Development of the Ottawa Disordered Eating Screen for Youth: The ODES-Y

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Objective To develop a concise screening tool that allows for early identification of disordered eating in youth. Study design In this 2-step classification accuracy study, questions for the Ottawa Disordered Eating Screen–Youth, a 2-question screening tool (index test), were conceptualized by clinician-scientists from tertiary care pediatric eating disorder and weight-related clinics, and was validated using retrospective data (2004-2010) from a community-based study, the Research on Eating and Adolescent Lifestyles (REAL) study. Results Analyses of contrast between the index test and the reference standard using data from 2892 (1714 females) students between grade 7 and grade 12 revealed classification statistics of 67.1% for sensitivity, 85.9% for specificity, 4.7 for positive likelihood ratio, 0.38 for negative likelihood ratio, 50.6% for positive predictive value, and 9.9 for positive predictive value for females and 61.1% for sensitivity, 93.9% for specificity, and 9.9 for positive likelihood ratio, 0.41 for negative likelihood ratio, 32.3% for positive predictive value, and 98.0% for negative predictive value for males. Conclusions Our findings suggest that the index test has utility as a short and accurate screening tool for earlier detection of disordered eating thoughts and behaviors in youth. Additional research is needed to best determine how the index test can be administered to youth across various health care, school, public health, and surveillance settings in clinically sensitive pragmatic ways. (J Pediatr 2019;215:209-15).

A common precursor among those with eating- and weight-related disorders is the tendency to engage in disordered eating thoughts and behaviors. Body image concerns and disordered eating practices typically emerge during adolescence and are strong risk factors for future weight gain, obesity, and the development of clinical eating disorders. More than one-half of female youth and one-third of male youth report engaging in disordered eating behaviors (eg, fasting, purging, laxative use), with those of higher weight being more likely to engage in disordered eating than average-weight or lower-weight peers. There is an increasing prevalence of clinical eating and weight-related issues among children and youth and the co-occurrence of eating disorders and obesity, making it imperative to have youth-friendly tools available to easily identify problematic thoughts and eating behaviors early enough to allow for effective targeted interventions in a timely manner.

Although primary care practitioners have a critical role in the early recognition of disordered eating behaviors and weight-related concerns, research demonstrates a lack of tools, time, knowledge, and comfort in the identification and management of these issues. This translates into low screening rates and an increased likelihood that diagnoses will be made only after substantial medical and psychological consequences develop. Early identification and intervention of disordered eating practices improves overall outcomes and helps decrease the likelihood that these conditions will become chronic; however, effective and timely methods for early identification of adolescents struggling with disordered eating behaviors and thoughts remain limited. Two validated eating disorder-specific screening tools are currently available for general use (Figure 1), although neither was initially developed for administration in youth. The SCOFF questionnaire was developed in England as a screening tool for eating disorders in primary care settings. Despite its widespread use, the SCOFF has been criticized for a lack of generalizability and suitability for use with adolescents. The Eating Disorder Screen for Primary Care, also designed

BMI Body mass index
DSM-5 Diagnostic and Statistical Manual of Mental Disorders, 5th Edition
EDDS Eating Disorder Diagnostic Scale
NPV Negative predictive value
ODES-Y Ottawa Disordered Eating Screen–Youth
PPV Positive predictive value
REAL Research on Eating and Adolescent Lifestyles

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specifically for primary care use, is better at identifying those with an eating disorder in primary care and university settings, although it has not been widely adopted and studied or validated for use in adolescents. In addition, given the age of both these instruments, neither was created using the updated recommended diagnostic criteria available in the *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition* (DSM-5), potentially missing screening for newer diagnoses (eg, Atypical Anorexia Nervosa). Both also contain 5 items necessitating the need to ask all 5 items in order to provide a valid screening.

With these specific challenges in mind, the objective of the present study was to develop a concise disordered eating screening tool that can be widely adopted into various settings (eg, primary care, specialty pediatric settings, public health, school environments, health surveillance), that is short, easy to administer, and youth-friendly to provide practitioners with a useful tool for screening. The development of this scale was a first step in validating a short screening tool that is clinically sensitive and can be applied widely, but that can also serve to quickly screen those at risk for eating disorders so that further investigation of eating- or weight-related issues can be pursued in a timely and sensitive basis for those most at risk.

### Methods

This 2-step study first undertook a process for developing potential questions for use in the Ottawa Disordered Eating Screen–Youth (ODES-Y), a 2-question disordered eating screening tool henceforth referred to as the index test (Appendix; available at www.jpeds.com); and then used retrospective data from a large school-based study to determine the classification statistics of this newly created measure. To identify potential youth-appropriate screening questions, a review of published literature pertaining to eating disorder screening tools was first undertaken. Next, consultation with a specialist group of clinicians from tertiary care pediatric weight management and eating disorder programs was conducted to ascertain which questions they would pose that would be both clinically and youth appropriate. Six potential questions emerged from this process that covered both behavioral and cognitive domains of disordered eating.

<table>
<thead>
<tr>
<th>SCOFF$^{17}$</th>
<th>Eating Disorder Screen for Primary Care (ESP)$^{20}$</th>
<th>Ottawa Disordered Eating Screen–Youth Version (ODES-Y)$^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>S - Do you make yourself SICK (vomit) because you feel uncomfortably full? (YES or NO)</td>
<td>Are you satisfied with your eating patterns? (YES or NO)</td>
<td>Over the past 3 months, has your weight and/or shape influenced how you think about (judge) yourself as a person? (YES or NO)</td>
</tr>
<tr>
<td>C - Do you worry that you have lost CONTROL over how much you eat? (YES or NO)</td>
<td>Do you ever eat in secret? (YES or NO)</td>
<td>Over the past 6 months, have you fasted (skipped at least 2 meals in a row) or eaten what other people would regard as an unusually large amount of food (e.g. a quart of ice cream) given the circumstance and experienced a loss of control (felt like you couldn’t stop eating or control how much you were eating)? (YES or NO)</td>
</tr>
<tr>
<td>O - Have you recently lost more than ONE stone (15 pounds) in a 3-month period? (YES or NO)</td>
<td>Does your weight affect the way you feel about yourself? (YES or NO)</td>
<td>* A ‘no’ on question 1, and ‘yes’ on questions 2-4 are considered ‘abnormal’ responses</td>
</tr>
<tr>
<td>F - Do you believe yourself to be FAT when others say you are thin? (YES or NO)</td>
<td>Have any members of your family suffered with an eating disorder? (YES or NO)</td>
<td>* A ‘yes’ on both questions indicates a positive screen</td>
</tr>
</tbody>
</table>

* One point for every ‘yes’; a score of ≥2 indicates potential anorexia or bulimia nervosa

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**Figure 1.** Items and scoring on the SCOFF, the Eating Disorder Screen for Primary Care, and the Ottawa Disordered Eating Screen–Youth Version.
Although conceptualizing how best to test whether some or all of these questions were useful for screening purposes, a few clinicians from the specialist group, who were also investigators on a large community-based project, the Research on Eating and Adolescent Lifestyles (REAL) study, recognized the potential overlap between the screening questions proposed and the items available from that dataset. The REAL study evaluated more than 3000 students in grades 7 through 12 from the capital region of Canada using self-report measures to study eating-, weight-, and mental health–related factors pertaining to adolescents, which coincidentally contained all of the potential questions derived from the consultation process. Baseline data from the REAL study collected between 2004 and 2010 were used to identify the best set of questions for use in the index test. The current study received approval from the Research Ethics Board of the hospital where the study was conducted.

Sample
English-speaking male and female students in grades 7 to 12 at participating schools located within 90 km of the capital region of Canada were approached to participate in the REAL study between 2006 and 2010. Collected as a convenience sample, all students who provided informed consent/assent from both themselves and their primary caregivers were approached for administration of the survey. The data were collected in 41 public, private, and alternative schools from urban, suburban, and inner-city locations. For the present study, eligible participants were identified who had completed all proposed questions identified for the index text and reference standard.

Demographic details, including eating disorder and weight status, were also collected as part of the REAL study. Participants’ measured height and weight at baseline assessment were used to calculate body mass index (BMI). The International Obesity Task Force criteria based on BMI percentile curves that are age- and sex-normed were used to establish weight rankings. Eating disorder diagnostic criteria based on the DSM-51 criteria were applied to the Eating Disorder Diagnostic Scale (EDDS) to identify those who, based on a self-report measure of eating disorder–related symptoms, met the criteria for an eating disorder. Because the EDDS had scoring guidelines provided by the authors that was designed to be able to detect DSM-IV criteria, and given the timespan of the REAL study, which straddled both versions of the DSM, the investigators amended the original scoring guidelines to reflect the DSM-5 criteria (eg, removed the weight andamenorrhea criteria from the coding for Anorexia Nervosa).

Test Methods
Development of the Index Test. The aim when developing the ODES-Y was to Ideally create a short 2-question screening tool that could quickly screen in or screen out individuals at risk for body image concerns and engagement in disordered eating behaviors that could potentially point to a possible eating disorder. A positive response to 1 question about body image concerns (cognitive domain) and to 1 question about disordered eating practices (behavioral domain) was deemed necessary to indicate a positive screen.

Six potential questions were derived from the first step of the study. Four of these 6 questions were similar to those posed in the EDDS, and an additional 2 questions were similar to those drawn from the Dutch Eating Behaviour Questionnaire (ie, do you have a desire to eat when you are emotionally upset?) and the McKnight Risk Factor Survey IV (ie, in the past year, did you eat less than usual to try to feel better about yourself?). After preliminary testing examining the descriptives of the items, alongside a secondary consultation with some of the clinician specialists, the latter 2 questions were not found to perform as well as the items from the EDDS and thus were eliminated from further analysis.

The final index test was developed based on the 4 remaining questions. Specifically, the first question of the index test was derived from combining the following 2 items from the EDDS: “Over the past 3 months, has your weight influenced how you think about (judge) yourself as a person?” and “Over the past 3 months, has your shape influenced how you think about (judge) yourself as a person?” Possible responses to these questions included “not at all,” “slightly,” “moderately,” and “extremely.” Those who responded “not at all” were considered negative on the index test, whereas those with any other response were considered positive (66.0% of female youth and 42.3% of male youth). Two other questions from the EDDS were combined to create the second item on the index test aimed at examining binging with a loss of control and restriction behaviors: “During the past 6 months, have you eaten what other people would regard as an unusually large amount of food (eg, a quart of ice cream) given the circumstance and experienced a loss of control (ie, felt like you could not stop eating or control how much you were eating)’ and “How many times a week on average over the past 6 months have you fasted (ie, skipped at least 2 meals in a row) to prevent weight gain or counteract the effects of eating?” Any indication of engagement in either of these practices was indicated as a positive response (26.6% of female youth and 13.1% of male youth) for this item on the index test. The 2 combined questions included in the ODES-Y are provided in Figure 1 and are worded using the exact terms in which they were used in the EDDS during the REAL study. The assumption is that those with a positive test result on the index test would merit further investigation and more formal assessment for eating and/or weight related disorders.

Reference Standard. The EDDS is a 22-item self-report measure used to assess sub-threshold and full-threshold diagnostic classification of Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, Purging Disorder, and subthreshold classifications of these diagnostic categories. Questions were answered using Likert rating scales, yes or no responses, or frequency ratings. The prespecified scoring algorithm for the full scale was used to obtain DSM-5 eating disorder
diagnostic classes, which were subsequently used as the reference standard for contrasting against the index test. The EDDS has been validated in adolescent populations and has shown excellent test-retest reliability ($r = 0.87$) and internal consistency (mean $\alpha = 0.89$).

**Statistical Analyses**
Descriptive and frequency analyses were completed to aid in describing the sample and the index test as designed. Cross-tab analyses and indices of sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV), positive and negative likelihood ratios, and corresponding 95% CIs were calculated, as was the accuracy of the index test. Given the well-known sex differences in disordered eating practices and eating disorders, all calculations were performed and reported separately for male and female youth. Analyses were conducted using SPSS version 24 (IBM, Armonk, New York).

**Results**

**Participants**
The flow of participants for the present study is depicted in Figure 2. Overall, approximately 6800 students were approached to participate in the REAL study between 2004 and 2010. Among these students, 3043 provided consent and were given the package of self-report measures (representing approximately 45% of those approached), and 2892 of those participants (95%) had data available for all items included in the present study.

Our sample consisted of 1714 (59.3%) female and 1178 (40.7%) male youth in grades 7 to 12. The mean (SD) age...
of the overall sample was 14.2 (1.6) years (range, 11.1-20.8 years), and the mean BMI was 21.25 (3.85) kg/m² (range, 14.14-43.94 kg/m²). The distribution of BMI categories was as follows: underweight, 5.8% (n = 166); normal weight, 69.3% (n = 1993); overweight, 19.1% (n = 550); and obese, 5.8% (n = 168). Similar demographic details by sex are displayed in Table I. Using EDDS scores and DSM-5 criteria to establish the prevalence rates of subthreshold and full-threshold eating disorders, 358 youth (12.4%) reported symptoms of a subthreshold or full-threshold eating disorder, with <5 participants (0.1%) meeting the criteria for Anorexia Nervosa, 60 (2.1%) meeting the criteria for Bulimia Nervosa, 18 (0.6%) meeting the criteria for Binge Eating Disorder, 37 (1.3%) meeting the criteria for Purging Disorder, and 242 (8.4%) meeting the criteria for Otherwise Specified Feeding and Eating Disorder or subthreshold eating disorders.

**Test Results**

To determine how many of the REAL participants would have the presence or absence of any of the symptoms listed in the index test, descriptive analyses were performed by sex. Results showed that 23.7% of female youth (407 of 1718) and 8.7% of male youth (103 of 1180) would have a positive test result on the index test.

Tests of classification accuracy of the 2-item index test contrasted against the reference standard yielded good sensitivity (67.1% for females and 61.1% for males) and specificity (85.9% for females and 93.9% for males) across both sexes (Table II), suggesting that the index test is accurate at ruling in and ruling out those with and those without disordered eating practices. The PPVs of 32.3% for males and 50.6% for females suggest that a positive screen is better for female youth than for male youth for confirming an eating disorder, although it was expected to be low given the overall prevalence of eating disorder in the sample (12.4%). Contrarily, as an initial screen, a negative test result is extremely good for reassuring that a youth is not at risk for an eating disorder as noted by the NPVs of 92.4% for females and 98.0% for males, with the index test able to correctly dismiss more than three-quarters of those cases without a subthreshold or full-threshold eating disorder. The likelihood ratios provide further evidence of the utility of the index test (Table II), as do the accuracy scores, estimated as 82.6% for females and 92.4% for males.

**Discussion**

The present study demonstrates that the ODES-Y has clinical utility when administered as a quick 2-item screen to identify youth with disordered eating practices. This has important implications for primary health care, school, public health settings, and surveillance studies, given that no youth-friendly tools applicable to both males and females currently exist that yield good screening accuracy of disordered eating and are short and easy to administer. The main findings of this study indicate that this 2-item screening tool is as accurate at identifying those at risk of eating disorders as the 5-item SCOFF, providing a tool that requires less than one-half the time to deliver with almost equal results, which in the context of busy clinical/school settings has the potential for a profound benefit. The ODES-Y is conceived to be more youth-friendly, in that it does not contain direct questions about weight. This allows clinicians to talk to youth about these sensitive issues around eating and weight and the way they feel about their bodies while screening for those who might be experiencing difficulties in these areas. In addition, weight is not a criterion for a diagnosis of Bulimia Nervosa, Binge Eating Disorder, Atypical Anorexia Nervosa, or Purging Disorder (diagnoses that are often missed in clinic visits), further supporting the ODES-Ys deemphasis on weight. The tool also allows the conversation to be broader, screening for maladaptive eating and weight-related thoughts and behaviors that could lead to a variety of chronic health issues.

We envision further testing and delivery of the ODES-Y alongside measurement and plotting of weight and height on appropriate growth curves with access to a health care decision aid (to be established) to guide meaningful, sensitive, and constructive discussions aimed at educating, preventing, and intervening in the presence of disordered eating thoughts and behaviors. If administered to facilitate dialog regarding disordered eating practices, this tool has the potential of improving outcomes and reducing morbidity through provision of early identification and targeted and timely interventions.
Based on a positive screen, the classification accuracy of the ODES-Y compares well with reports of 2 or more positive answers on the SCOFF (the instructions provided for a positive screen), which were 53.7% (95% CI, 36.2%-71.2%) for sensitivity, 93.5% (95% CI, 88.9%-98.0%) for specificity, 40.6% (95% CI, 28.9%-53.1%) for PPV, and 96.1% (95% CI, 88.9%-99.2%) for NPV, respectively. Although it should be noted that the sample in which the SCOFF was tested is older than our present sample, these comparisons suggest that the ODES-Y offers comparable reliability in screening for disordered eating practices and the presence of subthreshold and full-threshold eating disorders. As a result, the ODES-Y is inclusive enough to capture as many at-risk individuals as possible and at the same time not overburdening primary care providers by triggering unwarranted assessments for those who are not at risk for eating- or weight-related issues. Although not yet tested in clinical settings, the simplicity of the ODES-Y screen also affords the possibility for quick and easy integration into clinical practice as well as into electronic medical records.

Examination of the ODES-Y by sex afforded a more detailed look at how the screen operates for male and female youth. Accordingly, the screen appears to have greater sensitivity for female youth yet greater specificity for males, suggesting that it is better at screening in females with disordered eating behaviors and screening out males without reported disordered eating behaviors. This trend is also apparent when comparing the PPVs and NPVs. Although there was not much difference in the likelihood ratios between the 2 sexes, the accuracy statistics suggest that the measure is more accurate for males than for females, which may be due in part to the lower prevalence rates of disordered eating found in males and the greater ability of the screen to rule out those without eating disorders. Expanding the first question on the ODES-Y to include probing about a drive for muscularity may also help improve the accuracy of this screening tool for male youths.

Individuals who screen positive will require further assessment by way of an expanded clinical interview/assessment, thereby eliminating the need for any further additional screening items and providing additional evidence of the benefits of solely using 2 items. In addition, this screening tool is validated against all types of DSM-5 eating disorder criteria, including atypical anorexia nervosa, providing increased utility for identifying those at risk for other eating disorders not accounted for in previous screening tool designs.

The present study is not without limitations. As it stands, the ODES-Y was validated using a convenience sample of retrospective data collected between 2004 and 2010 as part of a larger community-based study. It has not formally been tested using clinical or community samples or using a prospective study design. The wording and specific applicability to a health care visit have not yet been studied. This study should be seen as only a first step in the tool creation and validation process, with the wording of the items likely to change; further validation studies of the ODES-Y likely will address this possible methodological drawback. It should also be noted that the dataset from the REAL study comprised information obtained using self-report measures as opposed to structured clinical interviews, although this method of validation has also been used by other screening tools.

The ODES-Y tool provides a possible mechanism for clinicians to quickly screen youth for disordered eating behaviors and possible eating disorders as part of a routine history-taking process. The ODES-Y can be seen to have utility in school and public health settings, in which screening for disordered eating among other mental health issues by personnel can be performed using a quick and easy method. Further validation studies are needed to best determine how the screen can be delivered to youth across various health care, school, and public health settings, as well as in surveillance studies.

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