Positive and Negative Emotions Predict Weight Loss Intentions and Behaviors beyond

Theory of Planned Behavior Constructs

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Abstract

Purpose: The current study examined the predictive utility of emotional valence (i.e., positive and negative emotions) on weight loss intentions and behaviors, beyond Theory of Planned Behaviors constructs (i.e., attitude, subjective norm, and perceived control), among a community sample of people who were overweight (BMI > 25 kg/m²). **Method:** Participants were recruited for a longitudinal study via an online panel. They completed a baseline survey (N = 732) and a follow-up survey 6 months later (N = 526), both administered online. The surveys included measures of attitude, subjective norms, perceived control, positive and negative emotion regarding one's current weight, intentions to engage in weight loss behaviors (time 1), and having engaged in weight loss behaviors in the past 6 months (time 2). **Results:** Emotion explained additional variance in weight loss intentions (range $\Delta R^2 = $ .03-.10, all $ps < .01$) and behaviors (range $\Delta R^2 = .01$-.02, all $ps < .05$) beyond Theory of Planned Behaviors constructs. Negative emotions mainly predicted the intake of unhealthy food and seeking social support, whereas positive emotions predicted physical activity (intention and behavior). These results suggested that the differential relations might be based on whether the strategy is approach- or avoidance-oriented. **Conclusions:** Based on these findings, comprehensive models of weight loss behaviors should consider emotion, and the valence of such emotion, regarding current weight.

Keywords: weight loss, overweight, obesity, emotion, theory of planned behavior, prospective study, community sample

Level of Evidence: Level IV, multiple time series without intervention.

Introduction

Overweight and obesity are continuing and growing global health concerns [1]. Recognizing this, psychological scientists have begun identifying the factors contributing to weight regulation behavior [2]. However, much of this research, such as that on dietary patterns [3], has focused on attitudes and cognition—i.e., relying on the Theory of Planned Behavior (TPB)[4-5]—while giving only limited attention to the role of emotion as a motivating factor [6]. As such, the current longitudinal study aimed to test whether emotion, beyond TPB, predicts weight loss intentions and (self-reported) behaviors.

In brief, TPB proposes that attitudes, subjective norms (i.e., what people assume others think they should do), and perceived behavioral control, influence intentions to engage in a behavior, and, in turn, that intentions are the most proximal antecedent/best predictor of future behavior [4-5]. Of importance to the present study, TPB has received strong support in the domain of weight regulation [7]. One criticism, among others, though, is that TPB models neglect emotion given their emphasis on cognitive processes [8-9]. Supporting this, Sandberg and Conner [10] found in a meta-analysis that the contributions of anticipated emotions (e.g., regret) resulting from engaging in unhealthy behaviors or not engaging in healthy behaviors predicted intentions and behavior beyond TPB factors (i.e., perceived behavioral control, attitudes, and subjective norms). These findings suggest that emotions might have unique explanatory value in predicting intentions and behavior related to health.

Anticipated emotions are not the only type of emotion that are likely associated with intentions and behavior, however. Emotions related to the present state (herein referred to as "emotions") might likewise motivate action. For example, the type and intensity of emotions can affect types of eating (taste- and hunger-eating) [11]. Emotions have also been found to influence physical activity. Indeed, studies have shown that loneliness is associated with physical inactivity [12] and that positive emotions are associated with positive outcome

expectancies for physical activity [13]. However, fewer studies have investigated the role of emotions in relation to eating behaviors and physical activity for weight loss.

Most of the research on emotion and weight loss has focused on the role of emotion regarding the progression of weight loss goals [14-16]. Although this research may inform the pursuit of weight loss goals, it is predicated upon the individual having already set the goal to lose weight. In contrast, a better understanding of emotions regarding one's current weight (e.g., "I feel ashamed", "I feel proud") may be important for the initiation of weight loss in the first place and a more direct predictor of weight loss behavior. Further research is needed on whether emotions regarding one's current weight add explanatory value to weight loss intentions and behaviors beyond TPB factors.

There remain several gaps in the literature, in addition to the lack of research on the relation between weight loss intentions and behavior and emotions related to one's current weight. Prominent among these gaps is the fact that little-to-no work has focused on the role of emotional valence (i.e., whether the emotion is positive or negative) in predicting weight loss intentions and behavior. This is important for at least two reasons. First, it is known that dimensional (i.e., positive-negative valence) emotional perspectives provide better models for how people report their emotions, particularly when appraising affective states involving less arousal [17]. The second reason that the valence gap in weight loss research is important is that positive and negative emotion have been directly linked to approach and avoidance motivation, respectively [18]. As the primary weight loss behaviors are motivationally contrasted, approach (e.g., exercise) and avoidance (e.g., limiting unhealthy food) [19], it stands to reason that an emotional valence approach to this area would provide the foundation for an emotional model of weight loss behavior. The current investigation represents a first step in this direction.

The following hypotheses were tested among a community sample of overweight adults: (1) Emotion would predict intentions above and beyond perceived behavior control, attitudes, and subjective norms. (2) Emotion would predict behaviors above and beyond perceived behavioral control and intentions (and their potential interaction term). We examined both intentions and behaviors as outcomes given that intentions are a proximal outcome of behavior change [20].

Further, specific hypotheses about the valence of emotion and the type of intention and behavior are proposed, based on the work associating positive and negative emotion with approach and avoidance behavior, respectively [18, 21]: (3) Positive weight-related emotion would positively predict intentions and behaviors related to physical activity (approach), but not limiting unhealthy food (avoidance). (4) Negative emotion would positively predict intentions and behavior related to limiting unhealthy food (avoidance), but not physical activity (approach). Since social support can be sought in order to provide relief from negative affective states [22], but is also an approach behavior (i.e., "seeking"), it was predicted that both positive and negative emotion would be positively associated with intentions and behaviors related to seeking social support. More importantly, it was predicted that these hypotheses would hold while controlling for the variance explained by TPB variables.

Method

Procedure

Participants were recruited through a paid research panel in Germany (www.wisopanel.net). In line with the panel policy, panel members could participate within one week after the call was sent out. The panel operator sent the panel members information about the study and a link to the online questionnaire. They could only access the study materials after indicating that they read the information about the study and provided consent.

At time 2 (6 months later), the panel operator sent those participants who had participated at time 1 a link to invite them to a follow-up study. Participants who agreed to participate in this follow up study filled out the same questionnaire with some minor differences, described below.

This study was approved by the ethics commission of the Leibniz-Institut für Wissensmedien (Tübingen, Germany; LEK 2013/013).

[Table 1 and Figure 1 near here]

Measures

All measures were presented in German. Items needing translation were translated by a native German speaker with considerable English knowledge. These translations were then discussed with a native English speaker until parity of meaning between translations was achieved. Moreover, each of the items are face-valid measures of the constructs and do not rely on context.

Emotion. Participants responded to 10 statements to assess their present emotions regarding their current weight. Each item began with the statement "Thinking about my own weight…". There were 8 negative emotion items (e.g., "…I feel ashamed") and 2 positive emotion items (e.g., "…I feel proud"). We derived these emotion items from the Positive and Negative Affective Schedule (PANAS), a well validated measure of state and trait emotion [23] in both English and German [24]. To select these particular items, we relied on the classification of emotions introduced by Bagozzi et al. [21] and included the goal-directed emotions (i.e., emotions that "produce action in a way promoting the achievement of goals", p. 2). Participants responded on a 7-point Likert-type scale (1 = *not at all applicable*, 7 = *absolutely applicable*). A *negative emotion* score was created by averaging the items at time 1 (Alpha = .93, $M = 3.28$, $SD = 1.56$) and time 2 (Alpha = .94, $M = 3.13$, $SD = 1.57$). The

same was done for *positive emotion* at time 1 (Alpha = .75, *M* = 2.71, *SD* = 1.53) and time 2 (Alpha = .78, *M* = 2.87, *SD* = 1.57).

Attitudes, subjective norms, and perceived control. Attitude, subjective norm, and perceived control were assessed as proposed by the TBP [25]. We took the standard wording as suggested by prior work [25] and adapted them to the current context by naming "weight loss" as the targeted behavior (for a similar approach in weight regulation research see [26-28]). Participants responded to 7 items: 3 items (e.g., "For me to reduce weight is…") assessed attitude on a 7-point scale (e.g., 1 = *good*, 7 = *bad*); 2 items (e.g., "People who are important to me think I should reduce weight or try to reduce weight") assessed subjective norm on a 7-point scale (1 = *absolutely disagree,* 7 = *absolutely agree*); and 2 items (e.g., "On a scale from 0 to 100: Your best estimate that an attempt on your part to reduce weight would be successful") assessed perceived control. The items were averaged to create an *attitude* score (Alpha = .92, *M* = 4.43, *SD* = .56), a *subjective norm* score (Alpha = .95, *M* = 4.55, *SD* = 1.48), and a *perceived control* score (Alpha = .90, *M* = 63.32, *SD* = 29.64).

Intention and behavior. At time 1, intentions to perform three different weight loss behaviors based on recommendations from the Center for Nutrition Policy and Promotion (http://www.cnpp.usda.gov/dgas2010-policydocument.htm) and the School of Public Health at Harvard University (http://www.hsph.harvard.edu/obesity-prevention-source/obesity-prevention/) were assessed. We adapted each of the recommendations into a separate item. Participants responded to 9 items on a 7-point scale (1 = *not at all applicable*, 7 = *absolutely applicable*): 6 items assessed intention to limit unhealthy food (e.g., "I will avoid or limit my intake of fatty food"); 2 items assessed intention to be more physically active (e.g., "I will engage in physical activities regularly"); and 1 item assessed intention to seek social support, stating "I will seek social support (e.g., join or participate in an online weight loss forum)". The items were averaged to create a *limit unhealthy food* score at time 1 (Alpha = .88, *M* =

4.83, *SD* = 1.38) and time 2 (Alpha = .90, *M* = 4.84, *SD* = 1.43). The same was done to create

a *physical activity* score at time 1 (Alpha = .60, *M* = 4.12, *SD* = 1.54) and time 2 (Alpha =

.70, *M* = 4.09, *SD* = 1.62). A single item represented a *social support* score at time 1 (*M* =

2.22, *SD* = 1.68) and time 2 (*M* = 2.12, *SD* = 1.73). The time 2 items for each of the

behaviors were worded slightly different than the time 1 items. As opposed to stating "I

will…" perform the behavior, they were worded as "I have…." preformed the behavior. The

differences in wording were to assess intentions at time 1 and behaviors at time 2. We

included three additional items (e.g., writing a food diary) at both points, but these did not

readily fit the three strategies of limiting unhealthy food, physical activity, or social support,

nor do they necessarily reflect either approach or avoidance tendencies. As such, they were

not included into the analyses.

Statistical Analyses

Data were analyzed in three steps. First, bivariate correlations between all variables

are reported to provide an overview. Second, the relations of TPB constructs and emotions on

intentions were tested within time 1. Finally, we tested the association between behavior

reported at time 2 and TPB constructs and emotions assessed at time 1.

To be more precise, the test of the predictions of intentions at time 1 are conducted as

follows: A first set of hierarchical multiple regression analyses tested whether weight-related

emotion predicted limiting unhealthy food, physical activity, and social support intentions

above and beyond attitude, subjective norms, and perceived control. The general form of

these regression analyses was as follows: In Step 1, time 1 attitude, subjective norms, and

perceived control were entered as predictors. In Step 2, time 1 positive and negative emotion

were entered as additional predictors beyond those already included in Step 1.

A second set of hierarchical multiple regression analyses tested whether emotion

predicts limiting unhealthy food, physical activity, and seeking social support behaviors

above and beyond perceived control and intentions. The general form of these regression analyses was as follows: In Step 1, time 1 perceived control was entered. In Step 2, time 1 intentions to engage in the behavior being predicted was entered. In Step 3, the interaction term between perceived control and the behavioral intentions was entered. Prior to computing the interaction term, both variables were mean centered to facilitate interpretation of the potential interaction effects and remove nonessential collinearity between the predictor variables [29]. Finally, in Step 4, positive and negative emotion were entered.

For analyses involving only time 1 variables, data from the entire sample of participants with a BMI ≥ 25 who completed the time 1 assessment were used. For analyses involving time 2 variables, data from the sample with a BMI ≥ 25 who completed both the time 1 and time 2 assessments were used. We applied this strategy to use all available data. However, the analyses within time 1 do not lead to substantially different results when only the participants participating in both waves are included.

Results

Sample and Attrition

At time 1, 1,480 participants completed the survey. For the current study, only data from people who were at least overweight (BMI ≥ 25 kg/m²; no upper BMI cutoff was applied) [30] were used as people who are overweight have been shown to have greater body weight dissatisfaction than people who are normal weight [31]. This resulted in a sample of 732 (50.5% female; M_{age} = 48.83, SD_{age} = 13.54, range: 19 - 89 years; M_{BMI} = 30.55 kg/m², SD_{BMI} = 5.61). Of the original sample of participants with a BMI ≥ 25, 526 responded at time 2 (49.0% female; M_{age} = 49.98, SD_{age} = 13.40, range: 19 – 89 years; M_{BMI} = 30.61 kg/m², SD_{BMI} = 5.71).

Table 1 presents the characteristics of the samples at both time points and Figure 1 displays participant flow. Those who responded at time 2 were compared to those who did

not on socio-demographic and the study variables assessed at time 1. People who responded at time 2 were older and reported lower perceived control in relation to weight loss and intention to exercise (both t > 2, both ps < .05, .15 < both d < .35). No group differences emerged on any of the other variables. Given that there were only two differences that were small in effect size between those who dropped out and those in the final sample, the samples were considered to be largely similar to each other and any changes between the two time points were deemed as unlikely to represent systematic changes in participant demographics related to drop out.

Bivariate Correlations

Bivariate correlations among all study variables are presented in Table 2. Most relevant for the predictions, positive weight-related emotion at time 1 was significantly positively correlated with physical activity intentions (time 1) and behaviors (time 2) and negatively correlated with limiting unhealthy foods intentions (time 1) and behaviors (time 2). Moreover, negative weight-related emotion at time 1 was significantly positively correlated with limiting unhealthy foods intentions (time 1) and behaviors (time 2) and not significantly correlated with physical activity intentions (time 1) and behaviors (time 2). Interestingly, providing only partial support for our hypotheses, only negative weight-related emotion was significantly and positively associated with social support seeking intentions (time 1) and behaviors (time 2). These findings provide only preliminary support for our hypotheses.

Hierarchical Multiple Regression Analyses Predicting Intentions

Table 3 presents the results of the three regression analyses predicting intentions. The first step predicted a significant proportion of variance in all three behavioral intentions. The proportion of additional variance predicted by the second step was significant for all three behavioral intentions. More specifically, together, positive and negative emotion predicted an

additional 3%, 4%, and 10% of the variance in limiting unhealthy food, physical activity, and social support intentions, respectively.

To test more specific hypotheses regarding positive and negative emotion and the behavioral intentions that they would predict, the standardized regression coefficients for positive and negative emotion were considered. For the intentions to limit unhealthy food, we hypothesized that negative feelings about one's own weight would be a significant predictor, but that positive emotion might not be. Indeed, negative emotion was a significant and positive predictor of intention to limit unhealthy food, but positive emotion was not. We also hypothesized that positive emotion about one's own weight, but not negative emotion, would predict greater intention to be more physically active. Although intention to be more active was significantly and positively predicted by both positive and negative emotions, the standardized regression coefficient was larger for positive emotion. Finally, it was hypothesized that both valences of feelings about one's own weight would predict the intention to seek social support. As hypothesized, intention to seek social support was significantly and positively predicted by both positive and negative emotion.

Hierarchical Multiple Regression Analyses Predicting Behaviors

Table 2 presents the results of the three regression analyses predicting behaviors. As shown, perceived control was only a significant predictor of physical activity behavior. Not surprisingly, intentions accounted for a substantial proportion of variance for all three weight loss behaviors. The interaction between perceived control and intention was not a significant predictor of behavior in any of the three models. The proportion of additional variance predicted by emotion was significant for all three behaviors. More specifically, together, positive and negative emotion predicted an additional 2%, 1%, and 2% of the variance in limit unhealthy food, physical activity, and social support behaviors, respectively.

Again, there were more specific hypotheses regarding positive and negative emotion and the time 2 reported behaviors they would predict. For the time 2 reported limiting unhealthy food behavior, we hypothesized that negative feelings about one's own weight at time 1 would be a significant positive predictor, but that positive feelings might not be. According to the second step reported in the previous paragraph (i.e., with time 1 intention controlled), in fact, negative emotion at time 1 significantly and positively predicted time 2 reports of limiting unhealthy food behavior. Time 1 positive emotion, however, did not. It was also hypothesized that time 1 positive but not negative feelings about one's own weight would predict greater time 2 reports of activity behaviors. Time 2 reports of activity behavior were significantly and positively predicted by positive, but not negative emotion. Finally, we hypothesized that both valences of time 1 feelings about one's own weight would predict reported social support seeking behavior. However, social support behavior was significantly and positively predicted by negative emotion, but not positive emotion.

[Tables 2 and 3 near here]

Discussion

The present study examined whether positive and negative emotion predict intentions and behaviors related to weight loss, above and beyond TPB, among a large sample of overweight adults (BMI ≥ 25 kg/m²). Furthermore, specific hypotheses regarding the associations between the valence of emotion and whether the intention/behavior was approach- (increased physical activity) or avoidance-oriented (limiting unhealthy foods) were tested.

Most important to the aim of the present study, negative and positive emotion related to weight explained additional variance in intentions above and beyond the TPB, thus supporting our hypothesis. *Weight-related* emotion explained an additional 3% to 10% of the variance in intentions, which is similar to estimates of a meta-analysis that found that

anticipated *action-related* emotion explained an additional 7% of the variance in intentions [10]. This further supports the contention that emotion is associated with intention. Again, most important to the aim of the present study, emotion predicted an additional 1% to 2% of the variance in all three behaviors above and beyond perceived behavioral control, intention, and their interaction.

The additional proportion of variance explained in our models is admittedly small, but it is also consistent with the findings of the meta-analysis that considered anticipated action-related emotion as a predictor of behavior above and beyond intention [10]. When evaluating the relevance of the effect sizes found here, one should keep in mind that we have tested the effects of emotions on behavior across 6 months. Given that emotions are usually considered as highly fluctuating, the effects should be substantially larger for shorter time intervals. A study of such short-term effects of emotions on weight regulation behavior and developing interventions relying on emotions, thus seems a promising endeavor. Overall, the findings of the present study add to the evidence that emotion about one's own weight is an important predictor of behavior, but extend this support to currently experienced emotion as opposed to anticipated emotions.

The more specific hypotheses regarding valence of emotion and type of intention/behavior were partially supported. For the regression analyses predicting both intentions and behaviors, negative emotion was a positive and significant predictor of limiting unhealthy food intentions and behavior, which are avoidance oriented. In contrast, it was a weaker predictor of physical activity intentions and did not predict physical activity behaviors, which are approach oriented. These findings may explain why previous studies have failed to show that negative emotions motivate people to eat healthy [16], i.e. because eating healthy is an approach-oriented behavior. In contrast to negative emotion, positive emotion was a positive and significant predictor of physical activity intention and behavior,

which are approach oriented. However, positive emotion did not predict limiting unhealthy food intentions or behaviors, which are avoidance oriented. Seeking social support can be considered as both motivated by positive and negative emotion. Indeed, both positive and negative emotion predicted social support seeking intentions. However, only negative emotion predicted social support seeking behaviors. This finding may be explained by work showing that people often seek social support to cope with negative emotion [22].

Together, these findings support the idea that the valence of emotion motivates different types of behavior (i.e., approach or avoidance). Furthermore, this study extends the literature on emotion as a predictor of intentions and behaviors related to weight loss by showing that valence of emotion differentially predicts certain intentions and behaviors.

Implications

The literature provides considerable support for TPB in predicting weight loss, but there is also considerable support that anticipated emotion explains intentions and behaviors related to weight loss beyond the TPB. The present study expanded these findings by demonstrating that emotion regarding one's current weight, as opposed to anticipated emotion, predicts intentions and future behaviors related to weight loss. Despite the somewhat low proportions of variance explained, emotions regarding weight emerged as independent predictors of weight loss intentions and behaviors. The literature and present findings thus suggest that theory should include both cognitions and emotions as factors that influence weight loss intentions and behaviors.

The present study also found that positive and negative emotion predict different weight loss intentions and behaviors. Thus, similar to others [9], we contend that emotions are potentially clinically meaningful targets for health behavior change interventions. In a domain like weight regulation, in which psychological approaches to intervention have limited success [32], these effects might point to a different opportunity for interventions.

That said, the findings of the present study have implications for addressing the public health concern of overweight and obesity. Understanding the role of emotions regarding one's current weight as a catalyst for health behavior change may inform future interventions and public health messages for promoting weight loss among people who are overweight or obese. Notably, there are concerns related to inciting negative emotion regarding one's weight, but the negative emotion that people may naturally experience regarding their weight may motivate weight loss. Interventions can potentially target positive emotion to promote physical activity or direct people's negative emotion to seeking out social support or limiting unhealthy foods in their diet.

Additional Considerations and Future Directions

We would also like to acknowledge that the current study has some limitations. All data were collected online. Therefore, we rely on self-reports of the anthropometric data when computing the BMI. These are less precise than measures taken by health professionals. However, given that BMI was only used as inclusion criterion, this should not substantially bias the main results. In addition, it has long been acknowledged that self-report data of weight and height is remarkably reliable [e.g., 33] and mostly lead to an underestimation of the BMI of overweight people [e.g., 34-35]. Accordingly, in our case the sample should be assumed to have a higher BMI and we rather applied a stricter criterion than we report. Furthermore, the number of concepts assessed was limited due to the restrictions posed by the online panel and thus we were not able to collect data on psychiatric conditions such as depression, which might moderate the effects found here. Future research should include such measures to test the effect of psychiatric conditions.

There are several additional points that warrant consideration. First, for the regression analyses predicting intentions, only data at one time point were used. Given that temporal precedence was not established, causal inference is limited. Second, and similarly,

participants were not assigned to levels of the primary independent variables: positive and negative emotion. Causal inference is also limited for this reason, especially in regard to any conclusions that positive and negative emotion related to weight *lead* to intentions and behaviors related to weight loss. Future research should follow up on these findings by manipulating positive and negative emotion regarding weight to test the effect on weight loss intentions and behaviors. This could first be done in laboratory experiments and then as components of interventions targeting weight loss. Third, we did not correct for alpha inflation, but most of the statistical predictors in the primary regression analyses would also be statistical at a stricter alpha level of .01. Finally, while intentions to perform weight loss behaviors and self-reported weight loss behaviors were considered as outcome variables, actual weight regulation behavior was not. This decision was made in favor of a larger sample size rather than in favor of actual behavioral measures in the current study. The intention is that this study will inspire future research to address these limitations.

In sum, the present study represents a first step toward a more comprehensive emotional model of weight loss behaviors. Future work is needed to confirm that emotional valence differentially predicts weight loss behaviors with contrasting motivational orientations (i.e., approach versus avoidance). Such work may inform the tailoring and development of interventions for addressing the public health burden of overweight and obesity.

What is Already Known on this Subject?

Anticipated regret and emotion related to pursuing the goal of losing weight predicts weight loss behaviors beyond cognitive factors.

What this Study Adds?

Emotion regarding one's current weight predicts weight loss behaviors beyond cognitive factors and emotional valence differentially predicts approach- and avoidance-oriented weight loss behaviors.

Compliance with Ethical Standards

References

1. Global Burden of Disease (GBD) 2015 Obesity Collaborators (2017) Health effects of overweight and obesity in 195 countries over 25 years. N Engl J Med 377:13-27. DOI: 10.1056/NEJMoa1614362

2. Elfhag K, Rössner S (2005) Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev 6:67-85. DOI: 10.1111/j.1467-789X.2005.00170.x

3. McDermott MS, Oliver M, Simnadis T, Beck EJ, Coltman T, Iverson D, Caputi P, Sharma R (2015) The Theory of Planned Behaviour and dietary patterns: A systematic review and meta-analysis. Prev Med 81:150-156. DOI: 10.1016/j.ypmed.2015.08.020

4. Ajzen I (1988) Attitudes, personality, and behavior. Dorsey, Chicago

5. Ajzen I (1991) The theory of planned behavior. Organ Behav Hum Decis Process 50:179-211. DOI: 10.1016/0749-5978(91)90020-T

6. Armitage CJ, Conner M (2001) Efficacy of the theory of planned behaviour: A meta-analytic review. Br J Soc Psychol 40:471-499. DOI: 10.1348/014466601164939

7. McEachan RRC, Conner M, Taylor NJ, Lawton RJ (2011) Prospective prediction of health-related behaviours with the theory of planned behaviour: A meta-analysis. Health Psychol Rev 5:97-144. DOI: 10.1080/17437199.2010.521684

8. Ajzen I (2011) The theory of planned behaviour: Reactions and reflections. Psychol Health 26:1113-1127. DOI: 10.1080/08870446.2011.613995

9. Conner M, McEachan R, Taylor N, O'Hara J, Lawton R (2015) Role of affective attitudes and anticipated affective reactions in predicting health behaviors. Health Psychol 34:642-652. DOI: 10.1037/hea0000143

10. Sandberg T, Conner M (2008) Anticipated regret as an additional predictor in the theory of planned behaviour: A meta-analysis. Br J Soc Psychol 47:589-606. DOI: 10.1348/014466607X258704

11. Reichenberger J, Kuppens P, Liedlgruber M, Wilhelm FH, Tiefengrabner M, Ginzinger S, Blechert J (2018) No haste, more taste: An EMA study of the effects of stress, negative and positive emotions on eating behavior. Biol Psychol 131:54-62. DOI: 10.1016/j.biopsycho.2016.09.002

12. Pels F, Kleinert J (2016) Loneliness and physical activity: A systematic review. Int Rev Sport Exerc Psychol 9:231-260. DOI: 10.1080/1750984X.2016.1177849

13. Cameron DS, Bertenshaw EJ, Sheeran P (2015) The impact of positive affect on health cognitions and behaviours: a meta-analysis of the experimental evidence. Health Psychol Rev 9:345-365. DOI: 10.1080/17437199.2014.923164

14. Reynolds JP, Webb TL, McCulloch KC, Fitzsimons GM (2019) Self-regulatory consequences of observing others making goal progress: A longitudinal field study in weight loss groups. Br J Health Psychol 24:970-981. DOI: 10.1111/bjhp.12389

15. Louro MJ, Pieters R, Zeelenberg M (2007) Dynamics of multiple-goal pursuit. J Pers Soc Psychol 93:174-193. DOI: 10.1037/0022-3514.93.2.174

16. Reynolds JP, Webb TL, Benn Y, Chang BP, Sheeran P (2018) Feeling bad about progress does not lead people want to change their health behaviour. Psychol Health 33:275-291. DOI: 10.1080/08870446.2017.1310862

17. Barrett LF (1998) Discrete emotions or dimensions? The role of valence focus and arousal focus. Cogn Emot 12:579-599. DOI: 10.1080/026999398379574

18. Krieglmeyer R, Deutsch R, De Houwer J, De Raedt R (2010) Being moved: Valence activates approach-avoidance behavior independently of evaluation and approach-avoidance intentions. Psychol Sci 21:607-613. DOI: 10.1177/0956797610365131

19. Elliot AJ, Church MA (1997) A hierarchical model of approach and avoidance achievement motivation. J Pers Soc Psychol 72:218-232. DOI: 10.1037/0022-3514.72.1.218

20. Webb TL, Sheeran P (2006) Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. Psychol Bull 132:249-268. DOI: 10.1037/0033-2909.132.2.249

21. Bagozzi RP, Baumgartner H, Pieters R (1998) Goal-directed emotions. Cogn Emot 12:1-26. DOI: 10.1080/026999398379754

22. Hemenover SH, Harbke CR (2017) Individual differences in forecast effectiveness of 5 negative affect repair strategies. Pers Individ Dif 114:175-180. DOI: 10.1016/j.paid.2017.04.014

23. Watson D, Clark LA, Tellegen A (1988) Development and validation of brief measures of positive and negative affect: the PANAS scales. J Pers Soc Psychol 54:1063-1070. DOI: 10.1037/0022-3514.54.6.1063

24. Krohne HW, Egloff B, Kohlmann CW, Tausch A (1996) Untersuchungen mit einer deutschen Version der „Positive and Negative Affect Schedule" (PANAS). Diagnostica 42: 139-156. DOI: 10.1037/t49650-000

25. Schifter DE, Ajzen I (1985) Intention, perceived control, and weight loss: An application of the theory of planned behavior. J Pers Soc Psychol 49:843-851. DOI: 10.1037/0022-3514.49.3.843

26. Hunt HR, Gross AM (2009) Prediction of exercise in patients across various stages of bariatric surgery: A comparison of the merits of the theory of reasoned action versus the theory of planned behavior. Behav Modif 33:795-817. DOI: 10.1177/0145445509348055

27. Gardner RE, Hausenblas HA (2004) Understanding exercise and diet motivation in overweight women enrolled in a weight-loss program: A prospective study using the theory of planned behavior. J Appl Soc Psychol 34:1353-1370. DOI: 10.1111/j.1559-1816.2004.tb02010.x

28. Palmeira AL, Teixeira PJ, Branco TL, Martins SS, Minderico CS, Barata JT, ... & Sardinha LB (2007) Predicting short-term weight loss using four leading health behavior change theories. Int J Behav Nutr Phys Act 4:14. DOI: 10.1186/1479-5868-4-14

29. Aiken LS, West SG (1991) Multiple regression: Testing and interpreting interactions. Sage, Newbury Park

30. Centers for Disease Control and Prevention (CDC) (2017, April 1) Defining adult overweight and obesity. Retrieved from

https://www.cdc.gov/obesity/adult/defining.html

31. Neighbors LA, Sobal J (2007) Prevalence and magnitude of body weight and shape dissatisfaction among university students. Eat Behav 8:429-439. DOI: 10.1016/j.eatbeh.2007.03.003

32. Hartmann-Boyce J, Johns DJ, Jebb SA, Summerbell C, Aveyard P, Behavioural Weight Management Review Group (2014) Behavioural weight management programmes for adults assessed by trials conducted in everyday contexts: systematic review and meta-analysis. Obes Rev 15:920-932. DOI: 10.1111/obr.1222

33. Stewart AL (1982) The reliability and validity of self-reported weight and height. J Chronic Dis 35:295-309. DOI: 10.1016/0021-9681(82)90085-6

34. Rowland ML (1990) Self-reported weight and height. Am J Clin Nutr 52:1125-1133. DOI: 10.1093/ajcn/52.6.1125

35. Niedhammer I, Bugel I, Bonenfant S, Goldberg M, Leclerc A (2000) Validity of self-

reported weight and height in the French GAZEL cohort. Int J Obes 24:1111-1118.

DOI: 10.1038/sj.ijo.0801375

Table 1

Baseline Characteristics of the Study Sample

	Time 1 Sample (N = 732)		Time 1 & 2 Sample (N = 526)	
Categorical Variables	n	%	n	%
Sex				
Female	370	50.5	258	49.0
Male	362	49.5	268	51.0
Nationality				
German	710	97.0	511	97.1
Other	22	3.0	15	2.9
Education				
No degree	3	0.4	2	0.4
Certificate of secondary education[a]	110	15.0	77	14.6
General certificate of secondary education[b]	212	29.0	163	31.0
High-School diploma	170	23.2	114	21.7
College/university degree	209	28.6	148	28.1
Doctoral degree	28	3.8	22	4.2
Work				
Employed	447	61.1	316	60.1
Student	60	8.2	34	6.5
Retired	121	16.5	103	19.6
Unemployed	51	7.0	37	7.0
Maternity leave	13	1.8	7	1.3
Other	40	5.5	29	5.5
Continuous Variables	*M* (*SD*)	Range	*M* (*SD*)	Range
Age	48.83 (13.54)	19 - 89	49.98 (13.40)	19 - 89
BMI	30.55 (5.61)	25.00 - 68.32	30.61 (5.71)	25.00 - 68.32

Note. [a]Hauptschule. [b]Mittlere Reife.

Table 2

Bivariate Correlations among All Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Attitude (T1)	-											
2. Subjective Norm (T1)	.29**	-										
3. Perceived Control (T1)	.02	.04	-									
4. Pos. Emotion (T1)	-.37**	-.30**	.12**	-								
5. Neg. Emotion (T1)	.32**	.42**	-.15**	-.50**	-							
6. Limit Intentions (T1)	.28**	.23**	.19**	-.13**	.26**	-						
7. Physical Activity Intentions (T1)	.01	.05	.29**	.18**	.01	.45**	-					
8. Social Support Intentions (T1)	.02	.12**	.04	.07	.25**	.27**	.32**	-				
9. Pos. Emotion (T2)	-.31**	-.28**	.11*	.56**	-.44**	-.10*	.14**	.06	-			
10. Neg. Emotion (T2)	.27**	.39**	-.14**	-.40**	.71**	.20**	-.01	.22**	-.53**	-		
11. Limit Behaviors (T2)	.20**	.19**	.07	-.12**	.30**	.61**	.31**	.27**	-.04	.20**	-	
12. Physical Activity Behaviors (T2)	-.02	-.08	.14**	.19**	-.02	.27**	.60**	.21**	.24**	-.08	0.41**	-
13. Social Support Behaviors (T2)	.10*	.15**	-.00	-.03	.26**	.22**	.20**	.47**	.08	.18**	0.36**	0.31**

Note. T1 = Time 1; T2 = Time 2; Limit = Limit unhealthy food.
*p < .05. **p < .01.

Table 3

Hierarchical Multiple Regressions Predicting Intentions and Behaviors

|	Dependent Variables: Intentions (T1)					
	Unhealthy Food		Physical Activity		Social Support	
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	$.14^{**}$		$.09^{**}$		$.02^{**}$	
Attitude		$.23^{**}$		-.01		-.02
Subjective Norm		$.16^{**}$		.03		$.12^{**}$
Perceived Control		$.18^{**}$		$.29^{**}$		.04
Step 2	$.03^{**}$		$.04^{**}$		$.10^{**}$	
Pos. Emotion (T1)		.05		$.24^{**}$		$.25^{**}$
Neg. Emotion (T1)		$.22^{**}$		$.15^{**}$		$.37^{**}$
	Dependent Variables: Behaviors (T2)					
	Unhealthy Food		Physical Activity		Social Support	
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.00		$.02^{**}$		.00	
Perceived Control		.07		$.15^{**}$		.00
Step 2	$.37^{**}$		$.34^{**}$		$.23^{**}$	
Intention		$.62^{**}$		$.61^{**}$		$.48^{**}$
Step 3	.00		.00		.00	
Perceived Control x Intention		.02		-.01		-.04
Step 4	$.02^{**}$		$.01^{*}$		$.02^{**}$	
Pos. Emotion (T1)		.05		$.11^{*}$		.03
Neg. Emotion (T1)		$.16^{**}$		.04		$.17^{**}$

Note. T1 = Time 1; T2 = Time 2;
$^{*}p < .05.$ $^{**}p < .01.$
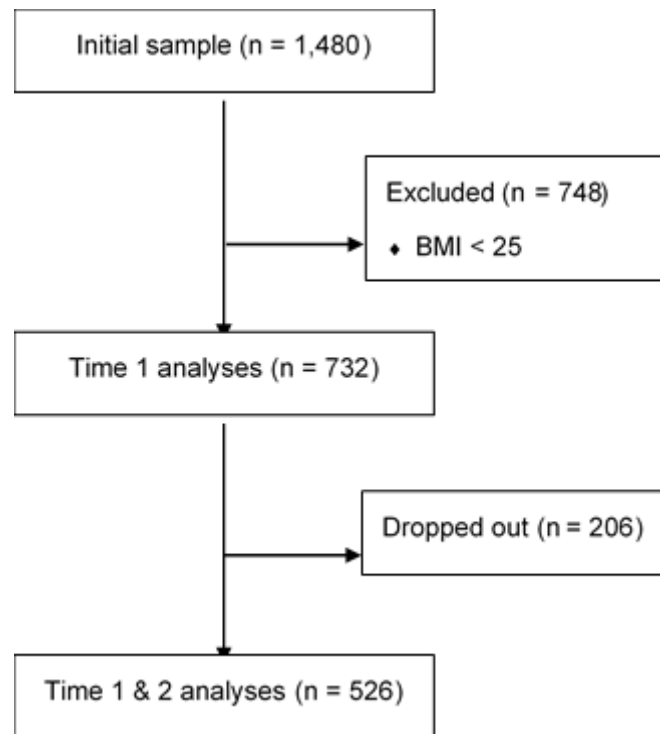
Figure 1. Participant flow chart.