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The Eating Disorder Assessment for DSM-5 (EDA-5): Development and Validation of a Structured Interview for Feeding and Eating Disorders

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Abstract

Objective—Existing measures for DSM-IV eating disorder diagnoses have notable limitations, and there are important differences between DSM-IV and DSM-5 feeding and eating disorders. This study developed and validated a new semi-structured interview, the Eating Disorders Assessment for DSM-5 (EDA-5).

Method—Two studies evaluated the utility of the EDA-5. Study 1 compared the diagnostic validity of the EDA-5 to the Eating Disorder Examination (EDE) and evaluated the test-retest reliability of the new measure. Study 2 compared the diagnostic validity of an EDA-5 electronic application ("app") to clinician interview and self-report assessments.

Results—In Study 1, the kappa for EDE and EDA-5 eating disorder diagnoses was 0.74 across all diagnoses (n= 64), with a range of κ=0.65 for Other Specified Feeding or Eating Disorder (OSFED)/Unspecified Feeding or Eating Disorder (USFED) to κ=0.90 for Binge Eating Disorder (BED). The EDA-5 test-retest kappa coefficient was 0.87 across diagnoses. For Study 2, clinical interview versus "app" conditions revealed a kappa of 0.83 for all eating disorder diagnoses (n=71). Across individual diagnostic categories, kappas ranged from 0.56 for OSFED/USFED to 0.94 for BN.

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Disclosure of Conflicts

Drs. Sysko, Glasofer, Hildebrandt, Mitchell, Wonderlich, Berg, Peterson, and Walsh, and Ms. Klimek have no conflicts to declare.

Discussion—High rates of agreement were found between diagnoses by EDA-5 and the EDE, and EDA-5 and clinical interviews. As this study supports the validity of the EDA-5 to generate DSM-5 eating disorders and the reliability of these diagnoses, the EDA-5 may be an option for the assessment of Anorexia Nervosa, Bulimia Nervosa, and BED. Additional research is needed to evaluate the utility of the EDA-5 in assessing DSM-5 feeding disorders.

A number of interview-based assessment tools are available to assign DSM-IV[1] eating disorder diagnoses. Commonly used measures in research studies include the Eating Disorder Examination (EDE[2]) and the Structured Clinical Interview for DSM-IV (SCID-IV[3]). However, these measures have limitations. For example, although the DSM-IV criteria for anorexia nervosa (AN) include disturbances in the experience of body weight or shape and a lack of recognition of the seriousness of low weight (Criterion C), these features are not evaluated by the EDE[4]. Further, diagnostic agreement using DSM-IV assessment interviews is variable. For example, using the standards described by Landis and Koch (1977[5]), kappa statistics for the diagnosis of AN are moderate for the interviewer-based EDE in comparison to self-report (κ=0.56[6]). Moderate to substantial agreement has been observed for AN (κ=0.68) and for eating disorder not otherwise specified (κ=0.60), with higher agreement for bulimia nervosa (BN; κ=0.83) between clinician interview and SCID-IV[7]. Taken together, these findings suggest that the current diagnostic instruments provide an incomplete assessment of DSM-IV eating disorder criteria and have inconsistent reliability estimates across diagnoses.

In addition, with the publication of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5[8]), the category of feeding and eating disorders has been revised. Both modest (e.g., reducing the frequency of binge eating and/or purging behaviors for the diagnosis of BN), and major (e.g., merging feeding and eating disorders into one category; designating binge eating disorder (BED) and avoidant/restrictive food intake disorder (ARFID) as formal diagnostic categories) changes were made from earlier versions of the DSM. Given the limitations of the existing measures for DSM-IV eating disorder diagnoses, and the differences between DSM-IV and DSM-5 diagnostic criteria for feeding and eating disorders, new diagnostic assessment tools are needed.

In constructing a new diagnostic instrument, we elected to develop an interview-based instrument for feeding and eating disorders that aimed to reduce participant and staff burden in research settings with a focused diagnostic evaluation that did not also assess related psychopathology. Such a measure might also be helpful in non-research settings to assist in determining if an individual's symptoms meet DSM-5 criteria. Thus, we created a semi-structured interview for feeding and eating disorder diagnosis, the Eating Disorders Assessment for DSM-5 (EDA-5). Two studies, described below, evaluated the initial psychometric properties of the EDA-5. Study 1 evaluated the diagnostic validity of the EDA-5 relative to the EDE, the test-retest reliability of diagnoses generated by the EDA-5, and the acceptability of the measure. Study 2 used an electronic application ("app") of the EDA-5 and examined the diagnostic validity of the EDA-5 to an unstructured clinician interview and a self-report diagnostic measure. Study 2 also examined group differences between diagnostic groups identified by the EDA-5 on two self-report measures of eating disorder psychopathology.

Study 1

Overview

Study 1 was designed to: (1) compare diagnostic agreement between the EDA-5 and the EDE, (2) examine the test-retest reliability of the EDA-5, and (3) evaluate the acceptability of the EDA-5 with regard to the duration and participants' perceptions of the measure.

Method

Measures

EDA-5: Our goal in developing the EDA-5 was to provide an instrument that could be administered with limited training and would assess the DSM-5 criteria for feeding and eating disorders and the frequencies of salient behavioral disturbances characteristic of these conditions (e.g., the number of objective and subjective binge eating episodes and compensatory behaviors). As the EDA-5 was developed solely as a diagnostic instrument, associated psychopathology and other psychiatric symptoms are not evaluated. The items in the EDA-5 were developed through an iterative process by three of the authors (RS, DG, BTW) using a checklist initially developed by Dr. Walsh (c.f., 9–11) that corresponded to each DSM-5 feeding and eating disorder criterion. The initial version of the EDA-5 tested in Study 1 provided probe questions and responses in a paper-and-pencil format, similar in style to the SCID-IV. As implemented, the EDA-5 relies on an algorithm that selects subsequent questions based on answers already obtained. Therefore, the number of questions administered varies across individuals. For example, a patient with AN, restricting subtype, would answer between 11 and 20 questions, depending on whether subjective binge eating episodes and excessive exercise were endorsed. Rather than use the time-line follow-back method employed by the EDE, which suggests the interviewer utilize a calendar to focus carefully on the preceding months, the EDA-5 instead asks for recent information on the frequencies of behaviors. For example, for binge eating, participants are asked the number of times binge eating episodes were experienced in the prior week, whether the frequency is consistent over the prior three months, and if not, how the frequency of episodes was different.

The following diagnoses can be generated by the EDA-5: AN (restricting or binge-eating/purging type), BN, BED, ARFID, pica, rumination disorder, other specified feeding or eating disorder (OSFED), or unspecified feeding and eating disorder (USFED). Diagnoses of AN, binge-eating/purging subtype, are assigned by the EDA-5 if the individual reports either objective binge episodes or purging at least once monthly, on average, over the prior three months. As the EDE does not differentiate between subtypes of anorexia nervosa, and reliability rates for the subtypes of AN could therefore not be calculated. Additional data relevant to subtype were not coded.

EDE: The diagnostic items from the EDE, version 16[2], were administered. Since Study 1 was initiated in 2012, the diagnostic algorithms for this study were applied as operationally defined by Fairburn and Cooper (1993[12]) with modification for DSM-5 (e.g., using a frequency of once weekly objective bulimic episodes for BN and BED). In April of 2014, a seventeenth edition of the EDE was released with scoring to generate DSM-5 diagnoses

(http://www.credo-oxford.com/pdfs/EDE_17.0D.pdf). Three primary changes were made to the EDE version 17: (1) removing the amenorrhea item for AN, (2) reducing the six-month time frame for questions evaluating BED, and (3) altering references to "whose weight might make them eligible for the diagnosis of AN" have been replaced by "whose weight might be viewed as 'significantly low.'" As described below, discrepancies with the EDE and EDA-5 do not appear primarily related to differences on the basis of the algorithms used. In prior research,[13] test-retest reliability correlations for diagnostic symptoms on the EDE (e.g., objective bulimic episodes, vomiting episodes) in a clinical sample ranged from 0.83 to 0.97.

Procedure: Participants were individuals seeking or receiving treatment at one of three tertiary care centers: the Columbia Center for Eating Disorders (CCED), Mount Sinai Eating and Weight Disorders Program (Mt. Sinai), both in New York City, and Sanford Eating Disorder & Weight Management Center/Neuropsychiatric Research Institute (Sanford/NRI) in Fargo, ND. Initial and subsequent interviews were completed by a bachelor's level research assistant (CCED, Mt. Sinai) or a Master's level project coordinator (Sanford/NRI). Assessments were conducted by phone at the CCED and Sanford/NRI sites, and in-person at Mt. Sinai. Verbal consent was obtained for phone interviews and written consent for interviews conducted in-person. Institutional Review Boards at each site reviewed and approved the protocol.

Initial Testing: Participants were interviewed using the EDA-5 and EDE within 24 hours. The order of the interviews was counterbalanced, the EDA-5 and EDE were conducted by different interviewers, and the length of each interview was recorded. Interviewers conducted both the EDE and EDA-5. Participants provided feedback to the interviewer about their experience in completing both assessments (e.g., interview preference, similarities/differences between interview style, structure and content, perceived variations in symptom reports between interviews). After completing initial testing, each participant received compensation ($50 at Mt. Sinai, $75 at Sanford, and $100 at the CCED). Fifty percent of the individuals completing the initial interviews were randomized to complete a second EDA-5 interview to assess test-retest reliability. Between seven and 14 days after the initial interview, another research assistant or project coordinator contacted the participants randomized to complete a second EDA-5. Participants who successfully completed this interview received an additional $25–50.

Statistical Analysis

Statistical calculations were performed with SPSS for WINDOWS software (version 21; SPSS). Means and standard deviations (SD) were calculated for continuous demographic measures, and one way ANOVAs were used to assess differences across sites (CCED, Mt Sinai, Sanford) using the least significant difference test. Two-way ANOVAs (Site X Diagnosis) compared the difference in the time needed to complete the EDE and EDA-5 across sites and EDE diagnosis (No diagnosis, AN, BN, BED, OSFED/USFED), and chi-squares analyzed the proportion of participants reporting a preference for the EDE or EDA-5. Effect sizes (*d*) were calculated as the mean difference between the two

comparisons (e.g., participants completing the EDE and EDA-5) for a given variable divided by the mean SD of that variable.

The EDE was used as the reference instrument in all analyses. Similar to other diagnostic instruments (e.g., 14), criterion validity was subsequently analyzed for AN, BN, BED, and OSFED/USFED by testing kappa, sensitivity, specificity, positive predictive value, negative predictive value, and accuracy. Kappa represents the agreement between diagnoses assigned by the EDE and EDA-5, taking into account the probability of chance agreement. Sensitivity and specificity indicate the proportion of participants with a positive or negative EDE diagnosis, respectively, who were correctly identified by the EDA-5. Positive predictive value is the proportion of participants classified as having a positive diagnosis by the EDA-5 who met criteria for the diagnosis by EDE, whereas negative predictive value signifies the proportion of participants not assigned a diagnosis by EDA-5 who did not meet criteria for a diagnosis by EDE. Finally, accuracy is the proportion of participants for whom the EDA-5 diagnosis matched their EDE diagnoses. To facilitate comparisons across studies, including research on diagnostic reliability for eating disorders (e.g., 13–15) and our previous work on the test-retest reliability of DSM-5 eating disorder diagnoses[16], we interpreted κ using two standards[5,17]. The standards described by Fleiss (1981[17]) describe κ< 0.40 to be ”poor,” κ of 0.40–0.75 to be “fair,” and κ> 0.75 to be “excellent.” Landis and Koch (1977[5]) indicate a κ of 0–0.20 is “poor,” κ of 0.21–0.40 is “fair,” κ of 0.41–0.60 is “moderate,” κ of 0.61–0.80 is “substantial,” and κ of 0.81 to 1.00 is “almost perfect.”

Results

A total of 66 treatment-seeking individuals were enrolled in Study 1. Two participants at the CCED did not complete both interviews at initial testing, and were excluded from the sample, leaving 64 adolescents or adults who completed the initial testing (n=10 Sanford/NRI, n=19 Mt. Sinai, n=32 CCED). Demographic information is presented in Table 1. Participants from the Sanford/NRI site were found to have significantly higher body mass indices than patients enrolled at Mt. Sinai or Columbia [$F(2, 61)= 8.83$, $p<0.001$], but the samples did not differ significantly on age, gender, or ethnicity.

Discrepancies between the EDE and EDA-5

One discrepancy between the EDE and EDA-5 was an interviewer error (i.e., the diagnosis checked on a summary sheet was not justified by the symptoms noted as endorsed during the interview). As this error did not reflect a difference in symptom assessment between the interviews, it was not included in the discrepancies reported below. A total of 52 of 64 participants, or 81.3%, had matching diagnoses. Across all eating disorder diagnoses, the EDE and EDA-5 eating disorder diagnoses had a kappa of 0.74, or “fair” to “substantial” agreement. When considering individual diagnostic categories, a range of fair/substantial (κ= 0.65 for OSFED/USFED) to excellent/almost perfect (κ= 0.90 for BED) was observed. Additional information about criterion validity is presented in Table 2.

Among the 12 participants with discrepant diagnoses (Table 3), one participant was not assigned an eating disorder diagnosis by the EDE, but the EDA-5 conferred a residual OSFED/USFED diagnosis, a discrepancy due to differences in patient report of symptoms

between the two interviews. The majority of the remaining 11 differences (n=6/11, 54.5%) related to the assessment of low body weight in each interview (see Table 4 for a comparison of the EDE and EDA-5 items for this criterion). Six participants diagnosed with AN by EDA-5 did not endorse the "maintained low weight" item on the EDE and were subsequently diagnosed with either BN (n=3) or OSFED/USFED (n=3). Other discrepancies were more disparate. One underweight participant (BN by EDE, AN by EDA-5) denied fear of weight gain item on the EDE but endorsed the criterion by EDA-5, and two individuals (OSFED/USFED by EDE, BN by EDA-5) did not meet criterion for the overvaluation of shape/weight on the EDE but did meet this criterion by EDA-5 (Table 4). Among the remaining two participants, one received a BN diagnosis by EDE and an OSFED (BN of low frequency/limited duration) diagnosis by EDA-5 because of reported difficulty providing detail about the content of binge eating episodes to the interviewer, and the other (OSFED/USFED by EDE, BED by EDA-5) reported an average of more than twice weekly binge episodes over the prior three months with two or more weeks without the presence of any binge eating episodes, which disqualified the participant from a BED diagnosis by EDE.

Interview Length and Preference

Time needed to complete the diagnostic items of the EDE and the EDA-5 differed significantly by site [$F(2, 63)= 6.7$, $p= 0.003$ and $F(2, 63)= 3.3$, $p= 0.04$, respectively]. The CCED site required significantly longer to complete both interviews (p's < 0.01), a difference not explained by altered distributions of eating disorder diagnoses [EDE diagnosis: $F(4, 63)= 0.97$, $p= 0.43$; EDA-5 diagnosis: [$F(4, 63)= 1.8$, $p= 0.15$]. The pattern of the EDA-5 requiring significantly less time in comparison to the EDE was noted at the CCED, Mt. Sinai, and Sanford/NRI sites [CCED: 21.5 ± 5.0 minutes for EDA-5 versus 35.4 ± 11.7 minutes for EDE; $t(34) = 7.3$, $p < 0.001$, $d =1.6$; Mt. Sinai and Sanford/NRI: 16.5 ± 5.2 minutes for EDA-5 versus 24.7 ± 8.0 minutes for EDE; $t(26) = 5.1$, $p < 0.001$, $d =1.2$]. Data for interview preference were missing for three participants, and nine participants (n=9/61; 14.8%) did not report a preference between the EDE and EDA-5. Among those who reported a preference for one of the two interviews (n=52/61; 85.2%), a larger proportion of individuals preferred the EDA-5 (n=33/61; 54.1%) versus the EDE (n=19/61; 31.1%; $\chi^2(2)=14.3$, $p = 0.001$). Qualitative data from participants suggested that the EDE was preferred for reasons including: use of the calendar, the type of questions (e.g., "thought-provoking," "relevant," "elaborate" questions), or ease of completing the interview. The EDA-5 was described as easier/simpler, requiring less detail, quicker, and focused on important symptoms.

Test-Retest Reliability

Thirty participants were randomized to evaluate the test-retest reliability of the EDA-5, and 21 (70%) successfully completed a second interview [n= 5 in Sanford (100% of randomized participants), n= 5 at Mt. Sinai (55.6% of randomized participants), and 11 at CCED (68.8% of randomized participants)]. The second EDA-5 was completed, on average, 9.2 ± 2.6 days after the first EDA-5 interview (range: 7–17 days). Two interviewer coding errors were noted (a failure to check off the appropriate diagnosis on a summary form on the basis of information collected during the first or second interviews). After these errors were corrected, diagnostic agreement was achieved in 19 of 21 cases (90.5%), and the test-retest

kappa coefficient was 0.87 across diagnoses, which would be considered excellent to almost perfect. One participant reported a slightly different amount of recent weight loss across interviews, and was assigned an Atypical AN diagnosis by EDA-5 at Time 1 and a Purging Disorder diagnosis by the EDA-5 at Time 2. The second case was described previously; due to difficulty describing binge eating episodes discrepant Time 1 EDE (BN) and EDA-5 (BN low frequency/limited duration) diagnoses were noted, and subsequently, a diagnosis of BN was assigned in the second EDA-5 interview.

Study 1 Discussion and Rationale for Study 2

Diagnoses obtained by EDA-5 showed substantial levels of agreement with the EDE, ranging from 88% for residual diagnoses (OSFED/USFED) to 98% for BED. The largest proportion of disagreements related to some subtle but important distinctions in how the interviews code symptoms related to low weight. Discrepancies such as these are expected, as the EDE and EDA-5 not only use different coding schemes for the diagnostic algorithms, but also differ in the degree to which the questions align with the DSM-5 criteria.

Rates of test-retest reliability of the EDA-5 in this study were high, and in comparison to the EDE, the EDA-5 required significantly less time to complete and was preferable to participants. These findings provide preliminary support for the validity of the EDA-5 in the diagnosis of DSM-5 eating disorders. However, based on feedback from interviewers, and aforementioned errors in coding, we concluded that the structure and skip rules required by the paper version of the EDA-5 were sufficiently complex to lead occasionally to confusion. Although the EDA-5 was completed more quickly than the EDE, assessors reported difficulty knowing when to leave a given section, as they needed time during the interview to read the instructions before deciding on the next appropriate follow-up questions.

Feedback from assessors about the complexity of the interview suggested that additional modification and testing of the EDA-5 were needed. Further, as structured interviews like the EDE are less commonly used to evaluate eating disorder symptoms outside of tertiary care centers, it was important to evaluate the performance of the EDA-5 against diagnoses assigned by clinician interviews, which are more typical measures in clinical settings. Thus, we conducted a second study (Study 2), with the aims of: (1) developing an electronic application of the EDA-5 (the EDA-5 “App”); (2) comparing diagnoses assigned by the EDA-5 and clinician interview; (3) examining interview-based diagnoses on the EDA-5 to self-reported eating disorder diagnoses from the Eating Disorder Diagnostic Scale; and (4) evaluating the construct validity of the EDA-5 by comparing scores on the Eating Pathology Symptoms Inventory across EDA-5 diagnoses.

Study 2

EDA-5—The paper-and-pencil version of the EDA-5 was adapted to an electronic format (available at www.eda5.org) for administration in this study. Automatic skip rules were built into the revised instrument, such that the electronic version chooses subsequent questions that should be administered on the basis of answers provided earlier in the interview. As in DSM-5, the EDA-5 App utilizes a diagnostic hierarchy (e.g., if criteria for AN are met, the BN and BED sections are skipped as a diagnosis of AN supersedes those of BN and of

BED). Binge eating and compensatory behaviors and the Pica section are administered for all participants, as information related to binge eating and/or compensatory behaviors is required to rule in or out several diagnoses and because it is possible to assign a diagnosis of Pica even in the presence of another feeding or eating disorder. Additional information about the administration of the EDA-5 App can be found in Glasofer, Sysko, & Walsh[18].

Eating Disorder Diagnostic Scale (EDDS[19]). The EDDS is a brief self-report scale that generates both eating disorder diagnoses and a composite score. Adequate criterion, predictive, and convergent validity, internal consistency, sensitivity, and test-retest reliability were documented for the version of the EDDS developed for DSM-IV,[14,20] and the measure was recently adapted for DSM-5.

Eating Pathology Symptom Index (EPSI[21]). The EPSI is a 45-item self-report measure of eating disorder psychopathology with strong psychometric properties, including excellent discriminant, convergent, and criterion-related validity[21]. Eight reliable internally-consistent subscales were identified empirically and replicated across men and women, and normative data are available for the EPSI.[21,22]

Procedure—Participants were enrolled at one of four tertiary care centers: the CCED, Mt. Sinai, Neuropsychiatric Research Institute (NRI; Fargo), or the University of Minnesota Eating Disorders Research Program (Minnesota). The EDA-5 was administered by a bachelor's level research assistant (CCED, Mt. Sinai) or a Master's or doctoral-level project coordinator (NRI, Minnesota), and clinical interviews were conducted by doctoral-level clinicians. Assessments were intended to be completed in-person at all four sites; however, in some cases, the EDA-5 was completed by phone. Institutional Review Boards at each site reviewed and approved the protocol, and all participants provided informed consent.

Interview and Questionnaire Administration—The EDA-5 App and clinician interviews were used to derive DSM-5 feeding and eating disorder diagnoses, and participants also completed the EDDS and EPSI. Interviews were intended to occur within 3–7 days (average time between = 1.3 ± 2.4 days, range of 0–11 days), and were conducted by different members of the staff. The length of EDA-5 interviews was recorded and clinicians completed a checklist to identify individual diagnostic criterion and final DSM-5 diagnoses. Participants received $25 after completing the interviews and self-report questionnaires.

Statistical Analysis

As in Study 1, means and standard deviations were calculated for continuous demographic measures, and one way ANOVAs with least significant difference tests to evaluate differences in these characteristics across sites (CCED, Mt. Sinai, NRI, Minnesota). Two-way ANOVAs (Site X Study) compared the difference in the time needed to complete the EDA-5 in Study 1 and Study 2 across sites, with effect sizes (*d*) as above. The clinician interview was used as the reference instrument for interview-based diagnoses; for the self-report diagnostic assessment (EDDS), the interview measure (EDA-5) was the reference for the analyses because psychometric data is not yet available for the DSM-5 version of the EDDS. As in Study 1, kappa, sensitivity, specificity, positive predictive value, negative predictive value, and accuracy were calculated for AN, BN, BED, and the residual diagnoses of OSFED/USFED. The κ standards used in Study 1[5,17] were applied to data from Study 2.

Results

A total of 72 participants enrolled in Study 2. One participant at Mt. Sinai did not complete a clinician interview and was excluded from the sample, and data from the remaining 71 adults who completed the initial testing (n=9 Minnesota, n=9 NRI, n=23 Mt. Sinai, n=30 CCED) were examined. One participant failed to complete the EPSI (1.4%), and missing data precluded analyzing the EDDS in two cases (2.8%). Study 2 demographic information appears in Table 5. As reflected in Table 5, site differences were observed for age and body mass index, but the samples did not differ in gender or ethnicity.

Discrepancies between the Clinical Interview and EDA-5

The EDA-5 App and the clinician interview assigned the identical diagnosis for 62 of 71 participants (87.3%) resulting in a kappa of 0.83, or "excellent" to "almost perfect" agreement. Among individual diagnostic categories, kappas ranged from fair/moderate (κ= 0.56 for OSFED/USFED) to excellent/almost perfect (κ= 0.94 for BN). Additional information about criterion validity between the EDA-5 and clinical interview is presented in Table 6.

Nine participants received discrepant diagnoses (Table 7). In general, discrepancies occurred as the result of differences in patient report across interviews. Among three cases assigned a diagnosis of AN by clinicians (n=2 Atypical AN, n=1 USFED by EDA-5), different reports of low weight were provided and symptoms of AN (e.g., restricting, shape/weight concern, fear of fat, etc.) were denied in the EDA-5 interviews. Binge size and binge frequency were at issue in four cases, including the one discrepant case of BN and three of the residual cases by clinician interview (n=1 purging disorder, n=2 BED, n=1 BN by EDA-5 interview). These patients reported differently sized binge episodes or frequency of binge eating episodes to the clinician and EDA-5 interviewer. Denial of BED criteria on the EDA-5 (i.e., distress about binge episodes and features related to binge eating episodes) explained the difference in the final two discrepant cases (BED by clinician interview and OSFED/USFED by EDA-5 interview).

Interview Length

As in Study 1, the time needed to complete the EDA-5 differed significantly [$F(3, 134)= 20.5$, $p<0.001$], with the CCED (p's < 0.01) and Minnesota (p's < 0.05) requiring significantly longer to complete the EDA-5 in comparison to Mt. Sinai and NRI. A significant main effect indicated that utilizing the electronic application of the EDA-5 significantly shortened the length of time needed to administer the interview from Study 1 to Study 2, from an average of 19.3 ± 5.6 minutes (range of 5–34 minutes) in Study 1 to 14.0 ± 6.2 minutes (range of 5–30 minutes) in Study 2 [$F(1, 134) = 29.2$, $p < 0.001$, $d= 0.90$].

Comparisons with Self-Report Questionnaires

Tables 6 and 7 include data relevant to criterion validity and discrepancies between diagnostic assignments by EDA-5 and EDDS. As reflected in measures of criterion validity from Table 6, notable differences between the EDA-5 and EDDS diagnoses included the number with a feeding or eating disorder by interview who had no diagnosis by EDDS (n=9;

13.0% of sample), and the number with a BED diagnosis by EDA-5 who were classified as BN by EDDS (n=5; 7.2% of sample).

As displayed in Table 7, four of the cases without a feeding or eating disorder by EDDS were diagnosed with AN, one with BN, one with BED, and three with OSFED/USFED by EDA-5. The most common reason for differences in diagnosis (n=4; 44.4% of cases) was the denial of functional impairment on the EDDS ("How much does any eating or body image problem impact your relationships with friends and family, work performance, and school performance?" rated as "not at all" or "slightly"), which occurred with one case of AN, one case of BED, and two OSFED/USFED cases by EDA-5. Two individuals without a diagnosis by EDDS (22.2%) did not report body mass indices below 18.5 kg/m^2 but were given a diagnosis of AN by EDA-5 on the basis of clinician judgment of low weight over the prior three months. One (11.1%) participant without an EDDS diagnosis denied fear of weight gain but endorsed Criterion B by EDA-5 and was diagnosed with AN. Another (11.1%) denied a clinically significant degree of shape and weight concern by EDDS but answered affirmatively on the EDA-5 and received a diagnosis of BN. The final participant without a diagnosis by EDDS reported only two of five features associated with binge eating episodes and was given an OSFED/USFED diagnosis (Binge eating disorder of low frequency or limited duration) by EDA-5. All five discrepancies in which BED was diagnosed by EDA-5 and BN by EDDS related to the way in which compensatory behaviors are evaluated by EDDS. As assessed by the EDDS, fasting, skipping at least two meals in a row, was endorsed at least once weekly by three of the five participants (60.0%), and "more intense exercise specifically to counteract the effects of overeating" at least once weekly was endorsed by all five of these participants.

Construct Validity: Group Differences

As illustrated in Table 8, EDDS symptom composite scale scores did not differ significantly across eating disorder diagnoses assigned by EDA-5. Significant differences were identified between at least two diagnostic groups on six of the eight EPSI scales, with Excessive Exercise and Muscle Building failing to discriminate between groups. Individuals with a BN or BED diagnosis by EDA-5 scored significantly higher than individuals with AN or OSFED/USFED on the Binge Eating Scale of the EPSI and patients diagnosed with BN by EDA-5 had significantly higher scores on the EPSI Purging scale in comparison to all other diagnostic groups. In comparison to those diagnosed with BN or BED by EDA-5, patients given an AN diagnosis scored significantly higher on the Restraint scale, as did those with an OSFED/USFED diagnoses compared to those with a BED diagnosis. Further, mean scores similar to those reported by Forbush and colleagues[18] for individuals with AN and BN were identified in the Study 2 sample for the majority of the subscales.

Study 2 Discussion

As in Study 1, substantial levels of agreement were observed between the EDA-5 App and clinician interview, with accuracy rates ranging from 87% for residual diagnoses (OSFED/USFED) to 97% for BN. Most disagreements were due to how participants described symptoms between interviews (e.g., frequency of binge eating episodes, degree of low weight). Diagnoses from information collected by the EDA-5 versus self-report by EDDS

revealed a larger number of discrepancies, however, the distinctions primarily related to the assessment of functional impairment, which may be expressed differently by interview than questionnaire, and the definitions of fasting and exercise employed across instruments. Symptom composite scores from the EDDS did not differ across groups, but this finding may relate to the overall level of severity of individuals included in this study, all of whom were evaluated in tertiary care centers specializing in eating disorders. On the basis of published data with the EPSI[21], expected differences were found between diagnostic groups on the EPSI. By adapting the paper version of the EDA-5 to electronic format, the time needed to complete the interview was significantly reduced without compromising the utility of the EDA-5 in assessing the diagnostic criteria for feeding and eating disorders. These data provide additional support for the validity of the EDA-5 to diagnose adults with eating disorders.

General Discussion

These two studies aimed to evaluate the psychometric properties of a novel, semi-structured interview for the diagnosis of DSM-5 feeding and eating disorders. High levels of agreement with the EDA-5 and the EDE (Study 1) and between the EDA-5 App and clinician interview were found. Consistent with prior research[7], concordance in the comparisons for both Study 1 and Study 2 (EDE vs. EDA-5 and clinician interview vs. EDA-5 App) were lowest for OSFED and USFED. Because OSFED/USFED captures all patients with sub-threshold presentations, heterogeneity of symptoms may be a general barrier to the reliable assessment of individuals in this category. Most of the discrepant cases between interviews occurred between a full-threshold diagnostic classification and a residual category (e.g., AN vs. OSFED/USFED), not between two full-threshold categories (e.g., AN vs. BN).

Two primary issues contributed to the observed discrepancies between the EDA-5 and the reference instruments in Study 1 and Study 2: the assessment of low weight and dissimilar patient reports across interviews. A number of discrepancies (n=6) were found in the diagnosis of AN between the EDE and EDA-5, which are expected when using alternative methods of classifying low weight, and in this case are likely related to small differences in how the instruments attempt to assess DSM-5 Criterion A. Study 2 did not identify differences between EDA-5 and clinician interview for the assessment of low weight among 15 cases of AN, which suggests that the EDA-5 recommendation of assigning current diagnosis of AN for adults at a body mass index less than 18.5 kg/m^2 in the past three months (even if not underweight at time of assessment) is similar to usual clinical practice in tertiary care. In both Study 1 and Study 2, several discrepant diagnoses were assigned on the basis of different reports of symptoms from patients (e.g., dissimilar binge episodes, different frequencies of binge episodes per week, etc.), and inconsistent expression by patients is a primary source of variability in estimates of diagnostic reliability.[23] It is not known whether reports on individual diagnostic criteria relate to the way questions were asked, differences in participant recall, or other factors. There are several well-known challenges in the assessment of eating disorder symptoms, as patients may consciously or unconsciously omit, conceal, or misrepresent behavior or internal experience, deny the presence of a disorder, or avoid questions about the extent of their symptomatology.[24] Other specific difficulties with the interpretation of low weight, short-term symptom fluctuations,

and the presence of weight and shape concerns have also been cited previously[7]. Thus, some differences in patient report across measurements are to be anticipated.

As described by Kraemer and colleagues,[23] test-retest reliability reflects the effect of the diagnosis on clinical decision making, and incorporates variability due to both patients and raters. Our kappa statistic ($\kappa = 0.87$) for test-retest reliability of the EDA-5 in Study 1 was excellent to almost perfect by the standards of Fleiss (1981[17]) and Landis and Koch (1977[5]), and was similar to rates of test-retest reliability of the EDE ($\kappa = 0.83–0.97$[13]), and eating disorder diagnoses by the SCID-IV ($\kappa = 0.64$[15]) and the EDDS ($\kappa = 0.71–0.95$[14]). In sum, without notable sacrifices in accuracy, the EDA-5 was significantly faster to complete than the EDE, and with modifications to develop an electronic version of this instrument, administration time was reduced significantly further, to an average of 14 minutes.

These studies had several important strengths, including: the inclusion of multiple sites in distinct geographical locations in the US; the inclusion of a heterogeneous eating disorder sample, including participants diagnosed with AN, BN, BED, and OSFED/USFED; and interviewers with differing levels of experience (BA, MA, and doctoral-level assessors) successfully using the assessment instruments. There were also several limitations to Study 1 and Study 2, including site differences in methodology (e.g., Study 1 telephone vs. in-person interviews), the limited age range of participants (primarily adults), the inclusion only of individuals evaluated in specialty tertiary care centers, and the lack of data on the assessment of the feeding disorders (i.e., Avoidant/Restrictive Feeding and Eating Disorder, Rumination Disorder, Pica). At least two discrepancies in the diagnosis of AN resulted from a participant providing a different weight history over the three months prior to the assessment by EDA-5 and in the clinician interview. Although information about weight over the last three months may often rely on self-report, the opening page of the EDA-5 strongly advises interviewer “to obtain objective information (i.e., clinician-measured height and weight) whenever possible.” It is possible that the rates of reliability observed with the EDA-5 will be different when the instrument is used with community samples, with individuals receiving treatment outside of specialist programs, or with younger patients. In addition, as observed in our prior work[16], reliability may be affected because, in comparison to general practice settings or primary care clinics, the staff of specialty programs is familiar with the assessment of feeding and eating disorder symptoms, including research assessments like the EDE, and the diagnostic criteria, regardless of their degree status[25]. Finally, only a small number of individuals without a feeding or eating disorder diagnosis were identified in our studies, which does not allow any examination of how effectively the EDA-5 distinguishes between case and non-case status.

To address these limitations and further develop the utility of the EDA-5, future research should: (1) determine whether this assessment successfully evaluates individuals with DSM-5 feeding disorders and distinguishes these diagnoses from DSM-5 eating disorders (e.g., AN vs. ARFID); (2) make developmentally appropriate adaptations to the existing measure to allow for use across age groups, and (3) evaluate whether the measure could collect a more limited amount of diagnostic information (e.g., [26]) to enhance suitability for private practice and help guide referrals to specialty care. However, on the basis of the data collected for these studies, the existing version of the EDA-5 offers the ability to quickly

and reliably generate DSM-5 eating disorder diagnoses. This instrument may therefore have utility for diagnosing eating disorders in both research and clinical settings. In particular, the EDA-5 should be considered for expediently eliciting a DSM-5 eating disorder diagnosis when supplementary information about other associated psychopathology can be obtained through other means (e.g., self-report questionnaires). For situations where a comprehensive eating disorder measure is needed, trained interviewers are available, and length of the assessment is not a concern, the EDE may be preferred. Finally, for any of the interviews, level of interviewer training may affect choice—the EDA-5 requires the least training, followed by the EDE, and finally the clinician interview.

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Table 1

Demographic Characteristics of the Study 1 Samples

	Sanford/NRI (n=10)	Sinai (n=19)	CCED (n=27)	Total Across Sites (n=64)	
	Mean ± SD (range)	**Mean ± SD (range)**	**Mean ± SD (range)**	**Mean ± SD (range)**	**Statistic**
Age	36.6 ± 13.2 (18–56)	29.6 ± 10.9 (14–56)	30.0 ± 10.2 (18–58)	30.9 ± 11.0 (14–58)	$F(2, 61)= 1.6$, $p=0.20$
Body Mass Index (kg/m^2)	31.9 ± 12.4 (18.5–46.8)	21.6 ± 4.2 (17.3–33.1)	20.9 ± 7.1 (11.2–38.0)	22.8 ± 8.4 (11.2–46.8)	$F(2, 61)= 8.8$, $p<0.001$, Sanford > CCED Sanford > Sinai
	N (%)	**N (%)**	**N (%)**	**N (%)**	
Female	8 (80.0%)	17 (89.5%)	32 (91.4%)	57 (89.1%)	$\chi^2(2)=1.1$, $p=0.59$
Caucasian	9 (90.0%)	14 (73.7%)	27 (77.1%)	50 (78.1%)	$\chi^2(8)=7.5$, $p=0.48$

Table 2

Study 1 Agreement of the Eating Disorder Assessment for DSM-5 (EDA-5) with the Eating Disorder Examination (EDE)

Eating Disorder	κ	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value	Accuracy
AN	0.77	1.00	0.83	0.76	1.0	0.89
BN	0.70	0.71	0.96	0.86	0.90	0.89
BED	0.90	1.00	0.98	0.83	1.0	0.98
Residual [EDNOS (EDE) or OSFED/USFED (EDA-5)]	0.65	0.65	0.96	0.85	0.88	0.88

Note. AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder; EDNOS = eating disorder not otherwise specified; OSFED/USFED = other specified or unspecified feeding and eating disorder

Table 3

Diagnoses assigned by the Eating Disorder Examination (EDE) and Eating Disorder Assessment for DSM-5 (EDA-5; Study 1)

		EDA-5 diagnosis assigned				
		No FED	**AN**	**BN**	**BED**	**Residual**
EDE diagnosis assigned	No FED	2	0	0	0	1
	AN	0	22	0	0	0
	BN	0	4	12	0	1
	BED	0	0	0	5	0
	Residual	0	3	2	1	11

Note. Shaded boxes identify diagnostic agreement between the EDE and EDA-5. FED = feeding and eating disorder; AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder; Residual= OSFED/USFED = other specified or unspecified feeding and eating disorder

Table 4

Items With Discrepancies in the Diagnostic Algorithm for Eating Disorders from the Eating Disorder Examination (EDE) and Eating Disorder Assessment for DSM-5 (EDA-5) in Study 1.

	EDE Question and Rating	EDA-5 Question and Rating
Anorexia Nervosa, Criterion A: Low body weight	Measurement of height and weight. Over the past three months, have you been trying to lose weight? *Item is coded for: attempts either to lose weight or to avoid weight gain over the past three months for reasons concerning shape or weight.*	What are your current height and weight? What was your lowest weight in the past 3 months? *A current diagnosis of AN is considered for adults who have been at a body mass index less than 18.5 kg/m^2 in the past three months (even if not underweight at time of assessment).*
Anorexia Nervosa, Criterion B: Fear of gaining weight or becoming fat OR persistent behavior interfering with weight gain	Over the past four weeks have you been afraid that you might gain weight? *Item is coded for: a definite fear of weight gain on more than half the days (16 or more days), for the prior 3 months*	Are you afraid of gaining weight? If no: Are you worried that if you start to gain weight, you will continue to gain weight and will become fat? Do you try to cut back on calories or amounts or types of food? What do you try to do? Do you exercise? What do you do and how often? Do you vomit or use any types of pills (such as diet pills, diuretics, or laxatives)? Do you do anything else that might make it hard for you to gain or maintain weight? *Item is coded if YES to any of the above*
Bulimia Nervosa, Criterion D: Disturbance in experience of body weight or shape	I am now going to ask you a rather complex question – you may not have thought about this before. Over the past four weeks has your weight (the number on the scale) been important in influencing how you feel about (judge, think, evaluate) yourself as a person? …If you imagine the things which influence how you feel about (judge, think, evaluate) yourself-such as (your performance at work, being a parent, your marriage, how you get on with other people)- and put these things in order of importance, where does your weight fit in? What about your shape? How has it compared in importance with your weight in influencing how you feel about yourself? Over the past four weeks have you "felt fat"? *Item is coded if: body shape OR weight are of at least moderate importance (definitely one of the main aspects of self-evaluation) for the prior 3 months OR participant has felt fat on more than half of the days of the month (16 or more) for the prior 3 months*	Does your body shape or weight impact how you feel about yourself? For example, if you were to have a day when you did not like the number on the scale, or the way your clothes fit, or how your body shape felt in general, how much would that impact you? Would it make you feel very badly about yourself? Please tell me a little about this. *Item coded if participant report shape/weight exert undue influence on sense of self-worth or on self-evaluation.*

Table 5

Demographic Characteristics of the Study 2 Sample

	Minnesota (n=9)	NRI(n=9)	Sinai (n=23)	CCED (n=30)	Total Across Sites (n=71)	
	Mean ± SD (range)	**Mean ± SD (range)**	**Mean ± SD (range)**	**Mean ± SD (range)**	**Mean ± SD (range)**	**Statistic**
Age	33.3 ± 13.4 (18–55)	49.2 ± 8.2 (39–65)	31.2 ± 11.0 (19–54)	28.6 ± 8.9 (18–47)	32.7 ± 11.9 (18–65)	$F(3, 67)= 9.6$, $p< 0.001$, NRI > CCED, NRI > Sinai, NRI > Minnesota
Body Mass Index (kg/m^2)	29.3 ± 8.2 (20.3–46.5)	30.0 ± 5.0 (21.5–36.8)	25.4 ± 5.9 (17.3–36.0)	20.8 ± 4.7 (14.3–33.3)	24.5 ± 6.6 (14.3–46.5)	$F(3, 67)= 9.7$, $p< 0.001$, CCED < Sinai, CCED < Minnesota, CCED < NRI, Mt. Sinai < NRI
	N (%)	**N (%)**	**N (%)**	**N (%)**	**N (%)**	
Female	8 (88.8%)	8 (88.8%)	22 (95.7%)	29 (96.7%)	67 (94.4%)	$\chi^2(3)=1.4$, $p=0.71$
Caucasian	7 (77.8%)	8 (88.8%)	18 (78.3%)	24 (80.0%)	57 (80.3%)	$\chi^2(9)=5.7$, $p=0.77$

Table 6

Study 2 Agreement of the Eating Disorder Assessment for DSM–5 (EDA-5) with Clinician Interview (n=71) and Eating Disorder Diagnostic Scale (n=69).

Clinician Interview[1]						
Eating Disorder	**κ**	**Sensitivity**	**Specificity**	**Positive Predictive Value**	**Negative Predictive Value**	**Accuracy**
AN	0.88	0.83	1.0	1.0	0.95	0.96
BN	0.94	0.96	0.98	0.96	0.98	0.97
BED	0.82	0.86	0.97	0.86	0.97	0.94
OSFED/USFED	0.56	0.73	0.90	0.57	0.95	0.87
EDDS[2]						
Eating Disorder	**κ**	**Sensitivity**	**Specificity**	**Positive Predictive Value**	**Negative Predictive Value**	**Accuracy**
No Diagnosis	0.27	1.0	0.87	0.18	1.0	0.87
AN	0.77	0.73	0.98	0.92	0.93	0.93
BN	0.73	0.92	0.84	0.77	0.95	0.87
BED	0.46	0.38	0.98	0.83	0.87	0.87
OSFED/USFED	0.57	0.54	0.96	0.77	0.90	0.88

Note. AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder; OSFED/USFED = residual diagnoses of other specified or unspecified feeding and eating disorder;

[1] Clinical interview= reference assessment for analyses;

[2] EDA-5=reference assessment for analyses

Table 7

Diagnoses assigned by the Eating Disorder Assessment for DSM-5 (EDA-5; Study 2) and Clinician Interview or Eating Disorder Diagnostic Scale (EDDS)

		EDA-5 diagnosis assigned				
		No FED	**AN**	**BN**	**BED**	**Residual (OSFED/USFED)**
Clinician diagnosis assigned	No FED	2	0	0	0	0
	AN	0	15	0	0	3
	BN	0	0	25	0	1
	BED	0	0	0	12	2
	Residual (OSFED/USFED)	0	0	1	2	8
EDDS diagnosis assigned	No FED	2	4	1	1	3
	AN	0	11	1	0	0
	BN	0	0	24	5	2
	BED	0	0	0	5	1
	Residual (OSFED/USFED)	0	0	0	2	7

Note. Shaded boxes identify diagnostic agreement between the EDE and clinician diagnosis. FED = feeding and eating disorder; AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder; OSFED/USFED = other specified or unspecified feeding and eating disorder

Table 8

Eating Disorder Diagnostic Scale (EDDS) and Eating Pathology Symptoms Index (EPSI) Scores by Diagnoses assigned by the Eating Disorder Assessment for DSM-5 (EDA-5; Study 2)[1]

	Eating Disorder Diagnosis by EDA-5				
	No Diagnosis (n=2)	**AN (n=15)**	**BN (n=26)**	**BED (n=14)**	**OSFED/USFED (n=13)**
EDDS Symptom Composite	28.0 ± 1.4	41.1 ± 22.2	63.0 ± 14.1	45.6 ± 9.8	43.2 ± 20.6
EPSI Body Dissatisfaction[2]	11.5 ± 0.71	18.0 ± 6.7	22.3 ± 5.2	21.6 ± 5.5	20.3 ± 6.6
EPSI Binge Eating[3]	9.5 ± 7.8	12.8 ± 7.7	23.6 ± 4.9	21.9 ± 6.2	13.7 ± 7.4
EPSI Cognitive Restraint[4]	9.0 ± 0.0	9.4 ± 2.0	8.6 ± 3.1	6.3 ± 2.4	9.3 ± 2.8
EPSI Purging[5]	3.0 ± 1.4	4.9 ± 3.4	9.5 ± 5.3	2.9 ± 2.6	6.2 ± 6.2
EPSI Restricting[6]	7.0 ± 0.0	12.9 ± 6.1	7.0 ± 5.3	4.9 ± 5.2	10.8 ± 7.8
EPSI Excessive Exercise	9.0 ± 7.1	11.2 ± 7.3	9.5 ± 7.3	7.0 ± 2.3	8.8 ± 7.2
EPSI Negative Attitudes toward Obesity[2]	0.50 ± 0.71	6.5 ± 5.3	10.6 ± 5.8	10.4 ± 6.1	10.5 ± 5.0
EPSI Muscle Building	5.0 ± 1.4	3.1 ± 2.7	3.2 ± 4.2	2.1 ± 3.0	2.8 ± 2.6

Note. AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder; OSFED/USFED = other specified or unspecified feeding and eating disorder; post-hoc tests are not reported for individuals without a feeding or eating disorder diagnosis due to sample size (n=2);

[1] Raw EDDS composite score reported in table, z-scores used for analyses, EDDS composite scores and EPSI scale scores compared by one-way ANOVA with least significant difference post-hoc comparisons;

[2] BN> AN ($p < 0.05$);

[3] BN and BED> AN and OSFED/USFED (all p's≤0.001);

[4] AN, BN, and OSFED/USFED > BED (all p's < 0.01);

[5] BN> AN, BED, and OSFED/USFED (all p's < 0.05);

[6] AN > BN and BED (p's < 0.01) and OSFED/USFED > BED ($p = 0.01$).