healthy eating, rather than how useful they thought it might be for others. After completing the Q-sort task, participants received a sheet of paper on which all statements were listed. For each statement, they then filled in the utility rating corresponding to the pile in which they had sorted that particular statement (so that behind each statement, a number from 1 to 5 was filled in). This procedure was followed to ensure active participation and to avoid that participants would become bored from having to rate one-by-one the utility of a long list of statements, as that could have led to limitations both in response variability and in reliability of the answers.

Materials

All participants completed a questionnaire in the first phase. This questionnaire included six items, which were devised by the authors based on items commonly employed in earlier studies (e.g. Achtziger, Gollwitzer, & Sheeran, 2008; Armitage, 2007). It assessed consumption of breakfast ('In general, how many days per week do you eat breakfast?', range 0–7) and the intake of fruits, vegetables, soft drinks and unhealthy snacks ('In general, how many portions of fruit/serving spoons of vegetables/soft drinks/unhealthy snacks do you eat per day?' on a scale of 0 = less than one per day to 4 = 4 or more per day). A last question assessed participants' perceived importance of healthy eating on a 4-point Likert scale ('Do you consider eating healthily to be important?', ranging from 1 = very unimportant to 4 = very important).

Analyses

After the first research session, the authors considered the pool of statements generated in the first phase, merging statements with the same meaning and deleting statements that were clearly irrelevant, resulting in a final selection of statements. After the second research session, statements from the final selection were then independently sorted by three of the authors into smaller sets of statements based on their content, with each set representing an overarching self-regulatory strategy. A final sorting was discussed between these three authors until unanimous agreement was reached. Only strategies that were reflected in one or more statements from at least three of the four school classes were considered to be self-regulatory strategies that adolescents generally recognize.

Through the Q-sort task, utility ratings were given for all statements separately. In order to determine the perceived utility of the overarching strategies that were discerned by the authors, averages were calculated from the separate statements making up each strategy. However, in this average, utility ratings from only three statements per strategy were included: the three statements that had been rated as most useful by the participants. This was done because the number of statements differed substantially per strategy, and strategies for which many different statements were generated often included just a few statements that were deemed very useful plus a number of statements deemed less useful. Including all these statements would put such strategies at a disadvantage compared to strategies on which, for example, only two very central statements were generated that were considered very useful. Including only the three most useful statements per strategy, then, ensured that each strategy was entered into the analysis with its most positive utility possible (at its strongest, as it

¹ This was further illustrated by giving the example of 'things I can do myself to make sure I do my homework': the experimenter explained that, rather than statements like 'I should just do my homework', or 'I should just make my math assignments', good statements would be 'writing the homework in my planner' or 'agreeing with myself that I can watch television after I have studied for two hours'. We further explained that the statements need not necessarily be strategies that the participants themselves used, but rather strategies they knew of that they thought *could* help ensure their healthy eating.

were). In other words, we analyzed whether utility ratings differed between the thirteen strategies, limiting the analysis to only the three statements considered most useful per strategy.

Results

Descriptive statistics

Participants considered healthy eating rather important ($M = 3.21$, $SD = .71$, range 1–4). However, self-reported actual eating behaviors did not mirror this: 45% of the participants reported not eating two portions of fruit per day and 65% ate less than 4 serving spoons of vegetables per day (as recommended by the Dutch Nutrition Center). Thirty-nine percent of all participants reported not eating breakfast every day. Moreover, participants reported consuming on average 3.26 snacks ($SD = 1.53$) and 3.50 soft drinks ($SD = 1.63$) per day.

Statement generation

In total, 357 statements were formulated by the participants in all four classes combined. On average, 5.76 statements were generated per participant. Overlapping ($n = 220$) and irrelevant or ambiguous (e.g., “doing a lot of sports”; “good surroundings”; “a Happy Meal”, $n = 23$) statements were removed, as were statements that were not generalizable (e.g. “I don’t like chocolate, so I don’t have to worry about that, but I need to be careful with crisps”; “My parents put a lock on the candy cupboard so I cannot get to it”, $n = 8$) or that repeated the intention of eating healthily (e.g. “to simply eat healthily”, $n = 4$). The remaining 102 statements were clearly distinguishable from each other and relevant to the self-regulation of eating. Where necessary, these statements were slightly adjusted to improve wording and grammar (e.g. changing the statement “buying fruit that opens easily” into “buying prepared or easy-to-eat fruits”), as well as to make some statements more general (e.g. changing ‘apple’ into ‘fruit’ and ‘coke’ into ‘soft drink’).

Sorting statements into strategies

When sorting the final selection of statements, thirteen strategies were discerned (see Table 1 for sample statements), twelve of which were previously identified in the self-regulation literature. These thirteen strategies were: *compensation* (the use of an alternative means to maintain a desired state when specific goal-relevant means are no longer available or failed, e.g. Knauper, Rabiau, Cohen, & Patriciu, 2004); *substitution* (replacing an unhealthy behavior with a healthier alternative, e.g. Adriaanse, De Ridder, & De Wit, 2009); *preparation* (general anticipatory efforts to arrange the environment in such a way that healthy eating is facilitated, cf. ‘environmental structuring’, Zimmerman, 1989); *avoidance of temptations* (staying away from situations that may undermine the healthy eating intention, e.g. Fishbach & Shah, 2006); *stimulus control* (removing specific cues for unhealthy behavior and adding prompts for healthier alternatives, e.g. Prochaska, Redding, & Evers, 2002); *seeking help* (asking others for assistance, e.g. Puustinen, 1998); *reminding of consequences* (thinking of the consequences that (un)healthy eating may have in the future, cf. ‘mental contrasting’, Oettingen, Hönig, & Gollwitzer, 2000), *mindful eating* (being aware of the reasons for eating, recognizing the appropriateness of eating cues, e.g. Framson et al., 2009); *seeking information* (gathering knowledge about (un)healthy eating, e.g. Brown, Ganesan, & Challagalla, 2001); *goal setting* (setting personal healthy eating goals for oneself, e.g. Latham & Locke, 1991), *planning* (specifying when, where and how one will perform healthy eating behaviors, cf. ‘planfulness’, Wills, Isasi, Mendoza, & AINETTE, 2007); *distraction* (focusing attention on things other than tempting food cues, e.g. Thayer, Newman, & McClain, 1994); and *adherence to healthy eating patterns* (specifications of habits or manners to eat healthily).

Utility of strategies

The mean utility scores of the individual statements ranged between 1.19 and 4.60 (scale 1 = relatively least useful to 5 = relatively most useful), with an average mean of utility ratings across all statements of $M = 3.11$ ($SD = .75$). Two ANOVAs indicated that the utility ratings were not significantly affected by participants’ school nor their school class, F 's < 1. Participants’ average utility rating of the statements was also not correlated with their gender, age, and eating habits. There was, however, a moderate correlation between participants’ mean utility rating of the statements and their perceived importance of healthy eating; $r = .37$, $p = .005$, indicating that participants who perceive healthy eating to be more important also gave higher utility ratings to the statements. Looking more specifically at the utility ratings of the separate strategies, bivariate correlation analyses indicated that perceived importance of healthy eating was correlated significantly with higher perceived utility of the strategies of avoidance of temptations, goal setting and planning (all r 's > .250, all p 's < .010). There was no correlation between perceived importance of healthy eating and the other ten strategies.

To determine whether adolescents perceived certain strategies to be more useful than others, an ANOVA was conducted with strategy type as independent variable. Results indicated that participant-perceived utility differed significantly between the strategies, $F(12, 26) = 4.91$, $p < .001$. Mean utility ratings per strategy, as well as the results of post-hoc analyses on the different strategies (using Fisher’s least significant difference test), are included in Table 1. Results demonstrated that there are clear differences in perceived utility between the thirteen strategies. Based on differences in significance, three broad clusters

Table 1

Strategies in descending utility, three best statements, mean utility ratings of the three best items and results from the post-hoc least significant difference analysis

Strategy (number of statements generated for this strategy)	Three best statements	Mean utility best items	Difference at $p < .05^*$
Preparation (18)	- Bringing my own lunch to school, so I don't have to buy anything - Reserving enough time in the morning to eat a healthy breakfast - Eating a good meal before I go to the supermarket to buy food	4.35	a
Adhering to healthy eating patterns (16)	- Always including vegetables in my dinner - Eating well at the three main meals of the day - Drinking a lot of water throughout the day	4.19	ab
Reminding of consequences (5)	- Keeping in mind that I don't want to become fat - Keeping in mind that eating healthy products will help me to not become ill	3.98	abc
Substitution (10)	- Thinking about how I would look if I were chubby - Taking a piece of fruit instead of something unhealthy, when I feel like a snack - Eating a sandwich instead of a snack if I get hungry before dinner - Bringing a bottle of water instead of a sugary sports drink when I go out to exercise	3.87	abcd
Avoidance of temptations (14)	- Not buying unhealthy foods, so I will not be tempted to eat them - Not spending my pocket money on snacks - Avoiding looking at advertisements and commercials for unhealthy products	3.71	bcd
Goal setting (7)	- Allowing myself only one unhealthy snack per day - Forcing myself to eat a piece of fruit at a set time every day - Making rules for yourself such as 'if I eat more than three cookies today, I cannot watch TV at night'	3.65	bcd
Seeking information (4)	- Learning about the consequences of snacking for my health - Finding out the benefits of healthy eating for my wellbeing - Looking for information about the nutritious values of different food types	3.56	cd
Mindful eating (4)	- Taking the time to prepare and eat healthy foods - Paying attention to the kind of situations in which I tend to eat unhealthy snacks - Paying attention to whether I'm really hungry when I crave a snack, or whether I'm just bored	3.51	cde
Stimulus control (5)	- Taking only a small cup of crisps instead of the whole bag - Making sure I have no unhealthy foods in my own room - Putting healthy food next to the PC when I play games, instead of unhealthy snacks	3.37	cde
Distraction (5)	- Staying busy with a hobby or sports, so I will not think about food - Going outside to play if I feel bored, so I will not hang around the kitchen - Brushing my teeth if I feel like eating candy	3.35	de
Planning (5)	- Planning a certain time of the day when I will always eat a piece of fruit - Making a schedule of the times of the day when I will eat something healthy - Planning in advance how much I will eat of something (like a bag of crisps)	2.95	ef
Compensation (5)	- Eating and drinking unhealthy things in the weekend only - Treating myself to something tasty in the weekend if I ate healthily all week	2.73	f
Seeking help (4)	- Eating only healthy things for a day if I snacked a lot the previous day - Asking your parents for help in preparing healthy foods - Asking your parents to buy more healthy groceries - Asking somebody to help remind you to eat healthily	2.66	f

*Note. Utility ratings of the three best items per strategy differed significantly for strategies that do not share any letter.

can be identified. The four strategies that adolescents deemed most useful for ensuring their own healthy eating are preparation, adherence to healthy eating patterns, reminding of consequences and substitution. The six strategies of avoidance of temptations, goal setting, seeking information, mindful eating, stimulus control and distraction were deemed of medium utility. Least useful, according to the participants, were the three strategies of planning, compensation and seeking help.

Bivariate correlation analyses were carried out to determine whether adolescents' eating habits were correlated with their perceived utility of the different strategies (see Table 2). Significant correlations were found between healthy eating habits and two of the strategies considered most useful by adolescents: adolescents who considered preparation a highly useful strategy reported eating more fruit ($r = .375, p = .012$) and fewer snacks ($r = -.347, p = .037$), while adolescents who considered reminding of consequences a useful strategy reported eating more fruit ($r = .576, p < .001$) and drinking fewer soft drinks ($r = -.349, p = .020$).

Discussion

In this study, adolescents were asked to identify ways in which they could themselves ensure their healthy eating. The design of this study allowed us to take a look at the array of self-regulation strategies adolescents are aware of in a way that, to the authors' knowledge, has not been done before. Results indicate that adolescents have substantial and varied knowledge of potential strategies for the self-regulation of their eating behavior. Thirteen different self-regulatory strategies were identified of which twelve are grounded in the existing self-regulation literature.

Whether the thirteenth, adherence to healthy eating patterns, can be considered a true self-regulatory strategy is a point of discussion. These statements reflected elaborations and specifications of the intention to eat healthily, rather than constituting actual behavioral strategies. Since the aim of the current study was to gain insight into the adolescent point of view on the self-regulation of eating behavior, this 'strategy' was nevertheless included in the results. The fact that adolescents generated statements belonging to this strategy along with many other statements reflecting other, true, self-regulatory strategies may indicate that to adolescents, adherence to healthy eating patterns is a proper self-regulatory strategy as much as the other twelve they identified.

Utility ratings indicated that adolescents find the self-regulatory strategies of preparation, adhering to healthy eating patterns, reminding of consequences and substitution, respectively, the four most useful strategies. Interestingly, two of these strategies, namely preparation and reminding of consequences, were also correlated with healthier self-reported eating habits. While many items were generated with regard to the avoidance of temptations, participants did not deem this strategy amongst the most useful for ensuring their healthy eating. These differences in utility ratings provide an indication that adolescents are aware that not all possible manners of ensuring healthy eating are equally effective, and that some strategies may be more helpful to them than others. An important question to address in future studies is whether the utility of strategies as perceived by adolescents corresponds to what experts would consider to be useful strategies and, even more importantly, to the actual effectiveness of these strategies in ensuring healthy eating behavior. If, as the high rated utility of 'adherence to healthy eating patterns' seems to suggest, this correspondence will not always be present, research should concern itself with identifying why there are discrepancies, as well as with how such discrepancies could be resolved.

Implications for adolescents' self-regulation of eating behavior

Results suggest that adolescents are familiar with different ways in which they can ensure healthy eating on their own part. These findings contribute to the available body of literature which shows that adolescents have good knowledge of *what* constitutes healthy eating (Croll et al., 2001) by now showing that adolescents also have different self-regulatory strategies available to them that can, in theory, aid them in the question of *how* they could achieve such healthy eating. As evidenced by

Table 2

Correlations between perceived utility of the thirteen strategies and healthy eating habits (*numbers of soft drinks, portions of fruit, serving spoons of vegetables and unhealthy snacks consumed per day, and number of days per week that breakfast is consumed*).

	Soft drinks	Fruit	Vegetables	Unhealthy snacks	Breakfast
Preparation	.213	.375*	.143	-.347*	-.029
Adhering to healthy eating patterns	-.055	.056	-.116	-.133	.158
Reminding of consequences	-.349*	.576**	.077	-.135	.063
Substitution	-.028	.300	-.063	.031	.072
Avoidance of temptations	.221	.133	.011	.240	-.183
Goal setting	-.161	.270	.126	.113	-.244
Seeking information	-.015	-.154	.143	-.105	.164
Mindful eating	-.066	.101	.035	.121	.301
Stimulus control	.068	.147	-.003	.059	-.182
Distraction	-.291	-.066	-.180	-.065	.219
Planning	-.179	-.097	-.142	-.283	-.037
Compensation	.015	.132	.241	.118	-.167
Seeking help	.167	.183	.344	.036	-.081

*Correlation is significant at $p < .05$

**Correlation is significant at $p < .01$.

today's obesity problems, however, adolescents apparently do not exercise these potential strategies – or at least not often enough. A gap thus appears to exist between adolescents' knowledge of potential self-regulatory strategies and their enacting these strategies when necessary. This begs the question of why this gap ensues, and how it could potentially be decreased. The current results provide two potential answers to this question.

Firstly, the fact that adolescents consider 'adherence to healthy eating patterns' to be a very effective self-regulatory strategy may indicate that they are not astutely aware of the potential difficulties of maintaining healthy eating habits in certain situations. Rather than reflections of efforts to engage in active self-regulation, statements from this strategy reflect what healthy eating entails (eating vegetables every day, eating at set moments) more than ways to really achieve such healthy eating habits. In other words, these statements still address the *what* of healthy eating rather than the *how*. Adolescents thus seem to believe that they will simply be able to adhere to healthy eating patterns when they have to, and that employing additional strategies for the maintenance of healthy eating are not necessary. Indeed, research has shown that adolescents often do not anticipate, nor recognize, health risk situations as such (Johnson, Carey, Marsh, Levin, & Scott-Sheldon, 2003; Steptoe & Wardle, 2001). This would imply that, even when adolescents do know a number of different self-regulatory strategies, as our results suggest, self-regulation still fails because they often do not anticipate nor recognize situations in which they should employ these strategies. An important question that should be addressed is how adolescents can be made more aware of the importance of preparing and equipping themselves to be able to adequately deal with a tempting food environment.

Secondly, we might gain valuable insights by considering what types of statements adolescents did *not* generate. Amongst all participants, only one statement was generated that could be classified as a self-monitoring strategy ("keeping a snack diary to become aware of my snacking habits"). This is important in light of a recent review indicating that self-monitoring may be a quintessential part of effective self-regulation interventions (Abraham, Michie, Whittington, & McAteer, 2008). This review found that of 26 different intervention techniques, self-monitoring was the most effective for improving eating behavior and that combining self-monitoring with *any* one other self-regulation intervention technique improved the efficacy of interventions even further. Self-monitoring, then, may be a highly effective self-regulatory strategy for the improvement of eating habits and might even play a large role in the effectiveness of other self-regulatory strategies. A focus in interventions on self-monitoring may be helpful in teaching adolescents to *learn to recognize* such risk situations, thus giving them the chance to, when necessary, put to use the other strategies they know. Another topic on which adolescents did not generate any statements was on the regulation of emotions, which from previous research is known to have an important influence on eating behavior (Evers, Stok, & De Ridder, 2010). This, too, may thus be an important topic to address in interventions.

Another reason for the gap between knowing strategies and using strategies may be that adolescents simply do not care enough². Even though they know *what* they should do and, as current results indicate, also *how* they should do this, they may not have strong incentives as to *why* they should do it. If that were truly the case, interventions should of course first of all focus on trying to improve adolescents' motivation for healthy eating, as any other type of intervention will fail for a lack of motivation. However, the present study shows that adolescents actually do consider healthy eating to be important. What is more, previous studies have even shown that adolescents in fact do have the intention to eat healthily (e.g. Croll et al., 2001). Therefore, a more likely explanation may be that adolescents do in theory have the intention to eat healthily but that they cannot, at the deciding moments, act upon these intentions. In other words, it may be the case that, while adolescents are motivated to eat healthily in general, their spur-of-the-moment motivation wavers. Here again, an increased use of the self-regulatory strategies (which they *do* have available, as the current research shows) could be highly beneficial (e.g. Sniehotta, Scholz, & Schwarzer, 2005). 'Reminding of consequences', for example, may be a highly effective self-regulatory strategy in terms of increasing healthy eating motivation: thinking about not wanting to become fat was a frequently mentioned statement.

Limitations and suggestions for future research

In this study, adolescents generated many statements that reflected one of three self-regulatory strategies. Fewer statements were generated reflecting the other ten strategies that emerged, which we interpreted as indicating that adolescents were less often aware of these strategies. There may be an alternative explanation, however. It could be that there are typical ways to carry out certain strategies, which many participants mention. This would result in only few statements remaining after removal of overlap, while the strategy was nevertheless one for which all participants generated statements.

Sixty-two adolescents participated in the current study, which constitutes a rather limited sample size. For the study's purpose, however, the sample size seems to be adequate. Research on qualitative methods has shown that theoretical saturation often occurs with as few as twelve participants (Guest, Bunce, & Johnson, 2006). This implies that with over 60 participants, we are very likely to have covered all potential strategies that adolescents might identify. Moreover, for the Q-sort task that participants carried out, much smaller sample sizes (8–20) are already considered to be sufficient (Block, 1978, Trochim, 1989).

Related to the previous point, four classes from two different schools participated in this study. The schools were carefully selected and differed in location (small suburban town vs. inner large city) as well as in socio-economic status. Results from

² We thank anonymous reviewer 3 for pointing this out.

the descriptive and demographic data also suggest that the sample was representative of larger adolescent populations. Nevertheless, it is important to replicate these initial findings, as well as the procedure of generating statements and discerning overarching strategies, among larger samples.

Conclusion

To the best of the authors' knowledge, the current study is the first to directly investigate the self-regulatory strategies for eating behavior that adolescents identify. Results indicated that adolescents have a rather broad knowledge of self-regulatory strategies. Judging by adolescents' generally rather unhealthy eating habits, however, these strategies are apparently not always put to use. Moreover, results showed that self-monitoring, which seems to be a centrally important self-regulation strategy, is not very accessible to adolescents, and that adolescents seem to rely to a large extent on their ability to simply eat properly when necessary, rather than engaging in preparatory self-regulation. Together, these results provide initial insight into adolescents' views on the self-regulation of their eating behavior and strongly point to the importance of placing greater emphasis on self-regulatory skill development in adolescents, for example in school. The application of self-regulatory skills clearly far transcends eating behavior alone, meaning that a focus on acquiring such skills fits well within the school setting. While additional research is certainly necessary, these findings are of importance for the development of future interventions regarding the self-regulation of adolescent eating behavior.

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References

- Abraham, C., Michie, S., Whittington, C., & McAteer, J. (2008). Specifying self-regulation intervention techniques in the context of healthy eating. *International Journal of Psychology*, 43, S575.
- Achtziger, A., Gollwitzer, P. M., & Sheeran, P. (2008). Implementation intentions and shielding goal striving from unwanted thoughts and feelings. *Personality and Social Psychology Bulletin*, 34, 381–393.
- Adriaanse, M. A., De Ridder, D. T. D., & De Wit, J. B. F. (2009). Finding the critical cue: implementation intentions to change one's diet work best when tailored to personally relevant reasons for unhealthy eating. *Personality and Social Psychology Bulletin*, 35, 60–71.
- Armitage, C. J. (2007). Effects of an implementation intention-based intervention on fruit consumption. *Psychology and Health*, 22, 917–928.
- Bauer, K. W., Larson, N. I., Nelson, M. C., Story, M., & Neumark-Sztainer, D. (2009). Fast food intake among adolescents: secular and longitudinal trends from 1999 to 2004. *Preventive Medicine*, 48, 284–287.
- Baumeister, R. F., & Vohs, K. D. (2004). *Handbook of self-regulation: Research, theory, and applications*. New York: Guilford.
- Block, J. (1978). *The Q-sort method in personality assessment and psychiatric research*. Palo Alto, CA: Consulting Psychologists Press.
- Brown, S. P., Ganesan, S., & Challagalla, G. (2001). Self-efficacy as a moderator of information-seeking effectiveness. *Journal of Applied Psychology*, 86, 1043–1051.
- Brownell, K. D., & Battle Horgen, K. (2004). *Food fight: The inside story of the food industry, America's obesity crisis, and what we can do about it*. Columbus, OH: McGraw-Hill.
- Croll, J. K., Neumark-Sztainer, D., & Story, M. (2001). Healthy eating: what does it mean to adolescents? *Journal of Nutrition Education*, 33, 193–198.
- De Ridder, D., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. (in press). Taking stock of self-control: A meta-analysis of how self-control affects a wide range of behaviors. *Personality and Social Psychology Review*.
- Dietz, W. H. (2004). Overweight in childhood and adolescence. *New England Journal Of Medicine*, 350, 855–857.
- Dutch Nutrition Center [Het Voedingscentrum]. (2010). *Alles over gezond eten volgens de Schijf van Vijf*. [Healthy eating according to the Food Pyramid]. The Hague, The Netherlands: Het Voedingscentrum.
- Evers, C., Stok, F. M., & De Ridder, D. T. D. (2010). Feeding your feelings: emotion regulation strategies and emotional eating. *Personality and Social Psychology Bulletin*, 36, 792–804.
- Fishbach, A., & Shah, J. Y. (2006). Self-control in action: implicit dispositions toward goals and away from temptations. *Journal of Personality and Social Psychology*, 90, 820–832.
- Framson, C., Kristal, A. R., Schenk, J. M., Littman, A. J., Zeliadt, S., & Benitez, D. (2009). Development and validation of the mindful eating questionnaire. *Journal of the American Dietetic Association*, 109, 1439–1444.
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation. *Field Methods*, 18, 58–82.
- Johnson, B. T., Carey, M. P., Marsh, K. L., Levin, K. D., & Scott-Sheldon, L. A. J. (2003). Interventions to reduce sexual risk for the Human Immunodeficiency Virus in adolescents, 1985–2000: a research synthesis. *Archives of Pediatrics & Adolescent Medicine*, 157, 381–388.
- 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.
- Knauper, B., Rabiau, M., Cohen, O., & Patriciu, N. (2004). Compensatory health beliefs: scale development and psychometric properties. *Psychology & Health*, 19, 607–624.
- Latham, G. P., & Locke, E. A. (1991). Self-regulation through goal setting. *Organizational Behavior and Human Decision Processes*, 50, 212–247.
- Maes, S., Karoly, P., De Gucht, V., Ruhlman, L. S., & Heiser, W. (2005). *The Self Regulation Skills Battery (SRSB)*. Leiden, the Netherlands/Phoenix, AZ: Leiden University/Arizona State University.
- Oettingen, G., Hönig, G., & Gollwitzer, P. M. (2000). Effective self-regulation of goal attainment. *International Journal of Educational Research*, 33, 705–732.
- Prochaska, J. O., Redding, C. A., & Evers, K. E. (2002). The transtheoretical model and stages of change. In K. Glanz, B. K. Rimer, & F. M. Lewis (Eds.), *Health behavior and health education. Theory, research, and practice* (pp. 99–120). San Francisco: Jossey-Bass.

- Puustinen, M. (1998). Help-seeking behavior in a problem-solving situation: development of self-regulation. *European Journal of Psychology of Education*, 13, 271–282.
- Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2005). Bridging the intention-behaviour gap: planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology & Health*, 20, 143–160.
- Stephoe, A., & Wardle, J. (2001). Health behaviour, risk awareness and emotional well-being in students from Eastern Europe and Western Europe. *Social Science & Medicine*, 53, 1621–1630.
- Stevenson, C., Doherty, G., Barnett, J., Muldoon, O. T., & Trew, K. (2007). Adolescents' views of food and eating: Identifying barriers to healthy eating. *Journal of Adolescence*, 30, 417–434.
- Story, M., Neumark-Sztainer, D., & French, S. (2002). Individual and environmental influences on adolescent eating behaviors. *Journal of the American Dietetic Association*, 102, S40–S51.
- Swinburn, B., & Egger, G. (2004). The runaway weight gain train: too many accelerators, not enough brakes. *British Medical Journal*, 329, 736–739.
- Thayer, R. E., Newman, J. R., & McClain, J. R. (1994). Self-regulation of mood: strategies for changing a bad mood, raising energy, and reducing tension. *Journal of Personality and Social Psychology*, 67, 910–925.
- Trochim, W. (1989). An introduction to concept mapping for planning and evaluation. *Evaluation and Program Planning*, 12, 1–16.
- Wang, Y., & Lobstein, T. (2006). Worldwide trends in childhood overweight and obesity. *International Journal of Pediatric Obesity*, 1, 11–25.
- Wills, T. A., Isasi, C. R., Mendoza, D., & Ainette, M. G. (2007). Self-control constructs related to measures of dietary intake and physical activity in adolescents. *Journal of Adolescent Health*, 41, 551–558.
- Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, 81, 329–339.