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## Emotional Appetite Questionnaire. Construct validity and relationship with BMI

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### Abstract

The Emotional Appetite Questionnaire (EMAQ) comprises ratings of tendency to eat in response to both positive and negative, emotions and situations. To assess construct validity, the responses of 232 male and female participants to the EMAQ subscales were correlated with the subscales of the Dutch Eating Behavior Questionnaire (DEBQ), which has been extensively validated. In addition, the EMAQ scores were correlated with BMI. Convergent validity was demonstrated by a significant positive correlation between the negative emotions and situations scores of the EMAQ and the emotional eating subscale score of the DEBQ (DEBQ-E). Moreover, discriminant validity was demonstrated by low correlations of EMAQ positive emotions and situations scores with the DEBQ-E score. For the study sample, the EMAQ negative scores were significantly positively correlated with BMI, and the EMAQ positive scores were significantly inversely correlated with BMI. As BMI increased so did reported negative emotional and situational eating whereas as BMI decreased, reported positive emotional and situational eating increased. Although causality cannot be inferred from correlations, eating more under negative emotions may contribute to being overweight whereas eating less may contribute to being underweight. The EMAQ was shown to have construct validity, and emotional eating was significantly correlated with BMI.

### Keywords

Emotional eating; Scale validity; Body mass index; Obesity; Body weight

### Introduction

Emotional eating is generally viewed as a response to negative emotion (Lindeman & Stark, 2001), ego-threat (Wallis & Hetherington, 2004), or distress (van Strien & Ouwens, 2007). Emotional eating has been associated with overeating, binge eating, bulimia nervosa, and obesity (see Lindeman & Stark, 2001 for review). Several theories have been presented to explain why some obese people engage in emotional eating. The psychosomatic theory (van Strien & Ouwens, 2003) suggests that poor interoceptive awareness (e.g., failure to recognize when one is hungry or satiated) may lead one to eat when aroused (Bruch, 1973). Alternative theories are Schachter's externality theory (Schachter & Rodin, 1974), which posits that obese individuals are overly responsive to the presence of food-related cues in the

environment but insensitive to internal physiological signals of hunger and satiety, and the restraint theory (Herman & Polivy, 1980) which proposes that external food cues and negative emotions can disrupt attempts to restrain food intake and control body weight.

Several questionnaires have been developed to measure emotional eating (van Strien, Frijters, Bergers, & Defares, 1986). Nearly all such questionnaires have focused on negative emotions (Geliebter & Aversa, 2003). Examples include the Dutch Eating Behavior Questionnaire (DEBQ) with diffuse and labeled negative emotions (van Strien et al., 1986) and the Emotional Eating Scale (EES; Arnow, Kenardy, & Agras, 1995) with 25 negative or unpleasant emotions. Neither explicitly separates emotions from emotional situations although some questions in the DEBQ could be considered situational. Furthermore, there is evidence that eating is affected differently by emotions of differing valence although relatively little is known about the effects of positive emotions on eating (Macht, 2008). While restrained eaters consume more food in the presence of negative emotional stressors, they may also consume more food in the presence of positive emotions, although to a lesser extent (Cools, Schotte, & McNally, 1992). There is evidence that positive emotions may contribute to food consumption in normal eaters. For example, in a field study of eating in a small sample of college students, eating associated with positive emotions was reported to occur as frequently as eating associated with negative emotions (Macht, Haupt, & Salewsky, 2004). Furthermore, several questionnaire studies have reported that joy can increase hedonic rating of food and food consumption (Macht, 1999; Macht, Roth, & Ellgring, 2002). Students reported a tendency to eat healthy foods in response to positive emotions and a tendency to eat junk food in relation to negative emotions (Lyman, 1982). Although the EES has more recently been extended to include some positive emotions (Kenardy, Butler, Carter, & Moor, 2003), it does not include emotional situations, and it has not yet been validated. Almost all prior studies have also focused on emotional eating in overweight individuals. In order to assess the role of both positive and negative emotions and situations in a range of BMI from underweight to overweight, Geliebter and Aversa (2003) developed the Emotional Appetite Questionnaire (EMAQ) and showed it to be reliable and internally consistent. They also found that compared to their usual eating habits, overweight participants reported eating more in response to negative emotions while underweight participants reported eating less. Underweight participants also reported eating more in response to positive emotions. However, the EMAQ has not yet been adequately validated.

There were several purposes for which the current study was conducted. The first was to examine the relationship between the EMAQ and the DEBQ, a widely used instrument with high reliability and validity (van Strien et al., 1986; Wardle, 1987), in order to establish construct (both convergent and discriminant) validity for the EMAQ. Moreover, the DEBQ has measures of dietary restraint and external eating which have been shown to correlate with emotional eating (van Strien, 1996; van Strien et al., 1986; Wardle, 1987). We expected a strong positive correlation between the negative emotion and situation scores of the EMAQ and the emotional eating subscale score of the DEBQ if they reflected the same construct (convergent validity). At the same time, we expected a low correlation between the positive emotion and situation scores of the EMAQ and the DEBQ emotional eating subscale score (discriminant validity, Messick, 1995). The second purpose was to elucidate the relationship between eating in response to negative emotions and eating in relation to positive emotions. The final purpose was to replicate the findings of Geliebter and Aversa (2003), which related emotional eating to BMI and gender. Based on their findings, it was expected that eating related to negative emotions would be positively correlated with BMI while eating related to positive emotions would be inversely correlated with BMI. Furthermore, it was expected that men would have higher ratings for eating in response to positive emotions.

## Methods

### Participants

This convenience sample included 232 undergraduate students and employees at Wagner College (171 women, 60 men, 1 offered no response to the gender question but was included in analyses that did not include gender as a variable) who volunteered to participate in experiments by enrolling in an online participant pool (one of several options for students to complete a research requirement for a course in Introduction to Psychology). Participants ranged in age from 18 to 52 years ( $M = 20.0$ ,  $SD = 4.6$ ) with 89.2% being 21 years or younger, reflecting the student status of the majority of participants. Mean body mass index (BMI) was computed from reported height and weight and was  $23.8 \text{ kg/m}^2$  ( $SD = 4.5$ ; range = 15.6–48.8). Three participants did not provide height and weight information for computation of BMI but were included in those analyses that did not include BMI as a variable. Of those who reported, 2.2% were underweight ( $BMI < 18$ ), 72.4% were normal weight ( $18 < BMI < 25$ ), 16.8% were overweight ( $25 < BMI < 30$ ) and 7.3% were obese ( $BMI > 30$ ). Overall, 24.1% of participants had a BMI greater than 25, which is comparable to college students elsewhere in the US (Huang et al., 2003). Racial/ethnic composition for the sample (among the 226 who reported) was 1.7% Asian, 2.2% Black, 6.0% Hispanic, 84.5% White, and 2.6% mixed race.

### Measures

Both the EMAQ and DEBQ were administered to each participant. The EMAQ contains 22 questions about tendency to eat in response to positive and negative emotions (14 items) and to positive and negative situations (8 items). The emotions and situations are not conceptually different, but the situations may be less abstract. Each item is rated on a 9-point Likert-type scale with “much less” and “much more” as anchors and 5 indicates “the same” (see Appendix A). For each item, there is also the option to indicate “not applicable” or “don't know,” and such responses are not included in the scoring. The positive emotion (EMAQ-PE) and positive situation (EMAQ-PS) scores can be averaged to obtain a positive EMAQ score (EMAQ-P). The negative emotion (EMAQ-NE) and negative situation (EMAQ-NS) scores can also be averaged to obtain a negative EMAQ score (EMAQ-N). The EMAQ has demonstrated high test-retest reliability ( $r$  coefficients ranged from .71 to .95) with Cronbach's  $\alpha$  of .78 and .75 for EMAQ-NE and EMAQ-PE and .65 and .57 for EMAQ-NS and EMAQ-PS respectively (Geliebter & Aversa, 2003).

The DEBQ contains three subscales: restrained eating (DEBQ-R), emotional eating (DEBQ-E), and external eating (DEBQ-X). The DEBQ-E contains 13 items, 4 of which describe eating in response to diffuse emotions, and 9 of which describe eating in response to clearly labeled emotions (van Strien et al., 1986). The restraint (cognitive restraint of eating) and external eating (eating in the presence of external cues) scales each have 10 items. All 33 questions are rated on a 5-point Likert-type scale with “never” and “very often” as the anchors. The DEBQ is reliable in both obese and nonobese men and women; Cronbach's  $\alpha$  = .95, .94, and .80 for restraint, emotional eating, and external eating respectively (van Strien et al., 1986). Wardle (1987) found support for the factor structure of the DEBQ in a sample of male and female students and established external validity for it in groups of women in weight loss programs, and in those diagnosed with eating disorders. DEBQ-E has been consistently found to be correlated with DEBQ-R and DEBQ-X while DEBQ-R has not been found to be correlated with DEBQ-X (van Strien et al., 1986; van Strien, 1996; Wardle, 1987).

In addition to the EMAQ and DEBQ, a demographics questionnaire was administered to obtain age, sex, height and weight, and ethnicity information. Although direct measures of

height and weight are preferable, self-reports of height and weight have been shown to be valid proxy measures with a correlation of .97 with measured values in 20–29 year olds and similar in older individuals (Kuczmarski, Kuczmarski, & Najjar, 2001).

## Procedure

Participants responded individually or in small groups of up to 10 (not seated next to each other) in a quiet room that afforded privacy. The questionnaires were administered in the afternoon between 13:00 and 18:00 on a weekday to provide some consistency in timing. Prior to the session, each participant provided written informed consent. The participants were given the EMAQ and DEBQ in counterbalanced order followed by the demographics questionnaire. After completing all the questionnaires, the participants were debriefed more fully regarding the purpose of the study. Procedures and consent forms were approved by the Wagner College Human Experimentation Review Board.

## Statistical analysis

All analyses were performed with SPSS (15.0) using  $\alpha = .05$ . The variables were tested for normality, and most were found to be skewed. Thus, the Spearman rho coefficient was used for correlations. Correlation coefficients were computed between the three DEBQ subscale scores and the four EMAQ subscale scores and BMI (1-tailed tests). To establish construct validity (Campbell & Fiske, 1959), it was expected that the absolute value of the correlation coefficients among the negative emotional eating measures (DEBQ-E, EMAQ-NE, and EMAQ-NS) would be weaker than the reliability coefficient for each scale and stronger than the correlations among the positive emotional eating scales (EMAQ-PE and EMAQ-PS) and DEBQ-E. A Bonferroni correction for the correlations was not used as we were not testing a universal null hypothesis (i.e., we had separate hypotheses for EMAQ relationships with DEBQ and BMI), and the related increase in Type II error probability was deemed excessive (Perneger, 1998). Multivariate analysis of variance (MANOVA) was used to test for sex differences in questionnaire scores.

## Results

### Correlations between EMAQ and DEBQ

The correlation coefficients for relationships among all variables are presented in Table 1. A highly significant positive correlation was found between EMAQ-NE and EMAQ-NS and DEBQ-E suggesting they measure the same construct (convergent validity). Both of the EMAQ positive emotion scales were significantly and weakly inversely correlated with DEBQ-E. Indeed, the correlation between EMAQ-NS and DEBQ-E was significantly different from that of EMAQ-PS and DEBQ-E, Hotelling's  $t(228) = 6.77, p < 0.0001$ , as well as the correlation between EMAQ-NE and DEBQ-E and that for EMAQ-PE and DEBQ-E, Hotelling's  $t(229) = 9.80, p < 0.0001$ , indicating that the positive and negative scores on the EMAQ measure different constructs (discriminant validity). In addition, all EMAQ positive emotion (but not EMAQ negative emotion) scores were significantly inversely correlated with the DEBQ-R score. DEBQ-X was significantly correlated with all EMAQ scores and DEBQ-E. Hotelling's  $t$ -tests revealed that DEBQ-X was more strongly correlated with DEBQ-E than with EMAQ-NS,  $t(229) = 4.73, p < .0001$ . The correlation between DEBQ-X and DEBQ-E was marginally higher than that with EMAQ-NE,  $t(229) = 1.85, p = 0.066$ .

Reliability coefficients (Cronbach's  $\alpha$ ) were calculated for the EMAQ and DEBQ subscales. These are presented with the correlations among the subscale scores (see Table 1). The patterns of association support the construct validity of the EMAQ. The reliability coefficients of each scale are greater than the absolute value of the correlation coefficients indicating convergence of scales (negative emotion) which, in turn, are greater than those

indicating discriminative validity (positive emotion). Critically, in the DEBQ-E column, the reliability coefficient for the DEBQ-E (0.94) is greater than its correlations with the EMAQ-NE and EMAQ-NS (0.58 and 0.43 respectively) which are in turn greater than its correlations with the EMAQ-PE and EMAQ-PS (.22 and .17 respectively).

### Correlations with BMI

Both negative emotion EMAQ scores were significantly positively correlated with BMI. In addition, the correlations between positive EMAQ scores and BMI were negative and significant. The correlation between EMAQ-PE and BMI was significantly different from the correlation between EMAQ-NE and BMI, Hotelling's  $t(226) = 2.81, p = 0.003$ . There was a similar difference in situation scores, Hotelling's  $t(225) = 2.73, p = 0.004$ . In contrast, DEBQ-E was not significantly correlated with BMI, and that correlation coefficient was significantly lower than that for the correlation between EMAQ-NE and BMI, Hotelling's  $t(226) = 1.94, p = 0.03$  (but not different than that between EMAQ-NS and BMI, Hotelling's  $t(226) = 1.18, p = 0.12$ ).

### MANOVA for sex groups

The results of the MANOVA revealed that there was a sex difference in eating tendency for EMAQ-PS,  $F(1,228) = 11.53, p = 0.001$ , and EMAQ-PE,  $F(1,228) = 10.74, p = 0.001$ : men had higher ratings than women (see Table 2). There were no sex differences on negative emotion subscores. Women scored higher on DEBQ-R,  $F(1,228) = 45.32, p < 0.001$ , and DEBQ-E,  $F(1,228) = 14.93, p < 0.001$ , than did men (see Table 2).

### Discussion

The results indicated good construct validity for the EMAQ overall, based on comparison with the more established DEBQ. The significant positive correlations of negative emotion and situation EMAQ scores with DEBQ-E demonstrate convergent validity since DEBQ-E largely concerns negative emotions. Furthermore, discriminant validity is demonstrated by the weak relationship between positive emotion and situation EMAQ scores and DEBQ-E. Indeed, the negative significant correlation between positive and negative subscales indicates opposite tendencies for eating in response to positive and negative emotions. Those who eat more in relation to positive emotions differ from those who eat more in relation to negative emotions. For example, Yeomans and Coughlan (2009) reported that women who scored low on restraint and high on disinhibited eating (as measured by the Three Factor Eating Questionnaire) ate more after a positive mood inducing film. In our sample, low restraint measured by DEBQ was associated with high EMAQ positive emotion eating scores. There is evidence that emotional eating is not only related to arousal but to the valence of the emotion. However, Cools et al. (1992) suggest level of arousal is more important than valence. More research on eating in association with positive emotions is warranted.

The significant correlation between negative EMAQ scores and BMI in a non-clinical sample with a wide range of BMIs extends similar findings by Geliebter and Aversa (2003) in truncated groups of low, average, and high BMI. These findings suggest, without proving, as the data are correlational, that the tendency to eat more when experiencing negative emotions may contribute to weight gain and obesity. Inversely, the tendency to eat less when experiencing negative emotions may contribute to becoming underweight. These findings are consistent with those of Macht (1999) who reported in a large sample of men and women that BMI was positively correlated with increased eating during negative emotions, but that hunger was negatively correlated with BMI when experiencing joy (the only positive emotion measured there).



The results of the MANOVA confirm sex differences in EMAQ scores reported by Geliebter and Aversa (2003). Men reported a tendency to eat more than usual than did women when experiencing both positive emotions and situations, and there was no sex difference for negative emotions. The increased eating by men during positive emotion states is consistent with the finding that men experienced an increase in appetite after a joy-inducing film but not after films that induced negative emotion (Macht et al., 2002). It is possible that for women, emotional eating is associated primarily with negative emotions, with normal food intake during positive emotions. Clinically, emotional eating in response to negative emotions and situations may be more relevant to women's eating styles.

Although the negative EMAQ subscales were significantly correlated with BMI, the emotional eating subscale of the DEBQ was not. van Strien, Frijters, Roosen, Knuiman-Hijl, and Defares (1985) reported a significant relationship between emotional eating and BMI, but we did not find this. This difference may be due to the presence of men in our sample (their sample was women only). Although there are studies of DEBQ that include men (e.g. van Strien et al., 1986; Wardle, 1987), they do not include data on BMI. Furthermore, the emotional eating measure used by van Strien et al. (1985) was a shortened 7-question measure, including 5 items of the DEBQ-E. Thus, that measure may be more related to BMI in both women and men than the current DEBQ-E. Using the present form of the DEBQ, a higher DEBQ-E score was reported in obese women (van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007).

It is possible that while the DEBQ-E primarily indicates a desire to eat in the presence of emotion, the EMAQ, which includes explicit situational questions, better reflects past eating behavior. The inverse correlation between the positive EMAQ scale and BMI replicates the finding in Geliebter and Aversa (2003). This tendency to eat more under positive emotions and situations in those of lower BMI apparently does not lead to weight gain. If negative emotions are more likely to be experienced or more salient than positive emotions, then negative emotions might be expected to predominate in influencing body weight and lead to weight loss in those of lower BMI and to weight gain in those of higher BMI.

The current study has several limitations. The sample represents a largely Caucasian and young college student population although an effort was made to include faculty and staff. Thus, there are limits to the generalizability to older persons and to more ethnically diverse populations. However, the sample does represent a group that is at relatively high risk for disordered eating (Mintz, O'Halloran, Mulholland, & Schneider, 1997). Since the study is correlational, no causal relationships can be established between emotional eating and BMI. Finally, while significant, the correlations between BMI and EMAQ are low, accounting for only a small proportion of the variance.

In conclusion, two components of construct validity were demonstrated for the EMAQ, a relatively new scale to assess emotional eating, by comparison with the better validated DEBQ: (1) convergent construct validity and (2) discriminative construct validity. By including positive emotions and situational questions, EMAQ is more inclusive of emotional eating. Since EMAQ-NE and EMAQ-NS are not as strongly correlated with DEBQ-X as DEBQ-E is, the EMAQ is less dependent on externality when measuring emotional eating. In addition, EMAQ is also less dependent on dietary restraint when measuring emotional eating. Finally, while both are measures of negative emotions, the negative EMAQ subscales predicted BMI while the emotional eating subscale of the DEBQ did not. Thus, the EMAQ may be useful in assessing weight gain/loss risk. Emotional eating has been associated with obesity (Faith, Allison, & Geliebter, 1997), and although the current study cannot establish a causal link between the two, it suggests that the EMAQ might predict changes in BMI in those who engage in emotional eating.

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## Appendix A

### Emotional Appetite Questionnaire

Please tell us first how your eating behavior is affected by certain emotional states and situations by circling a number on the scale below. The scale ranges from 1 to 9, where 1 represents much less food intake than usual, 9 much more than usual, and 5 the same as usual. If the specific question does not apply, please circle NA. If you don't know the answer, please circle DK.

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The following refer to EMOTIONS:

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As compared to usual, do you eat:	Much less					The same					Much more				
When you are: - Sad	1	2	3	4	5	6	7	8	9	NA	DK				
- Bored	1	2	3	4	5	6	7	8	9	NA	DK				
+ Confident	1	2	3	4	5	6	7	8	9	NA	DK				
- Angry	1	2	3	4	5	6	7	8	9	NA	DK				
- Anxious	1	2	3	4	5	6	7	8	9	NA	DK				
+ Happy	1	2	3	4	5	6	7	8	9	NA	DK				
- Frustrated	1	2	3	4	5	6	7	8	9	NA	DK				
- Tired	1	2	3	4	5	6	7	8	9	NA	DK				
- Depressed	1	2	3	4	5	6	7	8	9	NA	DK				
- Frightened	1	2	3	4	5	6	7	8	9	NA	DK				
+ Relaxed	1	2	3	4	5	6	7	8	9	NA	DK				
+ Playful	1	2	3	4	5	6	7	8	9	NA	DK				
- Lonely	1	2	3	4	5	6	7	8	9	NA	DK				
+ Enthusiastic	1	2	3	4	5	6	7	8	9	NA	DK				
- When under pressure	1	2	3	4	5	6	7	8	9	NA	DK				
- After a heated argument	1	2	3	4	5	6	7	8	9	NA	DK				
- After a tragedy of someone close to you	1	2	3	4	5	6	7	8	9	NA	DK				
+ When falling in love	1	2	3	4	5	6	7	8	9	NA	DK				
- After ending a relationship	1	2	3	4	5	6	7	8	9	NA	DK				
+ When engaged in an enjoyable hobby	1	2	3	4	5	6	7	8	9	NA	DK				
- After losing money or property	1	2	3	4	5	6	7	8	9	NA	DK				
+ After receiving good news	1	2	3	4	5	6	7	8	9	NA	DK				

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Table 1

Spearman rho correlation coefficients between EMAQ and DEBQ (subscales and total) scores and BMI for participants (Cronbach's  $\alpha$  in bold).

	DEBQ-E	EMAQ-NE	EMAQ-NS	EMAQ-PE	EMAQ-PS	DEBQ-R	DEBQ-X
DEBQ-E	<b>0.937</b>						
EMAQ-NE	0.580	<b>0.791</b>					
<i>p</i>	0.000						
<i>N</i>	232						
EMAQ-NS	0.429	0.695	<b>0.754</b>				
<i>p</i>	0.000						
<i>N</i>	231	231					
EMAQ-PE	-0.215	-0.162	-0.228	<b>0.871</b>			
<i>p</i>	0.001	0.007	0.000				
<i>N</i>	232	232	231				
EMAQ-PS	-0.168	-0.130	-0.108	0.605	<b>0.663</b>		
<i>p</i>	0.005	0.024	0.051	0.000			
<i>N</i>	231	231	231	231			
DEBQ-R	0.264	0.105	0.076	-0.311	-0.288	<b>0.929</b>	
<i>p</i>	0.000	0.056	0.126	0.000	0.000		
<i>N</i>	232	232	231	232	231		
DEBQ-X	0.455	0.356	0.159	0.219	0.176	-0.049	<b>0.866</b>
<i>p</i>	0.000	0.000	0.008	0.000	4.000	0.230	
<i>N</i>	232	232	231	232	231	232	
BMI	0.027	0.144	0.110	-0.136	-0.156	0.207	-0.002
<i>p</i>	<b>0.340</b>	<b>0.015</b>	<b>0.048</b>	<b>0.020</b>	<b>0.009</b>	<b>0.001</b>	<b>0.490</b>
<i>N</i>	229	229	228	229	228	229	229

Dark shading indicates areas of convergent validity and light shading indicates areas of discriminant validity (based on absolute values).

BMI = body mass index.

EMAQ= Emotional Appetite Questionnaire.

PE = positive emotions.

PS = positive situations.

NE= negative emotions.

NS = negative situations.

DEBQ= Dutch Eating Behavior Questionnaire.

R = restrained eating.

E = emotional eating.  
X = external eating.

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**Table 2**Mean ( $\pm$ SEM) EMAQ and DEBQ scores for male and female participants and results of MANOVA

	Women (N = 171)	Men (N = 59)	Sex effect
EMAQ-NE	4.76 $\pm$ 0.09	4.59 $\pm$ 0.13	n.s.
EMAQ-NS	4.13 $\pm$ 0.12	3.90 $\pm$ 0.20	n.s.
EMAQ-PE	4.86 $\pm$ 0.08	5.40 $\pm$ 0.15	$p = 0.001$
EMAQ-PS	4.64 $\pm$ 0.09	5.26 $\pm$ 0.18	$p = 0.001$
DEBQ-E	2.57 $\pm$ 0.07	2.08 $\pm$ 0.09	$p < 0.001$
DEBQ-R	3.00 $\pm$ 0.07	2.12 $\pm$ 0.11	$p < 0.001$
DEBQ-X	3.07 $\pm$ 0.05	3.15 $\pm$ 0.09	n.s.

Note: One male participant did not complete all scales.