

Reducing or using temptation

exposure to candy enhances self-regulatory competence but does not boost nor hurt subsequent self-regulation behaviour in children

MSc thesis



2014-2015



**Reducing or using temptation: exposure to candy enhances
self-regulatory competence but does not boost nor hurt
subsequent self-regulation behaviour in children**

MSC thesis
CPT-81333

Froukje Takens
910820822080

Supervisor: Dr. Emely de Vet

24-03-2015

Wageningen University and Research centre

Abstract

Background: The easy availability of highly palatable but unhealthy food in the current environment poses a burden to the self-regulation of food intake. To protect children from temptations, it might be beneficial to strengthen self-regulation. The majority of interventions restrict exposure to temptations to tackle self-regulation problems. The present study examines the role of exposure to temptation in strengthening self-regulation in a field setting and context which promotes self-regulation. **Methods:** 142 children aged between 9 and 12 years old were exposed to candy in their classroom. Strategies were created testing the effect of repeated exposure to temptation and distraction from the temptation. Classes were assigned to one of three conditions; a control condition, a normative condition, including the presence of a bowl of candy on the teachers' desk or a consummatory value condition in which children used candy as a tool for calculations. At baseline and post-exposure, questionnaires were conducted establishing liking, the relative reinforcing value of candy and self-regulatory competence. After pre-exposure, self-regulation behaviour was measured by asking how much candy children wanted to consume. **Results:** exposing children to a food temptation did increased the preference for the exposed food and did not harm nor enhance subsequent self-regulation behaviour, yet it did enhance self-regulatory competence. **Conclusion:** first steps have been made to translate exposure to temptation into a feasible method applicable in a field setting. More understanding is needed to comprehend the complex factors influencing self-regulation after exposure to temptation.

Keywords: childhood obesity; eating behaviour; self-regulation; self-regulatory competence; exposure to temptation.

Preface

The passion for food already started at a young age. My mother has always told me I was an easy child; just give her some food and she is happy:) This interest for food was also evident in my choice for the bachelor Nutrition & Health. Eventhough I shifted to the master Health & Society, I kept the tendency to choose nutrition related subjects. Writing a thesis concerning eating behaviour seemed only a logical step. The past six months I have enjoyed writing my thesis about the effect of temptation of candy to self-regulation. I've had my ups and downs, but in your hands you will find the result of the past six months of my life dedicated to this report.

I want to express my special thanks to de Wilhelminaschool te Bennekom, de St. Alexanderschool te Bennekom, de Prinsenakker te Bennekom, de Johan Frisoschool te Wageningen and of course to my supervisor Dr. Emely de Vet for her guidance and support.

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Summary

Today's public health is threatened by the rising amount of childhood obesity. In 2013 13% of children was overweight, of which 3% facing obesity. The environment has an important role in current obesity epidemic by stimulating overconsumption and discouraging exercising. Overconsumption is triggered by an environment in which unhealthy but palatable food is easy accessible. This easy accessibility poses a burden to self-regulation of food intake. Self-regulation is referred to as the ability to control ones impulses to achieve long-term goals and often includes a conflict between impulses and cognition. When self-regulation is low, this appears to be related with the overweight and obesity in children. To build self-regulation, the role of exposure to temptations is studied. Controlled exposure, rather than limiting access to a temptation, might benefit subsequent self-regulation. In order for a temptation to boost subsequent self-regulation, different pathways are suggested. Distracting children from the consummatory value of unhealthy but palatable food or repeatedly exposing them to unhealthy but palatable food in a context that supports self-regulation might enhance subsequent self-regulation. This context is supportive of self-regulation, because it creates a conflict between the impulse to consume and the situational inappropriateness of consumption. The actionability (i.e. the accessibility to the food temptation), response conflict similarity (i.e. the similarity in control processes that consecutive conflicts trigger) and the presence of higher-order goals are proposed as conditional for this effect to occur.

142 children aged between 9 and 12 years old were exposed to candy in their classroom. Two practical methods exposing children to candy in a field setting were developed. Classes were assigned to a control condition, a normative condition or a consummatory value condition. The normative condition included the presence of a bowl of candy on the teacher's desk. The consummatory value condition included distracting children from the consummatory value of candy by using candy as a tool for calculations. In the control condition classes ran as usual. The study comprised of two phases lasting for one week in total. The first phase lasted 4 days and included the pre-exposure to candy. Prior to this phase, a pre-test was conducted assessing the liking and reinforcing value of candy at baseline. At the fifth day a post-test was conducted assessing post-test liking of candy, Fruittella and Apekoppen, the reinforcing value of candy and the self-regulatory competence. Also, subsequent self-regulation behaviour was measured by assessing the amount of Apekoppen children wanted to consume. Data was analyzed by conducting an ANCOVA in SPSS. Additionally, observations were done to complement quantitative findings.

The results revealed a significant increase in post-test liking of candy and Fruitella and self-regulatory competence. The post-test liking of Apekoppen and the reinforcing value did not change significantly. Exposure to temptation did also not affect the main outcome of subsequent self-regulation behaviour, comprising a reversed measure of Apekoppen consumption. These findings do not support the idea that pre-exposure to temptation enhances subsequent self-regulation nor do they confirm the traditional view of ego-depletion after repeatedly exerting self-regulation strength. The findings also contradict the idea that subsequent conflicts are solved more easily by lowering the liking after successfully solving an initial similar conflict, stimulating self-regulation. Rather pre-exposure to candy increased the liking, suggesting that the initial conflict might have been too high. The increase in liking might be related with the increased self-regulatory competence. A bigger conflict might have created a bigger need to deal with the temptation, stimulating the utilization of self-regulation strategies. It can be concluded that pre-exposure with temptation does not affect subsequent self-regulation behaviour, but does train the self-regulatory competence of children aged between 9 – 12 years old. This study took some first steps in creating a intervention aimed at building self-regulation. More understanding is needed in the variety of factors that are at play in a field setting, like the social norm and the ambiguity of a context that discourages consumption but does not set rules.

1. Introduction

Background

Today's public health is challenged by the rising amount of childhood obesity. In 2010 42 million of children under the age of 5 were overweight globally and it is expected that in 2020 9.1% of children is overweight (de Onis, Blössner, & Borghi, 2010). In the Netherlands the prevalence of childhood obesity is rising as well. In the last 30 years the prevalence of childhood obesity in the Netherlands has increased by 40% ("Convenant Gezond Gewicht," n.d.). In 2013 13% of children between the age of 2 and 20 years were overweight, of which 3% facing obesity ("Convenant Gezond Gewicht," n.d.).

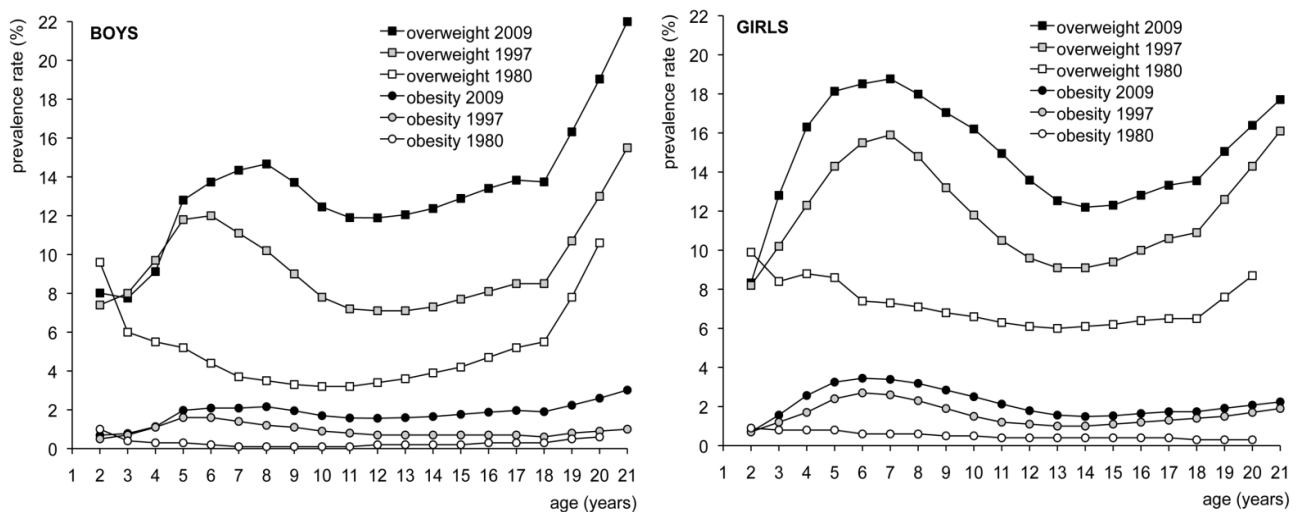


Figure 1 | Prevalence rate of Dutch children in 1980, 1997 and 2009 (Schönbeck et al., 2011)

Childhood obesity threatens public health because it increases the risk of certain (indicators for) health problems. On the short term it increases the chance of getting orthopaedic abnormalities, hypertension, asthma, sleep apnoea and diabetes mellitus type 2, and has an impact on children's emotional development, including disturbances of body image and self-esteem (Must & Strauss, 1999; Schönbeck et al., 2011). Childhood obesity increases cardiovascular risk factors and inflammatory mediators, which consequences can express later in life (Must & Strauss, 1999; Reilly, 2005). On the long term, childhood obesity health consequences also includes an increased risks of premature mortality (Must & Strauss, 1999; Reilly, 2005; Schönbeck et al., 2011; van Dijk & Innis, 2009). Moreover, childhood obesity increases the chance of getting adult obesity, which in turn is related to certain types of cancer and cardiovascular disease (Must & Strauss, 1999).

This rise in obesity is related to a an increased intake of energy-dense foods that are high in fat and sugars, but low in healthy micronutrients like vitamins and minerals (empty calories) and the development of a sedentary lifestyle. This has caused an imbalance between the calories one consumes and the calories one expends ("WHO | Childhood overweight and obesity," n.d.). In the last 30 years this change in lifestyle has especially affected children between the age of 2 and 6 years old (Schönbeck et al., 2011) and the increase in obesity goes most rapidly among children (Seidell, 1997). The first signs of overconsumption and obesity expresses as early as the age of 6 month (van Dijk & Innis, 2009).

Link between obesity and the environment

The environment is important when considering childhood obesity. The general belief is that the current environment plays a big role in the development of obesity by stimulating overconsumption and discouraging energy expenditure (Hill, Wyatt, Reed, & Peters, 2003). Thus, two factors influence the rise in obesity; on the one hand bad eating habits and on the other hand, a lack of physical activity. Diets are often seen as a main contributor to the rising obesity epidemic (de Vet et al., 2013), in which the easy accessibility of unhealthy foods are often blamed for stimulating unhealthy diets and eventually the current obesity epidemic (Faith, Fontaine, Baskin, & Allison, 2007). Therefore, this study will focus on the influence of eating behaviour, rather than physical activity in exploring ways to address obesity related behaviour.

In terms of the environment stimulating overconsumption, the easy accessibility and abundance of energy is believed to steer people to obesity related behaviour. When having easy access to unhealthy food, adolescents aged between 10 and 17 consume more unhealthy food (de Vet et al., 2013). Such an environment with easy access to an unhealthy lifestyle is referred to as an obesogenic environment (Swinburn, Egger, & Raza, 1999). An obesogenic environment influences obesity related behaviour in multiple ways. A lot of research is done about all kind of environmental factors influencing obesity related behaviour, identifying factors like peers, schools, families, supermarkets, infrastructure, the industry, costs of food, food policy and regulations, community, education, role models like celebrities and advertisement (Swinburn et al., 1999). For instance, parents are of major influence on children's food pattern, as children cannot choose the environment they live in and are for a large part dependent on their parents with regard to their diets ("WHO | Childhood overweight and obesity," n.d.). For instance, fruit and vegetable intake is highly influenced by parental influences compared to other factors, like peers, schools or the neighbourhood. A well-known research considering environmental cues and its effect on obesity is conducted by Wansink (2004). This study enumerates different environmental factors stimulating overconsumption unconsciously, like ambient factors, social interactions and the 5 S's including salience, structure and variety, size of food portion, stockpiling and the shape of for instance glasses. For example, the more salient a product is placed (independent whether it is healthy or not), the higher the intake (Wansink, 2004).

A lot of different environmental influences have been identified. To structure all these different environmental influences, Swinburn et al. (1999) has distinguished four different environments that can operate at a micro- and macrolevel; the physical, economic, political and sociocultural environment. The physical environment refers to what is literally available for instance at school, home or the neighbourhood. The economic environment refers to the costs of food, for instance, cheap energy-dense products. The political environment refers to the rules concerning food and the sociocultural environment refers to the attitudes, beliefs and values a community holds with regard to eating healthy (and exercising).

Self-regulation in the obesogenic environment

An environment full of temptations impedes the capacity to control your impulses and regulate your food intake. Easy access to unhealthy, energy-dense but highly palatable and cheap foods poses a burden to *self-regulation* (de Vet et al., 2013). Self-regulation refers to the ability to control ones impulses with a short-term rewarding value in order to achieve long-term goals. In other words, the easy access to unhealthy and palatable foods interferes with the ability to control the impulse to indulge in order to achieve a long-term goal, like staying slim or being healthy. Some children are

better in controlling their impulses and resist temptations like unhealthy but attractive food than other children. Also what is regarded a temptation is different (Dewitte, 2013). For instance, some children might have a hard time resisting chocolate when facing it, another might not even glimpse because he or she does not like chocolate. Next to the easy availability affecting self-regulation, the lack of clear, shared social eating appropriateness standards is claimed to compromise self-regulation (De Ridder, De Vet, Stok, Adriaanse, & De Wit, 2013). Without such standards to guide eating behaviour it might be hard to cope with an environment providing many eating occasions. Clear shared social eating appropriateness standards would put less pressure on individual decision making and thereby reduce self-regulation failure. Either way, self-regulation often comprises refraining from the consumption of unhealthy foods, which is hampered by an environment offering many occasions to indulge. In this scope, obesity can be viewed as a behavioural or social problem resulting from self-regulation failure (Hagger, Wood, Stiff, & Chatzisarantis, 2010).

Low self-regulation among children has shown to be related to the development of overweight and obesity in pre-adolescence (Francis & Susman, 2009; Graziano, Kelleher, Calkins, Keane, & Brien, 2013). Individual differences in delay behaviour at the age of four (i.e. whether a child can resist a treat to obtain a higher treat later) is predictive of self-regulatory competence more than a decade later (Mischel et al, 1989). The ability to use self-regulation strategies is referred to as self-regulatory competence (De Vet et al., 2014). In other words, the extent to which children can resist temptation at young age is predictive of the ability to use self-regulation strategies. Such strategy could include for instance distraction from the temptation. When the ability to self-regulate eating behaviour is low at a young age, this appears to be related to a high increase in weight between the age of 3 to 10, compared to peers with stronger self-regulation capacity (Francis & Susman, 2009) and this concerns a risk factor for obesity at the age of 10 (Graziano et al., 2013). Thus, poor self-regulation increases the risk of getting obese.

The contrary also seems presumable; when using self-regulatory strategies frequently, adolescents' (aged 10-17) unhealthy food consumptions appears to be lower (de Vet et al., 2013), which might lead to lower obesity risks. The obesogenic environment might play a role in this link as research has shown that easy access to unhealthy food is positively associated with the use of self-regulation strategies among adolescents. As mentioned, easy accessibility and availability increases the intake of unhealthy foods among adolescents (de Vet et al., 2013). The positive association between self-regulation strategies and easy access to unhealthy foods, implies that the use of self-regulation strategies can lower the impact of the easy availability of unhealthy foods among adolescents (de Vet et al., 2013). Children are capable of understanding strategies enabling self-control (Mischel, Shoda, & Rodriguez, 1989). However, even if knowing how to eat healthy, they do not necessarily exercise self-regulation strategies (Stok, de Vet, de Ridder, & de Wit, 2012). To release the burden the current obesogenic environment poses on self-regulation and eating behaviour, it might therefore be important to strengthen self-regulation among children, helping them to cope with temptations imposed by today's environment.

Building self-regulation

Even when acknowledging the importance of building self-regulation, it remains questionable how self-regulation can be built already at a young age to provide children with tools enabling them to self-regulate their food intake. In literature two opposing views about how self-regulation is achieved are present.

Reducing temptation

Since the environment has changed in favour of obesity related behaviour, some argue it is best to change the environment in such a way that it tempts children less to indulge. As this obesogenic environment enables overconsumption in the first place, it seems logical to alter this trigger. In this sense eating behaviour is guided to a higher extent and less self-regulation is needed. As unhealthy behaviour is seen as the default option, approaches are proposed that include interventions like restricting food advertisement to children or restricting soft drinks in schools (Schwartz & Brownell, 2007).

Intuitively one might argue it is best to remove or decrease temptations in order to regulate food intake. Indeed, when not having access to unhealthy foods, one is not tempted to indulge. Accordingly, self-regulation failure is often attributed to the obesogenic environment in which the easy accessibility of unhealthy food promotes obesity related behaviour i.e. the easy availability and accessibility are often blamed for self-regulation failure. According to Lowe (2003) the obesogenic environment makes self-regulation impossible. He argues that without considering the availability of food in the environment, addressing self-regulatory skills is not sufficient in weight control, because the environment has a stronger influence on body weight than the individual does. Within this environment promoting overconsumption, people will gain weight, unless devoting substantial cognitive effort to manage body weight, whereas body weight control used to be an instinctual unconscious process (Peters, Wyatt, Donahoo, & Hill, 2002).

However, restricting food intake might have adverse effects (de Boer, de Ridder, de Vet, Grubliauskiene, & Dewitte, 2014; De Ridder et al., 2013; Faith et al., 2007). Instead of stimulating self-regulation, limiting access to unhealthy food can hinder self-regulation of food intake. Food deprivation is shown to increase the motivation to eat, which might hinder weight maintenance (Epstein & Leddy, 2006). An example of food deprivation (in this case planned) and indulgence can be found in dieters. When dieters are exposed to palatable food for several minutes, dieters become more likely to overeat when subsequently given access to palatable food (Vohs & Baumeister, 2011).

Restricting the intake of unhealthy but palatable food among children might be effective children as long as they are under these restrictive conditions (De Boer 2014), but can promote the 'forbidden' food and increase intake at other occasions where it is available again (De Ridder et al., 2013; Faith et al., 2007). Parental restriction of consumption of unhealthy palatable foods may limit food intake at a specific occasion among children, but stimulates overeating in the long run (Faith et al., 2007). Such food restriction intervention are usually aimed at settings like homes or school, making it hard to restrict food intake in other settings children encounter (de Boer et al., 2014). Even though opportunities to limit the availability of tempting foods to promote self-regulation has got great attention in literature, it is unclear whether it is a successful method in building self-regulation in children and might even have unintended and detrimental effects on weight control (Faith et al., 2007).

From this perspective, obesity related behaviour is considered to be caused by impulses as a result from our current environment triggering unhealthy behaviour, where it seems as if temptations are regarded as limiting factor with regard to obesity related behaviour. These temptations provided by the environment are seen as something that should be avoided in order to build self-regulation.

Using temptation

A different approach to build self-regulation is exposing children to temptations rather than reducing them. A relatively new stream of research suggests exposure may help rather than hinder resistance to temptation and self-regulation (Fishbach, Friedman, & Kruglanski, 2003).

Research has focused on the situations in which exposure reduces self-regulation. However, under some conditions exposure might enhance self-regulation. When exposure is controlled it has the potential to enhance rather than hurt subsequent self-regulation. In this sense, the food temptation contributes to the activation of inhibitory goals that helps refraining from consumption (Fishbach et al., 2003; Geyskens, Dewitte, Pandelaere, & Warlop, 2008). In adults, prior exposure to a food temptation without consumption prevents the activation of an eating goal when a new food temptation presents itself, and thus enhancing subsequent self-regulation (Dewitte, 2013; Geyskens et al., 2008). Also in children, controlled pre-exposure has shown the potential to enhance self-regulation. Controlled pre-exposure to a food temptation in a context that discourages consumption can enhance subsequent self-regulation in boys (Grubliauskiene & Dewitte, 2014) and in girls (de Boer et al., 2014). Grubliauskiene & Dewitte (2014) observed a lower intake of candy in boys after pre-exposure with the temptation in a context that discouraged consumption, implying an increase in resistance to that temptation. During a task children were requested to form words with candy shaped letters (pre-exposure condition) or cardboard letters (control conditions). Then they participated in a taste test to measure subsequent consumption. Boy's intake of candy during the taste test was lower after pre-exposure compared to the control condition. De Boer et al. (2014) found that girls' subsequent free consumption is lower when pre-exposed to temptation in a situation which supported the self-regulation of food intake. Children participated in an adapted delay of gratification task. From Monday till Thursday they were daily asked to make a choice between one candy now or three candies on Friday. On Friday subsequent self-regulation was measured. This study showed a decreased intake among girls after pre-exposure compared to the control condition. Thus, in children, temptation might enhance subsequent self-control when the consumption context suggests it is not desirable to indulge, creating a conflict between the desire to consume and the situational inappropriateness of consumption (de Boer et al., 2014; Grubliauskiene & Dewitte, 2014). Therefore, manipulating the context in the sense that consumption is discouraged has the opportunity to enhance self-regulation.

As mentioned, restriction might yield an increase in liking for a certain product and as a consequence the intake increases (De Ridder et al., 2013; Faith et al., 2007). On the contrary, when a product is freely available (as proposed by previous studies), this might lower the liking. A change in preference of the rejected food temptation is assumed to underlie subsequent self-regulation enhancement after controlled pre-exposure to a food temptation (Geyskens et al., 2008). For instance, when someone chooses to refrain from a temptation, the liking of this rejected food temptation might decrease. When again faced with this temptation, the liking is lower compared to the previous encounter with that temptation. This might boost subsequent self-regulation by increasing the chance someone will reject the food temptation again.

The role of prior activation of control processes and self-regulation may be crucial in determining whether pre-exposure enhances rather than hurts subsequent self-regulation attempts. When self-regulation is effective (i.e. triggering restriction goals), these restriction goals might be easier reactivated when someone encounters a new food temptation similar to the former. It is assumed that if food temptations are similar (i.e. triggering a similar conflict between a nice taste vs. health),

this reduces subsequent consumption by activating the same regulatory strategy (Grubliauskiene & Dewitte, 2014). In other words, when one is repeatedly exposed to the same temptation, the activation of similar restriction actions becomes easier over time. When given time, people have the opportunity to adapt, facilitating self-regulation (Converse & Deshon, 2009). Thus, when more occasions present itself to cope with a certain temptation, exposure might enhance self-regulation. With reference to De Boer et al (2014) children's self-regulation was improved after a week's long exposure.

According this view, temptations can enhance self-regulation rather than undermining it, depending on certain conditions. Successfully resolving an initial conflict, may have beneficial aftereffect on self-regulation (de Boer et al., 2014). When setting up an intervention to reduce bad eating habits in children, it might be wise to keep in mind to create an environment which promotes resistance to food by enabling opportunities to build self-regulation competence (Grubliauskiene & Dewitte, 2014). Additionally to prior research showing self-regulation enhancement after pre-exposure in adults (Dewitte, Bruyneel, & Geyskens, 2009; Geyskens et al., 2008) and in children in both a laboratory (Grubliauskiene & Dewitte, 2014) as a field setting incorporating the opportunity to adapt over time (de Boer et al., 2014), this study builds on by investigating whether this principle can be translated into practical strategies implementable into a field setting like a classroom. To assess improvement in self-regulation both self-regulation behaviour as self-regulatory capacity (i.e. the ability to use self-regulation strategies) is assessed.

1.1. Research question

This paper will examine whether exposure to temptations of unhealthy tasty food can enhance children's self-regulatory capacity instead of hurting it. In this sense temptations are used to learn to utilize self-regulation strategies and gain in self-regulatory competence to refrain from eating behaviour, rather than considering the environment as a limiting factor with regard to the obesity epidemic. I will explore whether these findings withstand in a field setting, like a classroom and long-term exposure to temptation via the implementation of two methods implementing pre-exposure. This brings me to the following research question:

Can long-term exposure to temptations in a field setting enhance self-regulation aimed at reducing the consumption of unhealthy food in Dutch children?

Sub questions:

- Does exposure to temptation affect liking in a field setting?
- Does exposure to temptation affect the internal motivation to eat?
- Can exposure to temptations train the self-regulatory competence?

2. Theoretical background

2.1. What is self-regulation?

Daily, people are faced with all kinds of temptations, like those nice pair of shoes or appealing chocolate bar. Such temptations include objects with immediate benefits but delayed costs (Dewitte, 2013). In case of a chocolate bar, the nice taste would be an immediate benefit and the health consequences on the long term would include the delayed costs. When someone encounters such a temptation this can activate a certain impulse. This impulse includes a behavioural response as a result of the temptation, whereas impulsive behaviour is seen as a result from an unplanned and spontaneous impulse (Baumeister, 2002). When acting upon this impulse, this might contradict long-term goals (Baumeister, 2002). However to override impulses, people need to control their behaviour. This is referred to as self-control or self-regulation. When people are able to enact self-regulation, they can behave in line with their long-term goals (Hagger et al., 2010).

More broadly, self-regulation is seen as the attempt to regulate or alter thoughts, feelings or behaviour (Converse & Deshon, 2009). According to Baumeister self-regulation is “the self’s capacity to alter its own states and responses” (2002) or “the capacity of the individual to alter, modify, change or override his or her impulses, desires, and habitual responses” (1996). Usually self-regulation captures a certain conflict between immediately available gratification and delayed but more valued outcomes (Mischel et al., 1989). Mischel (1989) refers to this as future-oriented self-control. Self-regulation can either be successful or failing. When self-control fails, someone indulges (Dewitte, 2013). Self-regulation failure is the inability to control impulses or behaviour and is implicated as a mechanism relevant in the development of overweight (Francis & Susman, 2009).

Conflict between cognition and impulses

These definitions capture a conflict between one’s cognition and impulses. It seems as if cognitive processes are needed to override lower order processes that otherwise steer behaviour. This effortful control of self-regulation is often referred to as will-power (Vohs & Baumeister, 2011). Most self-control theories assume that indulgence is the default option (Metcalf & Mischel, 1999). Consequently, without top-down interference, people’s behaviour would follow situational dependent impulses (Dewitte, 2013). Therefore willpower seems needed for effective self-regulation. When considering the example of the chocolate bar, this would include that without higher power processes, behaviour is steered by the impulse to consume the chocolate. To act in line with your long-term goals willpower is needed to override this impulse. The cognitive element can also be framed as desire, in which the attitude towards the object of desire should be downplayed for effective self-control (Dewitte, 2013). Still this involves an effortful control of one’s impulses and might be considered indirect will-power (Dewitte, 2013).

In other words, cognition is phrased as a higher order process and ones impulses as a lower order process that is triggered by the environment. However Dewitte (2013) claims a conflict triggered by a temptation is not necessarily solved (or failure to do so) by a higher order system; self-regulation might also simply be the result of the attempt to solve the conflict, downplaying either one of the options. In this alternative explanation of the conflict, solving it is not viewed as being dependent on whether a higher order system works successful or fails. Rather, in this perspective impulses and ones cognitions are valued as being equal in which behaviour is led by activation of downplaying either one of the two choice options.

In other words, presence of temptation can trigger a behavioural *conflict* between one's impulses and one's cognition (de Boer et al., 2014; Geyskens et al., 2008). On the one hand, a certain desire is activated (impulse), which activates an eating goal. On the other hand food restriction objectives (cognition and willpower) are activated, facilitating self-regulation (Geyskens et al., 2008). To resolve the conflict, certain control processes occur which downplays or activates one of the two choice options (Dewitte et al., 2009). When self-regulation is effective, food restriction occurs either via down-regulating desire or activating will-power (Dewitte, 2013). On the contrary, when self-regulation fails, an eating goal is activated by either down-playing cognition or activating the desire.

The role of the context

Self-regulation can either be successful or fail. Many researchers believe that repeated exertion of self-regulation is related to self-control failure. However whether repeated exertion of self-regulation results in subsequent self-regulation success or failure, might be dependent upon the context.

Several contextual elements have been brought forwards that have the potential to enhance subsequent self-regulation attempts. First, it is suggested that the actionability of a food temptation determines whether it triggers a conflict (Geyskens et al., 2008). The actionability includes the immediate opportunity to consume, in which food temptations are easily accessible and available for indulgence. In this sense, a temptation will only trigger a conflict when it is really 'in your face'. When it is not really notable, it will not trigger the same conflict between impulses and cognition. When this conflict is not triggered, behaviour follows the impulses elicited by the environment. As a consequence, when given the opportunity to consume at a subsequent occasion, an eating goal will not be triggered in the former situation, whereas it will be triggered in the latter situation. For example, someone is driving to the supermarket. On their way over they encounter a candy bar advertisement, including a temptation that is not available for consumption right away. After arriving at the supermarket someone encounters the same candy bar waiting in line at the counter, including a food temptation that is accessible for consumption. According to this notion of actionability, the first exposure (an advertisement at the side of the road) is not actionable and will not trigger a conflict and thus will not trigger self-regulation processes. The second exposure (next to the counter) is assumed to be actionable, because of its easy availability and accessibility. In this case, a conflict between the impulse to buy the candy bar and the long-term goal of for instance staying slim will be triggered, instead of recruiting an eating goal.

Second, it is argued that the similarity between the conflicts exerting self-regulation has a pivotal role in determining whether it will enhance or reduce subsequent self-regulation. Dewitte (2013) argues that dissimilar control processes to solve a certain conflict leads to subsequent self-regulation failure, whereas conflicts that recruit similar control processes to solve the conflict enhances subsequent self-regulation. As mentioned cognitive processes are able to control one's impulses. It is argued that when someone encounters a similar conflict later on, it becomes easier to activate the same self-regulation strategies activated during the first encounter downplaying the conflict (Geyskens et al., 2008). Dewitte et al (2009) refers to this phenomenon as *response conflict similarity*; when a subsequent occasion presents itself with a similar response conflict (i.e. a control process which downplays one of the two choice options; either suppressing the activation of an eating goal or suppressing the activation of a food restriction goal) this enhances subsequent self-regulation (Dewitte et al., 2009). For instance, someone is at the supermall and encounters a bakery with all kind of tempting pastries in the window, after which a conflict is triggered between the immediate pleasure of a good taste, but on the other hand, the long-term goal of staying slim. Upon temptation,

cognitive processes are activated that suppress the activation of an eating goal. Half an hour later someone encounters a pizza place, again triggering a conflict between a nice taste and a long-term goal of staying slim. Because this temptation triggers a conflict similar to the conflict triggered earlier, it is assumed it becomes easier to activate similar self-regulation processes, enhancing subsequent self-regulation. When addressing everyday consumer context, similar control situations are ordinary (Dewitte et al., 2009), indicating the potential of addressing this theory to tackle the easy availability of palatable food in current obesogenic environment.

2.2. The different views on self-regulatory capacity

How self-regulation is perceived differs between different theories. Literature is indecisive whether exposure to temptations will decrease or enhance self-regulation. The general thought is that temptations will hinder self-regulatory capacity, but some theories show an opposite conclusion. In the next section different theories entailing self-regulation are mentioned. These theories include: the depletion model, the control theory of self-regulation, hot/cool system theory, counteractive self-control, distraction and avoidance, learned industriousness, adaptation-level theory and the cognitive control theory.

In literature three perspectives on the nature of self-regulation appear; self-regulation as state (situational), trait or skill. This paper focuses on the role of exposure to temptation. Not all of these lines of reasoning seem relevant in explaining this question. Therefore, only models following self-regulation as state (situational) and as a skill are included in the following section.

Before explaining the models one by one, I will first briefly explain the differences between the three different lines of reasoning with regard to self-regulation.

The most dominant view includes self-regulation as state-dependent being responsive to situational cues. Dependent on the situation, self-regulation is triggered. Independent on how and when self-regulation is triggered and solved, this view often includes the notion of self-regulatory capacity as being limited. The above mentioned theories following this line of reasoning include: the regulatory depletion model, the control theory of self-regulation, the hot/cool system theory, the counteractive self-control theory and the critical level model. The second view regards self-regulation as a *trait*. Some people are more impulsive (i.e. less resistant to temptations) and others more restrained (i.e. more resistant to temptations). Research shows that early low self-regulatory capacity is related with higher levels of impulsivity later in life (Francis & Susman, 2009), suggesting impulsivity is a (stable) trait. None of the discussed theories will follow this line of reasoning. The last view regards self-regulatory capacity as a *skill*. In this sense, self-regulation is malleable and can be trained. The above mentioned theories following this line of reasoning include: learned industriousness, the adaptation-level theory and the cognitive control theory.

Regulatory depletion model

The most dominant theory in literature addressing self-regulation is the regulatory depletion model. According to this model, self-regulation is dependent upon the inner resources available to the individual at a given time (Converse & Deshon, 2009). These resources are limited. Therefore, when self-regulation is exercised, people can get ego-depleted, reducing the self-regulatory capacity for further decision making (Hagger et al., 2010). Thus, after a period of self-regulation, subsequent self-regulation reduces its capacity (Dewitte et al., 2009).

When regarding self-regulation as limited resource, more terms are used to refer to the same principle, from regulatory depletion model, limited-resource model of self-regulation to the self-control Strength model. Within this field, the self-control Strength model is often cited. This model regards limited self-regulatory capacity as the strength of your inner self-regulatory resources, which determine the effectiveness of self-regulation. Exerting self-control consumes self-control strength, which reduces the amount of strength available for subsequent situations requiring self-control (Muraven & Baumeister, 2000). Resisting temptations is regarded as consuming self-control, which leaves less self-regulatory strength for subsequent exposure to temptations and increases the chance

at self-regulatory failure and indulgence (Muraven & Baumeister, 2000). For instance, dieters (who refrain their impulses on a regular basis) are more susceptible to eating and indulging (Muraven & Baumeister, 2000).

This model assumes that self-control originating from different spheres, all draw from the same resource (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven & Baumeister, 2000). Thus, when having to control emotions, this might influence the ability to exert self-control in a subsequent situation in which one is faced with a tempting chocolate bar. For instance, exerting self-control over eating by forcing oneself to eat radishes instead of tempting chocolates, increases the chance to quit fast on an unsolvable puzzle (different from controlling impulses, but also requiring self-control) (Baumeister et al., 1998).

The self-regulatory strength model claims that self-control resembles a muscle. A muscle cannot exert energy unlimited, but gets depleted over time when exercising. However, a muscle can conserve energy for the future, can train to increase endurance and can regenerate after a period of rest (Hagger et al., 2010).

First, for self-regulation this metaphor implies that like a muscle, an individual has the capacity to conserve (self-regulatory) strength for later decision-making. When anticipating on future self-regulation, one can save some 'strength' during a prior situation where self-control is needed for an anticipated situation needing self-regulation. Secondly, when exercising repeatedly, a muscle's strength increases. Also when exerting self-regulation on a regular basis, this supposedly increases the self-regulatory strength. Whereas in the past self-regulatory capacity would already have been depleted after repeated exposure to self-control, the trained and extended self-regulatory capacity can attenuate the ego-depletion effect. Last, when working out, a muscle can get depleted. When given rest, the muscle recharges, enabling 'renewed' strength for further exercise. Like a muscle, self-control can regenerate after a period of rest, enabling renewed self-regulatory strength. Despite of that Hagger et al (2010) does not find support for the latter, overall this review shows that there is a large body of evidence for ego-depletion via the self-control strength model, although not all show significant effects (Hagger et al., 2010).

Usually the ego-depletion effect is measured via the dual-task paradigm (Hagger et al. 2010). This paradigm contains two tasks involving self-control, in which the control condition requires only self-control in the second task. Subsequent self-regulation is determined to measure the effect of prior self-regulation effort to subsequent self-regulatory capacity.

Control theory of self-regulation

The control theory includes the notion of a discrepancy-reducing feedback loop (Carver & Scheier, 1982). The theory enables to understand various physical processes. The article of Carver & Scheier (1982) also apply the control theory on psychological processes.

The feedback loop consists of a few elements (see Figure 2). The input function senses the present condition. This perception is compared (comparator) to a certain reference value. When a discrepancy is monitored between the reference value and the perception of the current situation, behaviour (output function) is activated aimed at reducing the discrepancy. This behaviour might change the systems environment, but can be disturbed by external factors. This feedback loop is a continuous process of adjusting to the reference value.

The reference value represents one's goals. The control theory assumes there are different levels of control, but the highest level of control comprises a certain idealized self-image; what kind of personal characteristics does one want to embody? Thus, this theory assumes that behaviour ultimately follows one's own commitments and goals. These reference values are not static, but can change and develop.

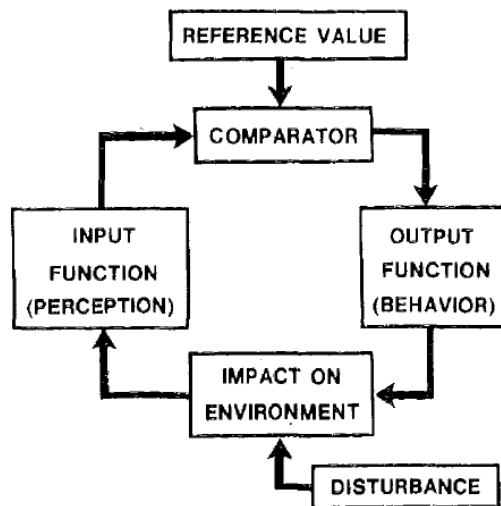


Figure 2| The negative feedback loop- the basic unit of cybernetic control (Carver & Scheier, 1982)

Dewitte et al (2013) refers to this control theory in the light of conscious self-regulation of (eating) behaviour rather than (automatic) physical processes. Self-regulation is referred to as a conscious process of controlling one's impulses to act in line with one's personal goals. In this sense, self-regulation contains a top-down interference to behaviour. When one monitors a discrepancy between one's goals and the current state (perception), behaviour is activated to reduce the discrepancy in the direction of the reference value (goal). For instance, the standard includes being healthy, but someone is tempted by the smell of pizza representing the current state. In this case, there is a discrepancy between the standard and the current state, creating a conflict. In line with the reasoning of the control theory of self-regulation, this discrepancy will trigger behaviour reducing the discrepancy. When focusing on the standard, this will result in refraining from the pizza and improved self-control (Dewitte, 2013).

Hot/cool system theory

This theory assumes there are two principles guiding self-regulation. This system either enables or undermines self-regulation, dependent on which of the two systems is activated (Metcalf & Mischel, 1999). On the one hand, a cool, cognitive 'know' system stimulates self-regulation and on the other hand, a hot, emotions/impulses based system undermining efforts at self-regulation (Metcalf & Mischel, 1999). Different characteristics of both systems are illustrated in Table 1 from Metcalfe & Mischel (1999).

Table 1| characteristics of the two systems (Metcalf & Mischel, 1999)

Hot system	Cool system
Emotional	Cognitive
"Go"	"Know"
Simple	Complex
Reflexive	Reflective
Fast	Slow
Develops early	Develops late
Accentuated by stress	Attenuated by stress
Stimulus control	Self-control

Self-regulation is reliant on the cool system and the hot system is under stimuli control. Behaviour naturally follows stimuli that elicits automatic reactions, but can be negated by self-regulation strategies to control behaviour (Metcalf & Mischel, 1999). The ability to inhibit such impulsive responses is referred to as will-power, which can be triggered by the cool system. Thus, mental networks (cool) suppresses the behaviour, which would otherwise be determined by impulses (hot) (Dewitte, 2013). To avoid drifting off to the hot system and activation of the cool system, self-regulatory competences, like attention skills, metacognitive knowledge are needed to achieve personal goals.

Mischel et al. (1989) assessed self-regulation by means of delay of gratification among 4-year olds. This included the choice between immediate gratification (small treat) or delayed but more valued outcomes (bigger treat). Delay time was assessed as a measure of self-regulation. When focussing on the hot, consummatory quality of food, children's self-regulation was lower. Also the other way around, when focussing on cool non-consummatory aspects of food, children were able to delay longer. Thus, focusing on the hot emotional system undermines self-regulation when tempted with food. When distracting children from the hot stimulus, either external as internal, this steers them to the cool system (Dewitte, 2013; Metcalfe & Mischel, 1999; Mischel et al., 1989).

Counteractive self-control

Counteractive self-control includes that both an approach tendency towards indulgence and activation of a goal are triggered simultaneously after exposure to a temptations. In this sense, exposure to temptation activates a counteractive goal, which stimulate self-regulation (Dewitte, 2013).

The idea between this counteractive activation is that a certain activity can pose a conflict between immediate short-term costs or gains and lasting long-term goals, which threatens the long-term interest. In response to this conflict, people might exercise counteractive control to counteract the influence of short-term effect and secure long-term outcomes (Trope & Fishbach, 2000). Self-control designed to counteract the influence of anticipated temptations, can diminish the influence that temptation could have on behaviour. In other words, self-control effort may counteract the effect of short-term outcomes in determining one's actions. The higher the short-term threat, the more self-control is needed.

In terms of controlling eating behaviour, this theory could include that upon temptation with that tasty pizza, a conflict is created in which simultaneously an approach tendency and a counteractive goal of health or maintaining weight is triggered. If counteractive control is triggered, this will diminish the effect of the short-term impulsive temptation, stimulating one's self-control in refraining from the pizza.

The counteractive self-control theory has a few assumptions. First, the counteractive control effort depends on the valued long-term outcomes. For instance, when someone does not value health or weight maintenance as long-term goal, one is less likely to bolster the value of refraining from an unhealthy temptation. Second, when the short-term effects are extremely high, one is unlikely to exert as much self-control effort. As the valence of short-term outcomes increase, the counteractive control also increases, up to a point where people do not perceive themselves capable enough to exert that amount of counteractive self-control. Thus even though that this theory assumes that the

more tempting a product is, the higher the counteractive self-control is exerted, this has a certain limit. Only when short-term effects are moderate, self-control efforts determine whether a certain activity is performed. Last, before rather than after performing a certain activity, people exercise counteractive control, helping them to choose.

Learned industriousness

Eisenberger (1992) laid the foundation of the learned industriousness theory. This theory assumes that reinforcement of high effort can enhance organisms' performance by lowering aversiveness of exerting such high effort.

Cognitive effort is referred to as "the intensification of mental activity when it is obstructed in some way". Within this theory of learned industriousness, exerting effort is considered an important inhibitor in achieving goal-oriented behaviour. On the one hand it is assumed that prolonged cognitive performance produces fatigue which results in a decrement of an organism's capacity to continue to perform a similar activity, comparable to an ego-depletion effect described in the regulatory depletion model. However, reinforcing high performance, related to a secondary reward value, can reduce the aversiveness of exerting a high amount of effort. In other words, when someone is putting a lot of effort in a certain activity and this activates a reward value, this reduces the aversiveness of putting that much effort in that activity. "In choice situations, organisms would increase their preference for high-effort tasks that produced a large magnitude of reinforcement relative to low-effort tasks that yielded a small magnitude of reinforcement". A larger preference for high effort yielding a lower aversiveness to effort will subsequently strengthen performance. Eisenberger (1992) shows that reinforced high performance increased subsequent self-control of effort in rats and children. Thus, being rewarded, resulting in a lower aversiveness to that activity, increases the preference for this option, making self-control of effort more likely. Long-term reinforcement of high-effort's secondary reward value, contributes to durable preferences for staying industrious increasing self-regulation, hence the term learned industriousness (Eisenberger, 1992).

Converse & Deshon (2009) allege this theory to find an explanation for the result of enhanced self-control after repeated exposure to temptation. They hypothesize that a task requiring a lot of effort, enhances self-regulation. Learned industriousness assumes that people learn about a certain level of exertion of control in certain situations. Thus, self-regulatory exertion in a subsequent task is higher, when initial self-regulatory effort was high. However, Converse & Deshon (2009) observe this effect seems stronger in an experimental design with more than two tasks; when participating in two initial tasks, the learned industriousness effect has the opportunity to fully develop, whereas with one initial task it is not, like the dual task paradigm, resulting in an ego-depletion effect. According to this theory, exposure to temptations has the potential to enhance self-regulation when given the time and opportunity to experience the effect of exerting high effort, triggering a reward value and a decrease in aversiveness.

Adaptation-level theory

The adaptation-level theory focuses on the experience of internal norms or standards, representing certain adaptation levels (Converse & Deshon, 2009). These internal adaptation levels guide behaviour (Converse & Deshon, 2009) by judging stimuli with regard to these adaptation levels (Helson, 1964). Helson (1964) regards behaviour as bipolar; behavioural responses are dichotomized, representing a neutral zone, and two opposing zones, for instance approach-ignore-avoidance. These

neutral zones, represent the adaptation levels. When an incoming stimuli is judged as different from the adaptation level, this elicits certain psychophysical processes to adapt stimuli to the adaptation level (Helson, 1964).

Repeated exposure to a similar stimuli can shift the internal norms (Helson, 1964). Prior experience with a certain temptation can therefore enable individuals to adapt their behaviour with regard to their shifting and developing internal adaptations levels (Converse & Deshon, 2009). Helson applies this theory to basic psychophysical processes, like the processing of colour stimuli in. Converse & Deshon (2009) apply this theory to self-regulation, to explain the effect of enhanced self-regulation after repeated exposure to a certain food temptation. They argue that food temptations can enhance self-regulation over time, possibly explained by this theories assumption that internal adaptation levels can shift and develop. Mere exposure causes individuals to be able to adapt subsequent food intake to prior exposure. When experiencing several (similar) tasks, one learns to adapt, enabling enhancement of self-regulation of food intake (Converse & Deshon, 2009).

Critical level model

This model assumes that when exposure exceeds a certain level, self-regulation strategies are triggered, which in turn trigger food restriction goals (Geyskens et al., 2008). Intense hedonic states, like an intense desire for a certain food temptation, trigger psychological processes which reduces these hedonic states (Gilbert, Lieberman, Morewedge, & Wilson, 2004). Without such psychological processes, this state would last much longer. Therefore mild hedonic states might last longer than intense hedonic states, because these are actively defended by the body. In this sense, only when the problem becomes serious enough, psychological processes are activated to solve the problem. However, people are unaware of these attenuating processes, and thereby misjudge the duration of intense versus mild states. Given a choice, people are likely to choose the less distressing option, triggering mild hedonic states, because they are unaware of the psychological processes a more distressing option would trigger. Ultimately this option is less satisfactory, because this state would last longer than an intense state in contrast to people's expectations. For instance, an individual might expect that a very tasty and tempting piece of apple pie would pose a bigger threat to a food restriction goal rather than a less preferred piece of cake. However when the desire of the apple pie exceeds the critical level, psychological processes are triggered to attenuate the desire, lowering the time that state of desire lasts. A lower state of desire of cake might not reach this threshold, not attenuating that hedonic state.

Geyskens et al (2008) applies the critical level model to food temptation and assumes that when a food exposure exceeds a certain critical level, self-control strategies are triggered to decrease (subsequent) consumption. In other words, a temptation only triggers a conflict when it is really 'in your face' and accessible for indulgence. When it is not really notable or accessible, it will not trigger the same conflict between impulses and cognition. Such conflicts might include for instance the choice between indulging to a tasty candy (desire) or refraining in line with the long-term goal of staying slim. According to Geyskens et al. (2008) an actionable food temptation exceeds this critical level triggering a food restriction goal, compared to non-actionable food temptations that do not exceed this critical level and still triggering an eating goal, resulting in a higher consumption of the cued food temptation.

Cognitive control theory

The cognitive control theory is based on the fact that the cognitive system has the ability to adjust to contextual information (Dewitte, 2013). When a certain conflict is monitored, cognitive control processes are activated. On the one hand there is a desire to consume and on the other hand a need not to consume. This activates an adjustment process in which one of the elements is preferred and triggers a longer term change in attitude. When a response conflict is similar to a prior response conflict, the same control processes are activated, independent of which option was preferred in the adjustment process (desire to consume or food restriction goal). When self-regulation is already activated in prior exposure to temptation, similar control processes are recruited, enhancing self-regulation in subsequent exposure (Dewitte et al., 2009; Dewitte, 2013). In 3 studies Dewitte et al. (2009) show improvement of subsequent self-regulation when response conflict similarity is high, supporting the cognitive control theory over regulatory depletion model. On the other hand, when response conflict is not similar, different control processes are activated, which might lead to ego-depletion.

2.3. What would be hypothesized based on these models?

It is dependent on the context whether self-regulation is enhanced upon exposure to temptations or not. Different distinctions can be made with regard to different types of self-regulation theories e.g. the distinction between self-regulation as state (situational), trait and skill as earlier. Also a distinction can be made on basis of research field, for instance, originated from neuroscience, human physics or psychology. Also, the symmetry can be a difference; some theory assume top-down systems controlling over lower-order systems, including all mentioned theories except for the cognitive control theory.

With regard to this paper's research question *"Can (long-term) exposure to temptations in a field setting contribute to self-regulation aimed at reducing the consumption of unhealthy food in Dutch children?"* the role of prior temptation on subsequent self-regulation is of special interest. Some models assume it is best to *reduce* temptations and other rather to *use* temptations to build self-regulation. These assumptions contradict each other in determining how self-regulation should be built in order to reduce obesity-related behaviour among children.

The context seems important in determining whether exposure to temptation enhances self-regulation or not. When exerting repeated self-regulation to inhibit a certain impulse within a short amount of time, it seems likely that self-regulation will follow the tendency of getting depleted, like a muscle, as suggested by the regulatory depletion model. However it seems that within certain boundary conditions exposure enables the temptation to enhance rather than to hurt self-control.

First, when someone wants to refrain from unhealthy eating because he or she has a higher *goal* of being healthy or being slim, this will enable this individual to exert self-regulate eating intake. Let's assume for children this goal represent being slim.

According to the control theory, a feedback loop will be activated when the current state, for instance binging with candy, differs with the reference point, representing the goal of being slim. This feedback loop triggers behaviour aimed at reducing this discrepancy, in this case to stop binging. This line of reasoning implies exposure to temptation will only enhance if a child has the ultimate goal of being slim or eating healthy.

Also the counteractive self-control theory includes a certain goal. Upon exposure to a temptation, simultaneously an eating goal is triggered on the one hand as well as a restriction goal on the other hand. This implies that in order for counteractive self-control activation, an eating goal should be activated. Without activation of the eating goal in the first place, a counteractive restraining goal is not triggered. Hence, exposure to a temptation triggers counteractive self-control, even though this triggers an eating goal at the same time. In this sense, exposure to temptation would enhance self-regulation upon exposure to food temptations.

Thus, it can be assumed that goal activation, like being slim, induces self-regulation efforts. When a certain temptation manages to trigger self-regulation efforts, subsequent self-control is likely to be boosted. In other words, temptation enables the activation of self-regulation upon exposure. Hence, exposure is needed for the activation of the restriction goal.

Second, exposure to temptation might only enhance self-regulation when repeatedly exposed over *time*. The regulatory depletion model, learned industriousness and adaptation-level theory include characteristics of training or a learning effect over time. In this sense, repeated exposure enables one to adapt and learn self-regulatory skills.

For instance, training self-regulation increases the self-regulatory capacity. However according to the regulatory depletion model, eventually self-regulation capacity is limited when exposure triggers self-control repeatedly, even if the capacity is extended i.e. training (which is over time) might extend the time able to self-regulate, but ego-depletion is inevitable.

Also, learned industriousness implies that exerting a high level of effort repeatedly, teaches one the amount of control needed in a certain situation. Raising effort lowers the aversiveness of exerting self-control, because the reward value of exerting self-control increases. In other words, repeated exposure over time would enhance self-regulation.

Furthermore, the adaptation-level theory assumes that repeated exposure, hence a time characteristic, can shift the internal norms when exposure to similar stimuli. When not triggered the adaptation levels remain the same. In this sense, exposure is needed to develop adaptation levels, as this exposure causes adaptation processes in which individuals keep adapting to prior experiences. If one is tempted with food, this enables them to adapt subsequent food intake.

Thus, when addressing the possibilities for the stimulating effect of temptation to self-regulation, the characteristics of goal activation and time appear to be important factors in the role of temptation in stimulating or undermining self-regulation. This stimulating effect of exposure of temptation on self-regulation enhancement seems to be conditional. Some factors might moderate the effect of temptation.

First, the intensity of the temptation seems a moderator of the effect of exposure on self-regulation. According to the critical level model, self-regulation is only enhanced when the exposure exceeds the critical level. When this threshold is reached, psychological processes attenuate the intensity of the hedonic state that exposure causes. When exposure does not exceed this threshold, psychological processes are not activated, omitting self-regulation, not intervening in the duration of the presence of the inner hedonic state. For instance, when exposure to candy would exceeds the critical level, the inner state of desire towards that candy, could last shorter than it would when the exposure to this candy does only trigger a mild state of desire. This pathway might indicate that when candy is present but not very salient, but in the background of a classroom, this does not exceed the critical level, not triggering self-regulation strategies.

Second, similarity seems a condition for self-regulation enhancement. The cognitive control theory assumes that when a subsequent conflict presents itself, which requires the same control processes as prior conflict, self-regulation is easier activated.

Third, the way the exposure is presented with regard to the consummatory value seems important in the question whether self-regulation enhances upon exposure to a temptation or not. It seems from the literature that when focusing on the cool, non-consummatory aspect of food, eases refraining from the temptation. In contrast to the 'hot system' i.e. focusing on the consummatory attractive elements, undermining self-regulation, whereas focusing on the cool 'know' system, stimulates self-regulation efforts.

This leads me to the following hypotheses:

H1	When distracting children from the consummatory aspect of unhealthy but palatable food, this enhances subsequent self-regulation attempts.
H2	When repeatedly exposing children to unhealthy but palatable food, this will enhance their subsequent self-regulation attempts.

Model addressing the role of exposure to temptation

This study assumes exposure to temptation has the potential to stimulate subsequent self-regulation in two ways (see Figure 3). First the effect of time on subsequent self-regulation is tested, enabling time to adapt. Second, it is tested whether distraction from the consummatory value of unhealthy food will enhance subsequent self-regulation behaviour. The outcome measure comprises self-regulation behaviour including the food intake after being exposed to unhealthy but palatable food. The way the exposure is applied should meet some criteria. First, the temptation should be actionable, in order to exceed a certain critical level after which psychological processes activate a restriction goal upon temptation. Second, the initial and subsequent temptation should trigger similar response conflicts, which might enhance reactivation of the same control processes. Last, in order for restriction goals to be activated it must be noted that it might be important that higher order goals are needed to oppose short-term impulses.

Psychological processes that are activated as a result of exposure to a temptation in a context that discourages consumption, might explain why exposure to temptation can enhance subsequent self-regulation when faced with a food temptation triggering similar response conflicts. These processes could range from the feedback loop from Carver & Scheier (1982), adjusting external stimuli to the internal reference value to a shift in internal norms as suggested by the Adaptation level theory (Helson, 1964) or a decrease in aversiveness after exerting high effort.

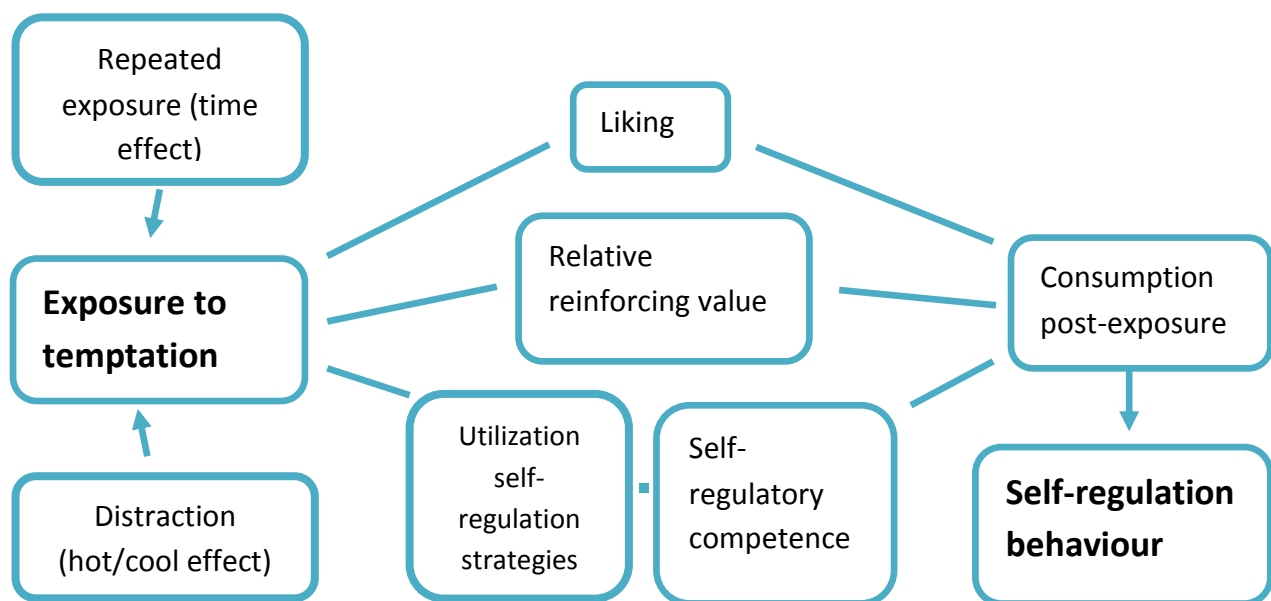


Figure 3| The tested influences of exposure to temptation of unhealthy but palatable food on eating behaviour and post-exposure consumption.

The pathway in which exposure to temptation has the potential to boost rather than hurt self-regulation is explored by considering the concepts of liking, the internal motivation to eat and self-regulation strategies.

It can be assumed that psychological processes might activate a restriction goal by for instance lowering the liking or internal motivation to obtain the food temptation. A rejected food temptation might change the preference for that food temptation (Geyskens et al., 2008). Therefore, the liking and the internal motivation to eat might be relevant in understanding the role of exposure to self-

regulation (see Figure 3). Liking includes the pleasure derived from eating (Havermans, 2011) and is assumed to increase when access to food is limited (De Ridder et al., 2013; Faith et al., 2007). The motivation to eat is assessed by the relative reinforcing value (RRV) of food. The relative reinforcing value of food is an objective measure of the motivation to eat and might substitute or complement measures for liking. It includes how hard someone is willing to work to obtain food and is considered a strong determinant of food intake (Epstein & Leary, 2006). It is claimed that food deprivation increases the motivation to eat (Epstein & Leary, 2006) and increases the RRV (Goldfield, Gary; Epstein, Leonard; Davidson, Martin; Saad, 2005). This raises the question whether exposure to the temptation rather than limitation, decreases the liking and RRV of food. In turn, this might facilitate the process of solving a conflict.

Psychological processes are assumed to solve a conflict between cognition and impulses, in which one of those options is activated or downplayed (Dewitte, 2013), activating either a eating or a restriction goal. To solve a conflict successfully, one can use self-regulation strategies (see Figure 3). These self-regulation strategies either downplay the impulse or activate long-term goals (De Vet et al., 2014). The self-regulatory competence represents the ability to utilize these self-regulation strategies.

3. Methods

3.1. Participants

For this research 61 local primary schools were contacted to recruit participants. Seven classes indicated they were willing to participate, of which six classes from four different primary schools were selected for participation. Participants consisted of children from the fifth and sixth grade (in Dutch: groep zeven en acht), aged between nine and twelve years old.

According to Williams et al. (1999) children's inhibition ability is in development between the age of 9 and 12 (referred to by (de Boer et al., 2014; Grubliauskiene & Dewitte, 2014)). Eating habits that are established during this period often become eating habits for life (Stok et al., 2012). When healthy eating is established in this period, this is a good precursor for healthy eating patterns throughout life. Self-regulation strategies are a method in which adolescents can adopt healthier eating patterns (De Vet et al., 2014). Therefore it might be important to train the ability to self-regulate at the age between 9 and 12.

This age group was also selected because it matched different studies done on the topic of eating behaviour and self-regulation in the transition phase between childhood and adolescence. The age of 9-12 years old overlaps with different studies relevant for the current study: research states that self-regulation might improve after exposure to temptation in a context which discourages consumption among 7 to 12 year-olds (Grubliauskiene & Dewitte, 2014), and among the fourth and fifth grade, with mean age 9.5 in de Boer et al. (2014); De Vet et al. (2014) included adolescents aged 10-17 in developing a questionnaire measuring self-regulation strategies (referred to as the TESQ-E) implying compatibility in filling out questions regarding self-regulation, and last the relevance of self-regulation in rapid weight gain from childhood into adolescence from age 3 to 12 found in Francis & Susman (2009) or among 2 to 10 years old in Graziano et al. (2012), indicating low self-regulation at young age is related with a higher BMI at a later stage of life.

In total, 142 children aged between 9 to 12 years old were included in this research. Children were excluded from data collection and analysis – not from participation in class – when having an allergy for the cued candy (n = 0), when parents prohibited participation (n = 0) or when participants did not complete either the pre- or the post-test (n = 18). The final sample comprised of 142 children, with 41, 50 and 51 children in the control, normative and consummatory value respectively. From participants, 51.4% was a boy.

3.2. Design

The study comprised a pre- and post-test cluster Randomized Controlled Trial (RCT). Classes were regarded clusters of participants and treatments were randomly assigned to clusters. The time span comprised a complete working week and like the dual-task paradigm the procedure consisted of two stages, matching Boer et al. (2014). Next to the two separate phases, the study included two data collection waves. The first phase included a pre-exposure phase with two experimental conditions exposing participant to candy and one control condition. As it was intended to reflect a setting as close to real-life as possible, this phase was led by the teacher. Prior to exposure, a pre-test was conducted (baseline). This represented the first data collection wave and was introduced and conducted by the executive researcher. At the fifth day, post exposure, the researcher again conducted a questionnaire, in which food intake was measured, representing the second data collection wave. For the exact content of these measures, see 3.5. measures.

3.3. Procedure

Prior to the start of this experiment, the consent of the Social Sciences Ethical Committee was acquired (see appendix 1). After recruitment of schools and participants, treatment conditions were randomly assigned to the different classes. It must be noted that one of the teachers indicated that she preferred to receive the normative or control condition, but randomisation turned out this was not an issue as this group was assigned to the control condition. Prior to the experiment, parents received a cover letter enabling them to forego participation (see appendix 2). Parents were also requested to inform their child's teacher when children had allergies or diets that precluded participation to the current study. No allergies or diets were reported and none of the parents prohibited participation. At baseline, questionnaires were requested to be filled out to determine age, weight and height (indirect BMI), and the reinforcing value and liking of candy (see appendix 4). Then the experimental phase started, and classes received either one of three conditions. Classes are either assigned to the control, normative or consummatory value condition. Due to logistics, the experiment was planned over two weeks: both weeks three groups participated, each assigned to one of the three conditions. The candy included 'Fruittella's' for both experimental conditions. The last day a questionnaire was conducted (appendix 5), including name, age, liking, reinforcing value, the strictness of parents with regard to candy consumption, and an adapted version of the TESQ-E determining self-regulation strategies. Furthermore self-regulation behaviour was measured by asking participants how many 'Apekoppen' they would like to eat.

For an extensive protocol, see Appendix 3. The extensive protocol also includes instruction for teachers (appendix 3.2 and 3.3), answering sheets for students (appendix 3.4) and an instruction sheet for students (appendix 3.5).

3.4. Conditions

The study consisted of three experimental conditions in the first phase. The first condition contained a control, in which classes ran as usual. The two experimental conditions contained a certain exposure to candy. The conditions exposing children to candy, were aimed at creating a supportive context and based on the assumption that exposure to candy when the context discourages consumption, induces a goal conflict between the desire to consume and the situational inappropriateness of its consumption, enhancing subsequent self-regulation (de Boer et al., 2014; Dewitte et al., 2009; Grubliauskiene & Dewitte, 2014). This research studies whether this can be translated into practical strategies which can be implemented into a school setting. The school as a field setting has the benefits of timing and duration in implementing an intervention (Grant & Monnot, 1995). First, when children go to school they develop behaviour affecting health (timing). Second, children spent a lot of time at school, which creates the opportunity to provide sustainable programs.

Children in the experimental conditions were approached positively. They were not told they couldn't consume candy, but told they would still need it in the future. Thus, no rules were set and children were not denied access to the candy. As assumed, the context in itself should be able to discourage consumption. The two pre-exposure conditions, used Fruittella as cued candy. The flavours of Fruittella used in this research included orange, lemon, strawberry, apple, pear, raspberry and blackberry. Choosing Fruittella had pure practical reasons; the candies are relatively small (even though children were not supposed to consume the candy, when tempted to eat candy, high caloric

intake was avoided), are individually wrapped (to avoid sticky hands) and do not age very quickly within a week (e.g. getting dry or soft).

Normative manipulation

Within this condition, a bowl of candy was placed on the desk of the teacher. The bowl was made of glass and contained a lit. The bowl was filled with 560 Fruittella's (with a weight of 2.490 kg, the bowl excluded). Even though the bowl was physically available and accessible to children, the context of the classroom triggered the assumption it would not have been appropriate to consume candy during lessons. The bowl remained in the classroom for 4 days, constantly tempting children for the selected timespan. Presumably this exposure triggers self-regulation, which in turn might enable self-regulation enhancement. It is expected that prolonged exposure enhances subsequent self-regulation, following the learned industriousness (Converse & Deshon, 2009; Eisenberger, 1992) and adaptation-level theory (Converse & Deshon, 2009; Helson, 1964).



Figure 4 | exposure in normative condition

Consummatory value manipulation

Within this condition, the temptation was incorporated in the mathematic lectures. The assignments were developed based on the level of mathematics set in the Dutch curriculum for children in the fifth and sixth grade ("Tule kerndoelen rekenen," n.d.) (See appendix 3.1).

In this condition children were asked to solve certain assignments by using candy. The sums were repeated once a day over 4 days. Teachers were requested to do this at the same time each day. Each child received their own bowl with 20 Fruittella's. An example of a sum was: how many candies represent 50% of 20 candies. When children stole or ate candies from others, they had to give that same amount back to the child s/he has got it from. For the elaborate content and example sums, see appendix 3.2.2. By using candy as a tool for, for instance math, it was expected this takes the attention away from the 'hot' quality of the stimulus and directs children to the 'cool' non-consummatory aspect of the stimulus (Mischel et al., 1989).

Control

Within the control condition, no intervention was initiated. Classes ran as usual. As this study tries to mimic a field setting, the control contained the amount of self-regulation training concerning temptations as usual. This was assumed not provided in average groups 7 and 8 of primary schools.

3.5. Measures

Pre-test

Prior to exposure, participants were requested to fill out a questionnaire. For this questionnaire, see appendix 4. This questionnaire was in Dutch and consisted of several elements, including name, age, weight and height, gender, liking, attraction, wanting and the reinforcing value of candy in general and for the cued candy Fruittella.

Weight and height were assessed to roughly determine children's BMI. Inclusion of BMI enables to correct for differences in BMI between conditions, as research shows that overweight is related to self-regulation failure (Francis & Susman, 2009; Graziano et al., 2013). Children were asked to write down their weight and height, so BMI can be calculated. If children did not know they were asked to

give an estimate. BMI was estimated based on the cut-off points used in Cole, Flegal, Nicholls, & Jackson (2007). However, it has been found that pre-adolescents are not able to accurately estimate their actual height and weight and underestimate weight, especially overweight/obese children (Beck et al., 2012; Seghers & Claessens, 2010). Obesity prevalence is lower when using self-report compared to actual measurements and typically self-reported height and weight is biased (Beck et al., 2012; Drake et al., 2013; Seghers & Claessens, 2010). Notwithstanding, this variable was included to roughly determine whether there were differences between obesity rates between classes.

Liking, attraction, wanting and reinforcing value were assessed for both candy in general and for Fruittella specifically. Liking, attraction and wanting were assessed using a scale containing smileys. Grubliauskiene and Dewitte (2014) assess liking via three smileys with a frowning, neutral or smiling expression. This study incorporated the 5-point Likert scale with smileys (see Figure 5). This scale enabled the participant to indicate to what extent they agreed with certain statements, ranging from not at all to very much. The statements included, “I like candy/Fruittella”, “I think candy/Fruittella looks attractive” and “I would like to eat candy/Fruittella right now” (translation). An overall variable was created for the pre-liking of candy and Fruittella separately by calculating a mean value of the three statements of liking, attraction and wanting. Internal consistency was acceptable for both candy (Cronbach’s alpha=0.615) as Fruittella (Cronbach’s alpha=0.768).



Figure 5 | visual 5-point Likert scale

To measure the reinforcing value of food (i.e. an objective measure of the motivation to eat which is considered a strong determinant of food intake (Epstein & Leidy, 2006)), three questions were included in the questionnaire. Children were asked how hard they are willing to work to obtain, 1, 3 or a whole bag of candy. The question contained seven response options, including less than 5 minutes to more than 30 minutes, with steps of 5 minutes in between. For analysis a mean value of RRV in minutes was created, averaging the three questions measuring the relative reinforcing value of candy. Internal consistency was good (Cronbach’s alpha = 0.912).

Post-test

The post-test comprised of two separate elements (see appendix 5). The first element of the second wave of data collection consisted of several questionnaires. First, participants were asked to indicate their name, age and hunger level. The hunger level was measured on a three-point scale (like de Boer et al, 2014), with answers varying from completely not, to a little and very much.

Also the strictness of parents was included. Research shows that the perceived level of parental restriction on eating is associated with lower external disinhibition in girls (Carper, Orlet Fisher, & Birch, 2000), meaning it appears to be associated with self-regulation problems in children. The strictness of parents was measured by the indicated amount and frequency candy children are allowed to consume candy. The statement to measure the frequency children were allowed to eat

candy; “My parents allow me to eat candy” (own translation) was tested based on answering options ranging from ‘almost never (e.g. 1-3 times per month)’ to ‘always (e.g. each moment of every day)’ (translation). The amount of candy children were allowed to eat was tested by the statement “my parents allow me to eat a lot of candy each time” (own translation) in which children could tick answers ranging from ‘almost nothing (e.g. 1 candy each time)’ to ‘how many I please (e.g. the maximum amount of bags of candy I can consume)’ (translation). As internal validity was not satisfying, the frequency children were allowed to eat candy and the amount children were allowed to eat candy were multiplied to get a sense of the overall strictness of parents.

Participants were also asked to fill in the RRV-F, liking, wanting and candy-specific TESQ-E questionnaire (see appendix 5). Liking, attraction, wanting and the reinforcing value of food (the amount of work children are willing to obtain to get candy) were measured similarly as in the pre-test questionnaire; liking, attraction and wanting on a visual 5-point Likert scale and the reinforcing value by asking how long they are willing to do homework to obtain 1, 3 or a bag of candy, with answers ranging between less than 5 minutes and more than 30 minutes. A mean value was created for the post-test liking of candy, Fruittella and Apekoppen and for the RRV.

Self-regulation strategies were measured by the TESQ-E questionnaire, which is developed to assess self-regulation among adolescents aged between 10 and 17 years old (De Vet et al., 2014). Self-regulation strategies enable restriction from tempting candy. The TESQ-E is a reliable and valid measure to assess three overall self-regulation approaches and more specific six self-regulation strategies. The three self-regulation approaches include an approach directly addressing the temptation, addressing the meaning of the temptation and directly addressing the goal. The more specific strategies include: avoidance of temptations (directly addressing temptation), controlling temptation (directly addressing temptation), distraction (addressing meaning of temptation), suppression (addressing meaning of temptation), setting goals and rules (directly addressing goal) and goal deliberation (directly addressing goal). The TESQ-E was transformed into questions addressing candy. The adapted self-regulation strategies questionnaire was included in the post-test questionnaire and included the same six strategies applied specifically on candy (appendix 5). For instance, the avoidance of temptation strategy was assessed by asking to which extent the statement “when I know candy is around, I try to stay away from it” was true for the participants. A mean value for overall self-regulatory competence was created, averaging the self-regulatory strategies. All strategies combined are assumed to represent a higher-order factor (De Vet et al., 2014). Thus, in the end all approaches and strategies are combined into one variable representing the overall self-regulatory competence (Cronbach’s $\alpha = 0.844$).

Second, the desired Apekoppen intake was measured. This question served as a measure for self-regulation behaviour. As a way of thanking children for participation, they were asked to indicate for a specific type of candy (Apekoppen), how much candy they would like to consume at that moment, ranging from zero to ten Apekoppen. This was considered representative for eating behaviour, in which a higher consumption of Apekoppen represented lower self-regulation. On purpose, this measure for self-regulation was conducted on paper. As social norms might be in play within the classroom, actual consumption of candy might have disrupted the outcome. Consequently, actual consumption of candy in this context might not be representative of eating behaviour. To avoid disruption of the natural behaviour of children (e.g. moving them to a lab setting for measuring food intake), food intake was measured at the end of the questionnaire by an indication for the amount of

candy ('Apekoppen') children want to receive. After participation, children received a small package of Apekoppen, but were also offered a healthier alternative ('Fruitkick appel').

Additionally, the consumption of candy during pre-exposure was assessed in the two pre-exposure conditions. In the normative manipulation, the weight of the bowl with candy was measured before and after exposure, so it could be calculated how much candy has been consumed as the teacher may not see all candy consumption. In the consummatory value manipulation children used the same bowl of candy during the week. As all bowls contained 20 candies, it could be counted how many candies were consumed during exposure.

Observations

Additional to a pre- and post-test questionnaire, classroom interactions were observed to assess the feasibility of the pre-exposure methods. A suitable method for studying settings in their natural state is observation (Ebrahim & Bowling, 2005). Topics of interest included practical aspects, gender, prolonged exposure, social norm, tempting value, context and commotion. Observations were done by teachers and by the executive researcher. First, the teachers were requested to write down things that came to mind regarding the exposure to candy (see Appendix 3.2 docenteninstructies). Second, during the pre-exposure phase, the executive researcher attended the math lecture for the consummatory value condition as a 'fly on the wall', including the researcher attended as an outsider and did not interfere in the setting (Fitzpatrick & Boulton, 1994). Field notes included (eating) behaviour and quotes from children. Third, when both phases ended, the week was evaluated by the teacher and/or by the researcher. Questions like 'what did you think of the experiment?' 'was it difficult?' 'In what sense was/wasn't it difficult?' and 'how did you refrain from the candy?' were addressed. Notes were written down to keep track on comments children made.

Manipulation check

The context was assumed to effectively trigger self-regulation behaviour during the pre-exposure phase. To check whether this was indeed the case, a manipulation check was conducted. For both experimental conditions, it was checked whether participants followed instructions and acted as expected. For the normative condition, this implied that candies were retrieved after the pre-exposure phase to be able to determine whether the context was effective in discouraging intake. For the consummatory condition, this was checked by retrieving the bowls of candy each child received at baseline. The amount and colours of candy were checked to determine whether children followed instructions or not. It was established whether the classes lacked adherence to the instructions or not. Consequently, classes that adhered to instructions were included in an intention to treat analysis. The same analysis (ANCOVA, see next heading) was applied to classes that followed instructions. Also, an additional explanatory analysis was conducted to be able to study differences between adherences to instructions between schools. This could create a better understanding of the factors interacting with the methods to enhance self-regulation behaviour via exposure. Since only two schools received pre-exposure conditions, only these schools' school guides were included in this analysis. Policy concerning eating (and in particular snack) behaviour was analysed.

3.6. Analytic plan

To study whether pre-exposure to candy enhances self-regulation, an ANCOVA was conducted in SPSS, following de Boer et al (2014), Grubliauskiene & Dewitte (2014) and Geyskens et al. (2008). ANCOVA allows covariates to explain within-group error variance (Kaiser, 2010). A list of variables

was made based on the questionnaires. The conditions were abbreviated as CON (control condition), NOR (normative condition) and SUM (consummatory condition). A distinction was made between control variables, outcome/dependent variables and the independent variable (see Figure 6). Control variables included grade, age, weight, height, gender, the pre-test liking, attraction and wanting of candy and Fruittella, the RRV for 1, 3 and a bag of candy, hunger and strictness of parents (amount and frequency children are allowed to eat candy). Outcome variables included a combined post-test score for liking (including liking, attraction and wanting) of candy, Fruittella and Apekoppen, the combined score for the RRV of 1, 3 and a bag of candy, and self-regulatory competence, including the six self-regulation strategies (two questions each) and the measure for self-regulation behaviour. The latter represents the main dependent variable. Consumption of Apekoppen was considered a reversed measure for self-regulation; a higher consumption of Apekoppen represented a lower score for self-regulation behaviour. Self-regulation behaviour was compared between the different conditions, where “temptation” (the three experimental conditions) represented the between-subject independent variable. A significant level of < 0.05 was used. When a significant level was measured, a contrast with the control conditions as a reference category was conducted to test the significance level for both experimental conditions individually. All observations were assumed to be independent and normally distributed.

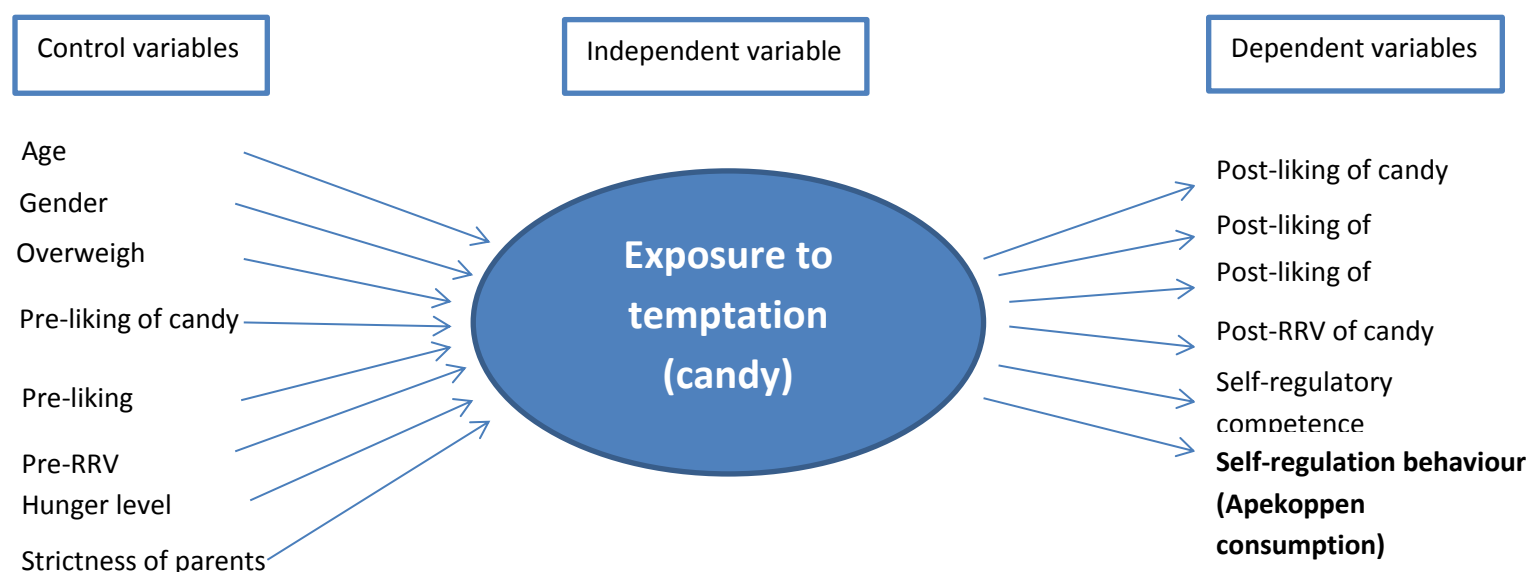


Figure 6| overview of variables

After entering the data in SPSS, a random sample was checked. When less than 5% was different from the questionnaires, the dataset was used for analysis. Only a few missing data showed a blank spot instead of a discrete missing value of -99. All commands in SPSS were tracked using a syntax. The first step in the analysis included the calculation of the mean values and determining internal consistency for different items of the questionnaire, including the pre-test liking of candy and Fruittella, the pre-test RRV of candy and the self-regulatory competence, including 12 items testing the six strategies. Items were combined into broader variables when the Cronbach's alpha was higher than 0.6/0.7. Based on the height and weight, BMI scores were calculated determining the amount of children with underweight, normal, overweight and obesity. For this research, overweight

and obesity were combined to distinguish between children with low/normal BMI and a high BMI which is related to self-regulation failure (Francis & Susman, 2009; Graziano et al., 2013). Then, descriptives were created showing the mean and standard deviation amongst others. Next the assumption underlying ANCOVA were tested. Also, it was examined which variables, including all control and outcome variables, were correlated, enabling to determine for which control variables outcome variables should be corrected. When control variables correlated significantly with outcome variables, they were included as covariates in the ANCOVA. Also, it was determined whether there were significant differences between conditions at baseline. When significantly different, control variables were included as covariates for analysis of all outcome variables. Last, an ANCOVA was conducted for studying the main effect(s) of the pre-exposure conditions compared to the control condition.

4. Results

4.1. Descriptives

For each experimental condition, the mean and standard deviation were assessed for the control variables. These descriptives are illustrated in Table 2. As illustrated in this table, experimental conditions were significantly different at baseline regarding age ($F(2, 139) = 11.66, p < 0.001$), overweight ($\chi^2 = 8.622, p = 0.013$), pre-test liking of candy ($F(2, 139) = 4.438, p = 0.014$) and liking of Fruittella ($F(2, 139) = 7.213, p = 0.001$). In the control group age is higher than the pre-exposure conditions (11.30 ± 0.46 vs. 10.69 ± 0.68 and 10.76 ± 0.80) with a significance level of <0.001 for both experimental conditions. Also the score for overweight is higher for the control group (15.0 % vs. 2.0% and 2.1%), with a significance level of $p = 0.009$ for the normative condition and $p = 0.010$ for the consummatory value condition. Compared to the control condition, the liking of candy (3.63 ± 0.86 vs. 4.11 ± 0.75 and 4.01 ± 0.82) and the liking of Fruittella (2.90 ± 0.95 vs. 3.50 ± 0.97 and 3.61 ± 0.93) at baseline were higher in both the normative condition (pre-test liking candy: $p = 0.005$, pre-test liking Fruittella: $p = 0.003$) and the consummatory value condition (pre-test liking candy: $p = 0.026$, pre-test liking Fruittella: $p < 0.001$). With respect to these control variables, the participants were not equally distributed over the pre-exposure groups. Therefore these variables were included as covariates in the analysis. No significant differences were observed for gender ($\chi^2 = 3.41, p = 0.182$), pre-test RRV of candy ($F(2, 134) = 0.84, p = 0.434$), hunger level ($F(2, 139) = 0.74, p = 0.479$) and strictness of parents ($F(2, 136) = 0.48, p = 0.621$).

4.2. Correlation

Also, a correlation table was created (see Table 3) to see whether control variables correlated with outcome variables. Next it is mentioned which control variables correlated with the outcome measures of post-test liking of candy, post-test liking of Fruittella, post-test liking of Apekoppen, the relative reinforcing value of candy, the self-regulatory competence and the preferred consumption level of Apekoppen, with the latter representing self-regulation behaviour. Accordingly, variables significantly correlating with outcome variables were included as a covariate in the ANCOVA.

First, the following Pearson correlation coefficients were significant and therefore predictive of the post-test liking of candy: overweight ($r = -0.17$), pre-test liking of candy ($r = 0.76$), pre-test liking of Fruittella ($r = 0.52$), hunger ($r = 0.50$) and strictness of parents ($r = 0.35$). Considering the control variables that were not equally distributed between the three experimental conditions, the ANCOVA for post-test liking of candy contained the covariates of age, overweight, liking of candy in the pre-test, liking of Fruittella in the pre-test, hunger and strictness of parents.

Second, the following Pearson correlation coefficients were significant and therefore predictive of the post-test liking of Fruittella: overweight ($r = -0.22$), liking of candy in the pre-test ($r = 0.41$), liking of Fruittella in the pre-test ($r = 0.80$) and hunger ($r = 0.26$). Considering the control variables that were not equally distributed over the three experimental conditions, the ANCOVA for the post-test liking of Fruittella contained the covariates of age, overweight, liking of candy in the pre-test, liking of Fruittella in the pre-test and hunger.

Third, the following Pearson correlation coefficients were significant and therefore predictive of the post-test liking of Apekoppen: pre-test liking of candy ($r = 0.64$), pre-test liking of Fruittella ($r = 0.30$), hunger ($r = 0.32$) and strictness of parents ($r = 0.24$). Considering the control variables that were not equally distributed between the three experimental conditions, the ANCOVA for the post-test liking of Apekoppen contained the covariates of age, overweight, liking of candy in the pre-test, liking of

Table 2 | Descriptives of control variables

variable	Control condition		Normative condition		Consummatory value condition		F (df ₁ , df ₂)	p-value	η^2
	M	SD	M	SD	M	SD			
Age (in years)	11.30	0.46	10.69	0.68	10.76	0.80	F(2, 139)=11.66	<0.001	0.14
Gender	63.4% *		48.0% *		45.1% *		$\chi^2 = 3.41^{***}$	0.182	
Overweight	15.0% **		2.0% **		2.1 % **		$\chi^2 = 8.62^{***}$	0.013	
Liking candy (pretest)	3.63	0.86	4.11	0.75	4.01	0.82	F (2, 139)= 4.44	0.014	0.06
Liking Fruittella (pretest)	2.90	0.95	3.50	0.97	3.61	0.93	F (2, 139) =7.21	0.001	0.09
Reinforcing value of candy (pretest)	15.11	9.21	17.45	8.63	15.63	9.41	F(2, 134) = 0.84	0.434	0.01
Hunger level	1.93	0.53	1.88	0.56	2.08	0.67	F(2, 139) = 0.74	0.479	0.01
Strictness of parents	4.55	1.57	5.27	1.20	5.25	1.59	F(2, 139)= 1.723	0.181	0.02

*. Percentage of boys in pre-exposure condition

**. Percentage of children having overweight or obesity

***. Pearson's chi square

Fruittella in the pre-test, hunger and the strictness of parents.

Fourth, only the pre-test RRV ($r = 0.85$) significantly correlated with the RRV in the post-test. Considering the variables not equally distributed over conditions, the covariates in this ANCOVA included age, overweight, pre-test liking of candy, pre-test liking Fruittella and the pre-test RRV.

Fifth, the following Pearson correlation coefficients were non-significant and therefore predictive of the self-regulatory competence: gender ($r = 0.20$), pre-test liking of candy ($r = -0.27$), hunger ($r = -0.39$) and strictness of parents ($r = -0.28$). Considering the control variables that were not equally distributed between the three experimental conditions, the ANCOVA for the self-regulatory competence contained the all control variables except the pre-test RRV.

Final, the following Pearson correlation coefficients were significant and therefore predictive of the preferred consumption level of Apekoppen: gender ($r = -0.36$), the liking of candy in the pre-test ($r = 0.46$), the liking of Fruittella in the pre-test ($r = 0.17$) and hunger ($r = 0.31$). Considering the control variables that were not equally distributed between the three experimental conditions, the ANCOVA for the self-regulation behaviour (i.e. preferred Apekoppen consumption) contained the covariates of age, gender, overweight, liking of candy in the pre-test, liking of Fruittella in the pre-test and hunger.

Table 3| Correlation

	Age	Gender	Over-weight	Liking candy (pre)	Liking Fruittella (pre)	RRV (pre)	Hunger	Strictness parents	Liking candy (post)	Liking Fruittella (post)	Liking Apekoppen(post)	RRV (post)	Self-regulatory competence	Self-regulation behaviour
Age		-.04	0.03	-0.02	-0.11	-0.11	0.13	-0.00	-0.06	-0.12	-0.03	-0.05	-0.08	-0.04
Gender			0.07	-0.11	0.04	0.07	-0.14	-0.11	-0.04	0.10	-0.11	0.09	0.20*	-0.36**
Overweight				-0.06	-0.12	0.09	-0.04	-0.11	-0.17*	-0.22*	0.06	0.12	0.14	-0.06
Liking candy (pre)					0.51**	0.16	0.42**	0.36**	0.76**	0.41**	0.64**	0.13	-0.27**	0.46**
Liking Fruittella (pre)						0.01	0.23**	0.11	0.52**	0.80**	0.30**	-0.00	-0.12	0.17*
RRV (pre)							0.13	0.13	0.07	0.05	0.13	0.85**	0.01	0.03
Hunger								0.26**	0.50**	0.26**	0.32**	0.16	-0.39**	0.31**
Strictness parents									0.35**	0.11	0.24**	0.09	-0.28**	0.21*
Liking candy (post)										0.59**	0.60**	0.05	-0.30**	0.47**
Liking Fruittella (post)											0.29**	0.02	-0.12	0.17
Liking Apekoppen (post)												0.15	-0.13	0.67**
Reinforcing value (post)													0.02	0.11
Self-regulatory competence														-0.15
Self-regulation behaviour														

*. Correlation is significant at the 0.05 level (2-tailed)

**. Correlation is significant at the 0.01 level (2-tailed)

Table 4| Descriptives of outcome variables with estimated marginal means and standard error

variable	Control condition		Normative condition		Consummatory value condition		F (df ₁ , df ₂)	p-value	η ²
	M	SE	M	SE	M	SE			
Liking candy (post)	3.65	0.10	4.01	0.08	3.88	0.08	F (2, 124) = 3.56	0.031*	0.05
Liking Fruittella (post)	2.96	0.12	3.45	0.10	3.57	0.10	F (2, 128) = 7.98	0.001**	0.11
Liking Apekoppen (post)	3.67	0.18	3.75	0.15	3.78	0.15	F (2, 124) = 0.09	0.914	<0.01
Reinforcing value (post)	12.82	0.84	14.77	0.68	14.91	0.65	F (2, 123) = 1.93	0.150	0.03
Self-regulatory competence	1.85	0.11	2.21	0.09	2.27	0.09	F (2, 123) = 3.91	0.023*	0.06
Self-regulation behaviour	6.36	0.62	6.86	0.51	6.95	0.52	F (2, 125) = 0.25	0.777	<0.01

*. Effect is significant at the 0.05 level (2-tailed)

**. Effect is significant at the 0.01 level (2-tailed)

4.3. Main effects

It was tested whether pre-exposure affects the outcome variables of post-test liking of candy, post-test liking of Fruittella, post-test liking of Apekoppen, the post-test RRV of candy, self-regulatory competence and self-regulation behaviour (see Table 4). The latter outcome variable included the consumption of Apekoppen and was considered the main outcome variable, representative of eating behaviour. Control variables were included as covariates either when significantly different between experimental conditions or when correlated with the dependent variable.

The ANCOVA revealed no main effect of experimental condition on self-regulation behaviour $F(2, 125) = 0.25$, $p = 0.777$). Significant differences between experimental conditions were observed for the post-test liking of candy, the post-test liking of Fruittella and self-regulatory competence.

Post-test liking of candy

The ANCOVA showed a significant effect of experimental condition on liking of candy in the post-test ($p = 0.031$) compared to the control condition. When corrected for age, overweight, liking of candy in the pre-test, liking of Fruittella in the pre-test, hunger and strictness of parents, the results revealed an increase in liking of candy. A contrast with the control condition as reference category, showed this effect only persisted for the normative condition ($p = 0.009$), but not for the consummatory value condition ($p = 0.084$).

Post-test liking of Fruittella

The study conditions had a significant effect on the post-test liking of Fruittella ($p = 0.001$). When corrected for age, overweight, liking of candy in the pre-test, liking of Fruittella in the pre-test and hunger, the results revealed an increase in liking for both the normative condition ($p = 0.002$) as for the consummatory value condition ($p < 0.001$) compared to the control condition.

Post-test liking of Apekoppen

The experimental conditions did not influence the liking of Apekoppen in the post-test ($p = 0.807$), when corrected for age, overweight, liking of candy in the pre-test, liking of Fruittella in the pre-test, hunger and the strictness of parents.

Post-test reinforcing value

The relative reinforcing value at post-test did not differ significantly between the three experimental conditions ($p = 0.435$), when corrected for age, overweight, pre-test liking of candy, pre-test liking Fruittella and the pre-test RRV.

Self-regulatory competence

After correction for age, gender, overweight, the liking of candy in the pre-test, the liking of Fruittella in the pre-test, hunger and the strictness of parents, study condition significantly affected self-regulatory competence ($p = 0.024$). Compared to the control condition, both the normative condition ($p = 0.022$) as the consummatory value manipulation ($p = 0.008$) significantly increased the self-regulatory competence.

Self-regulation behaviour

Experimental conditions were not related to the preferred level of Apekoppen consumption ($p = 0.925$), when corrected for age, gender, overweight, liking of candy in the pre-test, liking of Fruittella in the pre-test and hunger. In this study, pre-exposure with candy did not enhance self-regulation behaviour among children.

4.4. Intention to treat analysis

Manipulation check

As mentioned six classes participated in this research and were scheduled over 2 weeks. Both weeks, three classes (from the three different experimental conditions) participated. For the classes allocated to the normative condition with a bowl of candy present in class, the bowl was retrieved at the end of the pre-exposure phase. At the start of the experiment the bowl contained 560 Fruittella's. In one class, the bowl contained 430 Fruittella (130 Fruittella's missing) after the week of pre-exposure. In the second class, the bowl contained 559 Fruittella's (1 Fruittella missing) after the week of pre-exposure. It is undecided whether the first normative condition group acted in line with the intention. 130 Fruittella's were missing from the bowl, so the majority of candy was still left. Furthermore it is unclear who took the candy; some children indicated that they did not consume or only little candy. It cannot be ruled out that children did not have to exert self-regulation during the first week. This does not mean self-regulation was not triggered for this entire group. It is very much possible that self-regulation was in fact triggered. However because the consumption during the pre-exposure concerned the whole group, it was assumed that the first class did not behave in line with the context discouraging consumption.

To be able to check whether instructions in the consummatory value condition were violated, the bowls of candy were retrieved after the pre-exposure phase. At baseline, each child received a bowl with 20 Fruittella's. The amount of candy gone for children's personal bowl had a mean value of 4.57 ± 6.20 . Children received one role of Fruittella with the flavours strawberry, orange and lemon (adding up to ten) and one role of Fruittella with the flavours pear, apple, raspberry and blackberry (also adding up to ten), facilitating the check whether children adhered to the instructions. The first week it was appeared children did not adhere to instructions. For instance, one of the bowl contained solely strawberry-flavoured Fruittella. Hence it was clear that this participant did not follow instructions (which was confirmed by the teacher). For 42% of children it was obvious or ambiguous that they refilled their bowl. 58% of children did not refill their bowl of candy.

The second week three other classes participated in this study. During this second week, the class exposed to the consummatory value condition, did not show many signs of refilling their bowls. 96% of this class did not refill their bowl. The mean amount consumed from their bowl was 5.17 ± 6.54 . This leads to the assumption that the first class violated the instructions, but the second class did not.

Additionally, the questionnaire for this pre-exposure condition contained an extra question requesting to indicate their Fruittella consumption in class in the past week with a mean estimation of 4.91 ± 6.77 . This question was added to check for refilling of children's bowl.

It was assumed that the first pre-exposure groups (both normative as consummatory value condition) did not adhere to instruction, but the second pre-exposure groups did. For this reason, an intention to treat analysis was done. For this 'intention to treat' analysis for the main effects, data was used from participants that were included in the experiment in the second week.

Intention to treat analysis

In this sample, pre-exposure significantly influences the post-test liking of Fruittella ($F(2, 57) = 5.42$, $p = 0.007$) compared to the control (see Table 5). However when comparing the pre-exposure conditions separately to the control condition, the exposure in the normative condition does not significantly affect the post-test liking of Fruittella ($p = 0.935$) or self-regulatory competence ($p = 0.209$). Only a significant effect is found for the consummatory value condition, in which exposure managed to increase both the post-test liking of Fruittella ($p = 0.008$) and self-regulatory competence ($p = 0.007$).

For the pre-exposure conditions separately the normative condition only shows a significant effect with regard to the self-regulatory competence. In contrast to the total sample, the post-test liking of candy was not significantly different between conditions in the 'intention to treat' sample.

Table 5 | Main effects for intention to treat

variable	Control condition		Normative condition		Consummatory value condition		F (df ₁ , df ₂)	p-value	η ²
	M	SE	M	SE	M	SE			
Liking candy (post)	4.14	0.22	3.99	0.20	4.17	0.14	F (2, 54) = 0.21	0.809	0.01
Liking Fruittella (post)	3.12	0.22	3.15	0.20	3.81	0.15	F (2, 57) = 5.42	0.007	0.16
Liking Apekoppen (post)	3.41	0.34	4.30	0.31	3.78	0.22	F (2, 54) = 1.27	0.290	0.05
RRV (post)	12.10	1.87	16.75	1.64	12.61	1.27	F (2, 54) = 1.63	0.203	0.06
Self-regulatory competence	1.58	0.27	2.14	0.25	2.45	0.17	F (2, 53) = 4.10	0.022	0.13
Self-regulation behaviour	5.81	1.15	9.54	1.10	7.21	0.80	F (2, 54) = 1.95	0.152	0.07

Additional exploratory analyses at school level

The course of the experiment was different between schools. Two schools both participated with one normative and one consummatory value group. For the first school with a normative and consummatory value groups, both classes did not act in line with the context assumptions, while at the second school, both experimental groups did. When reading the school guides of both classes ("schoolgids 2014/2015 Alexanderschool," n.d., "Schoolgids Wilhelminaschool," n.d.), it appeared that both schools score above the national average for CITO scores. School policy appeared to be different with regard to candy consumption. The first school, where instructions were violated, has clear rules with regard to candy consumption. The school guide mentioned: "Onder schooltijd en tijdens het overblijven, uitgezonderd bij verjaardagen, is snoepen niet toegestaan. We vragen u de traktatie bij verjaardagen naar eigen goeddunken te verzorgen, het liefst in de sfeer van: 'Snoep verstandig...'. In other words, it is not allowed to eat candy at school except during birthdays. The second school, where children did adhere to the instruction, does not forbid candy consumption. The school guide mentioned: "Vanuit school willen we niet voorschrijven waarop wel en niet getrakteerd mag worden. Toch willen we u enkele gezonde tips geven: fruit, kaas, worst, toastjes, rozijntjes en komkommer." Additionally, the school guide mentioned that the school program includes health education stimulating healthy eating.

When comparing the baseline measures between the different schools, it appeared that these differ solely on the pre-test liking of candy ($F(3, 138) = 4.80$, $p=0.003$) and pre-test liking of Fruittella ($F(3, 138) = 5.28$, $p=0.002$). When comparing the Alexanderschool and Wilhelminaschool specifically, the pre-test liking was significantly higher ($p = 0.030$) for the Wilhelmina school (week 2) compared to the Alexanderschool (week 1), with $M_{alexander}=3.89$, $SD_{alexander}=0.89$ vs. $M_{wilhelmina}=4.24$, $SD_{wilhelmainar}=0.60$, but pre-test liking of Fruittella was not ($p=0.424$, with $M_{alexander}=3.48$, $SD_{alexander}=0.97$ vs. $M_{wilhelmina}=3.63$, $SD_{wilhelmainar}=0.93$). The schools did not differ significantly on pre-test RRV ($F(3, 133) = 1.30$, $p=0.28$ with $M_{alexander}=17.40$, $SD_{alexander}=8.67$ vs. $M_{wilhelmina}=15.64$, $SD_{wilhelmainar}=9.39$).

These outcomes are ostensibly inconsistent with the observations from the school guides. The first school's school guide (Alexanderschool) states candy is forbidden, expecting a higher liking of candy in general. However this is not supported by the data, showing in fact a lower liking of candy than the Wilhelminaschool, which does not forbid candy consumption at school.

4.5. Observations

After conducting the post-questionnaire the week was evaluated in class. This was done either by the teacher or by the researcher. Questions like what the student thought of the experiment, whether it was difficult/tempting or easy and why and how they managed to refrain from the candy were discussed in class.

Practical aspects

How the classes handled the experiment was different. One of the SUM classes discussed the sums in class, the other SUM class did the sums individually or in pairs. One of the teachers mentioned it was difficult for some children to use candy as a tool, because normally the sums were abstract. Also some thought it was childish to use tools with mathematics, because in the third grade they used cubes with mathematics. Some children used the candies as a tool. One of the children mentioned it was easier to refrain from eating. On the other hand, some children started with the sums without touching the candy, implying some did not perceive the candy as a tool.

Tempting value

Especially in the consummatory value condition, children indicated it was difficult to refrain from the candy. For instance they mentioned they could not resist the temptation or they felt like eating the candy. One child mentioned: “sometimes I had to literally close the candy wrapper again, because it was not allowed” (own translation). On the one hand, some said the temptation helped them to calculate, but on the other hand some said it was very distracting and difficult to use the candy as a tool because of the temptation. Also the normative condition groups mentioned it was tempting. Again children were mixed regarding the distraction the candy caused. Some children said they didn’t even notice the bowl after a while and some kept making comments about it during the week about the tempting or distracting appearance. Especially the fact that the bowl was see-through increased the temptation.

Gender

Boys seemed to be more tempted to start eating. The teacher of the first class assigned to the consummatory value condition reported about the children who did not comply and found ways around the instructions. Most of the children who did not even tried to hide the fact they were eating were boys. For instance, eating candy at 8.29 in the morning, doing the calculation with the candy wrappers and refilling their bowl from candy they took from home. One of the boys admitted to start with taking Fruittella from home to refill his bowl. The teacher also reported about girls who ate during class, but in her perspective girls never took the initiative but rather followed others. Also, in one of the normative condition classes, one of the boys took the first candy after which more children were tempted to grab a candy from the bowl. One of the girls mentioned “I didn’t want to get candy at first, when I saw others take some, I wanted to do it as well” (own translation). Girls seemed to be more sensitive for the context suggesting consumption was not appropriate, even though the temptation might got too high.

In one of the observations in class, I noticed girls arranged the Fruittella’s more often than boys. They arranged the Fruittella’s more often by groups, colour or sections.

Prolonged exposure

There also seemed to be an effect of time. Some children reported it became more difficult over time, others reported it became easier over time. For instance one child said; “in the beginning it was fine, but then it got too tempting” (own translation).

Social norm

“Als 1 schaap over de dam is volgen er meer”. This is an expression one of the teacher reported as his main observation involving that when one student starts, others follow. From both the consummatory value as the normative condition, children mentioned they were triggered by others. Comments that were made included: “I saw others chew” and “It is difficult when others do eat it. When others take it, I want some myself” (own translation). During the lesson, children spoke about the amount of candy they have left. For instance “how many have you left?”

Context

It was assumed the context of the exposure indicated that it would not be suitable to consume the candy. However it could be questioned whether implying consumption was not appropriate was enough to trigger self-regulation. In the introduction in class it was mentioned the candies were not for now, but later (normative condition) or they needed the candy for the assignments (consummatory value condition). No rules were set, but consumption was discouraged by this context. Even before the experiment started children started asking the researcher questions whether they were allowed to eat candy or not. Also the teachers indicated the children kept asking for clarification whether it was ok for them to eat the candy. One of the teachers of a class exposed to the consummatory value condition mentioned she found it difficult to see that children did not refrain from the candy when no clear boundaries were set. Another teacher indicated that this implicit discouragement of consumption caused a lot of confusion and that the students needed more clarity.

In the discussion after the experiment the phrasing of some children showed some signs they did grasp the idea that they were expected to refrain from eating. For instance it was said: “you know you need them, so I don’t eat candy” (own translation). One of the girls in the normative manipulation indicated she was ill the first day of the experiment. Therefore she missed the introduction and had no idea why there was a bowl of candy on the desk of her teacher. She assumed it was not the intention to eat from it, because it was on the desk of the teacher and nobody else took candy.

Commotion

As briefly mentioned under the heading context, the experiment caused a lot to talk about in the classes. For some it was confusing what was expected from them. Some also saw it as an opportunity to make a scene and eat candy during class. Especially some children in the first consummatory value condition class took it in their advantage. The teacher seemed quite upset at the end of the week. Children refilled their candy bowl with Fruittella’s they brought from home, enabling them to eat candy during class all week long. The teacher was instructed not to comment on children eating candy, so she did also not comment on the fact that children brought candy from home. Some of the things she observed as a consequence of the presence of the candy was that the bin was full of candy wrappers, children negotiated about help in turn for candy or made a game out of it, which caused a girl to lose a lot of candy and eventually to cry on the hallway. Another quote she wrote down from one of the students was: “miss, it is not fair. I cannot refrain. Could you? – Name- started eating

candy, but we don't know whether we are allowed to. Nobody dares to ask you" (own translation). These observations indicate the experiment caused a lot of commotion in this class.

The experiment did not seem to cause that much commotion during the pre-exposure phase in the other classes participating in the experiment. However when they heard they had to retrieve the candy and did not get anything in return for refraining (additionally to the 'Apekoppen' everybody received), this caused some commotion. "It is unfair, I should have eaten them" (own translation). In contrast to some of the classmates who did eat during the week, there was no reward for sticking to the instructions.

5. Discussion and conclusion

Main effects

Current study tested whether exposure to temptation enhances self-regulation in a classroom setting and is effective in changing eating behaviour regarding candy consumption. Either via a normative manipulation, in which a bowl of candy was placed on the teacher's desk for a week, or via a consummatory value manipulation, in which children had to use candy as a tool for calculations, children were exposed to candy. In both pre-exposure conditions, exposure was controlled by creating a context that encourages self-regulation. After a week's prolonged exposure, it was measured whether exposure affected subsequent self-regulation when presenting the participants with a temptation posing a response conflict similar to the initial temptation. The results are discussed in the following section. First the main outcome of self-regulation behaviour will be discussed. In other words, does the consumption post-exposure and thereby eating behaviour change as a result of exposure. Then the sub questions will be addressed, discussing whether exposure to temptation affects the liking, the internal motivation to eat and self-regulatory competence. After discussing the main results, the pre-exposure conditions are compared and factors are identified that might explain the main outcomes.

First, the results illustrate that exposing children to temptation in a field setting, like a classroom, does not affect eating and self-regulation behaviour (non-significant main effect of Apekoppen consumption). This finding opposes this paper's hypotheses: distraction from the consummatory value of candy or repeated exposure to an actionable food temptation will enhance subsequent self-regulation attempt. Rather, the findings of this study indicate that distraction from the consummatory value of candy or repeatedly exposing children to candy does not enhance nor harm subsequent self-regulation attempts in a classroom setting. Even though this study does not confirm its hypothesis, it does not support the traditional view of ego-depletion as well. The outcomes do not show signs of self-regulation failure after a weeks' prolonged exposure to candy constantly inducing behavioural conflicts (i.e. acting in line with the context assumption or acting upon ones impulses). The findings refute the argument that repeated behavioural conflicts invoking self-regulation strength induces ego-depletion and a lower capacity to refrain from subsequent temptations as argued by traditional views.

Second, the outcome variables of the liking of candy and Fruittella did show significant differences between experimental conditions. Exposure to candy, either in a normative or consummatory way, increases the liking for both candy and Fruittella. The liking of Apekoppen did not change significantly. This finding again contradicts my expectation based on literature. Within the theory that exposure enhances subsequent self-regulation, liking is seen as an intermediate variable. Exposure causes a conflict between ones cognition and ones impulses. To reduce the conflict, liking is decreased, facilitating subsequent self-regulation (Geyskens et al., 2008). In this research the opposite is seen; exposure to Fruittella increased the liking of candy and Fruittella. According to this theory increased liking would increase the conflict triggered by exposure to temptation, stimulating acting upon the impulse at hand. However, self-regulation behaviour was neither increased nor decreased.

Third, the findings showed that exposing children with a temptation did not change the RRV, implicating that exposure to temptation does not affect the internal motivation to eat. The reinforcing includes the amount of work someone is willing to do to obtain a certain amount of candy

and is considered a strong determinant of food intake (Epstein & Leddy, 2006). Based on literature a decrease in RRV was expected as a result of exposure to temptation. Restriction implies scarcity, which in turn reinforces the rewarding value of consumption and promotes its consumption (De Ridder et al., 2013). Therefore, when candy is easy accessible, the motivation to eat is likely to decrease, providing less motivation to work to obtain some candy. In other words, why work hard to obtain candy when it is abundant and easy to obtain? Consequently, one would expect a lower food intake and better self-regulation. However, the results do not show a decrease nor increase in the RRV of food. When linking this finding to self-regulation behaviour, this might not be very surprising. Both RRV and self-regulation behaviour did not show significant differences between experimental conditions. As RRV is considered a strong determinant of food intake, it seems logical that the RRV did not change as well. When the internal motivation to eat remains similar after exposure, it makes sense that the actual intake (and thus self-regulation behaviour) remains similar as well.

Last, self-regulatory competence increased in both the normative condition as the consummatory value condition. Children from the exposure conditions indicated a higher use of self-regulation strategies in the past week than did children from the control condition. The subsequent actual self-regulation attempt might not change after exposure to candy like indicated before, but self-regulatory competence did increase. Let's return to the liking of candy in general and Fruittella in specific. Assuming increased liking fuels a bigger conflict, this might explain the observed increase in self-regulatory competence. The need for self-regulation strategies might have increased the need to deal with the temptations at hand. This implies that exposing children to candy kindles a behavioural conflict. A bigger behavioural conflict might not facilitate self-regulation behaviour. On the other hand, this increased conflict might heighten the need for self-regulation strategies, enhancing the competence to utilize self-regulation strategies (see Figure 7). In turn, this might ultimately trigger awareness about the use of self-regulation strategies. Seemingly, when children like something better, they start searching for ways to refrain from the temptation, elucidating that self-regulation behaviour did not change, but the competence to use self-regulation strategies did. For instance, children could avoid the area where the bowl of candy is, start talking with their group mates when tempted to indulge to distract themselves or remind their selves they want to stay slim.

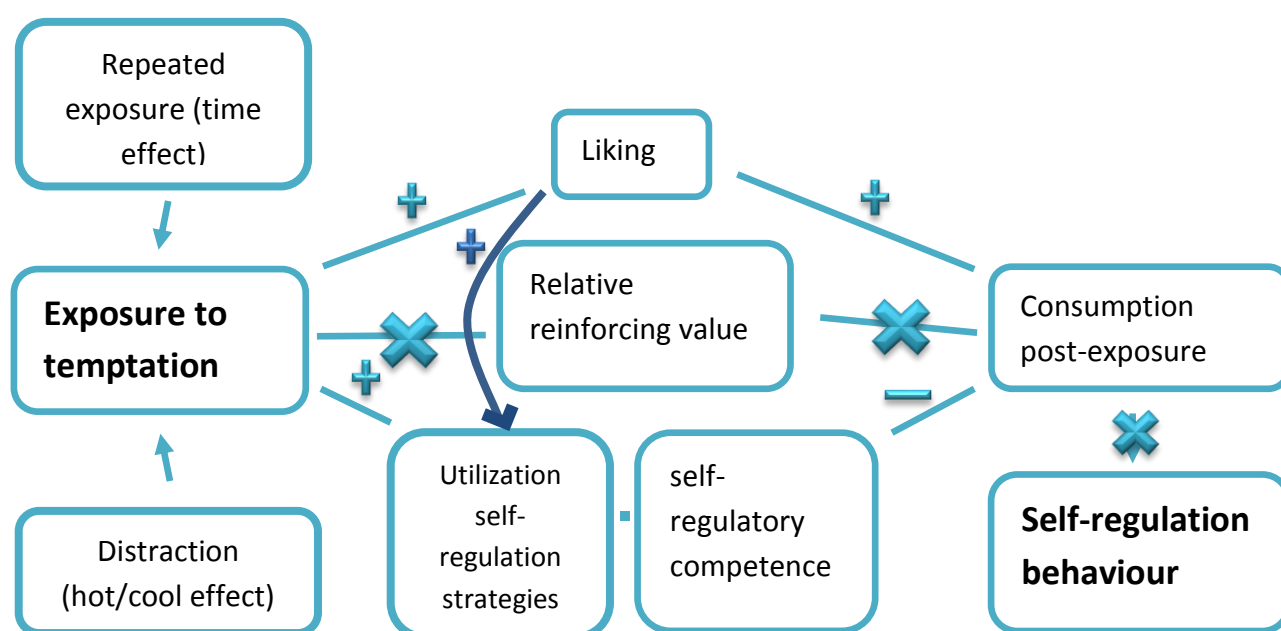


Figure 7 | main outcomes

It can be concluded that exposure to temptation, either by inducing a time effect or a distraction from the consummatory value of candy, does not affect subsequent self-regulation behaviour in contradiction to this paper's predictions (see figure 7). Even though it was expected that exposure to temptation would decrease liking, this paper shows the opposite. Exposure to temptation increased the liking of both candy as Fruittella, which is likely to stimulate eating behaviour. This effect might be negated by the observed increase in self-regulatory competence. The increased liking might have created a bigger conflict, which stimulated the use of self-regulation strategies as consumption during the pre-exposure phase was not appropriate. When presented with a new opportunity to eat candy, triggering a similar conflict between the desire to eat and a restriction goal, the stimulating effect of liking, but the inhibiting effect of self-regulatory competence might explain the neutral effect of self-regulation behaviour.

Normative condition vs. Consummatory value condition

The boosting effect of exposure to temptation on subsequent self-regulation found in literature was translated into two different methods for implementing this theory into practice. Both methods have a different approach in addressing the exposure. The normative condition exposed children for a prolonged period of time to candy, whereas the consummatory value condition repeatedly exposed children to candy while manipulating the consummatory value of it (focusing on the cool characteristics). Next it is discussed whether these two approaches differ in effectiveness. When comparing the main effect of both experimental conditions, the conditions do not seem to deviate in their effect on the main outcomes. When comparing the main effect of both experimental conditions, they are quite consistent in generating a change or not. When significant values were observed for one condition, then that same outcome variable was significant for the other experimental condition as well in two out of three significant values measured (Liking candy: $p_{\text{NOR}}=0.009$ vs $p_{\text{SUM}}=0.084$; Liking Fruittella: $p_{\text{NOR}} < 0.001$ vs. $p_{\text{SUM}} < 0.001$; Self-regulatory competence: $p_{\text{NOR}}=0.022$ vs. $p_{\text{SUM}}=0.008$). Therefore it can be questioned why the methods do not differ in their effect on subsequent self-regulation behaviour.

Both methods did not seem to benefit nor harm self-regulation. Self-regulation did not differ between conditions: self-regulation behaviour was non-significant for both condition and self-regulatory competence significantly increased in both experimental conditions. However, the setting of the consummatory value condition implies an even larger inappropriateness when indulging (eating candy interferes with the execution of the sums) as compared to normative condition (the setting only implies it is not appropriate). It could be suggested that because of this reason the consummatory value conditions might trigger a higher restriction goal. On the other hand, this approach might also pose a higher temptation, because the candies are within reach at all time. Research states that when people have to put more effort in obtaining a certain product – for instance, walk further away – they consume less (Engell, Kramer, Malafi, Salomon, & Leshner, 1996). Rather the candy was very easily accessible in the consummatory value condition, whereas children in the normative condition had to put more effort to obtain candy (i.e. they had to get up from their chair and walk through the class to get candy from the bowl). The fact that the candy was within reach in the consummatory value condition, might induce a higher conflict and in turn stimulate an eating goal. The observations seems to confirm this idea. The participants in the consummatory value condition did seem to be tempted more to indulge, because they consumed more candy than the participants in the normative condition.

Thus, on the one hand, the conflict might have been higher in the consummatory value condition,

but on the other hand the context triggered a larger situational inappropriateness. The combination of these seemingly opposing forces might explain the finding that the two approaches did not differ in outcomes.

The role of the context in triggering a conflict

The context played a central role in this study design, because the context is identified as a key factor in determining conditions in which exposure to temptation might enhance rather than hurt subsequent self-regulation. When the context controls the temptation children are exposed to, it is assumed this helps self-regulation. The observations revealed that two out of four experimental conditions did not act in line with the context triggering a situational inappropriateness of consumption while tempting children at the same time. Therefore it can be questioned why self-regulation was not triggered during the pre-exposure phase even though the context triggered the assumption that consumption was not appropriate. The main effect for the liking of candy and Fruittella increased after pre-exposure compared to the control condition. This finding might provide some clues why some experimental conditions did not follow instructions. As a result of the increased liking, the conflict might be higher as well. Children might experience a conflict between the desire to consume Fruittella and the situational inappropriateness of its consumption. Since adherence to the instruction was low, it is possible, that the conflict was too high. If the desire to consume the Fruittella dominated over the situational inappropriateness of its consumption, the exposure might have stimulated a conflict which was so high that it became too difficult to refrain from the temptation. Consequently, children were tempted to indulge.

Thus, in some classes the context was effective in triggering a restriction goal, whereas it was not in other classes. During the experiment one of the classes i.e., the first consummatory value condition group, went completely different as intended. Children saw their opportunity to interpret it to their own advantage and ate candy all week long. However the second week, the experiment did go as intended. To be able to compare the classes who did adhere and classes who did not adhere to instructions, an intention to treat analysis was conducted. With an intention to treat analysis it was checked whether the difference in adherence in the pre-exposure phase affected the main effects. The intention to treat analysis enables to check for differences between liking, RRV, self-regulatory competence and self-regulation behaviour for groups that did and groups that did not act in line with context. These findings might provide some clues with regard to why some classes did and other classes did not adhere to instructions. Also, when the context was effective in triggering restriction goals, rather than eating goals, do outcomes follow a similar pattern to what would be expected from literature? In other words, does exposure to temptation enhance subsequent self-regulation when corrected for self-regulation failure in the pre-exposure phase? After all, this theory assumes response conflict similarity is a condition for subsequent self-regulation enhancement. When an initial conflict is solved, processes to solve the conflict are easier reactivated (Geyskens et al., 2008). However, when these processes were not activated in the first place (or at least, not over the whole week), it does not make sense that these processes are easily activated when faced with a similar conflict again.

In the intention to treat analysis only a significant effect was found for the post-test liking of Fruittella in the consummatory value condition compared to the control condition. Exposure to the consummatory value manipulation increased the liking of Fruittella whereas exposure to the

normative manipulation did not anymore. Thus it can be stated that the liking was lower among children who did adhere to instructions.

Because liking of candy and Fruittella did not increase as much compared to groups that did not adhere to instructions, it can be assumed that the conflict for these children was lower to begin with. When a conflict is solved effectively, the preference for the rejected option decreases (Geyskens et al., 2008). When another conflict is initiated, liking is lower (compared to when not solving the initial conflict effectively), creating a lower conflict. Consequently, it was easier for these children to solve the conflict and refrain from consumption. Regardless, subsequent self-regulation was not boosted. Even though these children solved more conflicts in the pre-exposure phase, reactivation of the processes to solve subsequent self-regulation attempts did not enhance compared to the control condition. Based on the assumptions in response conflict similarity, one might expect better results in classes that did adhere to instruction. However, even though liking did not increase as much as for the classes that did not adhere to instructions, liking still increased. Therefore, the conflict still might have been too high for triggering effective subsequent self-regulation behaviour. Considering the counteractive self-control theory from Trope and Fishbach (2000), it might have been possible that the conflict the temptation created exceeded the point where people perceive themselves capable to exert enough counteractive self-control. According to this theory, when a temptation triggers an eating goal, counteractive control is triggered simultaneously. The more tempting a product is, the more counteractive control is exerted. However, when the temptation is too high, one might not perceive his or herself as capable enough to self-regulate intake.

School policy and social norms

Thus, regardless of the fact whether adherence was high or not, self-regulation behaviour did not improve. Still, a difference in adherence was observed. This triggers the question, why did similar food temptation trigger a higher conflict for one class compared to another class? When assuming that in fact in one class the conflict was lower than for other classes, what could explain the observed difference in adherence?

The answer to previous question might be found in the policies of both schools or in the observation regarding social norms. What could explain the observed differences between both schools participating to the pre-exposure conditions?

First, a possible explanation might be found in the school's policy. Both schools' school guides stated that their student scores are above average with regard to the national average, so the level of the schools does not provide an explanation for the observed difference between schools. However there is a clear difference in their policy regarding health and nutrition. At the first school snacking is prohibited. The second school on the other hand does not prohibit snacking. Rather, they stimulate healthy eating and provide health education. It is possible that the availability of candy on a school where it is normally prohibited stimulates intake, as research has shown that restriction can promote 'forbidden' food and increase its intake when it becomes available again (De Ridder et al., 2013). However, this explanation is contradicted by the finding that pre-test liking was higher at the school that does not restrict candy consumption. This finding contradicts the assumption restriction increases liking and questions the proposed role of liking in the potential to enhance self-regulation after pre-exposure.

Second, the social norm that is active in class might also be of great influence. The most persisting observation – from both teachers as the researcher – is the influence the social norm had on

children. Multiple children expressed that they didn't want to get candy but when they saw others do it, they couldn't resist anymore. Individual choices might be strongly dependent on the social environment. When children are in a lab setting and don't have other children around them, decision making might turn out differently than in the presence of peers. This presence of others might drive and encourage children to indulge.

Cialdini (1998) states that the presence of others influences whether people act out a certain behaviour or not, for instance a higher consumption. People tend to conform to actions of others, because they assume that those actions are the correct way to behave. Considering eating behaviour, the social norm serves as a guide with respect to the appropriate behaviour (Higgs, 2014). Following the norm is especially influential when there is a certain amount of ambiguity (Cialdini & Trost, n.d.; Higgs, 2014), which brings me back to current study. For children it was not clear what was expected from them, leaving them more reliant on social norms to guide behaviour. When others did consume (first NOR and SUM group) others followed, but when others did not consume the Fruittella's, others hardly did as well (second NOR and SUM group).

Peers' presence in guiding eating behaviour also seems to correlate with a high availability of snacks. When the availability of snack food is high in combination with a high consumption in peers, people's own consumption also appears to increase (Wouters, Larsen, Kremers, Dagnelie, & Geenen, 2010). When peers' consumption of snacks is low, individuals consumption is lower as well, both for a high as a low availability of snacks. Thus in current study the interplay between a high availability and peers' eating behaviour, might (partly) explain the differences observed between the two normative and consummatory value groups.

Strength and limitations

Current study brings along some strengths and limitation. First the strengths are discussed. Then some limitations are discussed.

The study design included a randomized controlled trial, including that the study comprised an experiment. An experiment enables a high level of control (Ebrahim & Bowling, 2005). An (field) experiment enables to control for the independent variable, in this case the temptation. In a natural setting it would be hard to study the effect of exposure to temptations, as many factor may be of influence. This makes it harder to distinguish the effect of exposure compared to no exposure. The design enabled to expose participants to the temptations, but at the same time to be able to control the context. In this sense, the conditions of exposure, which might be crucial in inducing ego-depletion or boosted self-regulation, are controlled.

Also, the study comprised a public health intervention. Current study addressed an issue threatening public health. Children's bad eating habits contribute to this rising obesity epidemic (de Vet et al., 2013; Faith et al., 2007). Previous research has shown that, under certain conditions, exposure to temptation enhances rather than hurts. Most research within this field assumes exposure does not benefit self-regulation. Therefore many approaches limit access. On the other hand a more recent thought is that it might help self-regulation, like De Boer et al., 2014, Dewitte et al., 2009, Faith et al., 2007, Geyskens et al., 2008 and Grubliauskiene & Dewitte, 2014. This study has translated this theory into practical methods, which might be useful for public health intervention addressing children's unhealthy diets.

Last, the mixed method of current study design is a benefit. Results are analysed quantitatively

primarily, including a pre- and post-test questionnaire. Additionally, observations complement quantitative findings, representing a qualitative measure.

The research also has some limitations. First, actual eating behaviour was not measured. The indicated amount of candy children wanted to consume was used as representative for self-regulation behaviour. This was a conscious choice, because this study tried to mimic a setting which was as close as possible to a real life setting. Getting children out of their classroom to participate to for instance a taste test, might disrupt children's natural behaviour. Alternatively, eating behaviour might be more natural when measured in their own familiar classroom. However, it was feared that measuring actual eating behaviour in a classroom would be influenced by peers, as the social norm is known to influence eating behaviour (Higgs, 2014). To limit the effect of peers on individual decision making with regard to subsequent self-regulation behaviour, this variable was measured at the end of the post-test questionnaire.

Second, the design exposed children to temptation for a period of one week. Immediately after exposure, self-regulation was measured, not including possible long-term effects. To strengthen the findings, it would have been valuable when more time was available to assess long-term effects of exposure. For instance, to measure whether the same effect would be found on liking, reinforcing value, self-regulatory competence and self-regulation a month after exposure.

Last, the current study included six classes, containing 142 children in total (minus the children that were excluded from data analysis). Considering that the experiment did not go as intended in every class, it would be good to have a larger sample size to see whether the same effects are found in a larger sample adhering to instructions.

Future research

Previous research has shown promising results (de Boer et al., 2014; Dewitte et al., 2009; Geyskens et al., 2008; Grubliauskiene & Dewitte, 2014), but these studies were executed in different settings. Some were executed in a laboratory setting (with higher control) (Dewitte et al., 2009; Geyskens et al., 2008), tested 1 on 1 in the canteen (Grubliauskiene & Dewitte, 2014) or in a classroom setting in which children had to make (anonymous) individual choices (de Boer et al., 2014). Compared to previous studies, the current study took this approach a step further and tried to translate it into an approach suitable for implementation in a classroom setting. This study might constitute some first steps towards a useful public health intervention that takes into account the role of exposure in enhancing self-regulation, and ultimately aims to address current obesity epidemic.

At first impression the lack of self-regulation enhancement seems disappointing. In contrast to above mentioned articles, this study does not find a significant difference in subsequent self-regulation when the response conflict is similar to a prior conflict in a context that stimulates self-regulation. Also, this study does not support the assumptions from the regulatory depletion model (self-regulation strength model), the hot/cool system theory, the critical level model, learned industriousness or adaptation-level theory. Focusing on the cool characteristics of candy (consummatory value) did not enhance subsequent self-regulation behaviour. Exposing children for a prolonged period to an actionable (critical level model) food temptation, enabling them to adapt (learned industriousness or adaptation-level theory), did not enhance subsequent self-regulation behaviour as well. On the other hand, exposure did not induce ego-depletion in the second phase as well, as assumed by the regulatory depletion model. However, the increase in self-regulation competence might be an important sign for future exploration of exposure to candy temptation.

After all, temptation does not harm subsequent self-regulation attempts, but does seem to train self-regulation competence. More insight is needed in the pitfalls of exposure to candy among children in a field setting. How feasible are methods using exposure to temptation to stimulate self-regulation in a field setting?

When addressing a field setting, many factors may play a role and have to be considered. Compared to studies that are able to exert more control (for instance in a lab setting as before mentioned studies), this study might have faced a more complex environment to deal with. For instance a side effect of this choice, included that the design allowed children to interact. A field study has to take into account many factors possibly influencing the exposure, like the social norm that is active in a classroom. Therefore it can be questioned how we can implement a strategy that is effective in building self-regulation in a setting that has to take into account many factors influencing the intervention? How can we track and ultimately control factors interfering with the method without interfering children's natural behaviour? How can we create a setting that exerts the right amount of control over children's behaviour (too less control enables indulging, too much control implies prohibitions which might make indulging even more exciting)?

Before I addressed the role the social norm and ambiguity might had on the outcome. My suggestion for future research is to consider the social norm and the ambiguity of a context that relies on the notion of situational inappropriateness that might be at play in similar group-based interventions to stimulate self-regulation. These factors might be important for the success of a method in a classroom.

For instance, maybe it is possible to use this social norm to stimulate self-regulation. Children seem to pay attention to their class mates in deciding how they will behave. Therefore, when including an element addressing the social norm, this might be beneficial for self-regulation attempts. A suggestion is to implement a rewarding value. Future research could include a certain reward that makes it worthwhile to comply. One might think of a design closer to a recent study of the Boer et al. (2014) that uses an adapted version of the delay of gratification task; 'get one candy now or save three for later'. This design trains self-regulation with a clear reward for children. When children choose to refrain on the short term, they will receive a bigger treat (reward) in the future. In this sense, they would have a clear aim when restricting food intake. For the consummatory value this could include a certain game or contest who can perform his sums the best. Creative ideas might provide a solution for this issue, so they know why they are doing it (next to health reasons). The student that performs his or hers sums the best and still has all of his or hers candies, receives a prize in the end. In contrast to the delay of gratification paradigm ('receive a small treat now or a bigger treat later'), this could include a non-food reward, like a medal, certificate or crown.

When the norm is then to perform well and to refrain from consumption, others might be motivated to refrain from consumption as well. At the same time, this might tackle the ambiguity about what is expected as well. The observations revealed that for many children it was unclear whether they were allowed to eat candy, which made them confused. The context is supposed to suggest situational inappropriateness of candy consumption. However children might need clear instructions to stimulate individual decision making with regard to food intake, as social norms are especially powerful when there is a certain amount of ambiguity (Cialdini & Trost, n.d.; Higgs, 2014). Providing clear, shared social eating appropriateness standards guides eating behaviour and puts less pressure on individual decision making (De Ridder et al., 2013). Thus, when providing a clear objective for children why they should not indulge and creating standards guiding behaviour, without prohibiting

consumption (e.g. including a rewarding value) to avoid activation of the ‘forbidden fruit’ phenomenon, this might decrease ambiguity, making children less reliant on the social norm in deciding how to behave. In other words, this might increase the amount of control, without interfering with their freedom of choice.

Conclusion

When exposing children to candy in a field setting while distracting them from the consummatory value of candy, or exposing them for a prolonged period of time to enable to opportunity to adapt, does not enhance nor hurt subsequent self-regulation behaviour. The subsequent intake of candy does not change after pre-exposure in a context that discourages food intake in children. Exposure to a temptation does increase both the liking of candy as well as the self-regulatory competence. The increase in liking might trigger a bigger conflict, which in turn might increase the need for the utilization of self-regulation strategies to be able to refrain from consumption, training self-regulatory competence.

This study might provide a first step in developing a practical method for enhancing self-regulation. More research is needed to understand this complex pool of factors triggering self-regulation behaviour in a field setting. Deeper insight is needed in the pitfalls of exposure to temptation when leaving lab settings and entering the real life. Ways should be found to create a context that controls self-regulation without interfering with individuals’ freedom of choice and forcing rules on them.

Main findings

Pre-exposure to temptation does not enhance nor harm subsequent consumption.

Pre-exposure to temptation increases liking in a field setting.

Pre-exposure to temptation trains the self-regulatory competence of children between the ages of 9 to 12 years old.

Translating pre-exposure to candy in a practical intervention is a complex process. More understanding is needed in the variety of factors at play in a field setting, such as the social norm or the ambiguity of a context that discourages but not prohibits consumption.

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Appendices

Appendix 1: Social Sciences Ethical Committee consent application

Reducing or using temptation: building self-regulation strategies to enable children to decrease their unhealthy food consumption

Project team

Dr. Emely de Vet
Froukje Takens

Funding

Wageningen University and Research Centre

Period

September 2014 – February 2015 (experiment January 2015)

Background of the project

Childhood obesity is becoming a bigger and bigger problem. The environment plays a role in this problem, because the easy accessibility of unhealthy, energy-dense but palatable food in current environment poses a burden to self-regulation of food intake. The aim of this study is to examine the role of exposure to temptation, rather than limiting access, in enhancing children's self-regulation of candy intake.

The objective

To demonstrate the role of pre-exposure to candy among 9-12 year-olds in enhancing subsequent self-regulation.

Methods

Participants will include children between the age of 9 and 12 year (groep 7 en 8). The experiment lasts for one week and includes two phases: the first phase will take on for the first four days (Monday – Thursday) and the second phase will take place on the fifth day (Friday). Within the first phase, grades will be assigned to either one of three pre-exposure conditions. The first condition consists of the placement of a bowl of glass with a lit on the desk of the teacher, which is filled with candy (Fruitella). The second condition includes the exposure to candy (Fruitella) incorporated in mathematics. Candy is used as a tool for calculations. The last condition comprises a control condition in which no intervention is implemented. In a pre-test children are requested to fill out a questionnaire, including age, weight and height (BMI), liking and reinforcing value. In the second phase, eating behaviour is measured. Children are requested to indicate how much candy they would like to eat. Furthermore they are requested to fill out a questionnaire containing their hunger, liking, reinforcing value, strictness of parents and self-regulation strategies.

Before starting the experiment, parents (or caregivers) and teachers are informed. Parents receive a cover letter, which contains the aim of the study and enables parents to forgo their child's participation. They are also requested to indicate allergies to the child's teacher. For a more elaborate description of the content of the experiment, see the protocol in the attachment.

Conflicts of interest

- 1.1 Is the research funded by an institute other than a university or the NWO? no
If yes, mention all funding institutes:
- 1.2 Does any funding institute have influence over the research process, interpretations of results, or content of publications? no if yes, to SEC
If yes, please explain the influence:
- 1.3 Does any funding institute impose secrecy on publishing the research results? no
If yes, which institute and for how long?
- 1.4 Is publication restricted to 6 months or more after finishing the research? no if yes, to SEC
If yes, explain why:

2 Primary data collection

- Does the research imply primary data collection on humans? yes
If yes, answer the sub-questions below; if no skip to question 3

2.1 Recruitment of participants

- 2.1.1. Will children less than 16 years of age or vulnerable persons be involved in the research? yes if yes, to SEC
- 2.1.2 Describe the participants to be recruited, or the subjects about whom information will be collected:
Participants will include children between the age of 9 to 12 years old from the fifth or sixth grade (in Dutch: groep 7 en 8).
- 2.1.3 Describe the inclusion and exclusion criteria:
Inclusion criteria: being in the fifth or sixth group (in Dutch: groep 7 en 8).
Exclusion criteria: allergy to the cued candy and not having parental permission.
- 2.1.4 Describe how, by whom and where the participants will be recruited:
Local primary schools (Wageningen and nearby villages like, Rhenen, Renkum, Bennekom, Randwijk and Heteren) are contacted to ask for their participation in the study. Schools are emailed and directly visited and meetings are organised where possible. If the school agrees to participate, parents of children in grade 5 or 6 receive an information letter. This information letter will be handed out in paper, but will also be sent to parents via email. The information letters include the aim and the reason for the experiment. Parents are asked to inform the teacher when they do not agree with participation or when their child has a certain allergy or diet in conflict with this research. This is made as easy as possible. A return slip will be included in the letter, but parents can also object participation via email.
- 2.1.5 Is permission by a gatekeeper required to get access to the participants? yes
If yes, describe this consent process:

The head master of the selected primary schools are asked to agree to participation. Also parents of children are informed and asked to inform their child's teacher when they do not agree with participation.

2.2 Consent by the participants

- 2.2.1 Will it be necessary for the participants to take part in the research without their knowledge or consent? No if yes, to SEC
If yes, explain why?
- 2.2.2 May the potential vulnerability (e.g. limited knowledge or dependency on others) of participants affect their consent? yes if yes, to SEC
If yes, how is the vulnerability mitigated?
Consent goes via the parents. Parents are able to object to participation when they do not want their child to participate.

2.3 Informed consent

- 2.3.1 Is a paper or electronic consent form used? no
If no, explain the reasons for not doing this:
Participation has little impact of the privacy of children and children are informed at the start of the study they can drop out any time they want.
Also, the parents are informed about this matter and may object participation by informing their child's teacher.
- 2.3.2. If no paper or electronic consent form is used, is there a protocol for asking oral informed consent? no
If no, explain the reasons for the absence of this protocol:
See above; the parents are informed about the aim and content of the study. They can object participation.
- 2.3.3. Are both questions 2.3.1 and 2.3.2 answered no? no if yes, to SEC
Explain why neither a consent form nor a protocol for asking oral consent is used:
See above; the parents are informed about the aim and content of the study. They can object participation.
- 2.3.4. If an informed consent form is used, does the form cover all topics mentioned in the format (see attachment)? n/a if no, to SEC
If no, explain which topics are not covered and why and attach the proposed form.
- 2.3.5. Are the participants informed of the research goal before they are asked to give consent? Yes, the parents are informed
If not, then describe the reasons for not mentioning the research goal before obtaining the consent:
- 2.3.6 Are the participants informed of the research goal at any moment? yes if no, to SEC
If yes, explain when and how:
Yes parents are informed prior to the start of the experiment. Also the head master and teacher will receive an explanation of the aim and content of the research

beforehand, so they know what is expected from them.

Contact information of the researchers is provided on the cover letter, enabling parents to mention ambiguities.

If no, explain why not:

- 2.3.7 Will the participants be informed on the research results? yes if no, to SEC

If yes, explain when and how:

Parents are informed beforehand. On request, schools will be sent a summary of the results of this research.

If no, explain why not:

2.4 Security of data

- 2.4.1. Are data collected on confidential or sensitive issues? yes if yes, to SEC

If yes, explain how this issue is handled:

Data is confidential. Personal details are not shared with third parties and remain confidential. The data collected is not sensitive.

- 2.4.2. Are sensitive or confidential data transported from the field to a secure place? yes if yes, to SEC

If yes, which security measures are taken during the transport?

After collecting data at primary schools, questionnaires will be put in a box and transported to a secure place.

- 2.4.3. Where are the data stored?

At the WUR-account of the researcher. This account is part of an intern password-protected WUR network.

- 2.4.4. Are sensitive or confidential data stored in a secure place? yes if no, to SEC

If no, explain why not:

- 2.4.5. Who has access to the stored data?

The master student and supervisor have access to the stored data.

- 2.4.6. Are sensitive or confidential data taken out of storage during the research? no if yes, to SEC

If yes, describe the security measures:

- 2.4.7. Will the data be destroyed at the end of the research? no

2.4.7.1 Why are the data not destroyed?

According to strict data management protocols, data should be stored for five years after data collection.

2.4.7.2 How long will the data be stored?

See above; data is stored for five years after data collection.

- 2.4.7.3. Has the researcher arranged the access to and management of data after completion of the research project? yes if no, to SEC

If yes, with whom?

With the supervisor Emely de Vet

If no, why not?

- 2.4.8. If participation is by e-mail, are the e-mail addresses deleted immediately after the responses are given? n/a
If yes, go to question 3; if no, answer the questions below
- 2.4.8.1. If no, are the participants asked to participate in similar future research and are therefore asked permission that the researchers keep their e-mail addresses? n/a if no, to SEC
- 2.4.8.2. If no, are the participants for other or no reasons asked permission that the researchers keep their e-mail addresses? n/a if yes, to SEC

3. Use of secondary data

Does the research involve the use of secondary data? no

If yes, answer the following sub-questions; if no skip to question 4.

- 3.1. From which institute(s) or organization(s) will the data be obtained?
- 3.2. Are personal or sensitive data analyzed or handled? no
- 3.3. Is it possible to determine (with near certainty) information about individuals, organizations or communities from the obtained dataset(s) or through the linking of datasets? no if yes, to SEC

4. Research risks

Does the research imply physical, psychological/emotional, social, political legal or any other risks for the participants? no if yes, to SEC

If yes, answer the following sub-questions; if no, skip to question 5.

- 4.1. If yes, describe these risks:
- 4.2. Describe what is done to minimize these risks?
- 4.3. Describe what is done to counterbalance risks which cannot be minimized?

5. Research in unsafe areas

Does the research take place in areas with a more than normal risk of natural or other disaster? no if yes, to SEC

If yes, answer the following sub-questions:

- 1.1. Is there a protocol for the protection of the researchers in case of a dangerous situation? n/a
- 1.2. Is there a protocol for the protection of local research assistants in case of a dangerous situation? n/a
- 1.3. Is there a protocol for the protection of the participants in case of dangerous situation? n/a

Date:

Signature of researcher:
supervisor:

Signature of PhD, AIO or postdoc

Name

Name



Ethical Clearance

To whom it may concern

The following project proposal has been reviewed by the Social Sciences Ethics Committee (SEC):

Title: "Reducing or using temptation: building self-regulation strategies to enable children to decrease their unhealthy food consumption"

Project team: Dr Emely de Vet & Froukje Takens

Funding: Wageningen University and Research Centre

Period: September 2014 – February 2015

Location: Primary schools in Wageningen and Bennekom (Johan Frisoschool, Prinsenakker, St. Alexanderschool and Wilhelminaschool)

The Committee has concluded that the proposal deals with ethical issues in a satisfactory way and that it complies with the Netherlands Code of Conduct for Scientific Practice.

With kind regards,

Prof. Dr Marcel Verweij
Chair Social Sciences Ethics Committee

DATE
05-01-2015

POSTAL ADDRESS
6706 kn Hollandsseweg 1
The Netherlands

VISITOR'S ADDRESS
Building 201

INTERNET
www.wageningenur.nl

HANDLED BY
Prof. Dr Marcel Verweij

TELEPHONE
+31(0)317484334

EMAIL SEC SECRETARY
esther.roquas@wur.nl



Appendix 2: Toestemming onderzoek onder leerlingen van groep 7 en 8

Wageningen Universiteit doet een onderzoek naar eetgedrag onder kinderen op de school van uw kind. Middels deze brief willen wij u informeren over dit onderzoek.

Doel van het onderzoek

Elke dag worden kinderen geconfronteerd met allerlei smakelijk maar vaak ongezond eten. Als ouder zult u zich misschien ook wel eens afvragen hoe u het beste met deze verleidingen kunt omgaan: al het lekkers verbieden of kan af en toe snoepen geen kwaad?

Het doel van deze studie is meer inzicht te krijgen in manieren hoe we kinderen kunnen leren met deze verleidingen om te gaan. We onderzoeken of de aanwezigheid van snoep in de klas zonder dat daarvan gegeten wordt, de aantrekkelijkheid van snoep vermindert.

Het onderzoek

Het onderzoek wordt verwerkt in de dagelijkse school routine van uw kind(eren) en duurt vijf dagen. We onderzoeken drie verschillende situaties. De groep van uw kind wordt per toeval toegewezen aan één van deze drie situaties. De eerste situatie houdt in dat er gedurende vier dagen een glazen pot met een deksel met daarin Fruittella snoepjes op het bureau van de juf of meester wordt geplaatst. De tweede situatie houdt in dat de kinderen vier dagen op rij rekensommen maken met behulp van Fruittella snoepjes. In de derde en laatste situatie zal er géén snoep aanwezig zijn.

Op de eerste en vijfde dag wordt aan de kinderen gevraagd een vragenlijst in te vullen. In de vragenlijst worden vragen gesteld over de aantrekkelijkheid van snoep. Ook wordt op de vijfde dag gemeten hoeveel Apekoppen de kinderen willen eten. Als bedankje voor hun deelname mogen de kinderen kiezen tussen een miniverpakking Apekoppen of Fruitkick appel.

Allergie en dieet informatie

Is uw kind allergisch of volgt uw kind een speciaal dieet waardoor hij of zij geen Fruittella's of Apekoppen mag consumeren, meld dit dan bij de meester of de juf van uw kind. Op de achterzijde van deze brief vindt u de ingrediënten van de producten.

Vrijwillige medewerking en anonimiteit

Medewerking aan het onderzoek is volledig op vrijwillige basis. U of uw kind mag ten alle tijden stoppen met de deelname. Mocht u besluiten om niet deel te nemen aan het onderzoek, dan heeft dit geen enkele gevolgen voor u of voor uw kind(eren). De gegevens van dit onderzoek worden volledig anoniem verwerkt en zullen alleen voor dit onderzoek gebruikt worden. De gegevens worden niet aan derden verstrekt. Als u om welke reden dan ook niet wilt dat uw kind(eren) meewerken, laat dit dan voor weten aan de juf of meester van uw kind(eren).

Hoe deelnemen? Mochten wij geen bericht ontvangen dat uw kind niet deel mag nemen, dan gaan we er stilzwijgend vanuit dat u geen bezwaren heeft en dat uw kind mee mag werken.

Vragen? Heeft u vragen of opmerkingen betreft dit onderzoek, dan kunt u hiervoor terecht bij

Froukje Takens (uitvoerend onderzoeker)
froukje.takens@wur.nl
0621626660

Dr. Emely de Vet (hoofdonderzoeker)
emely.deviet@wur.nl
0317-486146

Met vriendelijke groeten,
Froukje Takens & Emely de Vet



Fruittella

Fruittella bevat natuurlijke kleur- en smaakstoffen en bevat fruitsap.

Ingrediënten: glucosestroop, suiker, geheel gehard kokosvet, vruchtensappen (aardbei, sinaasappel, citroen) (3%), voedingszuur (citroenzuur), gelatine, bevochtigingsmiddel (glycerol), natuurlijke aroma's, geleermiddel (arabische gom), paprikaextract, concentraten (zwarte wortel, vlierbes), dextrine, wortelextract.



Apekoppen

Apekoppen bevatten natuurlijke kleur- en smaakstoffen en zijn vrij van dierlijke gelatine. Kan sporen van melk bevatten.

Ingrediënten: Glucose-fructosestroop, suiker, gemodificeerd zetmeel, zoethout (2,5%), melasse, geleermiddel (johannesbroodpitmeel, xanthan), salmiakzout, gehydrolyseerd erwtenproteïne, voedingszuur (citroenzuur), vlierbessapconcentraat, natuurlijk aroma, karamelsuikerstroop, natuurlijke aromastof, fruit- en plantenconcentraten (gardenia, sinaasappel, passievrucht, mango), keukenzout, glansmiddel (bijenwas wit).

Fruitkick Appel

FruitKick is een bron van voedingsvezels en is bovendien rijk aan calcium, ijzer en vitamine B6. Bevat Tarwe, gluten, soja, sesam. Kan sporen bevatten van ei en melk.

Ingrediënten: Havermeel 39,6%, fruitvulling 36,7% (glucose-fructosestroop, appelpuree 11,2%, bevochtigingsmiddel (glycerol), rozijnen 2,9%, suiker, gedroogde appel 1,4%, verdikkingsmiddel (gemodificeerd zetmeel), geleermiddel (pectine), kaneel, zuurteregelaars (calciumcitraten, trinitriumcitraat), voedingszuren (appelzuur, citroenzuur), appelaroma), suiker, plantaardige olie, glucosestroop, sesamzaad, calciumcarbonaat, zout, specerijen, aroma's (appelaroma, natuurlijk vanillearoma), rijsmiddel (ammoniumwaterstofcarbonaat), emulgator (sojalecithine), ijzer, vitamine B6, tarwebloem.



Appendix 3: Extensive Protocol

Objective

The objective is to demonstrate the role of pre-exposure to candy among 9-12 years olds in enhancing subsequent self-control.

Method

Participants

For this research local primary schools are contacted to recruit participants. From schools willing to participate, the fifth and sixth grade are invited to participate tot the study. Thus, participants consist of children from the fifth and sixth grade (in Dutch: groep zeven en acht), aged between nine and twelve years old. Each condition would ideally contain two grades or otherwise one big one. Both girls and boys are included. The fifth and sixth grades are equally distributed over the conditions to minimize differences in age.

Design

The study comprises a Randomized Controlled Trial (RCT). Classes are regarded clusters of participants where treatment is randomly assigned to classes. The study included two phases and two data collection waves. The first phase contains a pre-exposure phase with three pre-exposure conditions. Prior to exposure, a pre-test will be conducted. This represents the first data collection wave. At the fifth day, post exposure, a questionnaire will be conducted, including food intake, representing the second data collection wave. The design of the study is quasi experimental, because the conditions are not completely randomized; on the level of whole classes, a treatment is assigned. Thus, not each individual participant was randomly assigned to a certain treatment. Rather, the whole group is assigned to the same condition, regarding each child in that group as a single unit and participant.

Procedure

Preparation

Prior to the start of this experiment, the consent of the Social Sciences Ethical Committee will be acquired. After recruitment of schools and participants, conditions are randomly assigned to participating groups. The first of January, appointments are scheduled with teachers. They receive an explanation of what to expect specific for the condition their group receives. Also cover letters for parents and caregivers are brought to this appointment. This cover letter enables parents and caregivers forgo participation (see appendix 2). Parents will receive a letter in paper including a return slip, which they can hand to their child's teacher. Parents will also receive a letter via email enabling them to object to participation. The content of the letter includes the background, aim and content of the study. They are informed that the information obtained from the children is handled with care, protecting children's privacy. Parents are requested to inform their child's teacher, when their child has a certain allergy which is in conflict with the study. For this reason, a list of ingredients is provided at the backside of the letter. By informing parents via a paper letter and email, objecting is made as easy as possible. The researcher keeps track of the names of children not having consent to participate. A final list is made a day after the date mentioned in the letter till when parents can object.

Questionnaires are coded to be able to distinguish between different pre-exposure phases. Questionnaires that are filled out by students in the normative condition receive the code NOR, questionnaires that are filled out by students in the consummatory value condition are marked with the code SUM and questionnaires filled out by students in the control condition are marked CON.

Baseline

The experiment is scheduled in the second and third week of January. Three groups will participate in the second week and three groups will participate in the third week. At the first day of the experiment, questionnaires are requested to be filled out to determine name, age, gender, weight and height (via subjective assessment and an indication of the body size, see attachment of pre-test questionnaire), and the reinforcing value and liking of the candy in a 5-point Likert scale ranging from 'helemaal niet- niet zo- ik weet het niet- een beetje-heel erg' (see attachment). The reinforcing value includes the amount of work a child is willing to obtain for the cued candy and the liking represents the pleasure derived from eating.

Pre-exposure phase

The first four days participants are exposed to one of the three conditions. Children are either assigned to a 'normative manipulation', a 'consummatory value manipulation' or the control.

The first condition involves continuous pre-exposure during four days in which a bowl of candy is placed at the desk of the teacher. Before the pre-exposure phase, the bowl is weighted. After the fourth day, the bowl of candy is removed from classroom.

The second condition involves repeated exposure by incorporating mathematics using candy as a tool in the current daily activities. In this condition every child receives their own bowl of candy. On this bowl they are requested to write their names on and informed that they should use the same bowl and candy for all four days. The sums include proportions, percentages and fractures based on the curriculum that dictates that children should be familiar with these concepts in the fifth and sixth grade (in Dutch: groep 7 en 8). Before the start of the experiment, teachers are consulted whether the sums fit the level of the students. When needed, adjustments are made.

For both pre-exposure conditions applies that the candy includes Fruittella's. Also, children are not supposed to eat the candy. It is questioned whether this presence while suggesting consumption is not appropriate will reduce the appeal of the candy.

The third and last condition includes the control. This condition does not involve an intervention.

At the first day of the first phase, the researcher introduces the study to the teacher and the participants. The teacher receives an instruction about the how to handle the study in the coming days (see attachment of 'docenteninstructie'). Also the children are introduced with the study (see attachment of 'leerlingeninstructie') and asked to fill out a questionnaire, containing name, age, liking and reinforcing value (see attachment of pre-test questionnaire).

The next days the researcher was not present during exposure, she merely introduces the content of the exposure condition at the start of the research.

For each condition applies that children are able to stop whenever they want. For each condition, the collected data is handled with care. Questionnaires are transported immediately after collection and not viewed by other people than the researcher.

Second phase and post-test

The second phase is initiated on the fifth day. The researcher returns to the school and conducts a questionnaire. This test occurs at the same location as the first phase, as the class room is familiar to participants. The questionnaire includes, name, age, liking, reinforcing value, the strictness of parents with regard to candy consumption (5-point Likert scale), and an adapted version of the TESQ-E determining self-control strategies (see attachment post-test questionnaire). The bowls of remained candy (consummatory value) is retrieved by the researcher and the bowl of candy (normative) is weighted.

As a measure for eating behaviour, children are asked to indicate how much candy they would like to eat at the end of the questionnaire. This measure is presented as a 'bedankje voor deelname'. The children have to indicate how many Apekoppen they would like to eat.

In the end children may choose between a small bag of Apekoppen or a healthier alternative to not impose candy on them.

After data collection, data is stored for (at least) five years, following strict data management protocols.

Appendix 3.1: guidelines consummatory value condition

During lectures of mathematic, candy is used to exercise with fractions. According to the Dutch curriculum for primary schools, children from the fifth and sixth grade (Dutch: groep 7 en 8) should be able to understand equality of fractures e.g. $\frac{3}{4} = \frac{6}{8}$ and should be able to simplify these fractures e.g. $\frac{8}{5} = 1 \frac{3}{5}$. They should also be familiar with proportions, like 1 to 3, 2 of 5 or 3 euro per portion and weight or contents, percentages and converting these percentages to fractures and proportions.

Table 1: Curriculum mathematics - 'inhouden en activiteiten
bij de kerndoelen van 2006 (tule –rekenenwiskunde 2011)

groep 7 en 8
als groep 5/6 + Taal voor het uitdrukken of benoemen van: <ul style="list-style-type: none">• gelijkheid van breuken (bijv. $\frac{3}{4} = \frac{6}{8}$, $1 \frac{2}{3} = \frac{5}{3}$)• vereenvoudigen van breuken (bijv. $\frac{8}{5} = 1 \frac{3}{5}$)• vaste oplossingsschema's bij cijferen zowel bij het kolomsgewijs rekenen als het cijferen met decimale getallen• verhoudingen (bijv. 1 op 3; 2 van de 5; € 3 per pak)• verhoudingen in allerlei contexten (bijv. taal voor prijs: euro per stuk, euro per eenheid van lengte, gewicht of in- houd; snelheid: tijd-afstand; schaal; be- lasting: BTW)• verhoudingen vergelijken (bijv. is 3 op 5 méér dan 10 op 16?)• percentages (bijv. procent (per honderd) in verschei- dene contexten zoals: rente, korting, winst)• het onderling omzetten van verhoudin- gen, procenten en breuken• het onderling omzetten van breuken, procenten en kommagetallen• berekeningen met maten (bijv. het "omzetten" van km in meters)

Appendix 3.2: Docenteninstructie

Appendix 3.2.1. docenteninstructie - snoeppot

Deze week wordt er bij de leerlingen onderzocht hoe zij er mee omgaan als zij geconfronteerd worden met snoep. We willen zien of de aanwezigheid van snoep de aantrekkingskracht ervan verminderd. Het wordt onderzocht of de aanwezigheid van snoep wanneer ze hier van mogen eten, kinderen kan leren met verleidingen om te gaan.

Van maandag tot en met donderdag zal er een pot snoep op de tafel van u als docent staan. Deze pot is van glas –waardoor de kinderen de snoepjes wel kunnen zien- en heeft een deksel, wat suggereert dat consumptie hiervan niet gepast is.

Aan het begin van de proefperiode zal de onderzoeker uitleggen dat de snoepjes niet voor nu zijn, maar voor vrijdag. Ook worden er dan op papier een paar vragen gesteld aan de kinderen met betrekking tot hun naam, leeftijd, BMI en hoe lekker ze snoep - en dan met name Fruittella - vinden.

Mochten de leerlingen tijdens de resterende dagen nogmaals vragen naar de snoeppot, dan kunt u dit antwoord herhalen: “deze zijn niet voor nu, maar hier gaan we vrijdag mee verder”. U hoeft de kinderen niet te verbieden van de snoepjes te eten en ook niet uit u zelf te vertellen wat de bedoeling is. U kunt de kinderen gewoon hun gang laten gaan en hoeft slechts te reageren als ze uit zich zelf wat vragen.

Als ze dus toch een snoepje pakken, maakt dit niet uit. Geef hier geen commentaar op en laat het zijdelings voorbij gaan. Voor en na de vier dagen waarin de snoeppot aanwezig, zal deze gewogen worden om te bepalen hoeveel snoep er toch van is gegeten.

Het is dus belangrijk dat u neutraal blijft met betrekking tot het snoep. Probeer de indruk te vermijden dat snoepen of niet-snoepen positief of negatief is.

Op vrijdag komt de onderzoeker terug. De pot met snoep en lijst voor opmerkingen wordt weer opgehaald door de onderzoeker. Aan de leerlingen wordt op vrijdag gevraagd of zij een vragenlijst willen invullen. Aanvullend op de vorige vragenlijst, zal de vragenlijst aangevuld zijn met vragen naar strategieën om met snoep om te gaan en consumptie te beperken.

Opmerkingen

Valt u iets op tijdens het experiment? Hier kunt u eventuele opmerkingen noteren.

Denk bijvoorbeeld aan situaties waarin kinderen meer geneigd zijn toch te snoepen of juist als het de leerlingen helemaal niet lijkt af te leiden. Alles wat in u opkomt mag u opschrijven.

Maandag:

Dinsdag:

Woensdag:

Donderdag:

Appendix 3.2.2. Docenteninstructie – ‘rekenen met snoep’

Deze week wordt er bij de leerlingen onderzocht hoe zij er mee omgaan als zij geconfronteerd worden met snoep. We willen zien of de aanwezigheid van snoep de aantrekkingskracht ervan verminderd. Het wordt onderzocht of de aanwezigheid van snoep wanneer ze hier van mogen eten, kinderen kan leren met verleidingen om te gaan.

Van maandag tot en met donderdag wordt u gevraagd de sommen met Fruittella's te incorporeren in uw les. De lessen zullen op de Maandag van de proefperiode worden geïntroduceerd door de onderzoeker. Hierin zal naar voren komen dat de snoepjes zijn om mee te rekenen (impliciet dus niet om van te snoepen) en dat ze hele week hun eigen bakje hiervoor krijgen en gebruiken. Tevens worden er op papier een paar vragen aan de leerlingen gesteld met betrekking tot hun naam, leeftijd, gewicht, lengte en hoe lekker ze snoep - en dan met name Fruittella - vinden.

Van dinsdag tot en met donderdag herhaalt u de les ‘rekenen met snoep’. Bijgevoegd vindt u de antwoordbladen voor leerlingen voor tijdens het rekenen. Mochten de kinderen meer ruimte nodig hebben voor de sommen, dan kunt u ze wat kladpapier erbij geven.

U krijgt zelf de vrijheid om de sommen uit te voeren naar uw eigen inzicht. U bent vrij naar eigen inzicht de sommen aan te passen, zelf iets erbij te verzinnen of bepaalde gedeeltes van de antwoordbladen maar te gebruiken, zolang het contact met het snoep zonder hiervan te eten maar centraal blijft staan. Ook kunt u de vragen centraal per vraag doornemen of de kinderen op hun eigen tempo de vragen laten maken. Hier mag u zelf over bepalen.

De tijd die staat voor het behandelen van de sommetjes met Fruittella is 15-30 minuten. Dit is een richttijd, en hoeft u zeker niet te zien als een verplichting. Als dit niet haalbaar is, is dit geen probleem en mag u korter of langer aan het rekenen spenderen. Achteraf mag u dit aangeven op het bijgevoegde formulier voor opmerkingen.

Er is echter één ding wat ik u wel wil vragen strikt aan te houden. Het is belangrijk dat u de les elke dag ongeveer op hetzelfde tijdstip geeft, bijvoorbeeld elke dag na de ochtendpauze. Wanneer de kinderen later op de dag bijvoorbeeld meer vermoeid zijn, kan dit invloed hebben op de mate waarin zij zich in kunnen houden omtrent het snoep.

Mochten de leerlingen tijdens deze resterende dagen vragen naar de snoepjes, dan kunt u herhalen dat de snoepjes zijn om mee te rekenen. U hoeft de leerlingen dus niet te verbieden, doch aanmoedigen, van de snoepjes te eten. U kunt de kinderen gewoon hun gang laten gaan als ze gaan snoepen en hoeft alleen te reageren als ze uit zich zelf wat vragen. Als ze dus toch een snoepje pakken, maakt dit niet uit. Geef hier geen commentaar op en laat het zijdelings voorbij gaan. Het is dus belangrijk dat u neutraal blijft met betrekking tot het snoep. Probeer de indruk te vermijden dat snoepen of niet-snoepen positief of negatief is.

Ook is het belangrijk dat de leerlingen de hele week hetzelfde bakje met snoepjes gebruiken. Op maandag krijgen ze een bakje met 20 Fruittella's met hun eigen naam erop. Dit bakje blijven ze de resterende dagen gebruiken en wordt bewaard in hun eigen lade. Als ze snoepen, krijgen ze géén nieuwe snoepjes. Hierdoor kan aan het einde geteld worden hoeveel snoepjes de leerlingen hebben gegeten in de afgelopen dagen. Als ze dus toch snoepen, zit dit in de weg van het uitvoeren van de sommetjes. Mocht u zien dat een leerling snoep uit iemands anders bakje pakt, dan kunt u deze

leerling er wel op aanspreken dat dit niet de bedoeling is. Ze gebruiken hun eigen bakje de hele week lang.

Op vrijdag komt de onderzoeker terug. De bakjes met Fruittella's zal overhandigd worden aan de onderzoeker.

De leerlingen wordt op vrijdag gevraagd of zij een vragenlijst willen invullen. Aanvullend op de vorige vragenlijst, zal de vragenlijst aangevuld zijn met vragen naar strategieën om met snoep om te gaan en consumptie te beperken.

Opmerkingen

Valt u iets op tijdens het experiment? Hier kunt u eventuele opmerkingen noteren.

Denk bijvoorbeeld aan situaties waarin kinderen meer of juist minder geneigd zijn toch te snoepen of hoe lang u bezig bent geweest met de sommetjes. Alles wat in u opkomt mag u opschrijven.

Maandag:

Dinsdag:

Woensdag:

Donderdag:

Antwoordformulier - Maandag

We gaan vandaag rekenen met verhoudingen. Dit doen we niet zomaar! We gaan het rekenen wat leuker maken door hulpmiddelen te gebruiken om de sommen te maken. Je krijgt hiervoor een bakje met **20** Fruittella's.

Let op! Deze fruittella's gebruik je de hele week om mee te rekenen. Zorg er dus voor dat je de sommetjes kan blijven maken!

Opwarmertjes

Je hebt nu 20 snoepjes voor je liggen. Met dit gedachten, maak je de volgende sommetjes...

Leg in een verhouding van **1 op de 10**, het goede aantal snoepjes voor je op tafel.
Van de 20 snoepjes is dit:

.....

Leg in een verhouding van **5 op de 10**, het goede aantal snoepjes voor je op tafel.
Van de 20 snoepjes is dit:

.....

Leg in een verhouding van **7 op de 10**, het goede aantal snoepjes voor je op tafel.
Van de 20 snoepjes is dit:

.....

Leg in een verhouding van **1 op de 5**, het goede aantal snoepjes voor je op tafel.
Van de 20 snoepjes is dit:

.....

Leg in een verhouding van **3 op de 5**, het goede aantal snoepjes voor je op tafel.
Van de 20 snoepjes is dit:

.....

Leg in een verhouding van **4 op de 5**, het goede aantal snoepjes voor je op tafel.
Van de 20 snoepjes is dit:

.....

Leg in een verhouding van **2 op de 4**, het goede aantal snoepjes voor je op tafel.
Van de 20 snoepjes is dit:

.....

Bezoekje aan de dierentuin

1. Sarah is in de dierentuin. In één van de hokken zitten 20 Apen die net gevoerd worden door een verzorger. Na het voeren heeft de verzorger alleen per ongeluk het hok niet goed afgesloten. De apen lusten wel meer eten, waardoor ze proberen te ontsnappen. Hierdoor lukt het **1 op de 4** apen te ontsnappen. Als er in totaal 20 apen zijn, hoeveel apen zijn er dan ontsnapt?!

Leg het goede aantal apen voor je op tafel.

..... Apen



2. Als Sarah doorloopt, ziet ze de giraffes staan. Naast de oude giraffes, ziet ze ook 5 baby giraffes. Als er 10 moedergiraffes in het hok staan, hoeveel van deze moedergiraffes heeft dan 1 baby giraffe gekregen?

Leg het goede aantal moeder giraffes voor je op tafel.

1 op de moeder giraffes

3. Na als dat rond lopen heeft Sarah honger gekregen. In een van de restaurants gaat ze een broodje halen. 10 broodjes kosten samen 15 euro. Dát vindt Sarah wel erg veel. Ze neemt 2 broodjes. Hoeveel euro moet Sarah betalen?

Leg het goede aantal euro voor je op tafel.

.....Euro



Toppunt

1. Leg 6 op de 10 snoepjes neer op tafel. Dit zijn in totaal snoepjes.

2. Van de snoepjes die nu over zijn, mag je 1 op de 3 snoepjes op tafel laten liggen, de rest van je terug in het bakje doen.

3. Hoeveel snoepjes hou je over? snoepjes

Antwoordformulier - Dinsdag

Vandaag gaan we rekenen met breuken.

Opwarmertjes

Van de **20** snoepjes mag je de volgende hoeveelheid voor je leggen. Vul daarna in hoeveel snoepjes je voor je hebt liggen.

$$\frac{1}{2} = \dots\dots\dots \text{ snoepjes}$$

$$\frac{6}{20} = \dots\dots\dots \text{ snoepjes}$$

$$\frac{5}{10} = \dots\dots\dots \text{ snoepjes}$$

$$\frac{1}{10} = \dots\dots\dots \text{ snoepjes}$$

$$\frac{7}{10} = \dots\dots\dots \text{ snoepjes}$$

$$\frac{8}{10} = \dots\dots\dots \text{ snoepjes}$$

$$\frac{1}{5} = \dots\dots\dots \text{ snoepjes}$$

$$\frac{4}{5} = \dots\dots\dots \text{ snoepjes}$$

$$\frac{2}{5} = \dots\dots\dots \text{ snoepjes}$$

$$\frac{1}{4} = \dots\dots\dots \text{ snoepjes}$$



Naast de Fruittella's mag je ook een potlood of liniaal erbij pakken! Leg deze horizontaal in het midden op je tafel.

Verjaardagsfeestje!

- Pieter is jarig vandaag. 7 vrienden en vriendinnetjes heeft hij uitgenodigd. 1 van zijn vriendjes is echter te laat! Hoeveel vriendjes en vriendinnetjes zijn er al wel? Leg het goede aantal vriendjes/vriendinnetjes boven en onder de lijn (potlood of liniaal).

(aantal vriendjes al aanwezig)

(totaal aantal uitgenodigd)

- Voor zijn feestje heeft Pieter taart. Er zijn 7 vriendjes en vriendinnetjes op zijn feestje. Hijzelf, zijn zusje en zijn moeder lusten ook wel een stukje. Als Pieter de taart in gelijke stukken heeft gesneden, laat zijn zusje helaas twee stukken vallen. Welk gedeelte is er nog over? Leg het goede aantal taart stukjes boven en onder de lijn.



(aantal stukjes taart over)

(totaal aantal gesneden stukjes taart)

- Inclusief Pieters zusje, moeder en hijzelf zijn er dus aantal mensen op zijn feestje. Met deze groep gaan ze naar een 3d-film. Helaas zijn er niet genoeg 3d-brillen. Er zijn nog 6 brillen over. Welk gedeelte van de groep heeft wel een bril? Leg het goede aantal brillen boven en onder de lijn.



.....

.....

Deze breuk kunnen we makkelijker opschrijven! Wat is de kleinste breuk mogelijk?

Leg het goede aantal brillen boven en onder de lijn.

.....

.....

Toppunt

4. Iedereen mag tijdens de film kiezen tussen een klein bakje zoete of zoute popcorn. 5 mensen kiezen zoete popcorn.

Welk gedeelte kiest zoete popcorn? Kies de kleinst mogelijke breuk!

Leg het goede aantal bakjes boven en onder de lijn.

.....

.....

Als ik van deze breuk nog eens $\frac{1}{5}$ af trek, hou ik over:

.....(vorig antwoord) $\frac{1}{5}$ =

.....(vorig antwoord) 5



Antwoordformulier Woensdag

We gaan vandaag rekenen met procenten. We beginnen met een paar opwarmertjes.

Opwarmertjes

Stel je hebt **10** snoepjes in een zakje. Hiervan mag je maar een percentage aan snoepjes pakken. Hoeveel snoepjes mag je bij de volgende percentages pakken.

50% = snoepjes

90% = snoepjes

10% = snoepjes

40% = snoepjes

Stel je hebt **20** snoepjes in een zakje. Hoeveel snoepjes mag je bij de volgende percentages pakken.

50% = snoepjes

25% = snoepjes

80% = snoepjes

10% = snoepjes

65% = snoepjes

Stel je hebt **6** snoepjes in een zakje. Hoeveel snoepjes mag je bij de volgende percentages pakken.

50% = snoepjes

Stel je hebt **8** snoepjes in een zakje. Hoeveel snoepjes mag je bij de volgende percentages pakken.

25% = snoepjes

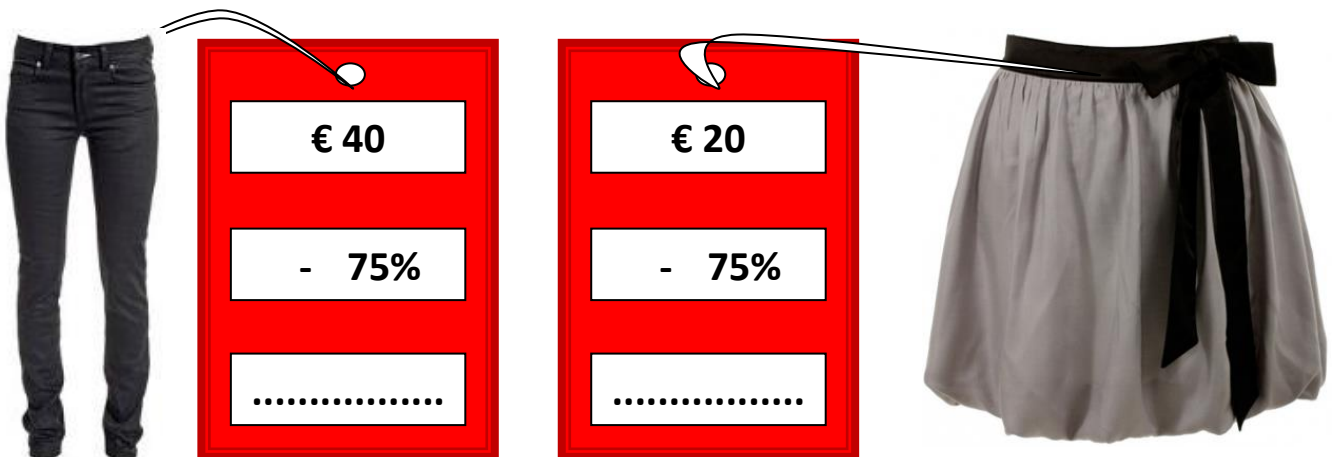
Shop till you drop, baby

1. Evi en Dunya gaat shoppen. Het is uitverkoop! Dunya ziet een leuk shirt hangen. Het shirt kost normaal 30 euro, maar het shirt heeft maar liefst 50% korting. Wat is de nieuwe prijs van het shirt?
Leg het goede aantal euro's voor je op tafel.

Het shirt kost nu euro

2. Bij de volgende winkel zijn nog betere aanbiedingen. Alles is afgeprijsd met 75% korting. Evi ziet een leuke spijkerbroek en rokje liggen. De spijkerbroek kost normaal 40 euro en het rokje 20 euro. Hoeveel kosten de spijkerbroek en rokje nu?

Leg het goede aantal euro's voor je neer voor zowel de spijkerbroek als het rokje.



3. Dunya heeft 20 euro van haar moeder meegekregen om te shoppen. Hiervan heeft ze euro (zie antwoord bij 1.) uitgegeven. Welk percentage heeft Dunya uitgegeven van het geld dat ze van haar moeder meekreeg?

Je hoeft dit percentage niet voor je neer te leggen met snoep, maar alleen op te schrijven.

.....%

4. Evi heeft 50 euro van haar moeder meegekregen. Hiervan heeft ze in totaal euro (zie antwoord bij 2.) uitgegeven. Welk percentage heeft Evi uitgegeven van het geld dat ze van haar moeder meekreeg?

Je hoeft dit percentage niet voor je neer te leggen met snoep, maar alleen op te schrijven.

.....%

Toppunt

5. Na al dat shoppen hebben Evi en Dunya trek gekregen en besluiten ze een broodje te halen. Evi vraagt zich af ze nog wel genoeg geld heeft. Ze mocht van haar moeder 50% uitgeven en moest de andere 50 % bewaren voor noodgevallen.

Hoeveel euro kan Evi nog uitgeven aan wat eten? (leg het goede aantal euro's voor je neer in snoepjes) €.....

Met hoeveel procent komt dit overeen? Van het totaal bedrag van €50 heeft Evi nog% te besteden.

Antwoordformulier Donderdag

Opwarmertjes

Neem **10 van de 20** snoepjes. Hoeveel is dit in.....

verhouding tot het totaal

een breuk

procent

..... op de 2

.....

.....%

Neem **1 van de 20** snoepjes. Hoeveel is dit in.....

verhouding tot het totaal

een breuk

procent

..... op de 20

.....

.....%

Neem **15 van de 20** snoepjes. Hoeveel is dit in.....

verhouding tot het totaal

een breuk

procent

..... op de 4

.....

.....%

Neem **2 van de 20** snoepjes. Hoeveel is dit in.....

verhouding tot het totaal

een breuk

procent

..... op de 10

.....

.....%

Neem **6 van de 20** snoepjes. Hoeveel is dit in.....

verhouding tot het totaal

een breuk

procent

..... op de 10

.....

.....%

Neem **14 van de 20** snoepjes. Hoeveel is dit in.....

verhouding tot het totaal

een breuk

procent

..... op de 10

.....

.....%

Neem **4 van de 20** snoepjes. Hoeveel is dit in.....

verhouding tot het totaal

een breuk

procent

..... op de 5

.....

.....%

Smartphone fever

1. Wanneer Omar naar huis fietst, krijgt hij een lekke band. Hij pakt zijn mobiel uit zijn jaszak om zijn vader te bellen. Even is hij bang dat zijn mobiel bijna leeg is. Tot zijn grote opluchting ziet Omar dat zijn batterij nog 40% heeft. Pak je liniaal of potlood er bij, en beeld uit aan welke **breuk** dit gelijk staat!



40 % van 100% batterij staat gelijk aan..



2. Aan de telefoon zegt Omar's vader dat hij er over een half uur is. Dat is wel lang wachten! Uit verveling maakt Omar een selfie met zijn platte band en plaatst deze op facebook. Al snel stromen de 'likes' binnen. $\frac{1}{3}$ van zijn vrienden op facebook vindt zijn foto leuk. Als Omar 60 vrienden heeft op facebook, betekent dit dat in totaal van zijn vrienden zijn foto hebben geliked.

Dit staat gelijk aan een verhouding van op de vrienden. Leg deze verhouding voor je neer.

3. Door al dat facebooken gaat de batterij van Omar's mobiel hard achteruit. In een verhouding van 10% per uur gaat de batterij achteruit. Het duurt een half uur voordat Omar's vader bij Omar aankomt met de auto om hem op te halen en een half uur geleden was zijn mobiel nog voor 40% opgeladen.

Hoeveel batterij verliest Omar binnen dit half uur?
Leg dit antwoord in snoepjes neer.

.....%

en hoeveel procent van Omar's mobiel is dus nog over? (Dit antwoord hoef je niet voor je neer te leggen, maar alleen op te schrijven)

.....%



Toppunt

Eenmaal thuis legt Omar zijn mobiel snel aan de oplader. Per uur laadt de mobiel 20% op. Na $\frac{5}{2}$ uur haalt hij zijn mobiel uit het stopcontact. Op hoeveel procent staat zijn mobiel na $\frac{5}{2}$ uur?

Hoe kan je de breuk van $\frac{5}{2}$ uur makkelijker opschrijven? Leg dit antwoord in snoepjes neer.

Op hoeveel procent staat de batterij na het opladen?

.....%

2

Antwoordmodel 'rekenen met snoep'

Maandag

Opwarmertjes

- 2
- 10
- 14
- 4
- 12
- 16
- 10

Bezoekje aan de dierentuin

1. 5 Apen
2. 1 op de 2 moeder giraffes
3. 3 Euro

Toppunt

1. 12 snoepjes
2. (12)
3. 4 snoepjes

Dinsdag

Opwarmertjes

- 10
- 6
- 10
- 2
- 14
- 16
- 4
- 16
- 8
- 5

Verjaardagsfeestje!

1. $\frac{6}{7}$
2. $\frac{8}{10}$ ($= \frac{4}{5}$)
3. 10 mensen
 $\frac{6}{10}$
 $\frac{3}{5}$

Toppunt

4. $\frac{5}{10} = \frac{1}{2}$

Om $\frac{1}{5}$ van $\frac{1}{2}$ af te trekken, moeten we deze breuken eerst omzetten naar breuken met gelijke noemers. Zet de noemers om naar 10. De som wordt dan: $\frac{5}{10} - \frac{2}{10} = \frac{3}{10}$

Woensdag

opwarmertjes

Een zakje met 10 snoepjes

- 5
- 9
- 1
- 4

Een zakje met 20 snoepjes

- 10
- 5
- 16
- 2
- 13

Een zakje met 6 snoepjes

- 3

Een zakje met 8 snoepjes

- 2

Shop till you drop, baby

1. 15 euro
2. Spijkerbroek: 10 euro
Rokje: 5 euro
3. 15 euro van 20 euro is 75 %
4. 15 euro
15 euro van 50 euro is 30 %

Toppunt

5. Evi mocht vandaag 25 euro uitgeven (50% van 50 euro = 25 euro). Aan de spijkerbroek en het rokje heeft Evi al 15 euro uitgegeven. Ze houdt dus nog 10 euro over om uit te geven aan een broodje.
10 euro van 50 euro = 20 %

Donderdag

Opwarmertjes

Verhouding tot het totaal	Een breuk	procent
1 op de 2	$\frac{1}{2}$	50%
1 op de 20	$\frac{1}{20}$	5%
3 op de 4	$\frac{15}{20} \quad (= \frac{3}{4})$	75%
1 op de 10	$\frac{2}{20} \quad (= \frac{1}{10})$	10%
3 op de 10	$\frac{6}{20} \quad (= \frac{3}{10})$	30%
7 op de 10	$\frac{14}{20} \quad (= \frac{7}{10})$	70%
1 op de 5	$\frac{4}{20} \quad (= \frac{1}{5})$	20 %

Smartphone fever

1. $\frac{4}{10} = \frac{2}{5}$
2. 20 vrienden
1 op de 3 vrienden
3. 5% van de batterij verliest de mobiel van Omar. Hij houdt dus nog 35 % over (40% - 5% = 35%)

Toppunt

4. $\frac{5}{2}$ staat gelijk aan 2 uur $\frac{1}{2}$.
Als de batterij 20 % oplaadt per uur en de mobiel 2 en half uur aan een oplader ligt dan komt er 50% bij (20 + 20 + 10). De batterij was 35 % opgeladen, dus nu is de mobiel voor 85 % opgeladen (50+35)

Appendix 3.2.3. Docenteninstructie – controle

Deze week wordt er onderzocht hoe leerlingen er mee omgaan als zij geconfronteerd worden met snoep. We willen zien of de aanwezigheid van snoep de aantrekkingskracht ervan verminderd. Het wordt onderzocht of de aanwezigheid van snoep wanneer ze hier niet van mogen eten, kinderen kan leren met verleidingen om te gaan.

Op maandag komt de onderzoeker een vragenlijst afnemen bij de leerlingen. Hierin worden vragen gesteld over een aantal basisgegevens, zoals hun naam, leeftijd, geslacht, gewicht en lengte. Ook worden er een paar vragen gesteld over hoe lekker ze snoep en specifiek, Fruittella vinden.

Op vrijdag komt de onderzoeker terug. De leerlingen worden gevraagd of zij weer een vragenlijst willen invullen. Aanvullend op de vorige vragenlijst, zal de vragenlijst aangevuld zijn met vragen naar strategieën om met snoep om te gaan en consumptie te beperken.

Appendix 3.3: Leerlingeninstructie

Appendix 3.3.1. leerlingeninstructie - snoeppot conditie

“Ik ben Froukje van de Wageningen Universiteit. Ik ben naar jullie school gekomen, omdat ik graag wil weten hoe jullie met snoepen omgaan. Ik ben benieuwd hoe jullie over snoep denken. Deze week doen jullie mee aan een onderzoek naar snoep. Vandaag mogen jullie een vragenlijst invullen. Deze vragen zijn geen toetsen. Er zijn geen goede of foute antwoorden, dus vul vooral in wat het beste bij jou past. Vul de vragenlijst zo eerlijk mogelijk in. De antwoorden die je geeft in de vragenlijst zijn privé. Dat betekent dat alleen de onderzoekers weten wat je hebt ingevuld. We vertellen je antwoorden niet aan de juf of meester of aan je ouders. Als je iets niet snapt, steek dan je hand op, dan kom ik je helpen.

Vrijdag kom ik terug en wil ik jullie nog een paar vragen over snoep stellen. Tot die tijd staat er een pot vol met snoepjes in de klas (laten zien). Deze zijn niet voor nu, maar hier gaan we vrijdag proefjes mee doen. Deze week staat de pot op het bureau van de juf/meester. Op vrijdag mogen jullie ook weer een vragenlijst invullen over snoepen.

Als je om welke reden dan ook niet mee wilt doen, of je wilt halverwege stoppen, dan mag dat. Laat het mij dan even weten. Doen jullie allemaal mee?”

To do:

- Checken welke kinderen niet mee mogen doen.
- Afnemen pre-test vragenlijst.
 - Uitleggen: onder snoepen verstaan we snoep zoals Fruittella, chocola, dropjes, lollies, winegums etc.
 - Eerst wat basisgegevens (hoe je heet, hoe zwaar en lang je bent en of je een jongen of meisje bent)
 - Uitleggen vragenlijst, wat betekent ‘helemaal niet – altijd’ bijv.. Bijv. bij de uitspraak “ik vind snoep lekker”. Als je het hier totaal niet mee eens bent en eigenlijk snoep helemaal niet lekker vindt, zet je een kruisje bij “helemaal niet”. Vind je snoepen juist hartstikke lekker, dan zet je een kruisje bij “heel erg”
 - Uitleggen tekens in vragenlijsten zoals < en >
 - Individueel vragenlijst maken, niet overleggen
- Checken of ze naam hebben opgeschreven op vragenlijst.
- Checken bij juf/meester of er dubbele namen bij zitten.
- Wegen van snoeppot voor aankomst

Attributen

- Fruittella's
- Bowl of glass with lit
- Pre-test questionnaires

- Instructions for teachers and students
- Opmerkingenlijst voor docenten

Vrijdag

“Hé daar ben ik weer, Froukje van de Wageningen Universiteit. Dank jullie wel dat jullie meedoen aan mijn onderzoek. Aan het einde mogen jullie als bedankje Apekoppen uitkiezen, of als je daar geen zin in hebt, mag je ook Fruitkick appel nemen. Maar eerst mogen jullie nog 1 keer een vragenlijst invullen. Als je iets niet snapt, steek dan je hand op, dan kom ik je helpen. Vul de vragenlijst zo eerlijk mogelijk in. Er zijn geen goede of foute antwoorden.”

To do:

- Herhalen uitleg betekenis van waarden (altijd etc) en tekens als < en >
- Als ze de vragenlijst afhebben krijgen ze een zakje Apekoppen (ondanks de hoeveelheid snoepjes die ze hebben ingevuld te willen krijgen)
- Wegen van snoeppot

Attributen

- Apekoppen
- Fruitkick appel
- Post-test questionnaires

Appendix 3.3.2. leerlingeninstructie - rekenen met snoepjes

Maandag

“Ik ben Froukje van de Wageningen Universiteit. Ik ben naar jullie school gekomen, omdat ik graag wil weten hoe jullie met snoepen omgaan. Ik ben benieuwd hoe jullie over snoep denken. Deze week doen jullie mee aan een onderzoek naar snoep. Vandaag mogen jullie een vragenlijst invullen. Deze vragen zijn geen toetsen. Er zijn geen goede of foute antwoorden, dus vul vooral in wat het beste bij jou past. Vul de vragenlijst zo eerlijk mogelijk in. De antwoorden die je geeft in de vragenlijst zijn privé. Dat betekent dat alleen de onderzoekers weten wat je hebt ingevuld. We vertellen je antwoorden niet aan de juf of meester of aan je ouders. Als je iets niet snapt, steek dan je hand op, dan kom ik je helpen.

Vrijdag kom ik terug en wil ik jullie nog een paar vragen over snoep stellen. Tot die tijd gaan jullie elke dag rekenen met snoepjes. Jullie krijgen daarom allemaal een bakje met 20 snoepjes. Op het bakje zit een witte sticker. Zet hierop je naam. De snoepjes heb je nodig om de sommetjes uit te kunnen voeren. Tussen deze lessen mag je de bakjes in je eigen lade doen. Bewaar de bakjes dus goed, want je hebt ze elke dag nodig.

Op vrijdag mogen jullie ook weer een vragenlijst invullen over snoepen.

Als je om welke reden dan ook niet mee wilt doen, of je wilt halverwege stoppen, dan mag dat. Laat het mij dan even weten. Doen jullie allemaal mee?”

To do:

- Checken welke leerlingen niet mee mogen doen.
- Afnemen pre-test vragenlijst.
 - o Uitleggen: onder snoepen verstaan we snoep zoals Fruittella, chocola, dropjes, lollies, winegums etc.
 - o Eerst wat basisgegevens (hoe je heet, hoe zwaar en lang je bent en of je een jongen of meisje bent)
 - o Uitleggen vragenlijst, wat betekent ‘helemaal niet – altijd’ bijv.. Bijv. bij de uitspraak “ik vind snoep lekker”. Als je het hier totaal niet mee eens bent en eigenlijk snoep helemaal niet lekker vindt, zet je een kruisje bij “helemaal niet”. Vind je snoepen juist hartstikke lekker, dan zet je een kruisje bij “heel erg”
 - o Uitleggen tekens in vragenlijsten zoals < en >
 - o Individueel vragenlijst maken, niet overleggen
- Checken of ze naam hebben opgeschreven op vragenlijst.
- Checken bij juf/meester of er dubbele namen bij zitten.

- Kinderen hun naam op hun bakje laten zetten.
- Eventueel helpen met afnemen ‘rekenen met snoep’ mocht daar vraag naar zijn.
- Checken niveau sommen bij docent.
- Bakjes in eigen la bewaren

Attributen

- Fruittella's
- Pre-test questionnaires
- Instructions for teachers and students
- Small bowl for each child (with sticker)
- Answering sheets for calculations (printed by teacher)
- Pencil for writing names
- Opmerkingenlijst voor docenten
- Antwoordmodel voor rekenen

Vrijdag

"Hé daar ben ik weer, Froukje van de Wageningen Universiteit. Dank jullie wel dat jullie meedoen aan mijn onderzoek. Aan het einde mogen jullie als bedankje een smaak Apekoppen uitkiezen! Natuurlijk mag je ook voor iets gezonds kiezen als je geen zin hebt in snoep. Maar eerst mogen jullie nog 1 keer een vragenlijst invullen. Als je iets niet snapt, steek dan je hand op, dan kom ik je helpen. Vul de vragenlijst zo eerlijk mogelijk in. Er zijn geen goede of foute antwoorden."

To do:

- Als ze de vragenlijst afhebben krijgen ze een zakje Apekoppen (ondanks de hoeveelheid snoepjes die ze hebben ingevuld te willen krijgen)
- De antwoordbladen voor het rekenen met snoepjes, mogen leerlingen mee naar huis nemen als ze willen
- Herhalen uitleg betekenis van waarden (altijd etc) en tekens als < en >

Attributen

- Apekoppen
- Fruitkick appel
- Post-test questionnaires
- Sandwich bags for collecting candy

Appendix 3.3.3. leerlingeninstructie - controle conditie

Maandag

“Ik ben Froukje van de Wageningen Universiteit. Ik ben naar jullie school gekomen, omdat ik graag wil weten hoe jullie met snoepen omgaan. Ik ben benieuwd hoe jullie over snoep denken. Deze week doen jullie mee aan een onderzoek naar snoep. Vandaag mogen jullie een vragenlijst invullen. Deze vragen zijn geen toetsen. Er zijn geen goede of foute antwoorden, dus vul vooral in wat het beste bij jou past. Vul de vragenlijst zo eerlijk mogelijk in. De antwoorden die je geeft in de vragenlijst zijn privé. Dat betekent dat alleen de onderzoekers weten wat je hebt ingevuld. We vertellen je antwoorden niet aan de juf of meester of aan je ouders. Als je iets niet snapt, steek dan je hand op, dan kom ik je helpen.

Vrijdag kom ik terug en wil ik jullie nog een paar vragen over snoep stellen. Op vrijdag mogen jullie ook weer een vragenlijst invullen over snoepen.

Als je om welke reden dan ook niet mee wilt doen, of je wilt halverwege stoppen, dan mag dat. Laat het mij dan even weten. Doen jullie allemaal mee?”

To do:

- Checken welke kinderen niet mee mogen doen.
- Afnemen pre-test vragenlijst.
 - o Uitleggen: onder snoepen verstaan we snoep zoals Fruittella, chocola, dropjes, lollies, winegums etc.
 - o Eerst wat basisgegevens (hoe je heet, hoe zwaar en lang je bent en of je een jongen of meisje bent)
 - o Uitleggen vragenlijst, wat betekent ‘helemaal niet – altijd’ bijv.. Bijv. bij de uitspraak “ik vind snoep lekker”. Als je het hier totaal niet mee eens bent en eigenlijk snoep helemaal niet lekker vindt, zet je een kruisje bij “helemaal niet”. Vind je snoepen juist hartstikke lekker, dan zet je een kruisje bij “heel erg”
 - o Uitleggen tekens in vragenlijsten zoals < en >
 - o Individueel vragenlijst maken, niet overleggen
- Checken of ze naam hebben opgeschreven op vragenlijst.
- Checken bij juf/meester of er dubbele namen bij zitten.

Attributen

- Pre-test questionnaires
- Instructions for teachers
- Instructions for students

Vrijdag

“Hé daar ben ik weer, Froukje van de Wageningen Universiteit. Dank jullie wel dat jullie meedoen aan mijn onderzoek. Aan het einde mogen jullie als bedankje een smaak Apekoppen uitkiezen! Natuurlijk mag je ook voor iets gezonds kiezen als je geen zin hebt in snoep. Maar eerst mogen jullie nog 1 keer een vragenlijst invullen. Als je iets niet snapt, steek dan je hand op, dan kom ik je helpen. Vul de vragenlijst zo eerlijk mogelijk in. Er zijn geen goede of foute antwoorden.”

To do:

- Als ze de vragenlijst afhebben krijgen ze een zakje Apekoppen (ondanks de hoeveelheid snoepjes die ze hebben ingevuld te willen krijgen)
- Herhalen uitleg betekenis van waarden (altijd etc) en tekens als < en >

Attributen

- Apekoppen
- Fruitkick appel
- Post-test questionnaires

Appendix 4: pre-test questionnaire

Wat is je naam:.....

Hoe oud ben je:..... jaar

Hoeveel weeg je? (maak een schatting als je het niet precies weet)

Gewicht:..... kg

Hoe lang ben je? (Maak een schatting als je het niet precies weet)

Lengte:..... m

Ik ben een: ☐ jongen ☐ meisje

Nu worden er een paar vragen gesteld over snoep. Denk bij snoep bijvoorbeeld aan Fruittella, drop, lollies, chocolade etc. Kruis het antwoord aan dat het beste bij je past. Ga op je gevoel af. Er zijn geen goede of foute antwoorden.






Een voorbeeld: neem de uitspraak “Ik vind snoep lekker”. Als je snoep erg lekker vindt, dan zet je een kruisje bij “heel erg”. Als je snoep helemaal niet lekker vindt, zet je een kruisje bij “helemaal niet”.

Als je een fout hebt gemaakt, streep je het foute antwoord door. Kruis vervolgens het goede antwoord aan. Als je een vraag niet goed snapt, zet dan een sterretje * voor die vraag. Probeer wel om toch alsnog een antwoord te geven, ook op zulke moeilijke vragen!



Naam:.....

Hieronder staan een paar uitspraken over snoep. Zet een kruisje bij het antwoord dat het beste bij je past. Wat vind jij van snoep?

	 Helemaal niet	 Niet zo	 Ik weet het niet	 Een beetje	 Heel erg
Ik vind snoep lekker					
Ik vind Fruittella lekker					
Ik vind snoep er aantrekkelijk uitzien					
Ik vind Fruittella's er aantrekkelijk uitzien					
Ik wil nu graag snoep eten					
Ik wil nu graag Fruittella eten					

Omcirkel het antwoord wat voor jou op de stippellijn past.

Hoe hard wil jij je best doen als je daar snoepjes voor zou krijgen?

Om 1 snoepje te krijgen, ben ik bereid om minuten huiswerk te maken	< 5 min	5 – 10 min	10-15 min	15-20 min	20 - 25 min	25-30 min	>30 min
Om 3 snoepjes te krijgen, ben ik bereid om minuten huiswerk te maken	< 5 min	5 – 10 min	10-15 min	15-20 min	20 - 25 min	25-30 min	>30 min
Om een zakje snoepjes te krijgen, ben ik bereid om minuten huiswerk te maken	< 5 min	5 – 10 min	10-15 min	15-20 min	20 - 25 min	25-30 min	>30 min

Appendix 5: questionnaire post-exposure

Afgelopen maandag hebben jullie al vragen beantwoord over snoep. Ook deze vragenlijst staat in het teken van snoep. Bij de meeste vragen staan meerdere antwoorden. Kruis het antwoord aan dat het beste bij je past op dit moment. Ga op je gevoel af. Er zijn geen goede of foute antwoorden.

Een voorbeeld: Neem de uitspraak “Ik heb honger”. Als je op dit moment een beetje trek hebt, omcirkel je “een beetje”.

Als je een fout hebt gemaakt, streep je het foute antwoord door. Kruis vervolgens het goede antwoord aan. Als je een vraag niet goed snapt, zet dan een sterretje * voor die vraag. Probeer wel om toch alsnog een antwoord te geven, ook op zulke moeilijke vragen!



Wat is je naam:.....

Hoe oud ben je:..... jaar

Hoeveel honger heb jij? Omcirkel het antwoord wat als eerste bij je op komt.

Ik heb honger	Helemaal niet	Een beetje	Erg honger
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Hoeveel snoep jij thuis? Denk hierbij terug aan de afgelopen week of maand. Omcirkel het antwoord wat als eerste bij je op komt.






Ik mag van mijn ouders snoepen	Bijna nooit Bijv. 1-3 keer per maand	Soms Bijv. 1 keer per week	Regelmatig Bijv. 2-5 keer per week	Vaak Bijv. Elke dag	Altijd Bijv. elke moment van elke dag
Van mijn ouders mag ik veel snoepen per keer	Bijna niks Bijv. 1 snoepje per keer	Maar een beetje Bijv. een paar snoepjes per keer	Redelijk wat Bijv. een handje snoepjes per keer	Veel Bijv. Meerdere handjes snoepjes per keer	Hoeveel ik maar wil Bijv. Hoeveel zakken ik maar op kan

Omcirkel het antwoord wat voor jou op de stippellijn past.

Hoe hard wil jij je best doen als je daar snoepjes voor zou krijgen?

Om 1 snoepje te krijgen, ben ik bereid om minuten huiswerk te maken	< 5 min	5 – 10 min	10-15 min	15-20 min	20-25 min	25- 30 min	>30 min
Om 3 snoepjes te krijgen, ben ik bereid om minuten huiswerk te maken	< 5 min	5 – 10 min	10-15 min	15-20 min	20-25 min	25- 30 min	>30 min
Om een zakje snoepjes te krijgen, ben ik bereid om minuten huiswerk te maken	< 5 min	5 – 10 min	10-15 min	15-20 min	20-25 min	25- 30 min	>30 min

Hieronder staan een paar uitspraken. Zet een kruisje bij het antwoord dat het beste bij je past. Wat vind jij van snoep?

	 Helemaal niet	 Niet zo	 Ik weet het niet	 Een beetje	 Heel erg
Ik vind snoep lekker					
Ik vind Fruittella lekker					
Ik vind Apekoppen lekker					
Ik vind snoep er aantrekkelijk uitzien					
Ik vind Fruittella's er aantrekkelijk uitzien					
Ik vind Apekoppen er aantrekkelijk uitzien					
Ik wil nu graag snoep eten					
Ik wil nu graag Fruittella eten					
Ik wil nu graag Apekoppen eten					

Hoeveel Fruittella's heb je de afgelopen week gesnoept in de klas? (maak een schatting als je het niet precies weet) (Alleen in de SUM versie)

..... Fruittella's

Afgelopen week stond er een pot er met snoepjes in de klas^{normative} /hebben jullie gerekend met snoepjes^{consumatory} /Snoepen kan erg lekker zijn^{control}.

Misschien herken je het wel?! In de wereld om je heen word je vaak geconfronteerd met lekker, maar vaak ongezond eten. Hoe ga jij om met al dat lekkere eten in je omgeving?

Hieronder staan een aantal uitspraken over verschillende manieren waarop je zou kunnen omgaan met lekkere snoepjes. Ik ben benieuwd of deze uitspraken ook voor jou gelden. Denk hierbij aan de *afgelopen week*. Omcirkel het antwoord dat het beste bij jou past.

Een voorbeeld: Neem de uitspraak “Als ik weet dat er snoepjes in de buurt zijn, vermijd ik deze expres.”. Als je dat in deze week nooit gedaan hebt, zet je een kruisje bij het antwoord “nooit”. Als je dat vaak gedaan hebt, zet je een kruisje bij het antwoord “vaak”.

	Geef je mening door een vakje aan te kruisen.				Naam:..... <small>NOR or SUM or CON</small>
	Bijna nooit	Soms	Regelmatig	Vaak	Altijd
Uitspraken					
Strategieën gericht op de verleiding zelf					
<i>Vermijden van verleidingen</i>					
1. Als ik weet dat er snoepjes zijn, blijf ik juist uit de buurt van het snoep					
2. Als ik weet dat er snoepjes zijn, probeer ik er zo min mogelijk naar te kijken, voelen of ruiken					
<i>Controleren van verleidingen</i>					
3. Als ik in de verleiding kom te snoepen, leg ik het snoep uit het zicht					
4. Als ik met iets bezig ben, zorg ik dat er geen snoep binnen handbereik ligt					
Strategieën gericht op de psychologische betekenis van de verleiding					
<i>Afleiding zoeken</i>					
5. Als ik zin heb om te snoepen, ga ik met een vriendje/vriendinnetje of de juf/meester praten					
6. Als ik zin heb om te snoepen, denk ik aan iets anders					
<i>Onderdrukken</i>					
7. Als er snoep in de buurt ligt, negeer ik de verleiding van de lekkere smaak					
8. Als ik wil snoepen, zeg ik gewoon “nee!” tegen mezelf					
Strategieën gericht op het doel zelf					
<i>Doelen en regels stellen</i>					
9. Ik spreek met mezelf af dat ik niet mag snoepen					
10. Ik heb regels om niet te veel te snoepen					
<i>Stilstaan bij doelen</i>					
11. Als ik zin heb om te snoepen, denk ik eraan dat snoep ongezond is					
12. Als ik zin heb om te snoepen, bedenk ik me dat ik er leuk wil blijven uitzien					

Versie die kinderen krijgen

	Geef je mening door een vakje aan te kruisen. Naam:.....				
	Bijna nooit	Soms	Regelmatig	Vaak	Altijd
Uitspraken					
1. Als ik weet dat er snoepjes zijn, blijf ik juist uit de buurt van het snoep					
2. Als ik weet dat er snoepjes zijn, probeer ik er zo min mogelijk naar te kijken, voelen of ruiken					
3. Als ik in de verleiding kom te snoepen, leg ik het snoep uit het zicht					
4. Als ik met iets bezig ben, zorg ik dat er geen snoep binnen handbereik ligt					
5. Als ik zin heb om te snoepen, ga ik met een vriendje/vriendinnetje of de juf/meester praten					
6. Als ik zin heb om te snoepen, denk ik aan iets anders					
7. Als er snoep in de buurt ligt, negeer ik de verleiding van de lekkere smaak					
8. Als ik wil snoepen, zeg ik gewoon “nee!” tegen mezelf					
9. Ik spreek met mezelf af dat ik niet mag snoepen					
10. Ik heb regels om niet teveel te snoepen					
11. Als ik zin heb om te snoepen, denk ik eraan dat snoep ongezond is					
12. Als ik zin heb om te snoepen, bedenk ik me dat ik er leuk wil blijven uitzien					

Naam:.....

Bedankt voor je deelname! We hopen dat je het leuk vond om mee te doen! Als bedankje mag je van ons Apekoppen :)

Hoeveel Apekoppen zou je nu willen eten? Omcirkel het antwoord wat nu het meeste van toepassing is.

0 1 2 3 4 5 6 7 8 9 10

