Development and preliminary validation of the Salzburg Stress Eating Scale

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Abstract

Stress-related eating has long been a focus of study in several disciplines. Currently available psychometric scales conflate stress-related eating with emotional eating despite that not all stress states can be subsumed under some form of specific emotion. Moreover, existing measures primarily assess increased food intake in response to emotions and stress, thus ignoring evidence of decreased food intake in response to stress. Therefore, we drew from established stress concepts to develop the first genuine stress-related eating scale (Salzburg Stress Eating Scale [SSES]) in both German and English versions. In the SSES higher scores indicate eating more when stressed and lower scores indicate eating less when stressed. In study 1 (n = 340), the German SSES was found to have a one-factor structure (α = .89). SSES scores were weakly or moderately correlated with other eating-related constructs (e.g., emotional eating, body mass index [BMI]), and weakly correlated or uncorrelated with non-eating-related constructs (e.g., impulsivity, perceived stress); in addition, women had higher scores than men. Perceived stress moderated the association between stress eating and BMI, such that higher SSES scores were significantly related to higher BMI in individuals with high perceived stress, but not in individuals with low perceived stress. In studies 2 (n = 790) and 3 (n = 331), factor structure, internal consistency, and associations with sex and BMI were replicated for both German and English versions of the SSES. Hence, the SSES represents a psychometrically sound tool for the measurement of stress-related eating.

Keywords

Stress; Stress eating; Emotional Eating; Body mass index

Introduction

Although the effects of stress on eating have been well documented, the mechanisms remain poorly understood (Greeno & Wing, 1994; Robbins & Fray, 1980; Tomiyama, Finch, & Cummings, 2015). Animal research-based 'main effect' models assuming a uniform eating-inhibitory effect of stress have fallen short of explaining the complexity and variability of stress' effects on human appetite. Depending on individual differences (e.g., Oliver, Wardle, & Gibson, 2000) or situational factors (e.g., Sproesser, Schupp, & Renner, 2014), experiencing stress can lead to decreased food intake, unchanged food intake, or increased food intake. In fact, it has been estimated that stress eaters are almost equally divided between those who perceive themselves as eating more than usual when stressed and those who perceive themselves as eating less than usual when stressed (Gibson, 2006; Oliver & Wardle, 1999). Thus, these individual differences need to be taken into account in research on stress-related eating in humans, particularly when it comes to its psychometric assessment.

While there are several measures for the assessment of emotional eating (cf. Bongers & Jansen, 2016), psychometrically sound self-report questionnaires for the measurement of 'pure' stress eating are lacking. States of distress can overlap with states associated with negative emotions, but there are also non-overlapping states. For example, one might feel stressed (due to time pressure, inability to control important outcomes, task overload, etc.) without endorsing specific emotions, such as anxiety, anger, or sadness. Some of the existing questionnaires for the assessment of emotional eating, such as the *Dutch Eating Behavior Questionnaire* or the *Emotional Appetite Questionnaire*, do probe for eating in response to stressful situations, but items are intermingled with items that include emotional situations (Geliebter & Aversa, 2003; Nolan, Halperin, & Geliebter, 2010; van Strien, Frijters, Bergers, & Defares, 1986). Furthermore, although some studies ask participants about their food intake in response to stress (e.g., with response categories ranging from *much less than usual* to *much more than usual*), these studies employed only one or a few questions (e.g., Sproesser, 2014; Oliver & Wardle, 1999; Epel, 2004; Stone & Brownell, 1994), which limits validity and replicability.

Therefore, the aim of the current studies was to develop a new self-report measure for the assessment of genuine stress eating–the *Salzburg Stress Eating Scale* (SSES)–and to evaluate its psychometric properties and correlates. In accordance with prior studies (e.g., Nolan et al., 2010; Sproesser et al., 2014), response categories of this measure were designed to enable participants to indicate whether they typically eat less, just as much, or more than usual when feeling stressed. High scores on the scale indicate a tendency to eat more when stressed, and low scores indicate a tendency to eat less when stressed. In contrast to other self-report questionnaires, however, the scale includes only items that specifically refer to stress without confounding with other affective states (e.g., sadness, boredom, or anger).

In a first study, it was expected that the scale would demonstrate a one-factor structure and high internal consistency (i.e., factorial validity) because all items refer solely to stress eating. Based on previous findings (Oliver & Wardle, 1999), it was hypothesized that women would score higher than men. As an indication of convergent validity, it was expected that the scale would show small to moderate correlations with other eating-related measures (emotional eating, eating disorder symptomatology, perceived self-regulatory success in weight regulation). As an indication of discriminant validity, it was expected that the scale would show small or no correlations with relevant measures that are not directly related to eating (impulsivity, perceived stress, depressiveness). As chronic life stress seems to be associated with a greater preference for energy-dense foods and weight gain (Torres & Nowson, 2007), whether scores on the scale were related to body mass index (BMI) as a function of perceived stress was examined. Specifically, higher SSES scores were expected to be related to higher BMI in participants who reported high levels of stress, but to be unrelated to BMI in participants who reported low levels of stress. Such an interactive effect would represent an additional, preliminary indication of validity, as the tendency to eat more when stressed should not result in higher body weight in an individual who does not experience chronic stress. Finally, two additional studies were aimed at replicating factor structure, internal consistency, and relationships with sex and BMI for the German and English versions of the SSES.

STUDY 1

Methods

Participants and procedure

Participants were recruited via student mailing lists at universities in Germany and Austria and completed the questionnaires online via www.unipark.com. Questionnaire completion took approximately 20 min. Every question required a response in order to continue. Initially 382 individuals participated; 42 participants who cancelled before or during completion of the SSES were excluded from analysis, resulting in 340 participants who provided complete data on sociodemographic details and the SSES (sample sizes were slightly lower for other study variables due to missing data). Most participants were women (77%, n = 261), students (92%, n = 312), and had German citizenship (94%, n = 321). Mean (± *SD*) age was 23.8 ± 5.0 y (range: 18-53 y) and mean BMI was 22.5 ± 3.6 kg/m^2 (range: 14.5-39.2 kg/m^2). Twenty-two participants (6.5%) were underweight (BMI < 18.5 kg/m^2), 250 participants (74%) were healthy weight (BMI = 18.5-24.9 kg/m^2), 52 participants (15%) were overweight (BMI = 25.0-29.9 kg/m^2), and 16 participants (4.7%) were obese (BMI ≥ 30.0 kg/m^2).

Measures

Salzburg Stress Eating Scale (SSES). The SSES was developed by the authors based on six stress-related items of the *Mood Eating Scale* (MES, Jackson & Hawkins, 1980) and four items of the *Perceived Stress Scale* (PSS, Cohen, Kamarck, & Mermelstein, 1983). Published German-language versions of the MES (Abramson, 1996, 2001) and PSS (Büssing, Günther, Baumann, Frick, & Jacobs, 2013; Büssing & Recchia, 2016) were used. One item of the MES ("I snack a lot while studying for an exam.") was modified to "…preparing for a strenuous task…" to broaden the applicability to non- student populations. PSS items that are worded as questions ("How often have you…?"), were reworded to statements ("When I feel…"). Finally, all items were modified such that each item described a stressful situation and the sentences ended in response categories, such that participants indicate if they usually eat much less, less, just as much, more, or much more (scored from 1 to 5) under the described stress circumstances (see Table 1 for all items in German and English). The original scales were available in both German and English, and a bilingual, native speaker verified that the modifications did not change the original content.

Dutch Eating Behavior Questionnaire (DEBQ). The emotional eating subscale of the DEBQ (Grunert, 1989; van Strien et al., 1986) was used to measure eating in response to specific emotional states. The scale consists of 10 items coded from 1 (*never*) to 5 (*very often*). Internal consistency was $\alpha = .90$ in the current study.

Eating Disorder Examination – Questionnaire (EDE-Q). The EDE-Q (Fairburn & Beglin, 1994; Hilbert, Tuschen-Caffier, Karwautz, Niederhofer, & Munsch, 2007) was used to measure eating-disorder psychopathology in the past 28 days. The scale consists of 22 items coded from 0 (*no days*/*not at all*) to 6 (*every day*/*markedly*). There are four subscales representing *eating restraint, eating concern, weight concern*, and *shape concern*. Only the total score was used in the current study. Internal consistency was $\alpha = .95$. Six additional items assess the number of days or times with overeating, loss of control eating, binge eating, and compensatory bulimic behaviors. Of these, the number of binge days was used in the current analyses.

Perceived Self-Regulatory Success in Dieting Scale (PSRS). The PSRS (Meule, Papies, & Kübler, 2012) was used to measure perceived self-regulatory success in weight regulation. The scale consists of three items coded from 1 (*not successful*/*not difficult*) to 7 (*very successful*/*very difficult*). Internal consistency was α = .64 in the current study.

Barratt Impulsiveness Scale – short form (BIS-15). The BIS-15 (Meule, Vögele, & Kübler, 2011; Spinella, 2007) was used to measure trait impulsivity. The scale consists of 15 items coded from 1 (*rarely*/*never*) to 4 (*almost always*/*always*). Three subscales assess attentional, motor, and non-planning impulsivity. Their internal consistencies were α =.60, α = .72, and α = .81, respectively, in the current study.

Perceived Stress Scale (PSS). A short version of the PSS (Büssing et al., 2013; Cohen & Williamson, 1988) was used to measure perceived stress in the past month. The scale consists of 10 items coded from 0 (*never*) to 4 (*very often*). Internal consistency was α = .85 in the current study.

Center for Epidemiologic Studies Depression Scale (CES-D). A short version of the CES-D (Hautzinger, Bailer, Hofmeister, & Keller, 2012; Radloff, 1977) was used to measure depressive symptoms in the past week. The scale consists of 15 items coded from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). Internal consistency was α = .89 in the current study.

Data analysis

Factor structure was tested with principal component analysis, and the number of components was determined by parallel analysis and Velicer’s revised Minimum Average Partial (MAP) test using the SPSS syntax by O’Connor (2000). Internal consistency was evaluated with Cronbach's α. Differences in SSES scores between men and women were tested with an independent samples *t*-test. Data are given as mean ± *SD*. Associations with continuous study variables were evaluated with correlational analyses. A linear regression analysis was calculated with PROCESS for SPSS (Hayes, 2013). Scores on the SSES, PSS, and the interaction SSES × PSS scores were used as predictor variables and BMI as dependent variable. Predictor variables were mean-centered before computing the product term. The Johnson-Neyman technique, which identifies the value of the moderator variable representing the transition point between a statistically significant and nonsignificant effect of the independent variable on the dependent variable (Hayes & Rockwood, 2017), was used to probe the interaction.

Results

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO = 0.87) and Bartlett's Test of Sphericity ($\chi^2_{(45)} = 1728$, $p < .001$) indicated that the data were appropriate for exploratory factor analysis. Both the MAP test (smallest average 4th power partial correlation: .005) and parallel analysis (Figure 1) suggested a one-factor structure, which explained 50.2% of variance. All factor loadings were higher than .35 (Table 1). Internal consistency was $\alpha = .89$. Women (3.10 ± 0.73) had significantly higher SSES scores than men (2.87 ± 0.61, $t_{(338)} = 2.55$, $p = .011$). Scores on the SSES were significantly positively correlated with scores on emotional eating, eating disorder psychopathology, BMI, the number of binge days, and scores on attentional impulsivity, significantly negatively correlated with perceived self-regulatory success in weight regulation, and uncorrelated with scores on motor impulsivity, non-planning impulsivity, perceived stress, and depressiveness (Table 2). Scores on the SSES significantly predicted BMI ($b = 1.03$, $SE = 0.30$, $p < .001$), but PSS scores did not ($b = 0.05$, $SE = 0.03$, $p = .130$). There was a significant interaction between SSES and PSS scores ($b = 0.08$, $SE = 0.04$, $p = .048$). Scores on the SSES were significantly positively associated with BMI at higher scores on the PSS, but not at lower scores (Figure 2).[1] Including sex as a covariate did not affect the interpretation of the regression analyses.

STUDY 2

Methods

Participants and procedure

An online study was conducted, which included the German SSES and similar questionnaires as study 1 (e.g., DEBQ, EDE-Q, PSRS, BIS-15, CES-D). Only items of the SSES were used in the current analyses as the other data will be reported elsewhere (Meule, Reichenberger, & Blechert, submitted). A link to the online survey at www.unipark.com was distributed via e-mail to student mailing lists at several German and Austrian universities, via social networks, and via a posting on the website of the German version of Psychology Today. Every question required a response in order to continue. Completion of the study lasted approximately eight to ten minutes. Three 50 € prizes were raffled among participants who completed the survey. The website was visited 1396 times and 805 participants completed the entire set of questions. Twelve participants who answered questions too rapidly (total completion time less than five minutes) and three participants who reported a very young or old age (12, 14 and 87 years old) were excluded, leaving a final sample size of 790. Most participants were women (83%, n = 655) and had German (81%, n = 642) or Austrian (14%, n = 112) citizenship. The majority of participants were students (80%, n = 629); others were employed (11%, n = 90) or pupils in secondary schools (4.7%, n = 37). Mean (± *SD*) age was 24.7 ± 6.8 y (range: 15-65 y). Mean BMI was 22.3 ± 3.9 kg/m^2 (range: 15.0-50.9 kg/m^2). BMI data were deleted for one participant due to implausible height. Seventy-six participants (9.6%) were underweight, 583 participants (74%) were healthy weight, 92 participants (12%) were overweight, and 38 participants (4.8%) were obese.

Data analyses

A confirmatory factor analysis was computed with Amos 24 (IBM SPSS, Chicago) to test the one-factor structure of the SSES found in study 1. Maximum likelihood estimation was used, fixing the factor loading of the first item to 1. In order to reduce shared method variance between four SSES items beginning with the same word stem in German language "When I feel…", correlated errors between these items were estimated (Brown, 2006, p. 157). According to the recommendations of Hu and Bentler (1999), model fit was evaluated by three fit indices: the comparative fit index (CFI), with .90 ≤ CFI < .95 indicating acceptable fit and CFI ≥ .95 indicating good fit, the root mean square error of approximation (RMSEA), with .05 < RMSEA ≤ .08 indicating acceptable fit and RMSEA ≤ .05 indicating good fit, and the standardized root mean square residual (SRMR), with .08 < SRMR ≤ .10 indicating acceptable fit and SRMR ≤ .08 indicating good fit. In order to evaluate whether factor structure of the SSES varied between female and male participants, we tested measurement invariance at three levels: configural, factor loading and intercept invariance. Measurement invariance across sex was evaluated according to recommendations by Chen (2007). Specifically, a χ^2 difference test can be used for statistical comparison between nested models, but is almost always large and statistically significant with complex models and large samples and, thus, an impractical and unrealistic criterion for measurement invariance (Chen, Sousa, & West, 2005). Therefore, model fit changes were examined, and decreases in CFI ≤ .010 or increases in RMSEA of ≤ .015 or SRMR of ≤ .030 (between configural and factor loading model) and ≤ .010 (for testing intercept invariance) were considered to indicate measurement invariance (Chen, 2007). Internal consistency was evaluated with Cronbach's α. The relationship between the SSES and BMI was examined with correlational analysis. Differences in SSES scores between men and women were tested with an independent samples *t*-test.

Results

Although RMSEA (.113) indicated poor fit of the one-factor model, CFI (.931) and SRMR (.059) indicated acceptable-to-good model fit. All factor loadings were greater than .47 (all *p*s < .001). Model fit changes between the configural invariance model (CFI = .930, RMSEA = .080, SRMR = .058) and the factor loading invariance model (CFI = .929, RMSEA = .075, SRMR = .061) indicated sex invariance for the factor score estimates (ΔCFI = .001, ΔRMSEA = .005, ΔSRMR = .003). Similarly, model fit changes between the intercept invariance model (CFI = .922, RMSEA = .073, SRMR = .060) and the factor loading model (ΔCFI = .007, ΔRMSEA = .002, ΔSRMR = .001) indicated sex invariance for the intercepts. Internal consistency was $\alpha = .90$. Mean SSES scores were 2.88 ± 0.73 (range: 1-5). Women (2.92 ± 0.76) had higher SSES scores than men (2.67 ± 0.56, $t_{(788)} = 3.56$, $p < .001$). SSES scores were positively correlated with BMI ($r = .209$, $p < .001$).

STUDY 3

Methods

Participants and procedure

An online study was conducted using the English version of the SSES. A link to the online survey was accessible on the project promotion website of the European Research Council (www.sciencesquared.eu). Every question required a response in order to continue. Completion of the study lasted approximately three to five minutes. The survey was begun by 425 individuals and completed by 335. Data from four participants were excluded from analyses because of implausible data entries, leaving a final sample size of *n* = 331. Most participants were women (78%, *n* = 258). Mean (± *SD*) age was 42.2 ± 11.2 y (range: 18-73 y). Mean BMI was 24.2 ± 4.2 kg/m^2 (range: 13.9-41.4 kg/m^2). Twelve participants (3.6%) were underweight, 197 participants (60%) were healthy weight, 93 participants (28%) were overweight, and 29 participants (8.8%) were obese. Participants were diverse regarding residency and citizenship: the majority of participants reported residence in Belgium (*n* = 189, 57%), the United Kingdom (*n* = 32, 9.7%), Ireland (*n* = 14, 4.2%), Italy (*n* = 13, 3.9%), or Germany (*n* = 12, 3.6%), and reported having Belgian (*n* = 42, 13%), British (*n* = 40, 12%), Italian (*n* = 37, 11%), German (*n* = 24, 7.3%), Spanish (*n* = 23, 6.9%), French (*n* = 22, 6.6%), Irish (*n* = 19, 5.7%), Romanian (*n* = 16, 4.8%), Polish (*n* = 13, 3.9%), or Portuguese (*n* = 10, 3.0%) citizenship.

Data analyses

Data analyses were similar to study 2.

Results

Although RMSEA (.096) indicated poor fit of the one-factor model, CFI (.944) and SRMR (.052) indicated acceptable-to-good model fit. All factor loadings were greater than .52 (all *p*s < .001). Model fit changes between the configural invariance model (CFI = .921, RMSEA = .081, SRMR = .046) and the factor loading invariance model (CFI = .924, RMSEA = .074, SRMR = .047) indicated sex invariance for the factor score estimates (ΔCFI = .003, ΔRMSEA = .007, ΔSRMR = .001). Similarly, model fit changes between the intercept invariance model (CFI = .920, RMSEA = .071, SRMR = .047) and the factor loading model (ΔCFI = .004, ΔRMSEA = .003, ΔSRMR < .001) indicated sex invariance for the intercepts. Internal consistency was $\alpha = .90$. Mean SSES scores were 3.23 ± 0.74 (range: 1.40-5.00). In contrast to studies 1 and 2, women (3.25 ± 0.76) and men (3.16 ± 0.65) had similar SSES scores ($t_{(329)} = 0.98$, $p = .330$). This might be explained by the larger number of overweight and obese individuals in study 3 than in study 1 or 2: Female sex was associated with higher SSES scores ($r_{\text{partial}} = .110$, $p = .046$) when controlling for BMI. In line with studies 1 and 2, SSES scores were positively correlated with BMI ($r = .264$, $p < .001$).

Discussion

To our knowledge, the SSES is the first measure of stress-related eating that does not include emotion-related items. In addition, the SSES assesses stress-related undereating as well as stress-related overeating, a feature that is lacking in several previous measures. The SSES was demonstrated to be a one-factorial, internally consistent measure. Notably, this one-factorial structure was invariant across sex, and, in line with previous findings (Oliver & Wardle, 1999), women had higher scores than men. Mean SSES scores ranged around the middle of the scale, but were highly variable. While this may have resulted in part from a central-tendency bias (i.e., participants tend to mark the middle of the five-point scale), it is also in line with the finding that similar numbers of individuals perceive themselves as eating less when stressed and eating more when stressed (Gibson, 2006; Oliver & Wardle, 1999).

Higher SSES scores were associated with higher BMI. Interestingly, SSES scores were uncorrelated with perceived stress in study 1, suggesting that the experience of stress and its translation into eating are subjectively separable and independent constructs. However, perceived stress moderated the relationship between stress eating and BMI: the association between stress eating and BMI was stronger when participants reported high stress levels than when stress levels were low (Figure 2). These results are in line with a meta-analytic study showing that stress is weakly related to adiposity (Wardle, Chida, Gibson, Whitaker, & Steptoe, 2011). This may be explained by the fact that experiencing stress results in higher BMI only in individuals who eat more in response to stress and are chronically exposed to stress. Importantly, similar effects were not found when examining interactive effects between negative affect and emotional eating, and SSES scores uniquely predicted BMI above and beyond the influence of emotional eating.[1]

Our results provided several indicators of convergent validity. SSES scores were weakly-to-moderately associated with other eating-related constructs, including increased emotional eating tendencies, higher eating pathology, and lower perceived self-regulatory success in weight regulation. These latter measures, in turn, have been found to correlate with higher attentional impulsivity (Meule, 2013). Consistent with that, SSES scores were specifically related to higher attentional impulsivity, but not to motor or non-planning impulsivity. This relationship, however, was weak, thus supporting discriminant validity. Therefore, taken together, our results suggest that there is a relatively large overlap between stress-related overeating and other problematic eating behaviors and that there is only a modest role of general trait impulsivity in stress-related overeating.

Although the current results provide preliminary support for validity of the SSES, the scale relies on self-report, which can potentially be biased. For example, it has been suggested that individuals scoring high on self-report measures of emotional eating may overestimate how much they actually eat in response to certain emotions or may simply attribute their overeating to negative affect retrospectively (Adriaanse, Prinsen, de Witt Huberts, de Ridder, & Evers, 2016; Royal & Kurtz, 2010). Thus, validity of the SSES should be further investigated in future studies that examine relationships with implicit measures (e.g., implicit association task; Bongers, Jansen, Houben, & Roefs, 2013), with actual food intake after stress induction in the laboratory, or with stress eating assessed in daily life (e.g., ecological momentary assessment; Bongers & Jansen, 2016).

The moderating influence of perceived stress on the SSES-BMI relationship also seems worthy of future examination. It appears unclear how an arguably state-dependent measure such as the PSS can moderate the relationship between more trait-like variables. However, although questions of the PSS refer only to the last month, it is a relatively stable measure (Cohen et al., 1983), suggesting that some individuals consistently report more stress than others (either because of consistent stress-generative appraisals or because of actual stress load). It might be that it is those individuals who either overeat in response to this stress or attribute their overeating to the stressfulness of their situation, which might be a more 'ego-friendly', acceptable explanation for overeating than a lack of self-control (Adriaanse et al., 2016; Royal & Kurtz, 2010). Laboratory studies with a clear timeline of induced stress and subsequent test meal would be necessary here.

Although our data are based on large samples with a wide range in age and BMI, it is necessary to examine psychometric properties and correlates of the SSES in more representative, non-self-selected samples, which also include, for example, less educated individuals. Moreover, examination of the English SSES was based on a heterogeneous sample that included non-native speakers of English. This may have influenced results, either due to imperfect comprehension of the items or to cultural differences. Therefore, future research should compare psychometric properties and correlates of the English SSES in native and non-native speakers and also investigate its performance in cross-cultural studies.

To conclude, the current studies showed that the SSES is an internally consistent measure that is correlated with, yet distinct from, related concepts, such as emotional eating. Furthermore, stress-induced eating and perceived stress interactively predict body weight. Thus, we conclude that the SSES is a useful and psychometrically sound tool for the investigation of stress-related eating.

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Footnote

[1]To examine the specificity of this finding for stress-related eating, a similar regression model was calculated with DEBQ instead of SSES scores, that is, including an interaction emotional eating × perceived stress, but neither predictor variable was significant (all *p*s > .125). As emotional eating may be particularly related to BMI when experiencing negative emotions (but not stress), a similar model was calculated with CES-D scores, that is, including an interaction emotional eating × depression, but neither predictor variable was significant (all *p*s > .148). Finally, to examine the unique influence of stress eating on BMI while controlling for emotional eating, a linear regression was calculated with SSES and DEBQ scores entered together as predictors of BMI. Here, SSES scores significantly predicted BMI ($b = 1.31$, $SE = 0.33$, $\beta = .255$, $p < .001$) while DEBQ scores did not ($b = -0.09$, $SE = 0.29$, $\beta = -.021$, $p = .744$).

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Table 1

Items, factor loadings, and item statistics of the Salzburg Stress Eating Scale in study 1

Item	Factor loading	*M*	*SD*	r_{itc}	α if item deleted
1. When I am overwhelmed with things I have to do, … [Wenn mich die Dinge, die ich erledigen muss zu erdrücken drohen, …]	.762	2.99	1.10	.683	.871
2. During periods of great stress, … [In sehr stressbelasteten Zeiten …]	.784	2.97	1.14	.702	.870
3. When I feel things are out of control, … [Wenn ich das Gefühl habe, dass mir die Dinge über den Kopf wachsen, …]	.790	3.12	1.00	.713	.869
4. On days where everything seems to go wrong, … [An Tagen, an denen alles schiefzugehen scheint, …]	.626	3.32	0.95	.538	.881
5. While preparing for a strenuous task, … [Wenn ich mich auf eine anstrengende Aufgabe vorbereite, …]	.354	3.14	0.85	.290	.895
6. When I am under pressure, … [Wenn ich unter Druck stehe, …]	.740	2.86	0.95	.666	.873
7. When I feel nervous and stressed, ... [Wenn ich mich nervös und gestresst fühle, ...]	.724	2.90	1.05	.640	.874
8. When I feel that I have no influence over the important things in my life, … [Wenn ich das Gefühl habe, wichtige Dinge in meinem Leben nicht beeinflussen zu können, …]	.686	3.10	0.93	.601	.877
9. When I feel that I am not really on top of things, … [Wenn ich das Gefühl habe, nichts mehr wirklich im Griff zu haben, …]	.745	3.07	1.04	.665	.872
10. When I feel difficulties have been piling up so high that I cannot overcome them, … [Wenn ich das Gefühl habe, dass sich die Probleme so aufgestaut haben, dass ich sie nicht mehr bewältigen kann, …]	.764	3.02	1.07	.685	.871

Notes. German items are displayed in brackets. Response categories are 1 = *I eat much less than usual* [esse ich viel weniger als sonst], 2 = *I eat less than usual* [esse ich weniger als sonst], 3 = *I eat just as much as usual* [esse ich genauso viel wie sonst], 4 = *I eat more than usual* [esse ich mehr als sonst], 5 = *I eat much more than usual* [esse ich viel mehr als sonst].

Table 2

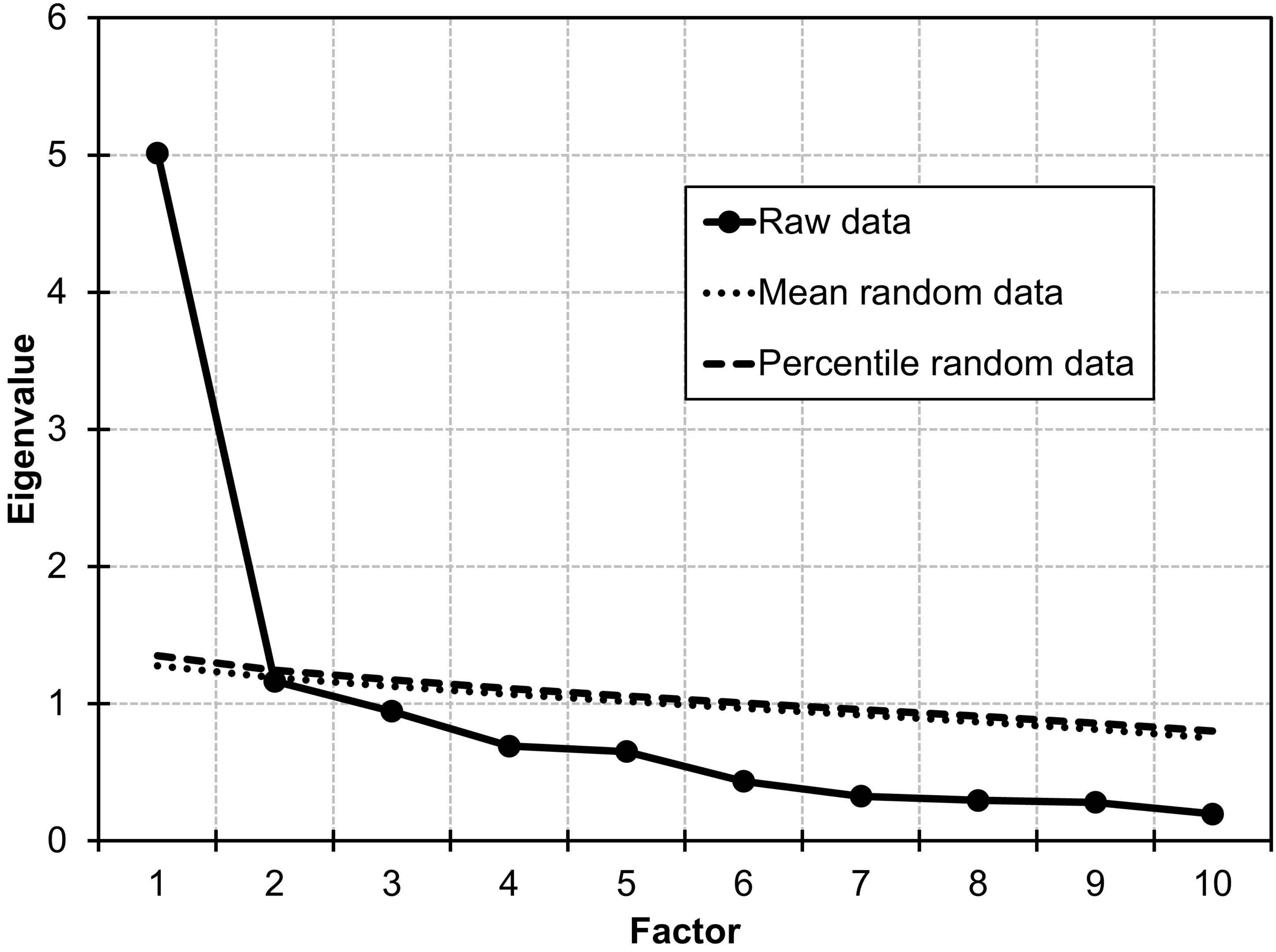
Descriptive statistics of continuous study variables and correlations with SSES scores in study 1

Variable	*M*	*SD*	Range	*r*	*p*
Salzburg Stress Eating Scale	3.05	0.71	1.00-5.00	-	-
Emotional Eating (Dutch Eating Behavior Questionnaire)	2.56	0.80	1.00-4.80	.516	< .001
Eating Disorder Examination Questionnaire	1.48	1.20	0.00-5.41	.298	< .001
Perceived Self-Regulatory Success in Dieting Scale	12.2	3.51	3-21	-.243	< .001
Body mass index (kg/m²)	22.5	3.56	14.5-39.2	.230	< .001
Binge days	1.39	3.71	0-28	.160	.005
Barratt Impulsiveness Scale					
Attentional impulsivity	9.66	2.48	5-17	.156	.005
Motor impulsivity	10.6	2.65	5-19	.048	.394
Non-planning impulsivity	10.9	3.10	5-19	-.012	.832
Perceived Stress Scale	17.9	6.66	3-37	.104	.065
Center for Epidemiologic Studies Depression Scale	12.4	8.18	0-40	.097	.079

Figure captions

Figure 1. Scree plot and eigenvalues of the parallel analysis in study 1.

Figure 2. Johnson-Neyman plot representing the interaction between scores on the Perceived Stress Scale (PSS) and the Salzburg Stress Eating Scale (SSES) when predicting body mass index (BMI) in study 1. The plot depicts the conditional effect of stress eating scores on BMI as a function of perceived stress scores. A score of 14 on the PSS represents the point of transition between a statistically significant and a nonsignificant association between SSES scores and BMI. Above this value, stress eating scores were significantly, positively associated with BMI. Below this value, the relation between stress eating scores and BMI was not significant.


Raw data
Mean random data
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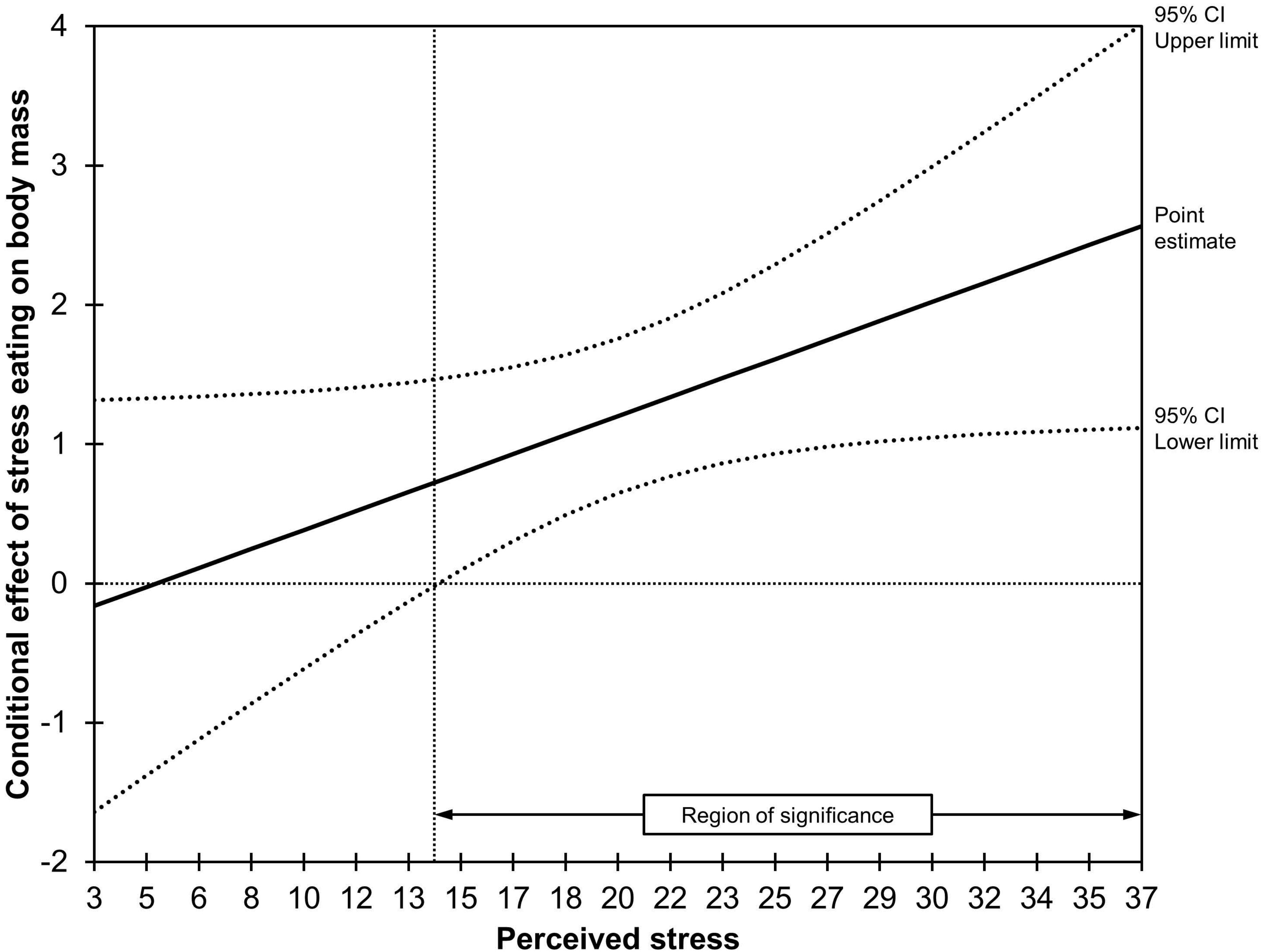
95% CI
Upper limit
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estimate
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Region of significance
Conditional effect of stress eating on body mass
Perceived stress
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