Hot or not?

The influence of the visceral state of hunger and self-efficacy on the formulation of implementation intention plans in order to lose weight

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Abstract

Current study aimed to examine the influence of the visceral state of hunger and the enhancement of self-efficacy, on the formulation of implementation intention plans in order to lose weight. It was hypothesized that people in the hot state were able to formulate qualitative better implementation intention plans regarding weight loss than people in the cold state. In addition, it was expected that enhancement of self-efficacy lead to the qualitatively better formulated implementation intention plans. In this experimental study 97 participants were part of the experiment and were asked to fill out an inquiry. Unfortunately, no evidence was found to support the predictions. It seems that the visceral state of hunger and the enhancement of self-efficacy do not affect the formulation of implementation intention plans in order to lose weight. The coding scheme used to assess the quality of implementation intention plans and the exercise via mental simulation in which the plans were formulated, can account for not finding support for the predictions.

Preface

By writing this thesis I would like to help people that want to lose weight. This study focuses on this target group. The reason for conducting this study is that nowadays people are more occupied with their weight: more and more people engage into weight loss. Not only the great amount of people that are overweight, but also people with a healthy BMI engage into weight loss programs in order to maintain their weight. The media enhances this effect by displaying models with slim bodies. People of all ages (therefore) struggle to lose weight: they eagerly form intentions to lose weight. They purchase the latest dieting books and dieting shakes, refrain themselves from unhealthy food or subscribe themselves at the gym. In my environment there are many people that are overweight, one of them is my mother. I experience them often struggling in losing weight. Enthusiastically and driven they form plans to lose weight, for example: "I will only eat healthy food". I notice that they can hold on to these intentions for a day or two, after which they relapse. This relapse often goes hand in hand with feelings of disappointment. Having witnessed this process many times, I would like to help people that have the serious intention to lose weight, but find it difficult to hold on to their intentions. As overweight influences ones self-esteem, I want to emphasize that I do not want to help people lose weight because of the way they look. Since people are not defined by their looks, but by their characters. The reason that I would like to help them is because of the serious health risks attached to being overweight. For this reason I am interested in the field of health behavior, as this aims to prevent people from enacting behavior that can be harmful to their health and wellbeing. I would like to help people to preserve their health.

While conducting the study many participants indicated that participation helped them to be consciously aware of their intention and motivated them to enact this intention. Even though they found it confronting, they evaluated it as helpful to recognize the moments of relapse.

I would like to – wholeheartedly – thank Denise de Ridder for supervising, helping and supporting me in conducting this study and writing this thesis. She introduced me in the world of Health Psychology and Self-Regulation and enthuse me at the very instance. Thanks to her, I enjoyed conducting the research and writing the thesis. Because of her supervision I am driven to be active in the research field in the future.

I also would like to thank Aukje Verhoeven sincerely for helping me – despite her busy schedule - in the process of assessment. I appreciate this a lot. Her remarks and knowledge were helpful in conducting the study.

Lastly, I would like to thank the companies (ServiceNow, Parts Express and Bouter Cheese) that gave me the opportunity to collect data. I value it enormously that employers gave the permission to conduct this experiment during working-shifts. I also appreciate it a lot that employees – despite their workload – took

the time to help me.

I hope you will enjoy reading the thesis as much as I enjoyed conducting the study and writing the thesis!

Sharoshna Joeglal

Vianen, 6th of June 2014.

Contents:

Introduction

Society nowadays forces people to lead stressful lives that consists mainly of rushing, hurrying and a lot of stress. With only very few time to exercise or to cook a healthy meal, people nowadays tend to adopt an unhealthy lifestyle, in which people tend to spend little time to preserve their health. Nowadays the "quickness" of food (e.g. fast food) is preferred over the healthiness of the food . The effect of this lifestyle is visible in the many people that struggle with their weight. In 2008 over 1.4 billion adults were overweight (World Health Organisation, 2013). The National Institute of Diabetes and Digestion and Kidney diseases (2012) notes that serious medical conditions, such as: type 2 diabetes mellitus, heart disease, stroke, hypertension, colon cancer, gallbladder disease and other serious health problems are related to obesity and overweight conditions. Because of the various health risks this problem needs to be addressed. Therefore, many people engage into health behaviors, which can be seen as activities undertaken for the purpose of preventing or detecting disease in order to improve health and wellbeing (Conner & Norman, 2005). Health behaviors influence health through three pathways : by producing biological changes, by changing exposure to health risks and by treatment of disease (Baum & Posluszny, 1999). An example of this is weight loss. Research from Stoltz, Reysen, Wolff & Kern (2009) indicates that lifestyle attributes are associated with the psychological, emotional, behavioral and motivational processes that may account for successful weight management. People therefore make plans to lose weight through self-change in order to improve their health and wellbeing. These plans are known as goal intentions. Goal intensions are concerned with intentions to perform a behavior or achieve a goal (i.e., "I intend to lose weight") (Abraham, Conner, Jones, & O'Conner, 2008). Often, this process is successful initially, but will be followed by a pattern of relapse (Polivy & Herman, 2000).

Gollwitzer (1993) made the distinction between goal intentions and implementation intensions. The latter has been shown to be an effective strategy for enacting the formed intentions, in situations that provide opportunities for goal-directed behavior as well as in situations that threaten goal-directed behavior (Gollwitzer & Sheeran, 2006). Implementation intensions involve "if-then"-plans, which specify an environmental prompt or context that will determine when the action should take place. The key point regarding implementation intentions is that they commit the individual to a specific course of action when certain environmental conditions are met. Sheeran, Milne & Webb (2006) emphasized the importance of a person identifying a response that will lead to goal attainment, when forming implementation intentions. Secondly, a person must anticipate a suitable occasion to initiate that response. An example of an implementation intention regarding weight loss is: "If I feel like eating crisps while watching television, I will eat a healthy apple". The specified environmental cue prompts the action so that the person does not have to remember or decide when to act.

In a laboratory study by Gollwitzer & Brandstätter (1997) participants were assigned to various goal projects, over which the completion rate was explored. Findings indicated that difficult goal intentions were completed three times more when participants had furnished them with implementation intentions. Additionally, beneficial effects of implementation intentions were found when participants were assigned to the same difficult goal intentions, but only half of them were instructed to use implementation intentions. Furthermore, implementation intentions facilitated the immediate initiation of goal directed action when the intended opportunity was encountered.

Formulating implementation intentions appear to be particularly effective in approaching the common problem in performing the intention, namely forgetting about the intention. Because of the specified cues that were initially identified, forgetting appears to be less likely (Abraham, et al., 2008). Once people engage into plans based upon implementation intentions, goal-directed behavior will be automatically triggered when the specified situation is encountered. This may be beneficial in the process of wanting to lose weight, because an intense state of hunger may make one forget about the intensions formed initially. In a study by Parks-Stamm et al. (2007) participants were instructed to identify words with a "D" (simple identification task) and respond by counting the number of letters of that given word (difficult response task). Given the fact that the latter requires much cognitive capacity, implementation intentions were expected to produce beneficial effects on task performance by automating response initiation, rather than facilitating cue detection. Evidence was found to support this hypothesis. The beneficial effects of implementation intentions on the initiation of critical response were not associated with a reduction in the initiation of alternative goal-directed responses, indicating the *automatic process*.

A well-known moment of relapse is often indicated by the visceral state of hunger. These visceral states can be described as signs from the internal body that guide people to perform a behavior that fulfills the needs of the body. When hungry, people experience a visceral state of hunger in which the body creates a strong desire for food-intake (Evers et al., 2011). According to the theory of the hot-cold system described by Metcalfe & Mischel (1999), hunger can interfere with plans made to lose weight. Activation of the cold-system involves: cognitive, complex, reflective, slow, weakened by stress, late developed and self-control mechanisms. Activation of the hot-system involves emotional, simple, reflex, quick, emphasized by stress, early developed and stimulus-control mechanisms. Activation of the hot-system facilitates the impulsive system taking the lead, while the cold system is functioning less. This means that during the visceral state of hunger decisions will be made more quickly and based upon emotions.

According to the Hot-cold empathy gap people in a hot-state cannot imagine how one will behave while being in a cold-state. Similarly, people in a cold-state cannot imagine how one will behave while being in a hot-state. The cold-state represents a state of hunger, while the cold-state represents a state of being satiated. According to Loewenstein (1996) it is due to constrained memory for visceral experience

that the visceral impulse is underestimated. This brings difficulty in formulating plans to lose weight. While being in a cold-state (satiated) the strength of the hot-state (hunger) is underestimated, plans formulated during this state mostly are not able to resist a person from acting a kind of behavior (eating). It appears that dieters craving for food (hot state) are more realistic in determining the difficulty of losing weight than satiated dieters (cold state). The latter had a more optimistic perspective, but underestimated the difficulty of this intention (Nordgren, van der Pligt, & Harreveld, 2008).

This theory is clearly visible in the intention-behavior gap. This refers to the fact that intentions are far from perfect predictions of behavior (Abraham, et al., 2008). A meta-analysis of 47 tests by Webb & Sheeran (2006) reveals that medium-to-large sized change in intentions engenders only a small-to-medium change in behavior. In respect, findings showed that intentions have less impact on behavior, when the participants lack control over the behavior, when there is potential for social reaction and when circumstances of the performance are conducive to habit formation. All given explanations seem accountable for being in a state of hunger.

On the other hand, according to Abraham, et al. (2008) self-efficacy promotes intention and performance. Therefore consideration of self-efficacy enhancement can be helpful in the process of changing motivation and behavior. Self-efficacy is the belief that a behavior is or is not within an individual's control and is usually assessed as the degree of confidence the individual has that they could still perform the behavior in the face of various environmental barriers. According to Bandura (1994) there are four approaches to enhance self-efficacy, namely: mastery experiences, vicarious experience, verbal persuasion and perception of physiological and affective states. The people who believe that they will succeed, and thus are high in self-efficacy, form more challenging goals. They then exert more effort, involve in more flexible problem-solving strategies and are more persistent because they believe in their success. On the other hand, people with low self-efficacy tend to experience self-doubt, activating poor analytic thinking and less effort in completing a difficult task (Bandura, 1994). Self-efficacy therefore affects how people conceptualize an intention, how confident they feel during performance, how persistent they are regarding setbacks, how much effort they exert en how they feel about themselves during performance (Abraham, et al., 2008). A way to enhance self-efficacy is by mental simulation. Mental simulation may enhance feelings of self-efficacy by virtue of making a goal seem proximal or by yielding information about how to achieve a goal. Mental simulation provides a window on the future by enabling people to envision possibilities and develop plans for bringing those possibilities about. Experts have long recognized the important role that mental simulation can play in solving problems. Mental simulation seems essential for coping effectively with inevitable stressful circumstances (Taylor, Pham, Rivkin, & Armor, 1998).

In the study of Koestner et al. (2006) it was found that the combination of implementation intentions with a self-efficacy boosting exercise would facilitate goal progress compared to a neutral control condition and a typical implementation condition. Nordgren, van der Pligt, & Harreveld (2009) conducted a study in which the self-efficacy and weight-loss beliefs of dieters was assessed, while being in either a hot or cold state, meaning in a hungry or in a satiated state. Findings indicate that participants in cold states showed higher self-efficacy than participants in a hot state. Furthermore, findings revealed that the more hungry a dieter was, the less weight she intended to lose and the less certain one was that the weight-loss goal could be attained. This finding indicates a relation between the visceral state of hunger, intentions and self-efficacy. However, results of the same study indicated that too much self-efficacy can be problematic as well, as it serves as a type of overconfidence. It was found that the participants with the highest self-efficacy formed the most unrealistic goals. The exact role of self-efficacy enhancement in forming intentions to lose weight is therefore still unclear.

Although studies regarding the hot and cold empathy gap suggests that it appears that people in the hot state are more realistic in determining the difficulty of losing weight than people in the cold state, no evidence has been found that implementation intention plans that are formed in order to lose weight, are influenced by the visceral state of hunger. Although implementation intentions are found to be effective, it is not yet clear whether the formation of those plans are state dependent. The question the current study focuses on is: Does the visceral state of hunger has an influence on the implementation intention plans made in order to lose weight? And does self-efficacy has an influence on how these plans are formulated?

Current research

Current research will explore the influence of the visceral state of hunger on the formulation of implementation intention plans in order to lose weight. Additionally, it is examined whether self-efficacy enhancement affects the quality of the formulated implementation intention plans. It will be investigated if a self-efficacy boost has effect on the formulation of implementation intention plans. It will be investigated if the visceral state of hunger and self-efficacy affect the formulation of the overall implementation intention plan, the formulation of the problematic situation (IF) and the formulation of the solution (THEN), words used to formulate the overall implementation intention plan, words used to formulate the problematic situation and words used to formulate the solution. A mental simulation task is used to facilitate the formulation of implementation intention plans. Based upon previous research on the hot and cold system it is expected that the – in the cold state- formed implementation intention plans are different from the implementation intention plans formed during the strong visceral state of hunger. Even

though research indicates that implementation intentions are an effective strategy to perform the formed intentions, it is expected that people in the hot state (state of hunger) are able to formulate qualitative better overall implementation intention plans regarding weight loss than people in the cold state (satiated). The reason for assessing the quality of implementation intention plans separately (overall, if and then) is that based upon previous research on the hot and cold system– it is expected that the formulation of the problematic situation is described in a better quality by people in a hot state. As, according to the theory of Loewenstein (1996), people in the hot state are able to estimate the strength of hunger more realistically: it is expected that hunger could lead to a better formulation of the problematic situation. People in the hot state can identify problematic situations more easily than people in the cold state. It is therefore expected that hunger could lead to better formulated problematic situations, but not necessarily to better formulated solutions. Both indicating that the formulation of implementation intention plans differ across the two states. Furthermore, it is expected that the enhancement of self-efficacy affects the formulation of implementation intention plans. It is expected that enhancement of self-efficacy leads to the qualitatively better formulated implementation intention plans compared to people that did not receive the self-efficacy boost.

Investigating this question can be considered highly relevant, seen the great amount of people in nowadays society that are overweight or want to lose weight, seen the various health risks that are involved. Many people want to lose weight, but fail to enact their intentions during the visceral state of hunger. If findings indicate that the formulation of implementation intentions are influenced by the visceral state of hunger, weight loss programs can be specified to more effective formulation of implementation intention plans. People can get help formulating an implementation intention plan regarding weight that is resistant against the strong visceral state of hunger. If findings indicate that self-efficacy enhancement facilitates the formulation of more optimistic implementation intention plans, it can be considered to add this psychological phenomenon to weight loss programs, in order to be even more effective. Overcoming the visceral state of hunger by enacting the implementation intention plan will motivate an individual to maintain the intention-behavior, because it provides the information that one is able to control the strong bodily signs to food-intake and that one is able to achieve their goals.

Method

Participants:

In this study 100 participants have participated, of who 53.6 % was female and 46.4% was male. Participants were employees of various departments of the company Service Now (located in Amsterdam), Parts Express (located in Vianen) and Bouter Cheese (located in Culemborg). Since the tasks of office personnel do not require physical activity during working hours, employees tend to feel inactive and want to lose weight. Therefore this study is focusing on office personnel. Participants were recruited by an invitation e-mail. In the invitation e-mail the purpose of the study was described by the influence of hunger on concentration, in order to preserve the effects that are studied in this experiment. People were motivated to participate by receiving a free breakfast. The non-response rate was 26,8%. This percentage can be explained by the fact that the experiment took place in a busy period: many employees were fully scheduled. Participants that responded were asked three global questions via e-mail. In one of them it was asked whether they – with the summer ahead – wanted to lose some weight. The question was asked globally to prevent giving away the purpose of the current study, as this otherwise would have affected the results. Unfortunately, seventeen people were excluded from the study for not having the intention to lose weight. These participants received an e-mail in which they were explained that the screening did not provide an indication for participating in the study. They were sincerely thanked for being willing to participate.

The participants that did have the intention to lose weight received the instructions for the study. Three participants were excluded from the database, as they did not complete the whole enquiry. Therefore the analytical sample consisted of 97 participants. Their mean age was 38.7 years ($SD = 11.3$).

Design :

In this study experimental research is conducted. The design can be described as a 2x2 between-design. The independent variables in this study were hunger (deprived vs. satiated condition) and self-efficacy (self-efficacy boost vs. non-self-efficacy boost condition). The dependent variable is the formulation of implementation intention plans, and is operationalized by a combination of different coding schemes of to assess the Quality of Plans (Adriaanse, 2010; De Ridder et. al. 2010; De Vet et. al., 2011; Verhoeven, 2012).

Procedure:

Participants were randomly assigned to either the deprived or satiated condition and to either the self-efficacy boost or non-self-efficacy boost condition. Participants in the deprived condition were instructed

to refrain from eating and drinking (except water) from 11 pm prior to their session. The experimental sessions were scheduled from 08.00 – 09.30 hour and took place in a conference room. Per session, up to four participants were tested. For practical reasons, participants in the same session were all in the same condition. Participants were placed apart from each other in order to prevent them from consulting.

Participants in the satiated condition were instructed to eat yoghurt half an hour before the session, to make sure that they were satiated. Participants then were invited to the breakfast buffet. After having the yoghurt and having breakfast they completed the experimental measures. Participants in the deprived condition first completed the experimental measures and then received their breakfast.

The experimental measure started with a 9-point Likert scale to assess the degree of hunger. Then, participants in the self-efficacy boost-condition were instructed to read a bogus article in which it was emphasized that office employers are able to determine their own success because they believe success is within their control and that because of this, they are more successful. Participants in the non-self-efficacy boost condition received an article that covered a neutral topic: the weather forecast. Following, participants ideas about potential challenging situations in weight loss attempt were assessed. First, they were asked to list all of the challenging situations they expected and to choose the situation that they thought would be most challenging. Subsequently they were asked via mental simulation to imagine the situation vividly. Participants were asked to describe the context, environment and the feelings associated with this situation. After they specified this situation in mind, they were asked to make a specified description of the problematic situation and write this after the "if"-part. Participants then engaged into mental simulation again to find solutions to this problematic situation. Participants were asked to imagine the situation, but to think of alternative behaviors in this challenging situation. Again, they had to imagine this situation specifically by describing what would happen in the situation and their associated feelings. The participants were asked to write down their specified solution as detailed and specific as possible, after the "then". Participants then were asked to form the whole implementation intention plan (If "X", Then "Y").

After the plans had been formulated, participants filled out the General Self-efficacy Scale as a manipulation-check. This questionnaire was taken after the actual experiment, to prevent priming-effects. Because participants were told the aim of the study was to investigate the influence of hunger on concentration, participants finished the experiment with a simulated visual concentration task (Pashler, 1998). To prevent the concentration task to counteract the results, this task was completed after the actual experiment. Participants were told to finish as much as possible from this concentration task in 90 seconds. At the end of the experiment the participants were fully debriefed and thanked for their participation.

Materials :

* Breakfast: the breakfast buffet consisted of white bread, brown bread, croissants, a typical Dutch toast variant ("beschuit"), a typical Dutch bread variant ("krentenbollen"), cornflakes, glass of orange juice, milk yoghurt, tea and coffee. The bread was fresh, all other foods were pre-packaged. All food was presented on a large table in the cafeteria, on neutral white dishware and white napkins. Participants were invited to eat as much as they wanted.

* Questionnaires: the whole task was provided on paper. The questionnaire started with demographical questions. In addition, height and weight were asked. Participants then received the bogus article. Following, participants were instructed to formulate implementation intention plans. After this task participants filled out the General Self-Efficacy Scale (Jaruzalem & Schwarzer, 1981). This questionnaire was used in order to determine the level of self-efficacy, as a manipulation check. This scale consists of 10 items that is designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life. Cronbach's alpha ranged from .76 to .90. The last task covers the concentration task, since participants were told that the influence of hunger on concentration was measured. A visual concentration task was simulated (Pashler, 1998). Concentration was no part of the actual aim of the study, therefore these results were not used at all.

Quality of plans

The quality of plans was assessed using a composed coding schemes for quality of coping plans, based on literature in the field of self-regulation (Adriaanse, 2010; De Ridder et. al. 2010; De Vet et. al., 2011; Verhoeven, 2012) and on consultation sessions with experts in the field of self-regulation.

The plans were evaluated as a total plan, the "If" separately and the "Then" separately. Participants could score a maximum of four point in formulation the "If". Assessment was based on the specification of: when/where (when the situation specified a place or time), why (when the situation specified a feeling) and what (when the situation specified food). Participants could receive one bonuspoint in case of a vivid description (de Vet et. al, 2011). Since more detailed plans are generally easier to adhere to and planning to eat an apple instead of chocolate when watching television is more likely to lead to a behavioural action than simply planning to eat more healthily (Gollwitzer, 1999; De Ridder et. al., 2010). The problematic situation was also analyzed by the total amount of words used to formulate the problematic situation. If no problem was anticipated, the remaining criteria were not scored. Participants could also score a maximum of four point in the formulation of the solution ("then"). Assessment was based on the specification of: an alternative, specificity and positivity. Participants could again gain a bonuspoint if the solution was described vividly (Adriaanse, 2010). Some plans were not

actual solutions to the described problematic situation. This was assessed with the first criterion. If a plan was no solution to the problem, the remaining criteria were not scored.

All criteria were dichotomously scored. A sample was scored by three independent raters who were blind to the condition. After the first coding, the raters discussed any discrepancies and came to an agreement on all cases. The criteria were then summed per plan into a total score ranging from 0 (low quality) to 8 (high quality). The criteria were summed per description of the problematic situation as well, with the score ranging from 0 (low quality) to 4 (high quality), and the criteria were summer per description of the solution with the score ranging from 0 (low quality) to 4 (high quality). In addition, the total amount of words used to describe the implementation intention plan, the problematic situation and solution were taken into account.

Results

Manipulation check visceral states
The manipulation of the visceral states was analyzed using an univariate ANOVA. An alpha level of .05 was used for the statistical test. With regard to the degree of hunger a main effect was found, with people assigned to the satiated condition reported being less hungry ($M = 1,39$, $SD = 1,021$) than people that were assigned to the deprived condition ($M = 5,29$, $SD = 1,209$), $F(1,96) = 295,214$, $p < .001$, $\eta^2 = .76$. This can be described as a medium-large effect following Cohen's criteria. In conclusion, the hunger manipulation was successful.

Manipulation check self-efficacy
The manipulation of self-efficacy was analyzed using an univariate ANOVA. An alpha level of .05 was used for the statistical test. With regard to the total score on the General Self-Efficacy Scale no main effect was found. People assigned to the high self-efficacy condition ($M = 31.38$, $SD = 5,115$) and people that were assigned to the low self-efficacy condition did not differ significantly ($M = 30,20$, $SD = 5,505$), $F(1,96) = 1,206$, $p = .275$. It can be concluded the manipulation of self-efficacy was not successful, since no main effect was found.

General descriptives
The total score on the General Self-efficacy Scale varied from a minimum of ten points to a maximum of forty points ($M = 30.84$, $SD = 5,305$). The total score regarding the quality of implementation intention

plans varied from a minimum of zero points to a maximum of eight points ($M = 3,22$, $SD = 2,595$). The quality of the formulation of the problematic situation varied from one to four point ($M = 1,65$, $SD = 1,377$). The quality of the formulation of the solution varied from one to four points as well ($M = 1,57$, $SD = 1,421$). The total amount of words used in the formulation of implementation intention plans varied from a minimum of two words to a maximum of forty-six words ($M = 22,15$, $SD = 9,661$). The amount of words used to describe the problematic situation varied from a minimum of one word to a maximum of twenty-two words ($M = 10,05$, $SD = 4,921$). The amount of words used to describe the solution varied from a minimum of one word to a maximum of thirty-one words ($M = 12,00$, $SD = 6,367$). The degree of hunger varied from extremely satiated to extremely hungry ($M = 3,04$, $SD = 2,226$).

In the formulation of implementation intention plans 21,6% of the participants chose to solve the problematic situation by eating a more healthy alternative, for instance an apple instead of a piece of cake. About 11,3% of the participants formulated two alternative steps in order to prevent failing to enact their intention. About 9,3% of the participants chose to avoid or flee from the problematic situation. About 15,5% of the participants did not define a problematic situation. About 9,3% of the participants did not formulate a concrete plan.

Randomization check
With regard to the manipulation of the visceral states, 56 participants were assigned to the satiated group and 41 participants were assigned to the deprived group. Not all participants in this condition were randomly assigned, since some participants – due to health reasons - were not able to deprive themselves from food. These participants were assigned to the satiated group. Apart from these participants, all participants were assigned randomly to the conditions. About 60.7% of the satiated group was female, 39.3% was male ($M = 0.39$, $SD = .493$). About 43.9% of the deprived group was female and 56.1% was male ($M = .56$, $SD = .502$). Age of participants in the satiated group varied from 22 to 65 years of age ($M = 37.28$, $SD = 10.735$). The age of participants in the deprived group varied from 19 to 64 years of age($M = 40.54$, $SD = 11.771$). With regard to the manipulation of self-efficacy, 52 participants were randomly assigned to the self-efficacy boost condition and 45 participants were randomly assigned to the non-self-efficacy boost condition. Exactly 50% of the self-efficacy boost condition was female and 50% was male ($M = .50$, $SD = .505$). About 57.8% of the non-self-efficacy boost condition was female and 42.2% was male ($M = .42$, $SD = .499$). Age of the participants in the self-efficacy boost condition varied from 25 to 64 years of age ($M = 38,74$, $SD = 9.142$). Age of participants in the non-self-efficacy boost condition varied from 19 to 64 years of age ($M = 38.66$, $SD = 13.368$).

Preliminary analyses

Since the assumption of homogeneity was violated, a Spearman's Rho was used to test whether the total amount of words are related with the quality of implementation intention plans. Spearman's Rho indicated the presence of a significant, medium, positive correlation between the total amount of words and the quality of implementation intention plans, $r_s = .434$, $p < .001$, two-tailed, $N = 97$. Kendall's Tau-B indicated that the correlation between the total amount of words and the quality of implementation intention plans was significant, weak and positive, $\tau = .329$, $p < .001$, two-tailed, $N = 97$.

Since the assumption of homogeneity was violated, a Spearman's Rho was used to test whether the total amount of words used to describe the problematic situation and to describe the solution are related to the degree of hunger. Spearman's Rho indicated the presence of a weak, positive, non-significant correlation between the total amount of words used to formulate the problematic situation and the degree of hunger, $r_s = .159$, $p = .119$, two-tailed, N= 97. Kendall's Tau-B indicated that the correlation between the total amount of words used to describe the problematic situation and the degree of hunger was weak and positive and non-significant, $\tau = .114$, $p = .129$, two-tailed, $N = 97$. Spearman's Rho indicated the presence of a weak, positive correlation between the total amount of words used to formulate the solution and the degree of hunger, $r_s = .054$, $p = .596$, two-tailed, N = 97. Kendall's Tau-B indicated a weak, positive correlation between the total amount of words used to formulate the solution and the degree of hunger, $r_s = .043$, $p = .596$, two-tailed, N= 97.

Since the assumption of homogeneity was violated, a Spearman's Rho was used to test whether the quality of the IF-plan was correlated to the quality of the then-plan. Spearman's Rho indicated a strong, positive and significant correlation between the quality of the if- and then plans, $r_s = .735$, $p < .001$, two tailed, N= 97. Kendall's Tau-B indicated a strong, positive and significant correlation as well, , $\tau = .630$, $p < .001$, two-tailed, $N = 97$.

Since the assumption of homogeneity was violated, a Spearman's Rho was used to test whether the total score on the GSE was related to the quality of plans. Spearman's Rho indicated the presence of a weak, negative, non-significant correlation between the total score on the GSE and the quality of plans, $r_s = -.050$, $p = .628$, two-tailed, N = 97. Kendall's Tau-B indicated that the correlation between the quality of plans and gender was weak, negative and non-significant, $\tau = .083$, $p = .276$, two-tailed, $N = 97$.

Since the assumption of homogeneity was violated, a Spearman's Rho was used to test whether the quality of plans was related to gender. Spearman's Rho indicated the presence of a weak, negative, non-significant correlation between the quality of plans and gender, $r_s = -.100$, $p = .331$, two-tailed, N = 97. Kendall's Tau-B indicated that the correlation between the quality of plans and gender was weak, negative and non-significant, $\tau = -.087$, $p = .329$, two-tailed, $N = 97$.

Test of hypotheses

A multivariate analysis of variance (MANOVA) was used to examine the effects of degree of hunger on the quality of plans (6 dv's: overall quality of implementation intention plans, formulation of the problematic situation and formulation of the solution, total amount of words, amount of words used to describe the problematic situation and amount of words used to describe the solution). With regard to the degree of hunger, no significant multivariate effect was found on the quality of the implementation intention plans, the quality of the problematic situation (IF), the quality of the formulated solution (THEN), the total amount of words, the amount of words used to formulate the problematic situation (IF) and the amount of words used to formulate the solution (THEN) $F(5, 89) = .994$, $p = .317$, partial $(\eta^2) = .063$. Neither were there any univariate effects for hunger on the overall quality of implementation intention plans, $F(1,93) = .154$, $p = .696$, partial $(\eta^2) = .002$, quality of the problematic situation (IF), $F(1,93) = .439$, $p = .509$, partial eta-squared $(\eta^2) = .005$, quality of the solution (THEN), $F(1,93) = .006$, $p = .937$, partial eta-squared $(\eta^2) = .000$, the total amount of words, $F(1,93) = .000$, $p = .986$, partial eta-squared $(\eta^2) = .000$, amount of words problematic situation (IF), $F(1,93) = .1,563$, $p = .214$, partial eta-squared $(\eta^2) = .017$ and amount of words of the described solution (THEN) $F(1,93) = .1,330$, $p = .252$, partial eta-squared $(\eta^2) = .014$.

With regard to self-efficacy, no significant multivariate effect was found on the quality of implementation intention plans, the quality of the problematic situation (IF), the quality of the formulated solution (THEN), the total amount of words, the amount of words used to formulate the problematic situation (IF) and the amount of words used to formulate the solution (THEN), $F(5, 89) = 1.198$, $p = .317$, partial eta-squared $(\eta^2) = .063$. Neither were there any univariate effects for self-efficacy on the overall quality of implementation intention plans, $F(1,93) = .567$, $p = .453$, partial $(\eta^2) = .006$, quality of the problematic situation (IF), $F(1,93) = 1.345$, $p = .249$, partial eta-squared $(\eta^2) = .014$, quality of the solution (THEN), $F(1,93) = .067$, $p = .937$, partial eta-squared $(\eta^2) = .001$, the total amount of words, $F(1,93) = 1,468$, $p = .229$, partial eta-squared $(\eta^2) = .016$, amount of words problematic situation (IF), $F(1,93) = .356$, $p = .552$, partial eta-squared $(\eta^2) = .004$ and amount of words of the described solution (THEN) $F(1,93) = .1,523$, $p = .220$, partial eta-squared $(\eta^2) = .016$.

No multivariate interaction effect was found between visceral state and self-efficacy, $F(5, 89) = 1,158$, $p = .336$, partial eta-squared $(\eta^2) = .061$. Neither were there any univariate interaction effects for self-efficacy on the overall quality of implementation intention plans, $F(1,93) = .009$, $p = .923$, partial $(\eta^2) = .000$, quality of the problematic situation (IF), $F(1,93) = .619$, $p = .433$, partial eta-squared $(\eta^2) = .007$, quality of the solution (THEN), $F(1,93) = .335$, $p = .564$, partial eta-squared $(\eta^2) = .004$, the total amount of words, $F(1,93) = .144$, $p = .705$, partial eta-squared $(\eta^2) = .002$, amount of words problematic situation (IF), $F(1,93) = .588$, $p = .445$, partial eta-squared $(\eta^2) = .006$ and amount of words of the described

solution (THEN) F (1,93) = 1.036, p = .311, partial eta-squared (η^2) = .011.

Discussion

This study tested whether the implementation intention plans formed by people in a hot state were qualitatively better than the implementation intention plans formulated by people in a cold state. It was expected that people in the hot state (state of hunger) are able to formulate qualitative better implementation intention plans regarding weight loss than people in the cold state (satiated), indicating that the formulation of implementation intention plans differ across the two states. Contrary to the expectations, no differences between satiated and hungry participants were found for either the formulation of the problematic situation (IF), the formulation of the solution (THEN) and the overall quality of implementation intention plans, the amount of words used to formulate the problematic situation (IF), the formulation of the solution (THEN) and the amount of words used to formulate the total implementation intention plan. It can be concluded that visceral state did not influence the quality of implementation intention plans made: the results indicate that deprived and satiated participants did not differ in quality of implementation intention plans made.

In addition this study tested whether self-efficacy had an effect on the quality of implantation intention plans formed. It was expected that enhancement of self-efficacy leads to qualitatively better formulated implementation intention plans compared to people that did not receive the self-efficacy boost. The manipulation of self-efficacy unfortunately failed to accomplish the expected effect. Contrary to the expectations, no differences between participants enhanced on self-efficacy and participants that were not enhanced on self-efficacy were found for either the formulation of the problematic situation (IF), the formulation of the solution (THEN) and the overall quality of implementation intention plans, the amount of words used to formulate the problematic situation (IF), the formulation of the solution (THEN) and the amount of words used to formulate the total implementation intention plan. It can be concluded that level of self-efficacy did not influence the quality of implementation intention plans made: people high on self-efficacy do not formulate qualitatively better implementation intention plans.

Current study can be considered a replication of the study performed by De Ridder et. al. (2010). In their study results showed that deprived participants made coping plans of a lesser quality than satiated participants and that participants in a hot state could better describe situations that would threaten one's weight loss goals. Current study was not able to find these results as no difference was found between

participants of both visceral states in the quality of implementation intention plans and the quality of formulation of the problematic situation (IF). Participants in the hunger state did not provide more specific, detailed and vivid descriptions of the problematic situations compared to participants in the satiated state. Results of the current study are not in line with the theory of the hot-cold system described by Metcalfe & Mischel (1999), in which is stated that hunger can interfere with plans made to lose weight. Even though it is presumable that during the visceral state of hunger decisions will be made more quickly and based upon emotions, since - contrary to the cold state - activation of the hot-system involves emotional, simple, reflex, quick, emphasized by stress, early developed and stimulus-control mechanisms, current study could not provide evidence for this theory. No difference in quality of implementation intention plans regarding weight loss was found between the deprived participants and the satiated participants. Despite the fact that the expectations were not met, several explanations for not being able to find this result can be named. In general, the findings suggest that, seen the population of the study, a considerable number of employees failed to form complete and precise implementation intention plans regarding weight loss. It seemed that participants had difficulty understanding that the emphasize was on forming an implementation intention plan and therefore specification of the problematic situation and solution, which is highly relevant in formulating implementation intention plans. The coding scheme used to evaluate the formulated implementation intention plans (Adriaanse, 2010; De Ridder et. al. 2010; De Vet et. al., 2011; Verhoeven, 2012) indicated that participants could score a maximum of eight points on the overall implementation intention plan (maximum four points for the formulation of the problematic situation and maximum four points for the formulation of the solution). This means that the variety in scores was minimal. In case of a not specifically formulated problematic situation or a not specifically formulated solution, participants received a score of "0" on that certain part. All participants that scored zero points on the formulation of the problematic situation, also scored zero points on the formulation of the solution, following the coding scheme. Because of this, thirty-one participants received an overall score of zero points. In addition, some participants did receive some points for the specification of the problematic situation, but did not receive any points regarding the formulation of the solution. Therefore, a great number of participants scored poorly on the quality of formulated implementation intention plans. Since implementation intention plans are only successful when they link a critical cue that causes the unwanted habitual behavior to an alternative behavior, it was of great importance that the solution suited the problematic situation (Adriaanse, 2009). In addition, the specification of the "where/"when", "what" and "why" are of crucial importance in describing the critical cue in implementation intention plans: a description that does not fully specify these aspects are considered less successful (Adriaanse, 2009). The power behind the success of implementation intention lies partly within the specified environmental cue, which prompts the action, so that the person does not have to remember or decide when to act (Gollwitzer,

1993). Since the great importance of these aspects, the decision of a minimal variety in scores had to be taken.

Second, where the study of De Ridder et. al. (2010) used uninformed planning in order to form implementation intention plans, current study used detailed and specific instructions on how to formulate the plans. This might explain the different outcome: it unfortunately seemed that participants did not quite understand the exercise which consisted of detailed and specific instructions on how to formulate the implementation intention plans. This can be explained using the Elaboration Likelihood Model (ELM), in which information is systematically processed via the central route or is processed in a more superficial manner via the peripheral route (Petty & Cacioppo, 1986). Central route processing involves greater cognitive elaboration and the meaning of the message is critical to persuasion (e.g. participants are motivated to form implementation intention plans in order to lose weight). In contrast, peripheral route processing involves little systematic processing (low cognitive elaboration) and other characteristics are more likely to determine whether it is persuasive and invites to formulate good implementation intention plans regarding weight loss. Since participants were only globally screened whether they had the intention to lose weight, we did not know the degree of motivation participants had to lose weight. Participants that were highly motivated to lose weight were more likely to engage into central route processing and therefore form better implementation intention plans. The desire to lose weight might not have been the priority of participants that did not formulate qualitatively good implementation intention plans. Those participants might want to lose weight, but were not intrinsically motivated to enact on this intention. It might be that these participants involved in peripheral route processing and therefore were not motivated to form good quality implementation intention plans or carefully read the instructions. In addition, when people have time to process messages or make time because they see the message as personally relevant, they are more likely to engage in systematic processing. Apart from the motivational aspect, it could be that participants that scored poorly on quality of implementation intention plans experienced a pressure of time, since the study was conducted during office hours. Due to the lack of time they might have been involved in peripheral processing and therefore were not motivated to either fully understand the exercise or form implementation intention plans.

Furthermore, the mental simulation task that was integrated into the task of formulating an implementation intention plan regarding weight loss, was confusing to participants. This is ascribable to the manner the exercise was composed and not to the theory behind mental simulation, since mental simulation is known for its effectiveness in regard to problem solving and reaching goals (Taylor et. al., 1998). Some participants did not describe a problematic situation, but instead described a situation in which they could attain their goal of not engaging into behavior opposing their intention of wanting to lose weight. A few participants formulated plans such as: "If I manage to hold on to my plan, then I will be

proud". It is likely that the participants were confused by the mental simulation task, since one of the final questions before formulating the official implementation intention plan was to describe how one would feel when adopting an alternative behavior, after which was asked if one could write down the solution. Those participants might have thought that they had to summarize the questions from above. Also, some participants interpreted the mental simulation task as outcome simulation, as they formed implementation intention plans like: "If I have accomplished my plan, than I have certainly lost weight". In outcome simulation one focusses on the outcome to be achieved to bring it about (Taylor et. al., 1998). Regardless its effectivity, it unfortunately did not result in a good quality implementation intention plan, since no specific problematic situation was formulated.

The outcome of the study can be explained by the transtheoretical model of change (TTM) by DiClemente et. al. (1991), in which five stages of change are identified: pre-contemplation (not thinking about change), contemplation (aware of the need to change), preparation (intending to change in the near future and taking action preparation for change), action (acting to change) and maintenance (of the new behavior). Though participants were screened on having the intention to lose weight, no further questions about this intention were asked. Participants likely differed in stages of change they were in and therefore differed in the formulation of implementation intention plans. A person in the "contemplation stage" presumably formulates an implementation intention plan that differs in quality than a person that is in the "action" stage. Despite the fact that the evidence in support of this model is relatively weak, the idea of not exactly knowing in what degree participants were occupied by their urge to lose weight must have contributed (Sutton, 2000).

According to Abraham (2008) self-efficacy affected how people conceptualize an intention. Unfortunately current study could not confirm this, as no difference was found between participants that received the manipulation and participants that did not in quality if implementation intention plans. An explanation of the failure of the self-efficacy manipulation might be the fact that only one of the four approaches argued by Bandura (1999) was used, namely verbal persuasion. Bandura (1999) also described mastery experiences (e.g. experience of successfully performing the behavior), vicarious experience (e.g. observation of successful others) and perception of physiological and affective states (e.g. interventions to reduce negative moods and anxiety or to reinterpret destructive interpretations of arousal). Usage of more approaches might have made a more powerful manipulation. Also, the fact that all participants were high educated office employers could explain the high score on self-efficacy. Since self-efficacy was not measured beforehand, it might have been that participants that did not receive the self-efficacy manipulation would already score high on self-efficacy without enhancement. In other words, individual differences between the participants may have contributed to the failure of the manipulation. In addition, it could be that the General Self-efficacy scale invites participants to response in a social desirable way. It

could be hard for participants to admit to statements such as: "I can usually handle whatever comes my way".

Limitations

Limitations of the current study concern the exercise in which the participants received specific and detailed instructions to, via mental simulation, formulate implementation intention plans. Subsequent to having conduct the study, this exercise seemed rather ambivalent. Also, instead of asking one question beforehand to globally screen whether people had the intention to lose weight, it would have been better to more specifically determine in what degree the participant is occupied by this intention, seen the fact that most people would want to lose some weight. It would have been better to distinct the people that really have the intention to lose weight from the people that had this intention less seriously. The reason for deciding to ask the participants one global question regarding their intention to lose weight, was to camouflage the purpose of the study.

Another limitation of the study is that although people were instructed to refrain eating from 23.00 pm the day before and people had to indicate the degree of hunger, we are not sure if participants in the hunger condition did really refrain from eating: we simply assumed they did. The reason for this decision lies in ethical aspects. A solution to this problem would be to schedule the timeslots of the experiment in the afternoon. It was decided not to do this since it would be more difficult for participants to refrain eating during a large part of their work shift and as it may affect their work performance.

A limitation can be found in the manipulation of self-efficacy. In the pilot study the manipulation check was actually found to be successful. Subsequent to conducting the study it would have been better to integrate all four approaches described by Bandura (1999) into the manipulation and to screen self-efficacy beforehand in all participants.

Strength of the study

The strength of the research lies in the fact that the quality of implementation intention plans was assessed by three independent assessors. In addition, participants were told that they would participate in a study which investigated the influence of hunger on concentration: therefore, participants was unaware of the real purpose of the study as this otherwise would color the data.

Future research

Future research could focus on the enactment of the formed implementation intention plans. As the current study only focused on the formulation of the implementation intention plans due to a lack of time, it would be interesting to focus in future research on the enactment of the formed implementation

intention plans. Do participants that formed the implementation intention plans during a cold state have more difficulty in enacting on the formed implementation intention plan compared to participants in a hot state? Future research could also focus on visceral state and self-efficacy, since the manipulation of the current study was not successful. Another possibility future research can focus on is the visceral state of hunger and processing of information via the ELM model. Are participants in a hot state more easily persuaded via the central route than people in a cold state?

In conclusion, the hot and cold theory of Metcalfe & Mischel (1999) is a growing field that invites researchers to conduct more studies regarding visceral states and several other factors, such as self-efficacy or persuasion.

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APPENDIX A

Quality of Plans Coding Scheme

Description of problem situation:
* score 1 if the participants mentions "**WHERE/WHEN**"
- Participants receive a point when the plan specified a certain place, activity, or time (e.g. at a party, in the cinema, at work, at home, when shopping, at the grocery store, in company of others).

* score 1 if the participants mentions "**WHAT**"
- Participants receive a point when the plan specified what could provoke the temptation (e.g. chocolate, fast food, unhealthy food).

* score 1 if the participants mentions "**WHY**"
- Participants receive a point when the plan specified the reason for having difficulty in enacting the intention (e.g. when the plan mentions a feeling: bored, lonely, emotional, tired etc.).

* score 1 if the participants provides a **vivid** description.
- Participants receive a bonuspoint when the problematic situation is formulated vividly. In this case, the participant replaced himself to the described situation, and therefore could formulate the plan accurately and detailed.

Solution for the problem situation:
* score 1 if the plan is an **alternative**.
- Participants receive a point when they formulated a solution that is actually an alternative to the problematic situation formulated earlier.

* score 1 if the plan is **specific**.
- Participants receive a point when they formulated a specific solution, which guides them in concrete steps (e.g. eating an apple instead of eating crisps).

* score 1 if the plan is **positively** formulated .
- Participants receive a point when the plan is positively formulated. This means that plans that simply stated "not involving in the temptation (e.g. not eating crisps) did not receive a point.

 * score 1 if the participant provides a **vivid** description.
- Once again participants receive a bonus point when they formulated the solution vividly. In this case, the participants replaced himself to the described situation and imagined taking the alternative steps. The solution is therefore described in accurately and detailed.

Examples:
* "*If a don't have enough motivation, I would have more discipline*"
- This plan received one point for the formulation of the problematic situation ("why") and zero point for the formulation of the solution.

* "*If I am at a business diner celebrating a renewed collaboration and I am offered a drink, then explain that I am on a diet and rather have a glass of water*".

       - This plan received four points for the formulation of the problematic situation ("where/when", "what", "why" and "vivid description". This plan received four points for the formulation of the solution ("alternative", "specific", "positive" and "vivid description").

* "*If people offer me sweets, then I will refuse them and walk away*".

       - This plan received two points for the formulation of the problematic situation ("where/when" and "what"). This plan received three points for the formulation of the solution ("alternative, specific and vivid description").