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Abstract: The high prevalence rates of problematic eating behaviors, such as binge eating symptoms and lack of healthy eating, have urged researchers to investigate which factors contribute to or hinder a healthy eating regulation. The current study employs a daily diary method to examine whether the daily satisfaction and frustration of the three basic psychological needs for autonomy, competence, and relatedness, as conceptualized within Self-Determination Theory (Deci & Ryan, 2000), is associated with daily healthy eating and daily binge eating symptoms. In a sample of female youngsters (N = 302), daily fluctuations in need satisfaction and need frustration were related to daily fluctuations in healthy eating and binge eating symptoms. Follow-up analyses indicated that competence satisfaction related to healthy eating, whereas the frustration of all three needs yielded an independent association with binge eating symptoms. Apart from the main effects of low self-control strength and emotional eating, emotional eating served as a moderator of the link between need frustration and binge eating symptoms. Theoretical and clinical implications of these findings are discussed.

Suggested Reviewers: Julia Schüler

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Dr. Julia Schüler has recently published an article in which similar theoretical and empirical questions were investigated (Schüler, J. & Kuster, M. (2011). Binge eating as a consequence of basic need thwarting and the moderating role of the achievement motive. *Motivation and Emotion*, 35(1), 89-97.) Therefore, she might be interested in reviewing the current paper.

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*Highlights

- We implement a diary study to investigate daily fluctuations in binge eating and healthy eating
- Daily fluctuations in psychological need satisfaction are associated with healthy eating behaviours
- Daily fluctuations in psychological need frustration are associated with binge eating symptoms
- Participants with an emotional eating style have stronger associations between daily need frustration and binge eating behaviours
- General self-control strength is associated with more healthy eating eating and less binge-eating, but has no moderation effect.

RUNNING HEAD: daily needs and eating behaviours

**Daily Ups and Downs in Healthy Eating and Binge Eating Symptoms:
The Role of Basic Psychological Needs, General Self-Control and Emotional Eating**

Key words: Self Determination Theory; Psychological need satisfaction; Binge Eating Symptoms, Healthy eating, Self-control strength, Emotional Eating; Diary Study

Abstract

The high prevalence rates of problematic eating behaviors, such as binge eating symptoms and lack of healthy eating, have urged researchers to investigate which factors contribute to or hinder a healthy eating regulation. The current study employs a daily diary method to examine whether the daily satisfaction and frustration of the three basic psychological needs for autonomy, competence, and relatedness, as conceptualized within Self-Determination Theory (Deci & Ryan, 2000), is associated with daily healthy eating and daily binge eating symptoms. In a sample of female youngsters ($N = 302$), daily fluctuations in need satisfaction and need frustration were related to daily fluctuations in healthy eating and binge eating symptoms. Follow-up analyses indicated that competence satisfaction related to healthy eating, whereas the frustration of all three needs yielded an independent association with binge eating symptoms. Apart from the main effects of low self-control strength and emotional eating, emotional eating served as a moderator of the link between need frustration and binge eating symptoms. Theoretical and clinical implications of these findings are discussed.

Daily Ups and Downs in Healthy Eating and Binge Eating Symptoms:

The Role of Basic Psychological Needs, General Self-Control and Emotional Eating

Past research has indicated that adolescents and young adults suffer from many eating problems (Ogden, 2010). For instance, prevalence rates of binge eating, which is defined as “episodes of eating which are experienced as excessive and beyond the subject’s control” (Fairburn, 1984, p. 235), as high as 60% have been reported in female students (Hart & Ollendick, 1985). In addition, a general lack of healthy eating has been observed, with up to 97% of adolescent girls failing to meet health recommendations of daily fruits and vegetables intake (Striegel-Moore et al., 2006). Both binge eating symptoms and lack of healthy eating can contribute to overweight and obesity, which, in turn, are associated with a variety of physical (e.g., coronary disease, diabetes, hypertension; e.g., World Health Organization, 1996) and mental health (e.g., depressive symptoms, low self-esteem; e.g., Bray, 1986; Wadden et al., 2006) problems.

Given these high prevalence rates, it is important to investigate why people sometimes lose control over eating and fail to eat healthy. In doing so, many researchers paid attention to individual characteristics (i.e., between-person differences), such as general self-control strength (e.g., Baumeister & Heatherton, 1996; Vohs & Heatherton, 2000) and eating style (e.g., Ouwens, van Strien, van Leeuwe, & van der Staak, 2009) to explain which persons are more likely to be successful or unsuccessful in their eating regulation attempts. Another approach, however, is to investigate fluctuations in eating regulation from day to day. Indeed, besides the more general and likely also more stable differences between persons in eating habits, it is likely there is variability within persons from day to day in both healthy eating behaviours and binge eating symptoms. Simply put, one day is not the other.

Recently, there’s a strong increase in interest towards fluctuations in one’s eating pattern, both towards binge eating symptoms (e.g., Haedt-Matt & Keel, 2011) and healthy eating

behaviours (e.g., O'Connor, Conner, Jones, McMillan, & Ferguson, 2009). The majority of these studies investigated the role of negative affect on binge eating symptoms (e.g., Haedt-Matt & Keel, 2011) and the role of 'daily hassles' on healthy eating behaviours (e.g., O'Connor et al., 2009). To our knowledge, no previous studies have relied on a more general motivational framework to understand exactly why it is more difficult on some days to eat healthily and maintain control over eating. As both healthy eating and binge eating symptoms are activities that involve self-regulation, motivation theories are particularly well suited to study these outcomes.

Grounded on Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000), a broad motivation theory on optimal human development and growth, the main goal of the current diary study is to investigate whether daily satisfaction and frustration of the basic psychological needs for autonomy, competence, and relatedness, can explain within-person variability in healthy eating and binge eating symptoms in a large sample of nonclinical women. A secondary aim of the study was to investigate whether individuals who have relatively low self-control strength and those who have an emotional eating style are more prone to display a disturbed or less healthy eating pattern at days their psychological needs get frustrated.

The Ups and Downs in Healthy Eating and Binge Eating Symptoms

Previous research on within-person fluctuations in eating behaviours can be divided into two research lines. First, researchers have investigated when binge eating occurs and which emotions or events precede these binges (e.g., Haedt-Matt & Keel, 2011). A second research line is oriented towards healthy eating and investigated the role of daily hassles on consumption of healthy and unhealthy food (e.g., O'Connor et al., 2009).

Research on within-person fluctuations in binge eating is mostly based on the affect regulation model (e.g., Gross, 2007; Haedt-Matt & Keel, 2011), which states that binge eating

serves to regulate one's emotional states. The basic premises are that negative affect precedes binge eating and is lowered after binge eating. Most studies have found support for the former hypothesis. For instance, in a comprehensive review, Haedt-Matt and Keel (2011) concluded that individuals experience more negative affect prior to binge eating episodes compared to their average levels of negative affect throughout the day. In addition to high negative affect, also other emotional states such as anger (e.g., Engel et al., 2007; Smyth et al., 2007), low positive affect (e.g., Smyth et al., 2007), low alertness (Greeno, Wing, & Shiffman, 2003) and stress (e.g., Smyth et al., 2007) have been found to precede a binge. Less empirical support has been found for the premise that negative affect decreases after binge eating. To the contrary, most studies reported that negative affect even increases after binge eating (e.g., Haedt-Matt & Keel, 2011), which suggests that binge eating is not an efficient strategy to regulate negative affect. In addition to studies examining the role of emotions in one's eating behaviors, a few studies have investigated other experiences as precursors of binge eating, including decreases in self-concept (Steiger et al., 2005), poor social experiences (Steiger et al., 1999) and negative family interactions (Okon, Greene, & Smith, 2003).

Negative emotions can be provoked when one encounters daily hassles, which are defined as 'events, thoughts, or situations which, when they occur, produce negative feelings such as annoyance, irritation, worry or frustration, and/or make you aware that your goals and plans will be more difficult to achieve' (O'Connor et al., 2009, p. 185). A number of studies have focused on the association between the experience of such daily hassles and the engagement in eating behaviours, like snacking and fruit consumption. These studies found that daily hassles are associated with a variety of eating behaviours, such as eating more high-fat foods and sugar snacks (O'Connor, Jones, Conner, McMillian, & Ferguson, 2008), snacking between meals (Conner, Fitter, & Fletcher, 1999), and eating less vegetables (e.g., O'Connor et al., 2008) on a daily basis. These studies demonstrate that also healthy eating behaviours

are subject to within-person fluctuations and, thus, it is important to investigate processes that are implicated in these daily variations in healthy eating.

The current study aims to extend previous work on processes involved in within-person fluctuations of binge eating symptoms and healthy eating behaviours by implementing a motivational perspective. Specifically, we aimed at investigating whether daily fluctuations in satisfaction and frustration of the basic psychological needs for autonomy, competence and relatedness, as defined within Self-Determination Theory (Deci & Ryan, 2000; Ryan & Deci, 2000), are associated with daily fluctuations in binge eating symptoms and healthy eating behaviours.

Self-Determination Theory: The Role of Psychological Needs in Eating Regulation

SDT is a motivation theory that investigates individuals' adaptive (e.g., well-being) and maladaptive (e.g., psychopathology) functioning in general, but also in more specific behavioral contexts (e.g., work, sports, eating regulation). A central aspect of SDT is the tenet that people are born with a set of basic psychological needs, which are considered as the psychological nutrients necessary for growth and integration (Ryan & Deci, 2000). Three universally important psychological needs have been identified, that is, the needs for competence, relatedness, and autonomy. Competence reflects the need to feel efficacious and capable of achieving desired outcomes. Relatedness involves the need to feel close to and valued by important others and to have a sense of belonging with peers, family, and the larger community. Finally, autonomy concerns the experience of volition and psychological freedom in carrying out an activity.

Consistent with SDT's claim that the psychological needs are implicated in individuals' adaptive and maladaptive functioning, a variety of studies demonstrated that need satisfaction is associated with more well-being (e.g., Deci & Ryan, 2008 for an overview) and with positive outcomes in specific behavioral contexts, for instance, enhanced engagement and

performance in the sport context (e.g., Ryan & Deci, 2007 for an overview). Otherwise, need frustration is associated with more negative outcomes such as emotional and physical exhaustion (e.g., Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011). In addition, a few studies have addressed the question of within-person fluctuations in psychological need satisfaction and wellbeing. In line with hypothesis, results demonstrated that individuals report more positive affect, vitality and less negative affect on days their needs had been satisfied, with all three needs yielding an independent contribution to these outcomes (Reis, Sheldon, Gable, Roscoe, & Ryan 2000; Ryan, Bernstein, & Brown, 2010; Sheldon, Ryan, & Reis, 1996).

No previous studies have investigated within-person associations between daily need satisfaction and frustration and daily eating behaviours. However, there are a few previous studies that relied on between-person designs which demonstrated that the psychological needs are implicated in one's eating behaviours. Between-person differences in need satisfaction were found to be associated with a healthier diet, such as a higher intake of fruits and vegetables (see Ryan, Patrick, Deci, & Williams, 2008 for an overview), while the frustration of the psychological needs related to more unhealthy weight control behaviours (Thøgersen-Ntoumani, Ntoumanis, & Nikitaras, 2010), more eating disorder symptoms (Bartholomew et al., 2011), and more binge eating behaviours (Schüler & Kuster, 2011).

The present study extends this rather small body of work by examining whether day-to-day fluctuations in need satisfaction and need frustration would relate to daily variation in binge eating symptoms and healthy eating behaviours. Two, albeit related, theoretical processes might help to understand why satisfaction and frustration of the psychological needs might relate to one's eating behaviours. First, individuals whose psychological needs are satisfied feel more energetic and vital (e.g., Ryan & Deci, 2008). As eating regulation is on average a challenging task that requires self-control and energy to resist unhealthy foods

(Vohs & Heatherton, 2000), the energy-providing character of need satisfaction (Moller et al., 2006) might help one to choose healthy foods and to prevent one of losing control over eating. Need frustrating experiences, on the other hand, might deplete one's energy (Muraven, Gagné, & Rosman, 2008) such that one has not sufficient energy left to choose healthy foods and to resist binge eating. Second, psychological need satisfaction and frustration might influence one's eating behaviours through the experience of positive and negative affect. Given that daily need satisfaction relates to more positive affect and less negative affect (e.g., Ryan et al., 2010) and, that low positive affect and high negative affect were found to precede binge eating behaviours (e.g., Haedt-Matt & Keel, 2011) and less healthy eating behaviours (e.g., O'Connor et al., 2009), these affective experiences may account for the association between psychological needs and eating behaviours.

The Moderating Role of General Self-control Strength and Emotional Eating

In addition to examining how daily need satisfaction relates to daily eating behaviors, we also examined whether individual (i.e., between-person) characteristics moderate these associations. In other words, is every person who experiences need frustration equally susceptible for a lack of optimal eating regulation? Would there be individual characteristics that attenuate or strengthen the association between the psychological needs and eating behaviours? Based upon the hypothesized pathways of energy-depletion and negative affect, we reasoned that one's general self-control strength (Baumeister & Heatherton, 1996) and one's emotional eating style (e.g., O'Connor & O'Connor, 2004) may moderate the link between the needs and eating behaviours.

The concept of self-control strength stems from the Self-Control Model (Baumeister & Heatherton, 1996), which states that people's self-control capacity is a limited resource or strength that gets depleted over time (i.e., ego-depletion). Self-control is defined as "the use of cognitive and attentional resources to override, inhibit, or alter impulses in the service of

attaining personal goals or satisfying motives" (Vohs & Heatherton, 2000, p. 214). On days people have engaged in various self-control activities, they are said to be less able to resist tempting foods because their limited energetic resources got eroded. Yet, there are considerable differences between persons in their general self-control strength, with high self-control strength being related to a variety of adaptive behaviors, both outside the eating domain (e.g., school performance, optimal emotional response; Tangney, Baumeister, & Boone, 2004) and within the eating domain (e.g., less bulimic and binge eating symptoms; Peluso, Ricciardelli, & Williams, 1999; Tangney et al., 2004).

In addition to examining the between-person effect of self-control strength in the prediction of binge eating and healthy eating behaviours, we investigated whether individuals with low self-control strength would be more prone to binge eating symptoms and be less capable of eating healthily on need frustrating days. There is some indirect evidence for this moderation hypothesis. For instance, Schüler and Kuster (2011) found that the association between unfulfilled needs and binge eating was present for people low in achievement motivation, but not for those high in achievement motivation. As people high in achievement motivation are characterized by high self-control competencies (Mischel, 1961), Schüler and Kuster argued that differences in self-control capacities could account for this moderation effect. Further, O'Connor and colleagues (2009) found that several aspects of conscientiousness, which shares conceptual overlap with the notion of self-control strength, moderates the relation between daily hassles and eating behaviours (O'Connor et al., 2009). In line with these findings, we hypothesized that daily associations between psychological need satisfaction and frustration and eating behaviours would be especially strong for those persons with low general self-control strength.

Next to self-control strength, we explored whether emotional eating would accentuate the relation between the psychological needs and eating behaviours. Emotional eating refers

to a tendency to eat more when anxious or emotionally aroused (e.g., O'Connor & O'Connor, 2004) and has frequently been studied as an individual characteristic that strengthens the relation between negative affect and binge eating symptoms. For instance, laboratory studies found that people with an emotional eating style ate more high-fat and/or sugared food after induction with negative affect or stress (e.g., Wallis & Hetherington, 2009; Loxton, Dawe, & Cahill, 2011), although other studies could not confirm these findings (e.g., O'Connor & O'Connor, 2004). The results of diary studies were equally mixed. Whereas O'Connor et al. (2008) reported that emotional eating moderated the association between daily hassles and snacking behaviors (O'Connor et al., 2008), Conner et al. (1999) reported no evidence for such a moderation effect. Given the mixed findings, we deemed it important to further explore this issue.

Present Study

In the present study we investigated the role of the psychological needs in the context of eating regulation by using a daily diary method in a group of young female participants. Given our primary aims to investigate within-person processes and how people differ in these processes, a diary method is an appropriate technique (Bolger, Davis & Rafaeli, 2003). Diaries offer the opportunity to investigate individuals' experiences within everyday context which increases the ecological validity of the study. Furthermore, given the limited time interval between the experiences and the measurement of these experiences, the likelihood of measurement errors due to retrospection are diminished, which increases the reliability and validity of the study (Bolger et al., 2003).

The first and primary goal of the study was to examine within-person associations between the three basic psychological needs and healthy eating behaviours and binge eating symptoms. A premise for investigating within-person processes, however, is that there is significant within-person variability in healthy eating and binge eating symptoms. This means

that, besides of the differences between persons, there are considerable fluctuations from day-to-day within persons. Therefore, we started with examining the amount of variation at both within- and between-person level.

If this premise was fulfilled, we investigated whether an aggregated score of daily need satisfaction and an aggregated score of daily need frustration was associated with daily healthy eating behaviours and binge eating symptoms. As recent studies indicate that need satisfaction is associated with more positive outcomes, whereas need frustration is associated with more negative outcomes (e.g., Bartholomew et al., 2011; Sheldon et al., 2011), we hypothesized that especially need satisfaction would relate to healthy eating, whereas need frustration would relate to binge eating symptoms (Hypothesis 1). Second, we investigated the unique contribution of each of the three needs. Whereas the use of a composite measure of need satisfaction and frustration (e.g., Schüler & Kuster, 2011) is valid in light of the high correlations between the three needs, it might also obscure unique effects of the three needs separately. Given that previous diary studies indicated that all three needs contributed uniquely to wellbeing (e.g., Ryan et al., 2010), we expected that the three needs would be associated uniquely with healthy eating and binge eating symptoms (Hypothesis 2).

A secondary aim involved investigating whether the individual characteristics of general self-control strength and having an emotional eating style would moderate the within-person associations between the needs and eating behaviours. A premise for investigating these moderation effects, is that there are significant between-person differences in the strength of the associations between the needs and eating regulation. If so, this opens the possibility to investigate which individual characteristics can explain this variability. In addition, we explored whether three background variables, that is, BMI, educational level and age, had significant effects on binge eating symptoms and healthy eating and, thus, should be controlled for in further analysis.

Next, two separate equations were built to investigate main and moderation effects of low self-control strength and emotional eating. In addition to a main effect of low self-control strength, we expected that especially people with low self-control strength, compared to those with high self-control strength, would be less able to eat healthily and control their eating on need frustrating or less need satisfying days (hypothesis 3). Given inconclusive evidence in previous studies regarding the role of an emotional eating style, we examined in a rather explorative fashion the possible main and moderating effects of emotional eating (research question 1).

Method

Sample and Procedure

Female adolescents aged 14 to 23 were invited by bachelor students psychology to take part in a diary study towards their daily feelings and eating habits. In total 302 females aged 14 to 23 (mean age = 17.7) participated in the study. Most participants were attending secondary education in Flanders with 45.7% enrolled in academic education, 14.2% in technical education and 3.7% in vocational education. In addition, 29.9% of the participants were enrolled in higher education and 4.1% were working. Prior to the diary study, informed consents were signed by participants and by one of the parents for under aged participants. During this first visit some basic questionnaires were completed in which demographic information (e.g., age, education, height and weight) and more dispositional traits (e.g., general self-control strength, emotional eating style) were assessed. Participants were handed over a booklet of questionnaires which had to be filled in at evenings before bedtime for 14 days in a row. Participants received an email or text message each day to help them remember to fill in the questionnaires. In addition, the students who contacted the participants visited the participant at home a second time after one week and a third time at the end of the study. This ensured maximal participation of all participants. Only two participants were taken out of the

analysis because they failed to fill in the questionnaire for two weeks. In total, there were 2% missing values in the data, which are treated as structural missing values by default in MIWin.

Questionnaires

Body Mass Index (BMI). Participants reported their height and weight. Based on this information, BMI was calculated with the formula [weight in kg/(2*length in m)].

Emotional Eating. Emotional eating was assessed with the Dutch Eating Behavior Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986). Participants indicated on a scale from 1 (never) to 5 (very often) how often they eat in response to emotions such as anger, anxiety, restlessness (e.g., “If you feel disappointed, would you like to eat something?”, 13 items). The items were scored such that a higher score represented a stronger tendency to eat in response to these emotions. Cronbach’s alpha was .92 in the current sample.

General Self-Control Strength. To assess general self-control strength a selection of 11 out of 13 items of the Self-Control Questionnaire (Tangney et al., 2004) was used. The questionnaire intends to measure individual differences in the disposition to control impulses, thoughts and emotions and to suppress undesirable behavior (Finkenauer, Engels, & Baumeister, 2005). The selection of items was based on the study by Finkenauer et al. (2005) who translated the items in Dutch for their study. Participants responded on a scale from 1 (completely disagree) to 5 (completely agree) on items such as “I’m good at resisting temptations“ and “I find it difficult to break with bad habits”. As most items were negatively worded, we created a composite score with higher scores indicating a stronger lack of general self-control strength. Cronbach’s alpha was .71 in the current sample.

Daily Psychological Needs. To measure daily satisfaction and frustration of the needs for autonomy, competence, and relatedness, we used a measure developed by Sheldon and Gunz (2009). Participants rated on a scale from 1 (not at all true) to 5 (very true) whether

they felt their needs for autonomy (e.g. “Today my choices were based on my true interests and values” or “Today I had a lot of pressures I could do without”), competence (e.g. “Today I was successfully completing difficult tasks and projects” or “Today I struggled doing something I should be good at”) and relatedness (e.g. “Today I felt close and connected to people who are important to me” or “Today I felt lonely”) were satisfied or frustrated during the day. This daily assessments of needs consisted of 18 items, that is, 6 items per need, 3 of which tapped into satisfaction and 3 of which tapped into frustration of the psychological needs. Reliabilities were calculated with Cronbachs’ alpha at each measurement time and for each separate need as well as for the aggregated measures of need satisfaction and need frustration. The aggregate measures had average reliabilities of .85 (range .79-.88) for need satisfaction and .79 (.74-.84) for need frustration. Satisfaction of the needs for autonomy, competence and relatedness had respective reliabilities of .75 (.70-.79), .77 (.69-.84), and .85 (.79-.89), whereas frustration of these needs had respective reliabilities of .67 (.56-.77), .72 (.69-.77), and .58 (.48-.70). Although most measures had sufficient reliability, the effects of relatedness frustration should be interpreted with some caution as Cronbach’s alpha revealed relatively low internal consistency at some measurement times.

Daily Healthy Eating. To measure healthy eating 5 items from the Healthy Eating Habits Scale (HEHS; Pelletier & Dion, 2007) were selected. This scale was constructed in collaboration with nutritionist and intents to measure the amount of healthy and unhealthy foods people usually eat. For the purpose of this study 5 items were adapted to a daily measurement format. Participants answered items (e.g. “Today I ate vegetables’ and “Today I ate a variety of foods as recommended in the food pyramid”) on a scale from 1 (not at all) to 5 (a lot). The average reliability across the 14 measurement times was .61 (.56-.67).

Binge Eating Symptoms. The bulimia-scale of the Dutch version (Van Strien, 2002) of the Eating Disorder Inventory (EDI; Garner, 1991) was used to assess binge eating

symptoms. The bulimia subscale assesses “the tendencies to think about and engage in bouts of uncontrollable overeating” (Garner, 1991, p. 5). One item was not included in the computation of the scale score (“i.e. “I have thought of trying to vomit in order to lose weight”) since we were mainly interested in binge eating rather than compensatory bulimic behaviours (see also Woods, Racine, & Klump, 2010). Further, we adapted the remaining 6 items to capture the daily experiences of participants by adding ‘today’ before each item. Participants responded on a scale from 1 (not at all) to 6 (very much) to items such as “Today I stuffed myself with a lot of foods“ and “Today I had episodes of eating in which I felt like I could not stop eating“. The scale had an average reliability of .83 (.77-.87).

Plan of Analysis

This study has a repeated measurements design in which 14 measurement times (Level 1) are nested within 302 persons (Level 2). To investigate daily variations within persons, it is important to take into account the hierarchical structure of the data as large dependencies within persons can be expected. Also, some of our research questions require simultaneously analyzing information about between-person and within-person differences. Therefore, multilevel analysis was considered the most appropriate technique. All analyses were performed with the statistical software package MIWin 2.02 with days at Level 1 nested in persons at Level 2. Also, all predictor variables were centered around their grand mean to facilitate convergence and interpretation of the models. Models for healthy eating behaviours and binge eating symptoms were estimated separately.

Prior to investigating our research hypothesis, we examined whether there was significant variability in healthy eating and binge eating symptoms on a daily basis. If there is no such variability, it is of little use to explore within-person variance as a function of the three needs. A null model with random intercepts and a constant as the only predictor was created for this purpose. This model decomposed the total variation into variation at the

between-person and within-person levels and served as a baseline model against which other models could be compared.

For the first aim, two series of models were tested. The first series of models involved examining whereas the aggregated scores of need satisfaction and need frustration were related to binge eating symptoms and healthy eating behaviours (hypothesis 1). Need satisfaction and frustration were further decomposed into their respective subcomponents of autonomy, competence, and relatedness in a second series of models to test unique associations between the three needs and eating behaviours (hypothesis 2). In each series of models we started with a random intercepts model only and then gradually included random effects at Level 1 and Level 2. In all models reported in Table 1 and 2, we controlled for significant random effects at both levels of analyses (as indicated by likelihood-ratio tests and by chi-square test).

For the second aim, we first tested whether there was significant variation between persons in the association between the needs and both outcomes and second, whether BMI, educational level and/or age had to be included as background variables. Then, we examined the moderating role of general self-control strength (hypothesis 3) and an emotional eating style (research question 1) on the association between the needs and eating behaviours.

Results

The resulting models for binge eating symptoms and healthy eating behaviours are presented separately in Tables 1 and 2, respectively.

Binge Eating Symptoms

In a first step, the null model with random intercepts indicated significant variability at the within-person level [$\chi^2(1) = 964.514, p < .001$] and at the between-person level [$\chi^2(1) = 132.163, p < .001$]. Specifically, 52% of the variance was attributed to between-person differences, whereas 48% was attributed to within-person differences. In other words, in

addition to significant variation between participants in binge eating symptoms, there were significant fluctuations from day to day in these symptoms within persons. This indicated it is necessary to take into account the hierarchical structure of the data and, thus, to use a multilevel approach.

In the first series of models, the aggregated measures of need satisfaction and need frustration were entered into the equations to test hypothesis 1 (Model 1 in Table 1). Results indicated that need frustration had a significant positive association with binge eating symptoms [$\chi^2(1) = 50.749, p < .001$], whereas need satisfaction had no association with binge eating symptoms [$\chi^2(1) = 0.585, ns$]. After excluding need satisfaction from the model, the fit did not deteriorate ($\chi^2(1) = 0.190, ns$) which further underscored the point that need satisfaction does not yield additional information above need frustration. For every unit increase in need frustration, there was an average increase of 0.116 on the scale of binge eating symptoms. The model explained 15% of the within-person variance in binge eating.

Next, we decomposed the variable need frustration into its subcomponents of relatedness, autonomy and competence frustration (Model 2 in Table 1), which allowed us to investigate hypothesis 2. After controlling for significant random effects at both levels of analysis, a positive fixed effect of relatedness [$\chi^2(1) = 24.388, p < .001$], autonomy [$\chi^2(1) = 5.707, p < .05$] and competence [$\chi^2(1) = 7.342, p < .01$] frustration on binge eating symptoms was found. On average, one unit increase in relatedness, autonomy and competence frustration was associated with a respective increase of 0.061, 0.024, and 0.038 in binge eating symptoms. This model explained 35% of the within-person variance in binge eating symptoms. In other words, the decomposition in the three separate needs explained an additional 12% of the within-person variance in binge eating symptoms. However, the fit of this model was lower compared to the previous model. For this reason and to limit the number of parameter estimates, we decided to proceed with the composite measure of need frustration

when examining the potential moderating role of emotional eating and self-control in the final models.

In the next step, we tested between-person differences in the association between need frustration and binge eating symptoms. Results indicated there was significant variation in the slope between persons [$\chi^2(1) = 22.095, p < .001$], meaning that there was indeed a difference between participants in the relation between need frustration and binge eating symptoms. Then, we tested the main and moderation effects of three background variables, that is, BMI, age, and educational level. No main or moderation effects for BMI [$\chi^2(1) = 1.71, ns$; $\chi^2(1) = 1.678, ns$], age [$\chi^2(1) = 0.859, ns$; $\chi^2(1) = 2.295, ns$] and educational level [$\chi^2(1) = 2.835, ns$; $\chi^2(1) = 0.136, ns$] appeared. Therefore, these background variables were not included in the subsequent analyses investigating low-self control strength and emotional eating style.

Low self-control strength had a positive association with binge eating symptoms [$\chi^2(1) = 10.111, p < .01$], but no moderation effect was found [$\chi^2(1) = 0.235, ns$]. People with lower self-control strength experienced more binge eating symptoms throughout the 14 days of measurement, but they had no stronger associations between need frustration and binge eating symptoms compared to individuals with higher self-control strength. The fit of this model was significantly better compared to the model with need frustration as only predictor [$\chi^2(1) = 10.984, p < .001$].

Second, emotional eating style was entered into the equations. Having an emotional eating style yielded a significant main effect [$\chi^2(1) = 46.838, p < .001$], while simultaneously playing a moderation role in the need frustration – binge eating symptoms association [$\chi^2(1) = 22.588, p < .001$]. The main effect indicated that emotional eaters experienced more binge eating symptoms across days. To interpret the moderation effect, a graph is plotted of the fixed effects in which the average binge eating symptoms score was calculated for participants with a low (Mean -1SD) or high (Mean +1SD) emotional eating style in

combination with a low (Mean -1 SD) or high (Mean + 1SD) need frustration score (see Figure 1). This plot demonstrated that the association between need frustration and binge eating symptoms was stronger for participants with a more emotional eating style. The inclusion of emotional eating as a predictor yielded a decrease of 28.6% of the variance in the slopes and resulted in a significantly better fit compared to the model with need frustration only [$\chi^2(1) = 48.668, p < .001$].

Healthy Eating Behaviours

Just as for binge eating symptoms, there was significant variability between persons [$\chi^2(1) = 132.491, p < .001$] and within persons [$\chi^2(1) = 965.611, p < .001$] in healthy eating behaviours, with 47% and 53% of the total variance being situated at the within-person and between-person level, respectively. In other words, in addition to variations between persons, there were significant fluctuations from day to day in healthy eating behaviours within persons. This indicated that also for healthy eating, it is necessary to take into account the hierarchical structure of the data and, thus, to use a multilevel approach.

In the first series of models we entered the aggregated measures of need satisfaction and need frustration into the equations to test hypothesis 1 (see Model 1 in Table 2). Whereas need satisfaction yielded a significant positive association with healthy eating [$\chi^2(1) = 6.264, p < .001$], need frustration had no association [$\chi^2(1) = 0.166, ns$]. Every unit increase in need satisfaction yielded an increase of 0.054 on the scale of healthy eating. This model explained 4.4% within-person variance in healthy eating and represented a significant improvement over the null model [$\chi^2(3)=59.226, p<.001$].

In the next series of models we investigated independent contributions of relatedness, competence, and autonomy satisfaction in the prediction of healthy eating (e.g., hypothesis 2; see Model 2 in Table 2). Competence satisfaction had a unique positive association with healthy eating ($\chi^2(1) = 27.733, p < .001$), whereas autonomy ($\chi^2(1) = 0.011, ns$) and

relatedness ($\chi^2(1) = 0.001, ns$) satisfaction were unrelated to healthy eating. Excluding the latter fixed effects did not result in a worse fit [$\chi^2(2) = 0.677, ns$], suggesting that autonomy and relatedness satisfaction did not yield additional predictive validity over competence satisfaction. The model explained 10.6% within-person variance in healthy eating and had a better fit compared to the previous model [$\chi^2(2) = 60.476, p < .001$]. Therefore, we concluded that the model with competence satisfaction as the only predictor for healthy eating was the best fitting model.

In the next step, we tested individual differences in the association between competence satisfaction and healthy eating behaviours. Results indicated there is significant variation in the between-person slopes [$\chi^2(1) = 14.412, p < .001$], meaning that the relation between competence satisfaction and healthy eating behaviours differs between persons. Therefore, in a final series of models, we investigated between-person characteristics to explain this variability.

First, BMI, age and educational level were tested for possible main and moderation effects on healthy eating behaviours. No main effects for BMI [$\chi^2(1) = 1.431, ns$], age [$\chi^2(1) = 0.620, ns$] and educational level [$\chi^2(1) = 0.183, ns$] appeared. The interaction terms between competence satisfaction and age [$\chi^2(1) = 1.385, ns$] and between competence satisfaction and educational level [$\chi^2(1) = 0.061, ns$] were not significant. However, a significant moderation effect between BMI and competence satisfaction emerged [$\chi^2(1) = 5.985, p < 0.05$]. The moderation plot (see Figure 2) demonstrated that the association between competence satisfaction and healthy eating was stronger for participants with a higher BMI. Consequently, BMI was included in the subsequent equations as a control variable.

Second, low self-control strength had a significant negative association with healthy eating [$\chi^2(2) = 10.364, p < .01$], which indicated that participants with low self-control capacities reported on average less healthy eating behaviours (see Model 3 in Table 2). The

interaction effect between low self-control strength and competence satisfaction on healthy eating was not significant [$\chi^2(1) = -0.014, ns$] indicating that participants with low self-control strength had the same associations between competence satisfaction and healthy eating, compared to participants with high self-control strength. The fit of the model improved significantly compared to the model with competence satisfaction alone [$\chi^2(1) = 20.373, p < .001$].

In the last model emotional eating style was entered into the equations. No main [$\chi^2(1) = 3.081, ns$] or moderation effect [$\chi^2(1) = 0.566, ns$] appeared, meaning that emotional eating could not explain variations in healthy eating nor why competence satisfaction was associated with healthy eating behaviors more strongly for some people compared to others. The model with BMI and emotional eating as Level-2 predictors had a significantly better fit compared to the model with competence satisfaction only [$\chi^2(1) = 11.812, p < .001$].

Discussion

In the current Western society many youngsters experience problems with adequately regulating their eating behaviours. Although there are substantial and relatively stable differences between persons in terms of how healthy one eats and the degree to which one is prone to binge eating (Ref), there also exists considerable fluctuations within people's own eating patterns (ref). Investigating variables that account for these daily fluctuations might result in a more thorough insight in eating regulation and, thus, how people can be supported to maintain a healthy lifestyle and remain in control over their eating. In the current study, we investigated (1) whether day-to-day variation in the satisfaction of one's basic psychological needs, as defined within Self-Determination Theory (Deci & Ryan, 2000) is implicated in one's daily eating behaviours and (2) whether general self-control strength and emotional eating, apart from yielding a main effect, play a moderating role in these daily associations. By considering predictors from a more general social-psychological framework (i.e.,

psychological needs) in conjunction with well-studied predictors in the eating regulation literature (i.e., emotional eating; self-control), we hope to bridge the gap between both literatures.

Basic Psychological Needs as Processes Involved in Day-to-Day Eating Regulation

A central tenet within SDT is that people have inherent psychological needs for autonomy, competence and relatedness. Satisfaction of these needs has been mostly studied in relation to wellbeing, consequently demonstrating that satisfaction of these needs is associated with more wellbeing, both at the between-person (e.g., Vansteenkiste, Lens, Soenens, & Luyckx, 2006) and within-person level (e.g., Reis et al., 2010). Although some studies documented associations between the psychological needs and eating behaviours (e.g. Schüler & Kuster, 2011), no previous studies investigated these associations at the within-person level. In line with hypothesis 1, we found that individuals ate more healthily on days their needs had been satisfied, whereas they experienced more binge eating symptoms on days their needs had been frustrated. This finding suggests that previously documented associations between psychological need satisfaction and eating behavior outcomes (e.g., Thogerson-Ntoumani et al., 2010; Schüler & Kuster, 2011) also apply at the within-person level.

The findings that need satisfaction was associated with healthy eating and need frustration with binge eating symptoms also have relevance for a recent development in SDT. More recent studies within SDT indicate that a lack of need satisfaction is not the same as need frustration and that especially need frustrating experiences are associated with pathological outcomes (e.g., Bartholomew et al., 2011; Sheldon, Abad, & Hinsch, 2011). The current study replicates these findings and extends these to the within-person level.

There are several explanations as to why need satisfaction and frustration are related to eating behaviours on a daily basis. For instance, previous diary studies indicated that daily need satisfaction is associated with more subjectively felt energy (i.e., vitality). Therefore, on

days one's needs get satisfied, one might have enough energy left to successfully choose more healthy foods. Otherwise, on days that one feels depleted of energy one might more easily lose control over eating, in particular when confronted with stressful experiences. Another explanation is that people eat more healthily on days they feel more positive affect, whereas uncontrollable eating might be a way to cope with negative affect associated with need frustrating experiences. More research is needed to investigate these explanatory mechanisms.

Further, to test hypothesis 2, we decomposed the aggregate measures into its' three subcomponents, that is, the needs for autonomy, competence and relatedness. As for binge eating symptoms, we found unique associations of each of the three needs, which is consistent with diary studies on need satisfaction and wellbeing (e.g., Reis et al., 2008; 2010). The finding that relatedness frustration was strongly associated with binge eating symptoms is in line with results of experience-sampling studies which found that poorer social experiences and negative family interactions precede binge-eating in clinical samples (Steiger et. al., 2005; Okon et. al., 2003). To our knowledge, no previous studies documented daily associations between autonomy and competence frustration and binge eating behaviours.

As for healthy eating, the results were less convincing. Although need satisfaction had a positive association with healthy eating, only competence satisfaction was uniquely associated with healthy eating when all three needs were entered simultaneously. This finding indicates that especially feeling competent in one's daily activities is associated with one's healthy eating on a daily basis. At this time, it is relatively difficult to explain why only competence satisfaction was associated with healthy eating. Given this is a first study, these findings clearly warrant replication.

The finding that only competence satisfaction had unique associations with healthy eating has to be considered in light of the more general trend that need satisfaction was a relatively weak predictor of healthy eating. Whereas 35% of the within-person variance in binge eating

symptoms was explained by frustration of the three needs, only 10% of the within-person variance in healthy eating was explained by satisfaction of these needs. This suggests that the needs have a more proximal link to disturbed eating behaviours, compared to healthy eating behaviours. Alternatively, the current findings might be specific for adolescents who still live at home. Whereas adults have to put some effort into preparing a healthy meal (e.g., going to the supermarket, cooking, ...), most participants in the current study were still living at home with their parents and, thus, their healthy eating behaviours might be co-determined by their parents. In other words, compared to daily variations in binge eating symptoms, daily fluctuations in healthy eating might be more strongly influenced by factors other than participants' personal experiences.

General self-control strength and emotional eating style as individual characteristics

An additional research question was to investigate whether two individual characteristics, that is, general self-control strength and an emotional eating style, moderate the associations between the needs and both types of eating behaviors. Preliminary analyses revealed that the strength of the association between need frustration and binge eating symptoms and competence satisfaction and healthy eating behaviours indeed varied across persons. This opens the possibility for individual characteristics to explain these between-person differences.

As for hypothesis 3, findings showed that persons who had rather low general self-control strength experienced more binge eating symptoms and ate less healthy foods across days. This finding is in line with self-control theory (Baumeister & Heatherton, 1996) and with previous findings that people with relatively more self-control strength display a healthier diet (e.g., Tangney et al., 2004). In contrast to our expectations, general self-control strength did not moderate the relation between the needs and eating behaviors. This finding is not in line with previous studies that yielded indirect support for this moderation hypothesis

(e.g., Schüler & Kuster, 2011; O'Connor et al., 2009). There are several possible explanations for these different results, both conceptually and methodologically. For instance, Schüler and Kuster used a cross-sectional design in their study and conceptualized self-control strength as achievement motivation. Also, O'Connor et al. (2009) measured conscientiousness rather than self-control strength. Although achievement motivation and conscientiousness share some conceptual overlap with self-control strength, there also remain some important conceptual and measurement differences. Future studies could shed more light onto these conflicting results.

As for research question 1, we investigated main and moderating effects of an emotional eating style in a rather explorative fashion. We found that people with an emotional eating style did not eat less healthily in general, but they did experience more binge eating symptoms across the days. Apart from this main effect, people with an emotional eating style had a stronger association between need frustration and binge eating symptoms during the day. This finding is in line with laboratory studies that demonstrated that negative affect causes disinhibited eating in participants with an emotional eating style (e.g., Loxton, et. al., 2011; study 1) and with the diary study of O'Conner et al. (2008) that indicated that emotional eating is the most pre-eminent individual characteristic to understand the associations between daily hassles and snacking behaviors.

The finding that emotional eating was a moderating characteristic, indicates that the association between need frustrating experiences and binge eating symptoms is especially strong for people with the tendency to eat as a coping mechanism with negative feelings. This might suggest that the negative affect associated with need frustrating experiences can help explain the association between need frustration and binge eating symptoms. In other words, need frustrating experience might be associated with binge eating symptoms because emotional eaters tend to indulge in overeating as a strategy to cope with negative feelings

arising from need frustrating experiences. This is in line with some prevailing theories on binge eating, such as the escape-of-awareness theory (Heatherton & Baumeister, 1991) and expectance theory (Hohlstein, Smith, & Atlas, 1998). Whereas the first theory states that binge eating can function as a mechanism to escape awareness after threatening experiences, the second states that binge eating is associated with negative affect because people believe that eating will reduce their negative feelings. Both theories suggest that binge eating is in fact a motivated attempt to deal with negative emotions. These ideas share some conceptual overlap with the more global hypothesis within SDT that need frustration will translate into 'need substitutes', in which one tries to fulfill one's needs at a maladaptive way after need frustrating experiences (e.g., Verstuyf, Patrick, Vansteenkiste, & Teixeira, 2011).

Limitations and suggestions for future research

Although our study has revealed several important findings, there are also some methodological and conceptual limitations. First, although we followed participants for 14 consecutive days, our analyses do not allow for any interpretation of the direction or causality of the effects. Although we assume that need satisfying or frustrating experiences precede healthy eating and binge eating symptoms, the opposite direction might be equally plausible. For instance, the moderation effect between the BMI and competence satisfaction in the prediction of healthy eating might indicate that people with a higher BMI are more sensitive to competence satisfaction and therefore eat more healthily, but, it could also reflect that people with higher BMI feel more competent at the end of days if they succeeded in eating healthily because it is more important to them. Second, although diary methods allow for investigating the dynamics involved in eating regulation in a ecologically valid way, another approach that allows for an even closer observation of within-day processes are experience-sampling studies. In that case participants fill in the questionnaires at several random moments during the day which strongly diminishes recall effects. Although we recognize the

surplus value of such a research design, we believe that a diary method in itself already provides a more vivid view on processes involved in eating regulation compared to the more traditional correlational or longitudinal methods. A third methodological limitation is that some of the daily measures had low reliabilities at some measurement times (e.g., relatedness frustration). Accordingly, we should be careful with our interpretation of these results.

In addition to these limitations, there are also some conceptual limitations. For instance, although we speculate that the associations between the psychological needs and eating behaviours can be accounted for by negative affect and vitality, these specific mechanisms were not measured. It would be interesting to test these mediating path models in a within-person design. Also, all our participants were female adolescents or young adults. The inclusion of a broader age range might result in different findings. For instance, healthy eating in adults who are responsible for preparing their own meals might be more strongly influenced by need satisfaction and frustration compared to the current group of younger people. Also, in light of the fact that men have on average less healthy eating habits (e.g. Ogden, 2010) and are also prone to binge eating symptoms (Striegel-Moore et al., 2009), it is equally interesting to investigate whether experiences of need satisfaction and need frustration are implicated in men's eating regulation. In addition to a broader age group and including both genders, it would be interesting to replicate this study in a clinical sample of eating disorder patients. A final conceptual limitation is our exclusive focus on eating behaviours. Although this domain is relevant for many female youngsters, inclusion of other self-regulatory behaviors and contexts could have resulted in a more broad picture of what is going on in the daily life of these youngsters. For instance, rather than experiencing binge eating symptoms, some youngsters might drink more alcohol or spend excessive time on the internet on need frustrating days.

Clinical and theoretical implications of the study

Despite these limitations, we believe our study has some important theoretical and clinical implications. Our study has revealed that, in addition to between-person variation, there is considerable variation within persons in healthy eating and binge eating symptoms. Thus, a one-time measurement of people's traits and eating behaviors is only a 'snapshot' out of the dynamics in daily life, but fails to capture the entire film. Investigating the dynamics in eating regulation over time, allows for including more within-person variables besides the rather stable trait-differences. Further, our study revealed that previously documented between-person associations between the psychological needs and eating behaviours, also apply at the within-person level. Finally, our study indicated that especially people with an emotional eating style are vulnerable to experience binge eating symptoms on need frustrating days.

The finding that there's considerable within-person variability is also of major clinical importance. This indicates that, although there are stable differences between people, a difference in eating patterns can be observed according to other experiences throughout the day. Professionals, who guide people in their attempts to regulate their eating behaviors, can more thoroughly capture the within-time fluctuations in problematic behaviors and improve skills to deal with the more difficult days. The associations between the psychological needs and eating regulation suggests that health care providers can help adolescents eat more healthy and control their eating behaviours by increasing awareness about need frustrating and need satisfying experiences. For instance, if adolescents are aware of which experiences are need satisfying for them, they could try to enhance such experiences. Also, when aware of need frustrating experiences, one could try to minimize such experiences and find tools to cope with need frustrating experiences. Finally, our study suggests that it would be useful to target emotional eaters, as these adolescents in particular tend to lose control over eating on need frustrating days.

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Table 1: results of multilevel models with binge eating symptoms as dependent variable

	Null model	Model 1	Model 2	Model 3	Model 4
<i>Fixed effects</i>					
Overall Intercept	1.313 (0.026)	1.301 (0.023)	1.306 (0.025)	1.301 (0.023)	1.298 (0.022)
Person level					
Selfcontrol				0.141 (0.043)	
Selfcontrol*Needfrustration				0.019 (0.030)	
Emotional eating					0.191 (0.028)
Emotional eating*Needfrustration					0.091 (0.019)
Day level					
Need satisfaction		-0.009 (0.016)			
Need frustration		0.116 (0.016)		0.114 (0.016)	0.112 (0.016)
Relatedness frustration			0.062 (0.012)		
Autonomy frustration			0.025 (0.011)		
Competence frustration			0.037 (0.014)		
<i>Random effects</i>					
μ_{0j}	0.189 (0.016)	0.147 (0.013)	0.160 (0.014)	0.142 (0.013)	0.126 (0.011)
μ_{1j}			0.016 (0.003)	0.028 (0.006)	0.023 (0.006)
μ_{2j}		0.029 (0.006)			
μ_{3j}			0.014 (0.004)		
$\mu_{0j} \mu_{1j}$		0.035 (0.007)	0.027 (0.005)	0.034 (0.007)	0.025 (0.006)
$\mu_{0j} \mu_{2j}$					
$\mu_{0j} \mu_{3j}$			0.020 (0.006)		
e_{0j}	0.175 (0.004)	0.150 (0.004)	0.114 (0.004)	0.150 (0.004)	0.150 (0.004)
e_{1j}				0.041 (0.008)	0.040 (0.008)
e_{2j}		0.040 (0.008)			
e_{3j}			0.025 (0.005)		
$e_{0j}e_{1j}$				0.066 (0.004)	0.066 (0.004)
$e_{0j}e_{2j}$		0.066 (0.004)			
$e_{0j}e_{3j}$			0.036 (0.002)		
2* loglikelihood	5464.463	4706.486	4774.676	4695.502	4657.818
χ^2 (df)		125.958(1)***	- 68.19(3)	10.984(1)***	48.668(1)***

Table 2: results of multilevel models with healthy eating behaviours as dependent variable

	Null model	Model 2	Model 3	Model 4	Model 5
<i>Fixed effects</i>					
Overall Intercept	2.836 (0.025)	2.838 (0.025)	2.836 (0.024)	2.835 (0.024)	2.835 (0.024)
Person level					
BMI*Needsatisfaction				0.012 (0.004)	0.012 (0.004)
Selfcontrol				-0.137 (0.045)	
Selfcontrol*Competencesatisfaction				-0.014 (0.012)	
Emotional eating					0.055 (0.031)
Emotional eating*Competencesatisfaction					-0.011 (0.015)
Day level					
Need satisfaction		0.054 (0.022)			
Need frustration		-0.005 (0.012)			
Relatedness satisfaction			0.000 (0.011)		
Autonomy satisfaction			-0.001 (0.011)		
Competence satisfaction			0.070 (0.013)	0.066 (0.012)	0.067 (0.012)
<i>Random effects</i>					
μ_{0j}	0.177 (0.015)	0.169 (0.015)	0.166 (0.015)	0.161 (0.014)	0.165 (0.014)
μ_{1j}		0.047 (0.011)		0.011 (0.003)	0.011 (0.003)
μ_{2j}					
μ_{3j}			0.012 (0.003)		
$\mu_{0j} \mu_{1j}$					
$\mu_{0j} \mu_{2j}$					
$\mu_{0j} \mu_{3j}$					
e_{0j}	0.160 (0.004)	0.153 (0.004)	0.143 (0.004)	0.114 (0.004)	0.144 (0.004)
e_{1j}				0.013 (0.005)	0.013 (0.005)
e_{2j}					
e_{3j}			0.013 (0.005)		
$e_{0j}e_{1j}$					
$e_{0j}e_{2j}$					
$e_{0j}e_{3j}$					
2* loglikelihood	5075.953	5016.727	4956.251	4938.467	4944.439
χ^2 (df)			60.476 (2)***	17.784 (1)***	11.812(1)***

Figure captions

Figure 1: plot of interaction effect between emotional eating and need frustration in the prediction of binge eating symptoms

Figure 2: plot of interaction effect between BMI and competence satisfaction in the prediction of healthy eating behaviours

Figure 1: plot of interaction effect between emotional eating and need frustration in the prediction of binge eating symptoms

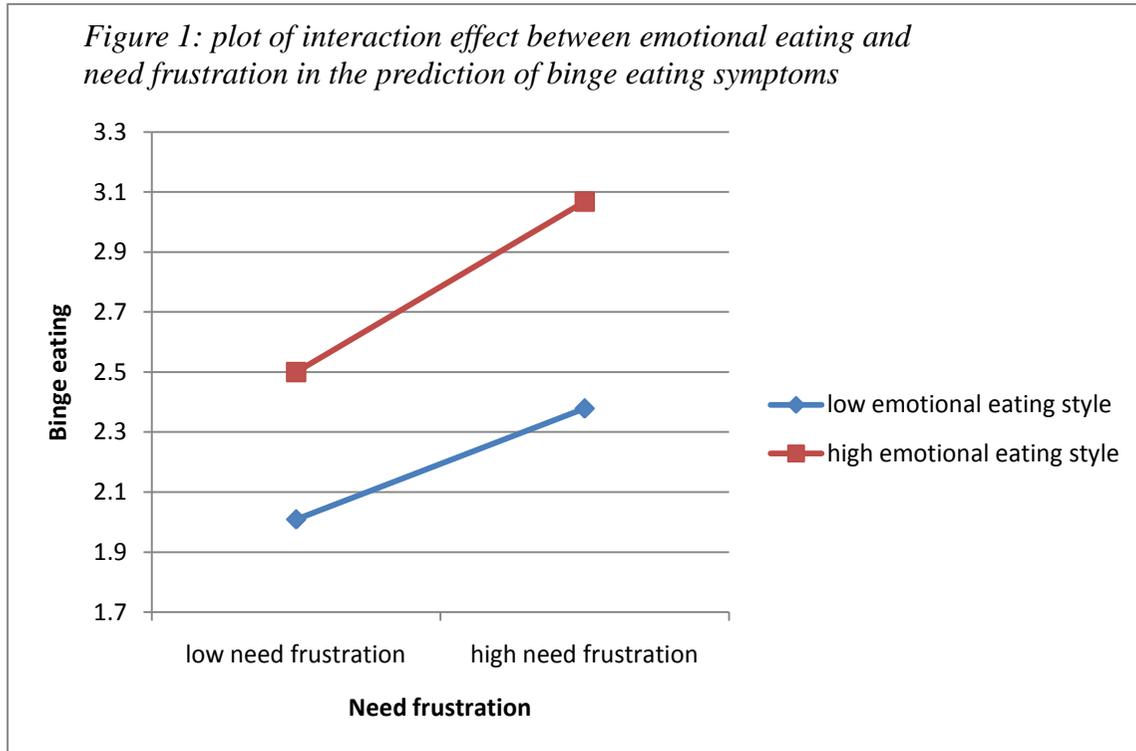


Figure 2: plot of interaction effect between BMI and competence satisfaction in the prediction of healthy eating behaviours

