The Journal of Behavioral Science
2018, Vol. 13, Issue 2, 51-67

ISSN: 1906-4675

The Relationships between Affect, Emotion Regulation, and Overeating in Thai Culture

Supalak Luadlai[1], Jean Liu[2], and Arunya Tuicomepee[3]

This study aimed to explore whether the relationships between affect and overeating, observed previously in individualistic cultures, could be generalized to a collectivistic culture where the emotional display rules differ. Focusing on Thai population, the study specifically investigated: (1) whether dietary disinhibition would mediate the relationships between affect and overeating behavior, and (2) whether emotion regulation would moderate this relationship. To this end, 298 participants (aged 18-24 years) were recruited from universities in the Bangkok metropolitan region. All participants were asked to complete pen-and-paper measures of affect, emotion regulation, dietary disinhibition, and overeating behaviors. Using a mediated-moderation analysis, results showed that only negative, but not positive, affect had a direct effect on overeating behavior (β = .25, $t(295)$ = 5.20, $p < .001$). This relationship was mediated by participants' dietary disinhibition (R^2 = .36, β = 82.85, $t(295)$ = 5.20, $p < .001$). Finally, emotion regulation moderated the relationships between negative affect (β = -.10, $t(292)$ = -2.35, p = .02), dietary disinhibition, and overeating behavior (β= .12, $t(292)$ = 2.49, p = .01). The findings suggest that even in collectivistic cultures, the ability to regulate emotions still serves as a protective factor against excessive food intake. These findings demonstrate the importance of an individual's emotion, emotion regulation, and cognitive pattern that could influence eating behavior. Consequently, the findings have implications for the development of obesity interventions in related cultural settings.

Keywords: positive affect, negative affect, dietary disinhibition, overeating, emotion regulation

Obesity predisposes an individual to develop non-communicable diseases (NCDs: WHO, 2014) and increases the risk of all-cause mortality (Collaboration, 2016). Most people who die from NCDs are between the ages of 30 and 69 years. Further, more than 80% of death occurs in low- and middle-income countries (James, 2009; WHO, 2014). In Thailand, a survey data in year 2014 showed that Thailand has become one of the Asian countries with the highest prevalence of obesity (Cheong, 2014). The data showed that almost 40% of Thai people were overweight and were people with obesity. Interestingly, 19.5% of Thai adolescents and young adults were people with obesity. Although the percentage of obesity in adolescents and young adults is not high when compared to other age groups, the trend of obesity in adolescents and young adults is increasing every year (Akeplakorn et al., 2014). This influences on health, life expectancy, and economic in Thai people in a long run (Teerawattananon & Luz, 2017). Moreover, it is likely that obesity in adolescents and young adults has an impact on obesity in middle and late adulthoods (Neumark-Sztainer et al., 2006).

Another report dedicated a large segment to understanding possible causes for obesity, with one portion focusing on excessive food intake or overeating behavior in an increasingly urbanized environment (WHO, 2000). Overeating behavior may play an

[1] Lecturer, Faculty of Psychology, Chulalongkorn University, Thailand. E-mail: supalak.l@chula.ac.th
[2] Assistant Professor, Yale-NUS College, Singapore
[3] Associate Professor, Faculty of Psychology, Chulalongkorn University, Thailand

important role in obesity. Moreover, there may be other important factors that influence overeating behavior, such as emotion, dietary disinhibition, and emotion regulation (Cools, Schotte, & McNally, 1992; Martyn-Nemeth, Penckofer, Gulanick, Velsor-Friedrich, & Bryant, 2008; Stunkard & Messick, 1985). Consequently, overeating behavior may lead to obesity. Hence, the present study focused on emotion, dietary disinhibition, and emotion regulation that may lead to overeating. Particularly, this study was conducted in late adolescence and young adult participants because the evidence showed that obesity in these groups of participants is increasing every year and it may lead to obesity in later life (Akeplakorn et al., 2014; Neumark-Sztainer et al., 2006).

Literature Review

Broadly defined, excessive food intake – or overeating behavior – involves the consumption of calories beyond what is needed for homeostatic needs. This occurs in the absence of hunger (French, Epstein, Jeffery, Blundell, & Wardle, 2012) and is evident in everyday situations such as birthdays or social occasions (de Castro, 1997; de Castro & de Castro, 1989). For some individuals, overeating behavior also deviates from the norm and is characterized by a loss of control, associated with intense and high frequencies of food craving (Abilés et al., 2010; Van den Eynde et al., 2012).

To address overeating, one key issue is to identify those who overeat. A large body of research suggests that overeaters are those with high 'dietary disinhibition', who eat in response to food cues (e.g., the smell of their favorite food), the influence of those around them, or their emotions, rather than responding to how much they have already eaten (Lee et al., 2013; Van Strien, Cleven, & Schippers, 2000).

Although public health campaigns have emphasized the external 'obesogenic' environment (Swinburn, Egger, & Raza, 1999), a number of researches suggest that overeating behavior is also related to internal mood states (e.g., Musaiger, Nabag, & Al-Mannai, 2017; Porter & Johnson, 2011). Such 'emotional eating' (Spoor, Bekker, van Strien, & van Heck, 2007) has been found with both positive and negative mood (Lowe & Maycock, 1988; Macht, 2008; Macht, Haupt, & Salewsky, 2004) and appears to influence both clinical and community participants of varying age groups (Bongers, Jansen, Havermans, Roef, & Nederkoorn, 2013; Cox, Skouteris, Hemmingsson, Full-Tyszkiewicz, & Hardy, 2016; Berg et al., 2014). For example, Udo and colleagues (Udo et al., 2013) demonstrated that obese participants were less able to resist eating and increased high-calorie food consumption during the positive mood condition than the negative condition. In contrast, non-obese participants were less able to resist eating during negative mood condition than positive mood condition. Both positive mood and negative mood trigger regulation on eating behavior in participants. Taken together, emotions appear to play a critical role in overeating behavior.

Although either positive affect or negative affect influences eating habits, several studies suggest that negative affect may have a stronger influence than positive affect (e.g., Jansen et al., 2008). Specifically, negative affect increases vulnerability to unhealthy food consumption and less regulation in resisting eating. This is consistent with the study of Barden and colleagues (2018) that eating in response to negative affect related to lower psychological well-being, eating disorder symptoms, and emotion regulation difficulties. Moreover, Barden and colleagues examine the relationships among specific types of

emotional eating (i.e., eating in response to depression (EE-D), anxiety/anger (EE-A), boredom (EE-B), and positive emotions (EE-P)), psychological well-being, eating disorder symptoms, and emotion regulation difficulties. In sum, affect can elevate emotional eating, which additionally influences difficulties in emotion regulation. This consequently enhances overeating and eating disorders (e.g. obesity and binge eating).

Emotion Regulation as a Moderator

One possible explanation for emotional eating is that individuals who experience negative affect may use overeating as a coping or distraction strategy (Martyn-Nemeth, Penckofer, Gulanick, Velsor-Friedrich, & Bryant, 2008). Spoor and colleagues (Spoor, Bekker, van Strein, & van Heck, 2007) found that eating in response to negative affect was the greatest amongst individuals who relied on emotion-oriented coping and avoidance distraction techniques for emotion regulation. Another study found that eating in response to depression, anxiety or anger, and boredom correlated with difficulties in emotion regulation. Moreover, negative emotional eating associated with difficulties in emotion regulation (Braden, Musher-Eizenman, Watford, & Emley, 2018). Finally, difficulty in emotion regulation predicted dietary disinhibition and overeating in a clinical sample (Stice, Akutagawa, Gagger, & Agras, 2000). Taken together, these findings highlight emotional regulation as a potential moderator of the relationships between affect, dietary disinhibition, and overeating, suggesting that one's ability to regulate emotions may serve as a protective factor against obesity. Thus, the present study investigated whether emotion regulation could be considered as the important moderator of the relationship among affect, disinhibition, and overeating behavior. If so, this study could provide the important evidence for Thai therapists and academicians in developing the emotion-regulation interventions in Thai cultural settings.

Dietary Disinhibition as a Mediator

Persons with high in dietary disinhibition respond to their internal emotional states or affect (Bryant, King, & Blundell, 2008). Further, dietary disinhibition has been found to have the strongest relationships to overeating (Mailloux, Bergeron, Meilleur, D'Antono, & Dubé, 2014). Particularly, dietary disinhibition means over consumption of food. Individuals, who show dietary disinhibition, demonstrate less self-control and self-regulation on eating. Dietary disinhibition would occur when individuals see their favorite food or experience negative affect (Stunkard & Messick, 1985). In fact, dietary disinhibition eating derives from the Three Factors of Eating Behavior theory of Stundkard and Messick (1985). The Three Factors of Eating Behavior theory suggests that there are 3 factors involve in eating behavior;1) hunger, 2) cognitive restrain in eating, and 3) dietary disinhibition. All factors have been studies for many decades and found to be important variables that associated with dietary, overeating, binge eating, and obesity (Blundell, et al., 2005; Hays & Roberts, 2008; Maayan, Hoogendoom, Sweat, & Convit, 2011). Thus, dietary disinhibition occurs when individuals experience either positive or negative emotion (Rodgers, Fuller-Tyszkiewicz, Holmes, Skouteris, & Broadbent, 2018; Yeomans & Coughlan, 2009). Moreover, dietary disinhibition influences on overeating among restraint eaters, who showed a high tendency in overeating (Zhou, Gao, Chen, & Kong, 2017). Dietary disinhibition also mediates relationships between unhealthy food consumption, overweight/obesity, and poor health (Bryant, King, & Blundell, 2008). It is likely that dietary disinhibition plays an important role in overeating behavior as well as affect. However, there has not been evidenced that dietary disinhibition mediates the relationships between affect and overeating in nonclinical

participants. Thus, it is interesting whether dietary disinhibition would influence overeating in nonclinical participants or not. The present study would focus on overeating behavior, mood or affect, and dietary disinhibition.

Dietary Disinhibition and Emotional Regulation

Evidence further demonstrates relationships between dietary disinhibition and emotion regulation (Goldscmidt, Lavender, Hipwell, Stepp, & Keenan, 2017; Svaldi, Griepenstroh, Tuschen-Caffier, & Ehring, 2012). However, most of them have been studied in clinical participants. Many studies found relationships between emotion regulation and dietary disinhibition in female participants with obesity (e.g. Gianini, White, & Masheb, 2013). Hence, it is necessary to investigate the role of emotion regulation on dietary disinhibition and overeating among non-clinical participants. Although the links between affect and eating patterns have been examined, it remains unclear whether these results – reported in North America and Europe – will generalize to an Asian society. Therefore, the present study was conducted in Thai cultural setting to investigate whether emotion regulation plays the important role on dietary disinhibition and overeating among Thai non-clinical participants.

Aims of the Present Study

This study aimed to investigate the relationships among affects (positive affect and negative affect), dietary disinhibition, emotion regulation, and overeating behavior. Specifically, this study aimed to investigate whether dietary disinhibition would mediate previous relationships and emotional regulation would moderate the relationships of affects, dietary disinhibition, and overeating behaviors.

It particularly hypothesized that either positive or negative affect would influence on overeating and dietary disinhibition would mediate previous relationships. Emotion regulation would moderate the relationships among affect, dietary disinhibition, and overeating. This means that participants with high degree of emotion regulation would decrease the effect of either positive or negative affect on overeating behavior. Participants with high degree of emotion regulation would decrease the degree of dietary disinhibition even he/she was emotional. In addition, this would influence on lower level of overeating behavior.

Research Methodology

Participants

Two-hundred ninety-eight participants (93 = Males, 205 = Females), ages between 18-24 years old (Mean = 21.09 years), were recruited in this study. As mentioned before, the number of obesity in adolescents and young adults are increasing every year. Further, it impacts life expectancy and health (Akeplakorn et al., 2014; Neumark-Sztainer et al., 2006; Teerawattananon & Luz, 2017). Therefore, this study specifically focused on late adolescence and young adulthood participants. Using convenience and snowball sampling techniques, participants were recruited in the year 2015-2016. Only participants who gave consent to the researcher could participate in this study. They were informed that all of their information

and answers were secretly and safely kept in the Faculty of Psychology, Chulalongkorn University. Only scores and average scores would be used in the study. Participants showed average weight around 57.21 Kgs (37-125 Kgs., *SD* = 14.03), height = 164.11 (149-190 cm, *SD* = 7.89), and mean of Body Mass Index (BMI) was 17.34 (11.42-35.11, *SD* = 3.67). All participants were studying in undergraduate programs in either public or private universities in Bangkok metropolitan region, Thailand.

Procedures

This study was granted approval from the Thailand Research Fund (TRF). After it was approved by the TRF committee, participants' recruitment was started. To recruit a large number of participants, this study was advertised in social networks (e.g. Facebook, Twitter, and Line). Participants were asked to inform their demographic information, such as age, sex, weight, height, year of study, income, and health information. In addition, they were asked to complete The Three-Factor Eating Questionnaire to Measure Dietary Restraint, Dietary Disinhibition, and Hunger (TFEQ: Stunkard & Messick, 1985), The Positive and Negative Affect Schedules (The PANAS: Watson, Clark, & Tellegan, 1988), Overeating Behavior Questionnaire (OBQ: Luadlai, 2015), and Emotion Regulation Questionnaire (ERQ: Gross, 2002) in Thai versions.

Research Instruments

The Three-Factor Eating Questionnaire to Measure Dietary Restrain, Dietary disinhibition, and Hunger (TFEQ: Stunkard & Messick, 1985). This questionnaire composed of 3 components (1) Hunger, (2) Cognitive Restraint of Eating, and (3) Dietary Disinhibition. True or false scales (items 1-36) and four-point Likert scale (items 37-51) ranged from 1 = never to 4 = always (or not at all to very much) were used to measure how often participants exhibit the level of hunger, cognitive restraint, and dietary disinhibition. Although this research was conducted to use dietary disinhibition as a mediator only, other components were completed by participants. Hence, participants had to complete fifty-one items. This questionnaire was translated into the Thai language. Moreover, true or false items were adjusted into rating scales. Thus, all items were rating scales ranged from 1 = never to 4 = always (or not at all to very much). Higher scores report high level of hunger, cognitive restraint of eating, and dietary disinhibition. The study of Stunkard and Messick (1985) showed that this questionnaire demonstrated very good reliabilities (Cronbach's α = .93). Result from present study showed that the Thai version of the TFEQ demonstrated satisfied reliability (Cronbach's α = .77).

The Positive and Negative Affect Schedules (The PANAS: Watson, Clark, & Tellegan, 1988). The twenty-item questionnaire was translated into the Thai language and used to assess participants' current affect. The five-point Likert scale comprised of 2 factors, one is positive affect (e.g. excited, interest, and inspired) and another one is negative affect (e.g. distress, guilty, and afraid). According to Watson and his colleagues (1988), The PANAS can be used for assessing either trait domains or state domains of person's affect. Result from present study revealed that the Thai version of the PANAS showed very good reliabilities (Cronbach's alpha = .85). Each factor further showed good reliability, Cronbach's alpha was .85 for positive affect and Cronbach's alpha was .82 for negative affect.

Overeating Behavior Questionnaire (OBQ: Luadlai, 2015). The ten-item questionnaire was created by applying overeating criteria from the Diagnostic and Statistical Manual of Mental Disorders-5th Edition (DSM-V, American Psychiatric Association, 2013). Further, the OBQ items were also adapted from the Binge Eating Scale of Gormally and colleagues (Gormally, Black, Daston, & Rardin, 1982). A five-point Likert scale was assessed overeating behavior, such as "When I eat, I eat a lot." or "When I eat, I eat fast." or "I eat a lot of food, even though I am not hungry". The OBQ showed very good reliability (Cronbach's alpha = .83).

Emotion Regulation Questionnaire (ERQ: Gross, 2002). The ERQ composed of 2 components (1) Antecedent-Focused Emotion Regulation or Reappraisal, and (2) Response-Focused Emotion Regulation or Suppression. The ERQ assessed strategies that participants regulated their emotional state and expression. Results from the present study demonstrated that the ERQ showed good reliability (Cronbach's alpha = .77). For the reappraisal component, Cronbach's alpha was .78. For the suppression component, Cronbach's alpha was .62.

Data Analyses

Overeating behavior was defined as the dependent variable. Positive and negative affects were independent variables. Moreover, dietary disinhibition was aimed to investigate whether it could perform as mediator of the relationship between affects and overeating behavior. Emotion regulation was defined as moderator of the relationships among positive affect, negative affect, dietary disinhibition, and overeating behavior. Firstly, correlation analysis was used to test the relationships among all variables. Secondly, the PROCESS macro program (Hayes, 2018) was conducted to analyze moderated-mediation model of the relationships among positive affect, negative affect, overeating behavior, dietary disinhibition, and emotion regulation. Results are presented in tables and model charts.

Results

Correlation Analysis

Table 1 demonstrated the correlational metrics of all variables. Correlations were used as the basis for conducting moderated moderation analyses. Results revealed that negative affect significantly related to dietary disinhibition ($r = .29$, $p < .01$) and overeating behavior ($r = .39$, $p < .01$). Further, dietary disinhibition significantly related to emotion regulation ($r = .14$, $p < .05$). However, there was no relationship between positive affect and overeating behavior ($r = .05$, $p < .05$), as well as dietary disinhibition ($r = .10$, $p > .05$). Interestingly, positive affect significantly associated with emotion regulation ($r = .37$, $p < .01$). Emotion regulation was not found to be related to negative affect. Finally, there was no relationship between emotion regulation and overeating behavior ($r = .07$, $p > .05$). As presented in Table 1, all correlation coefficients were less than .80. Therefore, there was no multicollinearity problem (Hair, Black, Babin, & Anderson, 2013).

Table 1

Correlational metrics of Positive Affect, Negative Affect, Dietary Disinhibition, Emotion Regulation, and Overeating Behavior.

	Min	Max	Mean	SD	1	2	3	4	5
1. Positive affect	11.00	50.00	32.90	7.54	1				
2. Negative affect	10.00	48.00	25.35	8.11	.09	1			
3. Dietary disinhibition	4.00	37.00	18.43	6.15	.10	.29**	1		
4. Emotion regulation	17.00	70.00	47.90	9.05	.37**	.00	.14*	1	
5. Overeating behavior	8.00	40.00	21.09	6.31	.05	.39**	.55**	.07	1

Note: * $p < .05$, ** $p < .01$

Moderated-Mediation Analyses: Dietary Disinhibition as a Mediator.

The PROCESS macro program was conducted to test study hypotheses. The results revealed no significant influence of the positive affect on overeating (β = -.01, $t(295) = -.11$, $p = .91$) and dietary disinhibition (β = .10, $t(296) = 1.70$, $p = .09$). In contrary, standardized regression coefficient between dietary disinhibition and overeating behavior was significant (β = .55, $t(295) = 11.23$, $p < .001$). However, mediation analysis showed that dietary disinhibition (the mediator), controlling for negative affect, was not significant (z = 1.68, $p = .09$). Using bootstrapping procedures, unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles ($R^2 = .30$, β= 63.54, $t(295) = 5.20$, $p < .001$). The bootstrapped unstandardized indirect effect was .25, and the 95% confidence interval ranged from -.02 to .12. Therefore, the indirect effect was statistically not significant. That is, dietary disinhibition did not mediate the relationship between positive affect and overeating behavior. Positive affect did directly not influence on overeating.

However, results revealed that the negative affect and overeating was significantly associated ($\beta = .25$, $t(295) = 5.20$, $p < .001$). Negative affect further significantly predicted dietary disinhibition (β = .29, $t(296) = 5.18$, $p < .001$). In addition, the standardized regression coefficient between dietary disinhibition and overeating behavior was significant ($\beta = .48$, $t(295) = 9.78$, $p < .001$). Mediation process showed that dietary disinhibition was significantly mediated the relationships between the negative affect and overeating. Using bootstrapping procedures, unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2. 5th and 97.5th percentiles ($R^2 = .36$, β = 82.85, $t(295) = 5.20$, $p < .001$). The bootstrapped unstandardized indirect effect was .25, and the 95% confidence interval ranged from .1 6 to .35. Therefore, the indirect effect was statistically significant. That is, results indicated that dietary disinhibition partially mediated the relationship between negative affect and overeating behavior (See Figure 1.).

Moderated-Mediation Model Analyses: Emotion Regulation as a Moderator.

Additionally, emotion regulation was tested as a moderator of the relationships among either positive affect or negative affect, dietary disinhibition, and overeating behavior. Thus,

moderated-mediation model was conducted in PROCESS macro program to test the hypotheses. Using positive affect as the independent variable of moderated-mediation model 59, results revealed that emotion regulation did not moderate the relationship between positive affect and dietary disinhibition (path a) (β = -.07, $t(294) = -1.25$, $p = .21$). Using bootstrapping procedures, unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles. The bootstrapped unstandardized indirect effect was .03, and the 95% confidence interval ranged from -.18 to .04.

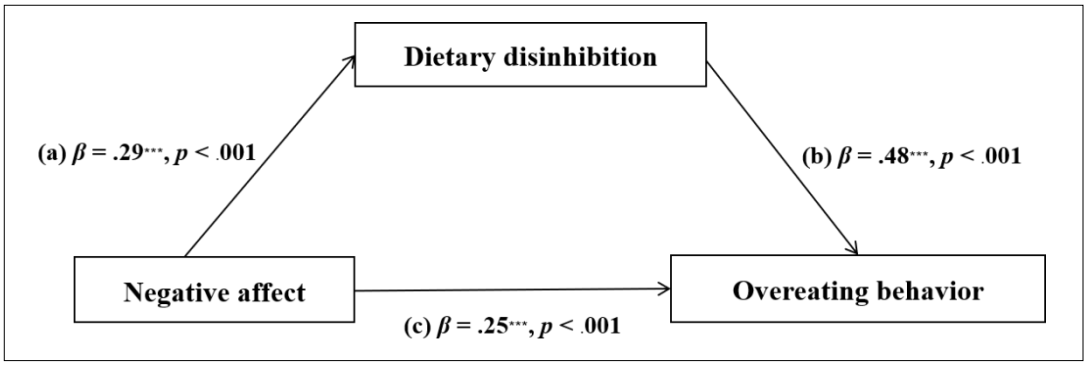

Figure 1. Model of mediation of relationships between negative affect and overeating.

However, emotion regulation moderated the relationship between dietary disinhibition and overeating (path b), β = .11, $t(292) = 2.23$, $p = .03$). Using bootstrapping procedures, unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles. The bootstrapped unstandardized indirect effect was .34, and the 95% confidence interval ranged from -.22 to -.04.

Moreover, emotion regulation significantly moderated the relationship between positive affect and overeating (path c), β = -.13, $t(292) = -2.78$, $p = .01$. Using bootstrapping procedures, unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles. The bootstrapped unstandardized indirect effect was .34, and the 95% confidence interval ranged from .01 to .20. Checking conditional direct effect domain by using emotion regulation as moderator found that participants, who have low the level of emotion regulation, would overeat when they experienced the positive affect. The bootstrapped unstandardized direct effect was .16, $p = .02$, and the 95% confidence interval ranged from .02 to .29. However, participants, who exhibited moderate and the high level of emotion regulation, were not influenced by the degree of the positive affect.

Additionally, moderated-mediation model was conducted by using the PROCESS Macro program to investigate the relationships among negative affect, dietary disinhibition, and overeating by using emotion regulation as the moderator. Using negative affect as independent variable of moderated mediation model 59, results revealed that there was a significant influence of emotion regulation on dietary disinhibition (β = .14, $t(294) = 2.52$, $p = .01$). The standardized regression coefficient between negative affect and dietary disinhibition

was also significant (β = .28, $t(294) = 5.21$, $p < .001$). Moreover, emotion regulation significantly moderate the relationship between negative affect and dietary disinhibition (path a), β = -.10, $t(292) = -2.35$, $p = .02$). Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples by using bootstrapped procedures. The 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles. The bootstrapped unstandardized indirect effect was significant. The 95% confidence interval ranged from -.18 to -.02. Emotion regulation further moderated the relationship between dietary disinhibition and overeating (path b), β= .12, $t(292) = 2.49$, $p = .01$). Using bootstrapped procedures, unstandardized indirect effects were repeatedly computed 10,000 times. The indirect effects were computed at the 2.5th and 97.5th percentiles, and the 95% confidence interval ranged from .04 to .21. However, emotion regulation did not moderated the relationship between negative affect and overeating (path c), β = .04, $t(294) = .75$, $p = .42$. Using bootstrapping procedures, unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles, ranging from -.06 to .14 (See Figure 2 and Table 2).

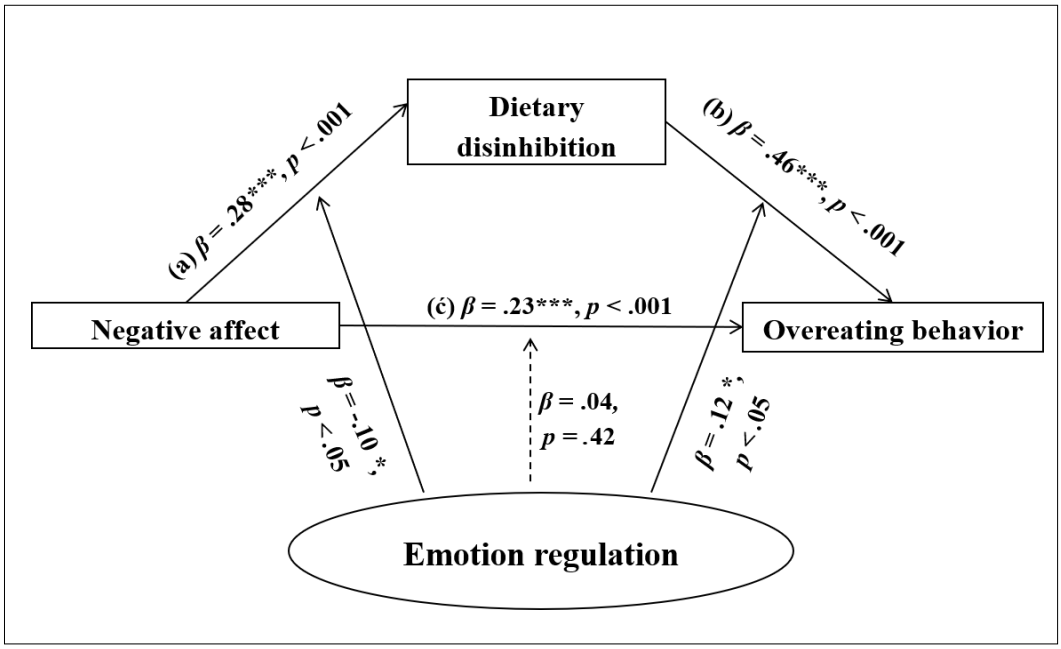

Figure 2. Model of moderated mediation of the relationships among negative affect, dietary disinhibition, and overeating by using emotion regulation as the moderator.

According to conditional direct effect domain by using emotion regulation as moderator found that participants, who have the low level of emotion regulation, would not control their impulsivity to be more overeaten when they experienced the negative affect. The bootstrapped unstandardized direct effect was .16, $p = .02$, and the 95% confidence interval ranged from .02 to .29. However, participants, who exhibited moderate and high levels of emotion regulation, were not influenced by the degree of positive affect. No matter how low or high degree of positive affect they had experienced, they would not overeat because they had moderate or high level of emotion regulation.

Table 2

Direct and indirect influences of negative affect on overeating behavior by using emotion regulation as moderator.

Emotion Regulation	Indirect Effect				Direct Effect			
	ab	LB	UB	ab_{cs}	Ć	LB	UB	$ć_{cs}$
Low (*M* - *SD* =)	.57*	.03	.17	.09	.84***	.21	.46	.33
Moderate (*M* =)	.68*	.07	.20	.13	.91***	.14	.33	.23
High (*M* + *SD* =)	.74	.08	.31	.19	.97*	.01	.26	.13

Note: *p < .05, ***p < .001; ab: a and b path coefficient of relationship between negative affect, dietary disinhibition, and overeating; ć: direct relationship between negative affect and overeating behavior; ab_{cs}: conditional indirect effects; LB: Lower limited confidential interval; UB: Upper limited confidential interval; $ć_{cs}$: conditional direct effects.

Discussion

The present study aimed to investigate the relationships among emotions (positive affect or negative affect), dietary disinhibition, overeating behavior, and emotion regulation. In particular, it aimed to investigate dietary disinhibition as the mediation role of the association between emotion (positive affect or negative affect) and overeating behavior. Moreover, the study focused whether emotion regulation would moderate the relationship between positive affect or negative affect and overeating (path c), including the relationship between the positive affect or negative affect and dietary disinhibition (path a), and the positive affect or negative affect and overeating (path b), respectively.

The results revealed that the negative affect had significant influence on dietary disinhibition and overeating while the positive affect did not. These findings were consistent with previous studies that the negative affect showed stronger influence on overeating behavior (Musaiger, Nabag, Al-Mannai, 2017; Sultson, Kukk, & Akkermann, 2017). Overeating may be elevated in responding to negative circumstance. Likewise, individual in the negative affect may overeat to distract or gain comfort for negative emotion (Spoor, et al., 2007; Stice, Presnell, Shaw, & Rohde, 2005). Using overeating may crucial considered as an escape or avoidance variable of the negative affect. Further, the negative affect may increase the value of appetitive stimuli (the reward of food cues), which additionally increases craving and the attention bias for food cues (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Bradly, Garner, Hudson, & Mogg, 2007). The finding was relevant to Hepworth et al.'s study which reported that negative mood related to overeating. Specifically, the negative affect can increase attentional bias on food cues and individual's appetite. Individual's current negative affect enhances motivation for food craving. Consequently, this may lead to overeating behavior (Hepworth, Mogg, Brignell, & Bradley, 2010).

Moreover, the result demonstrated the relationship between the negative affect and dietary disinhibition. These results were consistent with previous studies which showed that negative affect may lead to dietary disinhibition (Rodgers, Fuller-Tyszkiewicz, Holmes, Skouteris, & Broadbent, 2018; Stunkard & Messick, 1985). Dietary disinhibition has been considered as the cognitive pattern in responding to emotional states (Bryant, King, & Blundell, 2008). Specifically, dietary disinhibition would be occurred in the case that individuals experience negative emotion (Yeomans & Coughlan, 2009; Rodgers, et al., 2018) . Results further

demonstrated that dietary disinhibition has been concerned as the important mediator which showed partial mediation influence on the relationship between the negative affect and overeating. Consistent with Cox and Brode's study, dietary disinhibition mediated the relationship between the negative affect and overeating behavior (Cox & Brode, 2018). Individuals, who experience negative affect, may lose their control and show high impulsivity or dietary disinhibition. In addition, they would gain more negative affect. In consequence, they cannot control themselves to be overeaters in avoiding negative emotion (Ward, 2000).

In case of the moderation effect on the relationship between the negative affect and dietary disinhibition, the result demonstrated that emotion regulation significantly moderated relationship between the negative affect and dietary disinhibition. This study consistently demonstrated that emotion regulation influences cognitive pattern (Stice, et al., 2000) . Specifically, emotion regulation decreased the impact of the negative affect on dietary disinhibition. The result was consistent with the previous study of emotion regulation that it changes the way in which individual interpret situations and feelings. In addition, this interpretation would lead to a reduction of the negative affect and its impact on dietary disinhibition (Gross, 2002). Thus, the decrease of dietary disinhibition may lead to the lower level of overeating behavior.

In case of the moderation effect on the relationship between dietary disinhibition and overeating behavior, the result demonstrated that emotion regulation moderated the relationships between dietary disinhibition and overeating behavior. Surprisingly, regression coefficient demonstrated a positive way of the influence. Emotion regulation increased the impact of dietary disinhibition on overeating. The higher emotion regulation, the more participants showed dietary disinhibition, and this consequently lead higher overeating behavior. However, this result was unclear because of the using of the total scores of the emotion regulation. As mentioned in the measures section, the emotion regulation scale is composed of two dimensions which assess emotion reappraisal and emotion suppression. Thus, it is unclear which dimension could influence on this relationship. It is possible that emotion suppression would lead to higher dietary disinhibition and overeating (Butler, Young, & Randall, 2010). Inhibition or reduction of emotion-expressive behavior may lead to higher dietary disinhibition. In contrast, hiding individuals' emotional expression would turn to elevate higher loss of emotional control. This may lead to overeating behavior in responding to the negative valence of individuals' internal state (Görlach, Kohlmann, Shedden-Mora, Rief, & Westermann, 2016). Hence, overeating may crucial be considered as avoidant behavior for negative emotion (Spoor, et al., 2007).

It is further possible that the low level of emotion reappraisal (ability to reinterpret emotion-elicit situation and change emotional impact) may lead to higher dietary disinhibition and overeating behavior. A large number of studies showed that emotion appraisal has crucial been considered as healthy regulation strategies, which relate to well-being, healthy food choice, and healthy eating pattern (e.g., Siep, et al., 2012; Svaldi, et al., 2015). It is possible that the low level of emotion appraisal may lead to dietary disinhibition and overeating. However, it is necessary for the future study to investigate this association.

Dietary disinhibition plays the crucial role in overeating behavior. Dietary disinhibition significantly mediated the relationship between negative affect and overeating. Further, emotion regulation seemingly reduced the impact of negative emotion on dietary disinhibition. This may additionally decrease overeating behavior among non-clinical

participants. These findings were very important and they may elucidate higher understanding on how non-clinical participants may develop later overeating and obesity. Thus, there have been the implications of the present study yielded to be considered. First, this study showed empirical evidence of the important roles of emotion, cognitive pattern (dietary disinhibition), and emotion regulation on overeating behavior among Thai adolescents and young adults. This provides the link between the individual's internal factors and overt behavior. These results will help both therapists and academicians to develop unique therapeutic strategies for Thai adolescents and young adults in dealing with their negative emotion and dietary disinhibition. Second, emotional regulation training is necessary for individuals with the low level of emotion regulation (Aldao, Nolen-Hoeksema, & Schweizer, 2010). This may be the effective strategy that helps the individuals to decrease the impact of negative affect on dietary disinhibition and overeating behavior. Third, self-regulation training may be considered as another strategy that would assist individuals with the low level of emotion regulation. This strategy may enhance higher self-awareness and emotion recognition (Johnson, Pratt, & Wardle, 2012; Vohs & Baumeister, 2015). This may then lead to higher awareness on negative emotion, and the lower level of the dietary disinhibition and overeating.

Limitations

There were limitations in this present study. First, it was difficult to identify the true effect of either positive or negative affect on overeating behavior among Thai participants. Second, a number of female participants were greater than male participants. This may lead to an overestimation of the influences of the negative affect on overeating in all genders. Third, variables that influence on males' overeating behavior should be investigated. Forth, the present study focused on late adolescence and young adulthood participants. Results from the present study could not be generalized to other age groups. Fifth, dietary disinhibition was found to be the important mediator of the relationship between negative affect and overeating. There have been other variables (e.g., food restraint and impulsivity) that may increase overeating behavior among non-clinical participants. Sixth, there has not been enough research showed us on how normal overeating may lead to abnormality in eating pattern. This eating pattern may lead to obesity and other eating disorders (i.e., binge eating disorder and bulimia nervosa). Seventh, this study used sum of scores of the emotion regulation. Thus, it is unclear whether emotion reappraisal or emotion suppression could moderate aforementioned relationships.

Future Directions

To improve the quality of the research, the experimental or mixed-method study to clarify effects of emotional states on overeating among non-clinical participants should be conducted in the future. Moreover, previous evidence suggested that negative affect showed high influence on overeating in females rather than males (e.g., Loxton, Dawe, & Cahill, 2011; Wu, et al., 2018). Hence, the number of male and female participants should be equally recruited for the future study. Future study should separately investigate the influences of emotion suppression and emotion reappraisal on affects, dietary disinhibition, and overeating. This will provide specific issues for therapists and academicians of which dimension of emotion regulation would impact emotion, cognitive pattern, and overeating behavior.

Finally, other potential variables and the transmission of the normal eating pattern to abnormal eating pattern should be focused.

In conclusion, the present study demonstrated the important roles of the dietary disinhibition and emotion regulation on overeating behavior in Thai non-clinical participants. The dietary disinhibition partially mediates the relationship between the negative affect and overeating behavior. Emotion regulation may be considered as the moderator that reduces the impact of negative affect on dietary disinhibition.

Acknowledgement

This research was supported by the Thai Research Fund (TRF: project TRG5880228) and Chulalongkorn University.

References

Abilés, V., Rodríguez-Ruiz, S., Abilés, J., Mellado, C., García, A., Pérez de la Cruz, A., & Fernández-Santaella, M. C. (2010). Psychological characteristics of morbidly obese candidates for bariatric surgery. *Obesity Surgery*, *20*(2), 161–167. doi:10.1007/s11695-008-9726-1

Aekplakorn, W., Inthawong, R., Kessomboon, P., Sangthong, R., Chariyalertsak, S., Putwatana, P., & Taneepanichskul, S. (2014). Prevalence and trends of obesity and association with socioeconomic status in Thai adults: National health examination surveys. *Journal of Obesity, 2014*, 1-8. doi: 10.1155/2014/410259

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review, 30*(2), 217–237. doi: 10.1016/j.cpr.2009.11.004

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Baker, T., Piper, M., McCarthy, D., Majeskie, M., Fiore, M. (2004). Addiction motivation reformulated: an affective processing model of negative reinforcement. *Psychological Review, 111*(1), 35-51. doi: 10.1037/0033-295X.111.1.33

Berg, K. C., Peterson, C. B., Crosby, R. D., Cao, L., Crow, S. J., Engel, G., & Wonderlich, A. (2014). Relationships between daily affect and overeating-only, loss of control eating-only, and binge eating episodes in obese adults. *Psychiatry Research, 215*(1), 185-191. doi: 10.1016/j.psychres.2013.08.023

Blundell, J., Stubbs, R. J., Golding, C., Croden, F., Alam, R., Whybrow, S.,… Lawton, C. L. (2005). Resistance and susceptibility to weight gain: individual variability in response to a high-fat diet. *Physiology and Behaviors, 86*(5), 614–622. doi: 10.1016/j.psysbeh.2005.08.052

Bongers, P., Jansen, A., Havermans, R., Roef, A., & Nederkoorn, C. (2013). Happy eating. The underestimated role of overeating in a positive mood. *Appetite, 67*(August), 74-80. doi: 10.1016/j.appet.2013.03.017

Braden, A., Musher-Eizenman, D., Watford, T., & Emley, E. (2018). Eating when depressed, anxious, bored, or happy: Are emotional eating types associated with unique psychological and physical health correlates? *Appetite, 125*(June), 410-417. doi: 10.1016/j.appet.2018.22.022

Bradley, B. P., Garner, M., Hudson, L., & Mogg, K. (2007). Influence of negative affect on selective attention to smoking-related cues and urge to smoke in cigarette smokers. *Behavioural Pharmacology, 18,* 255-263. doi: 10.1097/FBP.0b013e328173969b

Bryant, E. J., King, N. A., & Blundell, J. E. (2008). Dietary disinhibition: its effects on appetite and weight regulation. *Obesity Review, 9*(5), 409–419. doi: 10.1111/j.1467-789X.2007.00426.x

Butler, E. A., Young, V. J., & Randall, A. K. (2010). Suppressing to please, eating to cope: The effect of overweight women's emotion suppression on romantic relationships and eating. *Journal of Social and Clinical Psychology, 29*(6), 599-623. doi: 10.1521/jscp.2010.29.6.599

Cheong, W. S. (2014, December 2). *Overweight and Obesity in Asia*. Retrieved from http://www.genre.com/knowledge/publications/uwfocus14-2-cheong-en.html.

Collaboration, T. G. B. M. (2016). Body-mass index and all-cause mortality: Individual-participant-data meta-analysis of 239 prospective studies in four continents. *The Lancet, 388*(10046), 776-786. doi: 10.1016/S0140-6736(16)30175-1

Cools, J., Schotte, D. E. & McNally, R. J. (1992). Emotional arousal and overeating in restrained eaters. *Journal of Abnormal Psychology, 101*(2), 348-351. doi: 10.1037/0021-843X.101.2.348

Cox, S., & Brode, S. (2018). Predictor of binge eating among bariatric surgery candidates: Dietary disinhibition as a mediator of the relationships between depressive symptoms and binge eating. *Obesity Surgery, 28,* 1990-1996. doi: 10.1007/s11695-018-3129-8

Cox, R., Skouteris, H., Hemmingsson, E., Fuller-Tyszkiewicz, M., & Hardy, L. L. (2016). Problematic eating and food-related behaviours and excessive weight gain: Why children in out-of-home care are risk. *Australian Social Work, 69*(3), 338-347. doi: 10.1080/0312407X.2015.1024267

De Castro, J. M. (1997). Socio-cultural determinants of meal size and frequency. *British Journal of Nutrition, 1*(S1), 39-54.

De Castro, J. M., & de Castro, E. S. (1989). Spontaneous meal patterns of humans: influence of the presence of other people. *American journal of Clinical Nutrition, 50*(2), 237-247. doi: 10.1093/aicn/50.2.237

French, S. A., Epstein, L. H., Jeffery, R. W., Blundell, J. E., & Wardle, J. (2012). Eating behavior dimensions. Associations with energy intake and body weight. *Appetite, 59,* 541-549. doi: 10.1016/j.appet.2012.07.001

Gianini, L. M., White, M. A., & Masheb, R. M. (2013). Eating pathology, emotion regulation, and emotional overeating in obese adults with binge eating disorder. *Eating Behaviors, 14*(3), 309-313. doi: 10.1016/j.eatbeh.2013.05.008

Goldscmidt, A. B., Lavender, J. M., Hipwell, A. E., Stepp, S. D., & Keenan, K. (2017). Emotion Regulation and Loss of Control Eating in Community-Based Adolescents. *Journal of Abnormal Child Psychology, 45*(1), 183-191. doi: 10.1037/hea0000389

Gormally, J., Black, S., Daston, S., & Rardin, D. (1982). The assessment of binge eating severity among obese persons. *Addictive Behaviors, 7*(1), 47-55.

Görlach, M. G., Kohlmann, S., Shedden-Mora, M., Rief, W., & Westermann, S. (2016). Expressive suppression of emotions and overeating in individuals with overweight and obesity. *European Eating Disorder Review, 24*(5), 377-382. doi: 10.1002/erv.2452

Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39*(3), 281-291. doi: 10.1017.S0048577201393198

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate Data Analysis* (7th ed.). Essex: Pearson Education Limited.

Hayes, A. F. (2018). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach (Methodology in the Social Sciences)* (2nd ed.). NY: The Guildford Press.

Hays, N. P., & Roberts, S. B., (2008)**.** Aspects of eating behaviors "dietary disinhibition" and "restraint" are related to weight gain and BMI in women. *Obesity, 16*(1), 52-58. doi: 10.1038/oby.2007.12

Hepworth, R., Mogg, K., Brignell, C., & Bradley, B. P. (2010). Negative mood increases selective attention to food cues and subjective appetite. *Appetite, 15*(1), 134-142. doi: 10.1016/j.appet.2009.09.019

James, W. P. (2009). WHO recognition of the global obesity epidemic. *International Journal of Obesity, 32*, S120-S126. doi: 10.1038/ijo.2008.247

Jansen, A., Vanreyten, A., Balveren, T., Roef, A., Nederkoorn, C., & Havermans, R. (2008). Negative affect and cue-induced overeating in non-eating disordered obesity. *Appetite, 51*(3), 556-562. doi: 10.1016/j.appet.2008.04.009

Johnson, F., Pratt, M., & Wardle, J. (2012). Dietary restraint and self-regulation in eating behavior. *International Journal of Obesity, 36*(5), 665-674. doi: 10.1038/ijo.2011.156

Lee, Y., Chong, M. F.-F., Liu, J., Libedinsky, C., Gooley, J., Chen, S., . . . Chee, M. (2013). Dietary disinhibition modulates neural valuation of food in the fed and fasted states. *American Journal of Clinical Nutrition, 97*(5), 919-925. doi: 10.3945/ajcn.112.053801

Lowe, M. R., & Maycock, B. (1988). Restraint, dietary disinhibition, hunger and negative affect eating. *Addictive Behaviors, 13*(4), 369-377.

Loxton, N. J., Dawe, L. S., & Cahill, A. (2011). Does negative mood drive the urge to eat? The contribution of negative mood, exposure to food cues and eating style. *Appetite, 56*(2), 368-374. doi: 10.1016/j.appet.2011.01.011

Luadlai, S. (2015). *The Influences of Positive Affect and Negative Affect on Overeating Behavior: A Mediated-Moderation Model of Dietary disinhibition and Emotion Regulation.* Bangkok: The Thailand Research Fund.

Maayan, L., Hoogendoom, C., Sweat, V., & Convit, A. (2011). Disinhibited eating in obese adolescents is associated with orbitofrontal volume reductions and executive dysfunction. *Obesity, 19*(7), 1382-1387. doi: 10.1038/oby.2011.15

Macht, M. (2008). How emotions affect eating: A five-way model. *Appetite, 50*(1), 1-11. doi: 10.1016/j.appet.2007.07.002

Macht, M., Haupt, C., & Salewsky, A. (2004). Emotions and eating in everyday life: application of the experience-sampling method. *Ecology of Food and Nutrition, 43*(4), 11–21. https://doi.org/10.1080/03670240490454723

Mailloux, G., Bergeron S., Meilleur, D., D'Antono, B., & Dubé, I. (2014). Examining the associations between overeating, dietary disinhibition, and hunger in a nonclinical sample of college women. *International Journal of Behavior Medicine, 21*(2), 375–384. doi: 10.1007/s12529-013-9306-1

Martyn-Nemeth, P., Penckofer, S., Gulanick, M., Velsor-Friedrich, B., & Bryant, F. B. (2008). The relationships among self-esteem, stress, coping, eating behavior, and depressive mood in adolescents. *Research in Nursing and Health, 32*(1), 96-109. https://doi.org/10.1002/nur.20304

Musaiger, A. O., Nabag, F. O., & Al-Mannai, M. A. (2017). Is emotional eating a problem of concern among adolescents in poor countries? An example from Sudan. *International Journal of Medicine and Health, 29*(5), 20160049. doi: 10.1515/ijamh-2016-0049

Neumark-Sztainer, D., Wall, M., Guo, J., Story, M., Haines, J., & Eisenberg, M. (2006). Obesity, disordered eating, and eating disorders in a longitudinal study of adolescents: How do dieters fare 5 years later? *Journal of the American Dietetic Association, 106*(4), 559-568. doi: 10.1016/j.jada.2006.01.003

Rodgers, R. F., Fuller-Tyszkiewicz, M., Holmes, M., Skouteris, H., & Broadbent, J. (2018). What does behavior follow intent? Relationships between trait level dietary restraint and daily eating behavior. *Appetite, 120*(January), 449-455. doi: 10.1016/j.appet.2017.09.030

Siep, N., Roef, A., Roebroeck, A., Havermans, R., Bonte, M., & Jansen, A. (2012). Fighting food temptations: The modulating effects of short-term cognitive reappraisal, suppression and up-regulation on mesocorticolimbic activity related to appetitive motivation. *NeuroImage, 60*(1), 213-220. doi: 10.1016/j.neuroimage.2011.12.067

Spoor, S. T.; Bekker, M. H.; van Strien, T.; van Heck, G. L. (2007). Relationship between negative affect, coping, and emotional eating. *Appetite, 48*(3), 368-376. doi:10.1016/j.appet.2006.10.005.

Stice, E., Akutagawa, D., Gagger, A., & Agras, W. S. (2000). Negative affect moderates the relationship between dieting and binge eating. *International Journal of Eating Disorders, 27*(2), 218-229. doi: 10/1002/(SICI)1098 108X(200003)27:2<218::AID-EAT10>3.0.CO;2-1

Stice, E., Presnell, K., Shaw, H., & Rohde, P. (2005). Psychological and behavioural risk factors for obesity onset in adolescent girls: a prospective study. *Journal of Consulting and Clinical Psychology, 73*(2), 195-202. doi: 10.1037/0022-006X.73.2.195

Stunkard, A., & Messick, S. (1985). The three-factor eating questionnaire to measure dietary restraint, dietary disinhibition and hunger. *Journal of Psychosomatic Research, 29*(1), 71-83. doi: 10.1016/0022-3999(85)90010-8

Swinburn, B., Egger, G., & Raza, F. (1999). Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Preventive Medicine, 29*(6 Pt 1), 563-570. doi:10.1006/pmed.1999.0585

Sultson, S., Kukk, K., & Akkermann, K. (2017). Positive and negative emotional eating have different associations with overeating and binge eating: Construction and validation of the positive-negative emotional eating scale. *Appetite, 116*(September), 423-430. doi: 10.1016/j.appet.2017.05.035

Svaldi, J., Griepenstroh, J., Tuschen-Caffier, B., & Ehring, T. (2012). Emotion regulation deficits in eating disorders: A marker of eating pathology or general psychopathology? *Psychiatry Research, 197*(1-2), 103-111. doi: 10.1016/j.psychres.2011.11.009

Svaldi, J., Tuschen-Caffier, B., Biehl, S. C., Gschwendtner, K., Wolz, I., & Naumann, E. (2015). Effects of two cognitive regulation strategies on the processing of food cues in high restrained eaters. An event-related potential study. *Appetite, 92*(1), 269-277. doi: 10.1016/j.appet.2015.05.026

Teewawattananon, Y., & Luz, A. (2017). *Obesity in Thailand.* Tokyo: Asian Development Bank Institute.

Udo, T., Grilo, C. M., Brownell, K. D., Weinberger, A. H., DiLeone, R. J., & McKee, S. A. (2013). Modeling the effects of positive and negative mood on the ability to resist eating in obese and non-obese individuals. *Eating Behaviors, 14*(1), 40-46. doi: 10.1016/j.eatbeh.2012.10.010

Van den Eynde, F., Koskina, A., Syrad, H., Guillaume, S., Broadbent, H., Campbell, I. C., & Schmidt, U. (2012). State and trait food craving in people with bulimic eating disorders. *Eating Behavior, 13*(4), 414–417. doi: 10.1016/j.eatbeh.2012.07.007

Van Strien, T., Cleven, A., & Schippers, G. (2000). Restraint, tendency toward overeating and ice cream consumption. *International Journal of Eating Disorders, 28*(3), 333-338. doi: 10.1002/1098-108X(200011)28:3<333::AID-EAT11>3.0.CO;2-#

Vohs, K. D., & Baumeister, R. F. (2015). *Handbook of Self-Regulation: Research, Theory, and Application (3rd ed.)*. NY: The Guilford Press.

Ward, A. (2000). Don't mind if I do: Disinhibited eating under cognitive load. *Journal of Personality and Social Psychology, 78*(4), 753-763. doi: 10.1037/0022-3514.78.4.753

Watson, D., Clark, L. A., & Tellegan, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality abd Social Psychology, 54*(6), 1063-1070.

WHO. (2000). *Obesity: Preventinng and managing the global epidemic*. Retrieved from Geneva: WHO.

WHO. (2014). *Global Status Report on Noncommunicable Diseases*. Geneva: World Health Organization, WHO.

Wu, J., Wilner, C. J., Hill, C., Fearon, P., Mayes, L. C., & Crowley, M. J. (2018). Emotional eating and instructed food-cue processing in adolescents: An ERP study. *Biological Psychology, 132*, 27-36.

Yeomans, M. R., & Coughlan, E. (2009): Mood-induced eating: Interactive effects of restraint and tendency to overeat. *Appetite, 52*(2), 290-298. doi: 10.1016/j.appet.2008.10.006

Zhou, Y., Gao, X., Chen, H., & Kong, F. (2017). High-disinhibition restrained eaters are disinhibited by self-regulatory depletion in the food-related inhibiting control. *Eating Behavior, 26*, 70-75. doi: 10.10162jeatbeh.2017.01.010