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ABSTRACT

Early identification of individuals with Body dysmorphic disorder (BDD) is essential to direct them to appropriate care and to reduce the chance of developing or maintaining comorbid psychiatric disorders (like an eating disorder (ED)). The present study aimed to develop a simple screener, the Body Dysmorphic Disorder Screener for DSM-5 (BDDS-5), to overcome existing screeners' limitations and test its psychometric properties.

The BDDS-5 consists of 12 statements with dichotomous answer options. Specific attention is paid to the readability of the screener for those with lower reading skills. Additional eating disorder screening questions (S section) were added to investigate whether these questions are necessary for detecting potential BDD cases. Finally, the factor structure, internal consistency, and validity of the BDDS-5 were examined within populations with a high risk of screening positive for BDD or ED. Principal axis factor analysis showed that two factors accounted for 63.5% of the variance. The factor analysis was based on polychoric correlation. Based on the BDDS-5, 33 persons (14% of $N = 235$) were screened as likely BDD cases. Nineteen persons were excluded as potential BDD cases based on the eating disorder related question (question D). Based on the S-section, this turned out to be largely correct for the majority, however, in 8% ($n = 4$) of the cases BDD was probably missed. The convergent validity appeared to be high ($r > 0.80$) with three other BDD measures.

The BDDS-5 is a valid and widely applicable screener for BDD that may help in the early detection of BDD. The BDDS-5 uses simple wording and is thus suitable for people 8 years and older.

1. Introduction

Body dysmorphic disorder (BDD) is a debilitating mental disorder characterized by preoccupation with one or more defects or flaws in physical appearance, which are believed to look ugly unattractive, abnormal, or deformed. In the current fifth version of the DSM BDD is classified as an obsessive-compulsive disorder [1,3]. To fulfill these criteria, the perceived flaws should not be observable or appear only slight to other individuals (criterion A). Besides, the individual must perform or have performed at one time during the course of the disorder repetitive behaviors or mental acts in response to the appearance concerns (such as excessive grooming or reassurance seeking) (criterion B). Furthermore, the preoccupation needs to cause clinically significant distress or impairment in social, occupational, or other areas of functioning (criterion C). Lastly, the preoccupation is not better explained by body fat or weight concerns in an individual whose symptoms meet the criteria of an eating disorder (criterion D) [1,3]. This last criterion can be very challenging since both disorders are characterized by body image dissatisfaction and repetitive behaviors to reduce these negative feelings or avoid feared outcomes [9].

Distinguishing BDD from an eating disorder may be relatively easy if the focus of body concerns is characteristic of BDD (i.e., skin, nose, teeth, hair, or eyes) and if the related behavior is typical for BDD as well (e.g., excessive grooming, camouflage of the perceived flaw, skin picking, or cosmetic surgery) [34]. However, it becomes more difficult when individuals with BDD have vague complaints about being 'ugly' or about their thighs, weight, hips, or belly and/or engage in compulsive body checking (i.e., frequently looking in the mirror or seeking reassurance

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from other people about their perceived defect) since these complaints and behaviors are very similar to those observed in individuals with an eating disorder (i.e., behaviors like pinching the stomach and thighs, measuring the thigh gap, ritualistic weighing, and visual assessment of the body in different positions) [11,33,48].

Criterion D may also lead to underdiagnosing BDD in individuals who also fulfill the DSM criteria of an eating disorder. Almost one-third of the patients with BDD appear to have a comorbid eating disorder [31], and 45% percent of patients with an eating disorder screen positive for BDD [9]. Compared to controls without psychiatric symptoms, those with a primary diagnosis of BDD appear to have more eating disorder psychopathology and vice versa [9,27]. Moreover, those with an early-onset BDD, i.e., before the age of 18, are more likely to have a lifetime eating disorder (anorexia nervosa or bulimia nervosa) than those with a late-onset BDD [6].

BDD is a potentially life-threatening disorder with 24 to 28% of patients attempting suicide making it important to detect patients as early as possible [12,29]. BDD is however often not detected and diagnosed by the treating physician or therapist [16,39], even in inpatients [43]. As a result, it may take a very long time before patients receive treatment for their disorder. Shame is one of the barriers to seeking mental health treatment next to a preference for cosmetic and medical (dermatological) treatments [16,26]. Only a minority receives (evidence-based) mental health treatment for BDD at some point in their life [39,43]. Concluding, patients with BDD present themselves in different settings and are often not recognized as such [45]. Early identification of individuals with BDD is essential to direct them to the most appropriate care at an early stage, to prevent aggravation of symptoms, seeking unnecessary dermatological treatment or cosmetic surgery, and to reduce the chance of developing or maintaining comorbid psychiatric disorders (like an eating disorder). The regular use of a screening instrument might help to attain this goal.

Many screening questionnaires for BDD have been developed, such as the Dysmorphic Concern Questionnaire ([24,25,37], the Body Image Disturbance questionnaire [8], the Body Dysmorphic Disorder Symptom Scale [40,47] and the Cosmetic Procedure Screening Questionnaire [46]. Although validated with a clinical interview, these screening questionnaires are not based on DSM-5 criteria. To date, three screeners for BDD according to the DSM-5 have been developed by Schieber et al. [35,36] and Möllmann et al. [28] (see Table 1). These screeners check the presence of the four DSM-5 criteria for BDD (i.e., criteria A, B, C, and D). In all three screeners, extra questions were added to screen for the presence of an eating disorder. However, these extra questions could be distressing or difficult to understand for people not suffering from an eating disorder. Moreover, these items make the BDD screener multidimensional and longer than necessary. Also, those individuals who do have a comorbid eating disorder next to BDD, would probably not be detected. A screener for BDD would be more widely applicable without eating disorder screening questions.

Another point of critique is the formulation of the items of the existing BDD screeners. That is, the wording of the screeners is often complex (e.g., “Do you believe yourself to have one or more ugly or disfigured body areas, whilst other persons do not agree or consider it to be exaggerated?”), items include more than one subject (e.g., “The concerns about my appearance limit me personally, socially, and/or professionally”), and uncommon words are used (e.g., “perceived flaws of my physical appearance”, “mental actions”). Furthermore, some items include a severity measure such as ‘very’ (e.g., “Is the preoccupation about the ugly or disfigured body parts very distressing to you?”) or ‘markedly’ (e.g., “Do you think you have one or more ugly or disfigured body parts although other people do not share this opinion or believe your concern to be markedly exaggerated?”). These aspects make the questions and statements difficult to understand especially for those with low reading skills.

The present study aimed to develop a new and simple screener - the Body Dysmorphic Disorder Screener for DSM-5 (BDDS-5) - to overcome the limitations of the existing screeners and to test its psychometric properties. The first part of the study was to develop a screener based on the DSM-5 criteria which could be read and understood by 95% of the population (i.e., requiring low reading skills (B1-B2) that most individuals reach at the age of eight) and which had dichotomous answer options. The second part of the study consisted of two objectives. The primary objective was to determine the factor structure and internal reliability, as well as the convergent, divergent, and concurrent validity of the BDDS-5. The second objective was to investigate whether leaving out the additional eating disorder screening questions (S section) would affect the detection of potential BDD cases. Concerning the validity, it is hypothesized that the BDDS-5 will correlate strongly with instruments known to measure BDD and correlate weakly with instruments that measure different constructs. For this reason, it is also expected that the amount of potential BDD cases based on the BDDS-5 will not differ from the number of cases based on other instruments measuring BDD. A one-factor solution is expected when the eating disorder screening questions are left out and the internal reliability of the BDD criteria with more than one question is expected to be good. Furthermore, it is hypothesized that the question referring to criterion D (i.e., the preoccupation is not better explained by body fat or weight concerns in an individual whose symptoms meet the criteria of an eating disorder) suffices and does not lead to loss of possible or likely BDD cases (sensitivity), nor to unjustly assigning the diagnosis of BDD (specificity).

2. Method

2.1. Part 1: Development of the BDDS-5

The first step in the development of the BDDS-5 consisted of turning the DSM-5 criteria A to C into questions. In the second step, the questions were reformulated such that they could be answered with a yes or no (dichotomous). After that, to improve readability both professional and naïve persons were asked to command the questions. The questions were then adapted according to their commands until they elicited no more commands and the questionnaire was finalized. The BDDS-5 consists of 12 dichotomous statements with answer options ‘true’ and ‘not true’ corresponding to the DSM-5 criteria (sections A to D), see Table 2. The readability tool on the Dutch accessibility website (www.accessibility.nl/kennisbank/tools/leesniveau-tool) was used to check the reading level. The reading level is B1/B2. Text at this level can be read and understood by 95% of the Dutch population. The BDDS-5 has been *lege artes* translated into English and German and back-translated into Dutch. Differences in meaning between the translations and back translations have been solved by discussion to ensure proper cultural adaptation [4]. The English translation can be found in Table 2. See supplementary for the English, German, and Dutch versions of the BDDS-5.

The S-section was developed using the diagnostic questions of the Eating Disorder Examination (EDE) [13,19]. The S section consists of five eating disorder screening questions about the last four weeks. AN is excluded if BMI >18,5 (S1 and S2) and the answer to S3 is ‘no’ or if BMI < 18.5 and the answer to S3 is ‘no’. BN and BED are excluded if the answer to S4 and/or S5 is ‘no”. One of the questions to be answered is whether the question (i.e., ‘the only reason that I am dissatisfied with my appearance is that I think that I am too fat (too heavy) or too skinny (too light)’) regarding the criterion D (i.e., ‘The appearance preoccupation is not better explained by concerns with body fat or weight in an individual whose symptoms meet diagnostic criteria for an eating disorder) is sufficient to exclude those who screened positive on the BDD-screener but are more likely to suffer from an eating disorder.

Table 1
Three Screeners for BDD according DSM-5.

DSM-5	[36][a]	[35]	[28][b]
A. Preoccupation with one or more perceived defects or flaws in physical appearance that are not observable or appear slight to others.	A1. Do you believe yourself to have one or more ugly or disfigured body areas, whilst other persons do not agree or consider it to be exaggerated? (Yes or No)	A1. Do you think you have one or more ugly or disfigured body parts although other people do not share this opinion or believe your concern to be markedly exaggerated? (Yes or No) A2. How much time do you spend every day thinking about your ugly and disfigured body parts? (Not at all; <1; 1–3; 3–8; >8 h a day)	A1. I am very concerned with one or more perceived flaws of my physical appearance that are not observable or appear only slight to others. (“do not agree at all” or “fully agree”)
B. At some point during the course of the disorder, the individual has performed repetitive behaviors (e.g., mirror checking, excessive grooming, skin picking, reassurance seeking) or mental acts (e.g., comparing his or her appearance with that of others) in response to the appearance concerns.	B1. How much time do you spend every day thinking about your ugly and disfigured body areas? (Not at all; <1; 1–3; 3–8; >8 h a day) B2. How much time do you spend every day on behaviors that are related to your appearance (for example: mirror checking, mirror avoidance, comparing yourself to others, grooming)? (Not at all; <1; 1–3; 3–8; >8 h a day)	B1. How much time do you spend every day on behaviors that are related to your appearance (for example: mirror checking, mirror avoidance, comparing yourself to others, grooming)? (Not at all; <1; 1–3; 3–8; >8 h a day)	B1. I’ve done (before or now) certain things with regard to my appearance over and over again (e.g., checking the appearance in front of the mirror, excessive body care, plucking or squeezing the skin, reinsurance with others about your own appearance). (“do not agree at all” or “fully agree”) B2. As a reaction to the concerns about my appearance, I have repeatedly performed certain mental actions (e.g., comparing my own appearance with that of others). (“do not agree at all” or “fully agree”)
C. The preoccupation causes clinically significant distress or impairment in social, occupational or other areas of functioning.	C1. Are you very distressed by the preoccupation with the ugly or disfigured body part? (Yes or No) C2. Does the preoccupation with the physical disfigurement lead to an impairment that influences your daily life (job, relationship)? (Yes or No)	C1. Is the preoccupation about the ugly or disfigured body parts very distressing to you? (Yes or No) C2. Do the worries about your physical defect cause significant impairment in your everyday life (job, relationship?) (Yes or No)	C1. I am worried about my appearance. (“do not agree at all” or “fully agree”) C2. The concerns about my appearance limit me personally, socially and/or professionally (“do not agree at all” or “fully agree”)
D. The appearance preoccupation is not better explained by concerns with body fat or weight in an individual whose symptoms meet diagnostic criteria for an eating disorder.	D1. Is your body weight the main cause of your preoccupations? (Yes or No)	D1. Is your body weight the primary cause of your appearance concern? (Yes or No)	D1. The main cause of my main concerns about my physical appearance is my body weight (“do not agree at all” or “fully agree”)
Excluding eating disorders	11 items of the Eating Disorder Examination-Questionnaire [49] to screen for eating disorder psychopathology	12 Items about restraint eating, self-induced vomiting, laxative/diuretics misuse, shape/ weight concern, objective bulimic episodes, excessive exercise, BMI	Do you throw up when you feel uncomfortable full? (“do not agree at all” or “fully agree”) Are you worried that you sometimes can’t stop eating? (“do not agree at all” or “fully agree”) Have you lost more than 6 kg in three months, recently? (“do not agree at all” or “fully agree”) Do you find yourself to fat while others find you to thin? (“do not agree at all” or “fully agree”) Would you say that eating influences your life a lot? (“do not agree at all” or “fully agree”)
BDD diagnosis	A1 yes; B1 and B2 any time spend; C1 or C2 yes; D1 no and not fulfilling criteria for an eating disorder (anorexia nervosa and bulimia)	A1 yes; A2 any time spend; B1 more than 1 h a day spend; C1 or C2 yes; D1 no and not fulfilling criteria for an eating disorder (anorexia nervosa and bulimia)	A1 yes; B1 or B2 yes; C1 or C2 yes; D1 no and not fulfilling criteria for an eating disorder (anorexia nervosa and bulimia)

[a] The self-report items assessing current DSM-5 criteria for BDD (BDD-5) were requested from the first authors of the screeners used in the studies of Schieber 2013, 2015 and Möllman 2017.
[b] Translated from German in English with the help of Google translate.

Table 2
Body Dysmorphic Disorder Screener −5 (BDDS-5).

DSM-5 criteria	Questions
A. Preoccupation with one or more perceived defects or flaws in physical appearance that are not observable or appear slight to others.	A1. I think that I look strange or ugly A2. I constantly think about how strange or ugly I look A3. Other people do not think that there is anything wrong with my appearance, or they think that I have nothing to worry about
B. At some point during the course of the disorder, the individual has performed repetitive behaviors (e.g., mirror checking, excessive grooming, skin picking, reassurance seeking) or mental acts (e.g., comparing his or her appearance with that of others) in response to the appearance concerns.	B1. I keep looking in the mirror because I am dissatisfied with my appearance, or I avoid looking in the mirror because I do not want to see that I look strange or ugly B2. I constantly pick at my skin or make adjustments to my wardrobe or clothing style because I am dissatisfied with my appearance B3. I keep asking other people if they think that I look strange or ugly B4. I keep comparing my appearance to that of others
C. The preoccupation causes clinically significant distress or impairment in social, occupational or other areas of functioning.	C1. I feel bad or miserable about my appearance C2. I avoid doing certain things (for example, going out, dating, changing jobs, or travelling), because I am dissatisfied with my appearance. C3. I find it difficult to do things together with other people because I am dissatisfied about my appearance. C4. I have trouble focusing on my work or on a conversation because I am dissatisfied with my appearance
D. The appearance preoccupation is not better explained by concerns with body fat or weight in an individual whose symptoms meet diagnostic criteria for an eating disorder.	D1. The only reason that I am dissatisfied with my appearance is that I think that I am too fat (too heavy) or too skinny (too light)

Eating disorders	
A. Anorexia nervosa	S1. What is your current weight? S2. What is your height? S3. Are you constantly afraid that you might gain weight?
B. Bulimia nervosa	S4. Have you consumed what would generally be regarded as "large" amounts of food and did you feel as if you had no control over your food consumption while you were eating?
C. Binge eating disorder	S5. Have you made yourself sick, taken laxatives or exercised compulsively as a means of controlling your shape or weight?

2.2. Part 2: Examination of the factor structure, internal consistency, and validity of the BDDS-5

2.2.1. Participants and procedure

Participants were recruited through the website of Utrecht University, social media (e.g., Facebook), personal networks, and patient organization websites for BDD and ED as populations with a high risk of screening positive for BDD or ED.

Eligible participants were aged 18 years or older. The exclusion criteria were visual handicaps and the inability to read Dutch. After expressing interest, eligible participants were informed about the study procedure, and that they could stop participating at any time during the study. Subsequently, follow-up emails were sent and an incentive in the form of a 5-euro voucher was offered. After data were collected, the voucher was sent to the participant and the email addresses were removed from the dataset. Questions could be confronting. At the end of the survey, references were made to patient organizations (i.e., BDD (bdd-info.nl)), eating disorder (proud2Bme.nl), and suicide prevention websites (113.nl)) in case of participants needed help. The study was approved by the ethics committee of the Leiden University Medical Center (LUMC) (N19.052).

2.2.2. Measures

Yale-Brown Obsessive Compulsive Scale for BDD self-rating version (Y-BOCS-BDD-sr). The Y-BOCS-BDD-sr is a 12-question self-rating scale for assessing BDD severity. The original English interview version [30] has been translated into Dutch with the permission of the authors [42] and has been transformed into a self-rating questionnaire. The questions are addressed using a Likert scale ranging from zero to four. A total score ranging from zero to 48 can be calculated, with higher scores representing more symptoms. The internal consistency of the Y-BOCS-BDD-sr is good (current study $\alpha = 0.91$) and the convergent and divergent validity are satisfactory [42]. The Y-BOCS-BDD-sr was used to establish the convergent validity of sections A-D of the BDDS-5.

Body Image concern inventory (BICI). The BICI [22,23] has been translated into Dutch with the permission of the authors. The BICI is a 19-item self-report measure that assesses body dysmorphic appearance concerns. Items are scored on a Likert scale ranging from one to five. The BICI sum score is calculated by adding up all item scores. The total score ranges from 19 to 95. The internal consistency is excellent (current study $\alpha = 0.96$) and the convergent and divergent validity is good [38]. The BICI total score was used to establish the convergent and concurrent validity of sections A-D of the BDDS-5.

Appearance Anxiety Inventory (AAI). The AAI is a 10-item self-report measure designed to assess cognitive processes and safety-seeking behaviors concerning appearance [44]. The AAI was translated *lege artes* into Dutch with the permission of the author. Each item is scored on a Likert scale ranging from zero to four. The total score is obtained by adding all the items (range 0–40). Higher scores reflect greater psychopathology. The scale was found to have good internal consistency (current study $\alpha = 0.94$). The correlation coefficient between AAI and Y-BOCS BDD (interview) was strong (0.55) indicating a moderate convergent validity [44]. In the present study, the AAI was used to establish the convergent validity of sections A to D of the BDDS-5.

Eating Disorder Examination Questionnaire (EDE-Q) The EDE-Q is a 28-item self-report questionnaire for assessing eating disorder pathology over the past 28 days. This measure considers both psychological features (22 items) and core eating disorder behaviors (6 items). Items assessing the psychological features use a 7-point Likert scale ranging from 0 to 6. A global score of eating psychopathology can be calculated by averaging the 22 items relating to psychological features, with higher scores reflecting more severe eating disorder psychopathology. The present study used a clinical cut-off value of a global score of 2.17 [10]. The internal consistency of the EDE-Q is excellent [2] (current study $\alpha = 0.94$). Several studies provide support for the validity of the scores on the EDE-Q for assessing eating disorder symptoms [5]. The EDE-Q was used to establish the convergent and concurrent validity of section S of the BDDS-5.

Symptom Questionnaire-48 (SQ-48) The SQ-48 consists of 48 questions to assess the severity of general psychopathology and does not include specific questions about appearance dissatisfaction or eating disorders. Items are rated on a 5-point scale (range 0–148), with higher scores reflecting greater frequency. The internal consistency was found to be adequate to high. Measures of convergent validity show correlation coefficients ranging from moderate to strong [7] (current study $\alpha = 0.95$). In the present study, the SQ-48 total score, which was calculated by adding all the subscales excluding 'work' and 'vitality', was used to establish the divergent validity of sections A-D and section S of the BDDS-5.

2.2.3. Statistical analyses

A principal axis factor analysis using a direct oblimin rotation was carried out on 15 items (except S1 and S2 of the S-section) of the BDDS-5 to determine the underlying factor structure. A direct oblimin rotation was used to allow for correlations between factors, given that the

proposed subscales of the BDDS-5 are assumed to be correlated. The factor analysis was based on polychoric correlation (*hetcor* function from R package *polycor)*. The number of factors was determined using parallel analysis using 500 replications (*fa.parallel* function from R package *psych*). The Kaiser-Meyer-Olkin (KMO) measure was used to verify the sampling adequacy [14]. Subsequently, Cronbach's alpha of the individual factors was computed as a measure of internal reliability. A Cronbach's alpha of $\geq$0.70 was for the instrument to have sufficient internal reliability [14].

A chi-square test comparing the amount of likely BDD cases on the BDDS-5 with and without section S was computed to test whether section S can be omitted from the BDDS-5 without resulting in a loss of possible BDD cases. Phi was used to assess the effect size. The significance will determine which subsequent analyses are performed. Pearson correlations were computed when the assumption of normality was met, and otherwise, Spearman's rho is used. The skewness and kurtosis statistic values should be less than $\pm$1.0 to be considered normal. A significant ($p < 0.05$) and large ($r \geq 0.50$) enough correlation between the sum scores of sections A-D and the sum scores of the BICI, Y-BOCS-BDD-sr, and AAI, is supportive of convergent validity. Divergent validity of section A-D is assumed if the correlation between the sum scores of section A-D and the sum scores of the SQ-48 is small ($r \leq 0.30$) and not significant ($p > 0.05$).

Concurrent validity of the BDDS-5 was established by computing a chi-square test with Phi as an effect size, comparing the number of possible or likely BDD cases with the number of likely BDD cases on the BICI with a cut-off value of 55 ($p < 0.05$ for significance) [38].

In case section S cannot be omitted due to a loss of cases, the validity of this section will be assessed by computing the correlation coefficient between section S of BDDS-5 and the EDE-Q. A significant and high enough correlation ($r \geq 0.50$) between section S of the BDDS-5 and the EDE-Q is seen as evidence for the convergent validity of this section, and $p > 0.05$, and a low and non-significant correlation between section S and the SQ-48 will be seen as evidence for the divergent validity.

Computing a chi-square test ($p < 0.05$) with Phi as a measure for effect size, comparing the number of possible or likely eating disorder cases based on section S of the BDDS-5 and the EDE-Q global score (cut-off 2.17) will determine the concurrent validity of section S.

Data were processed using SPSS version 27. Percentages and standard deviations were calculated for the demographic variables.

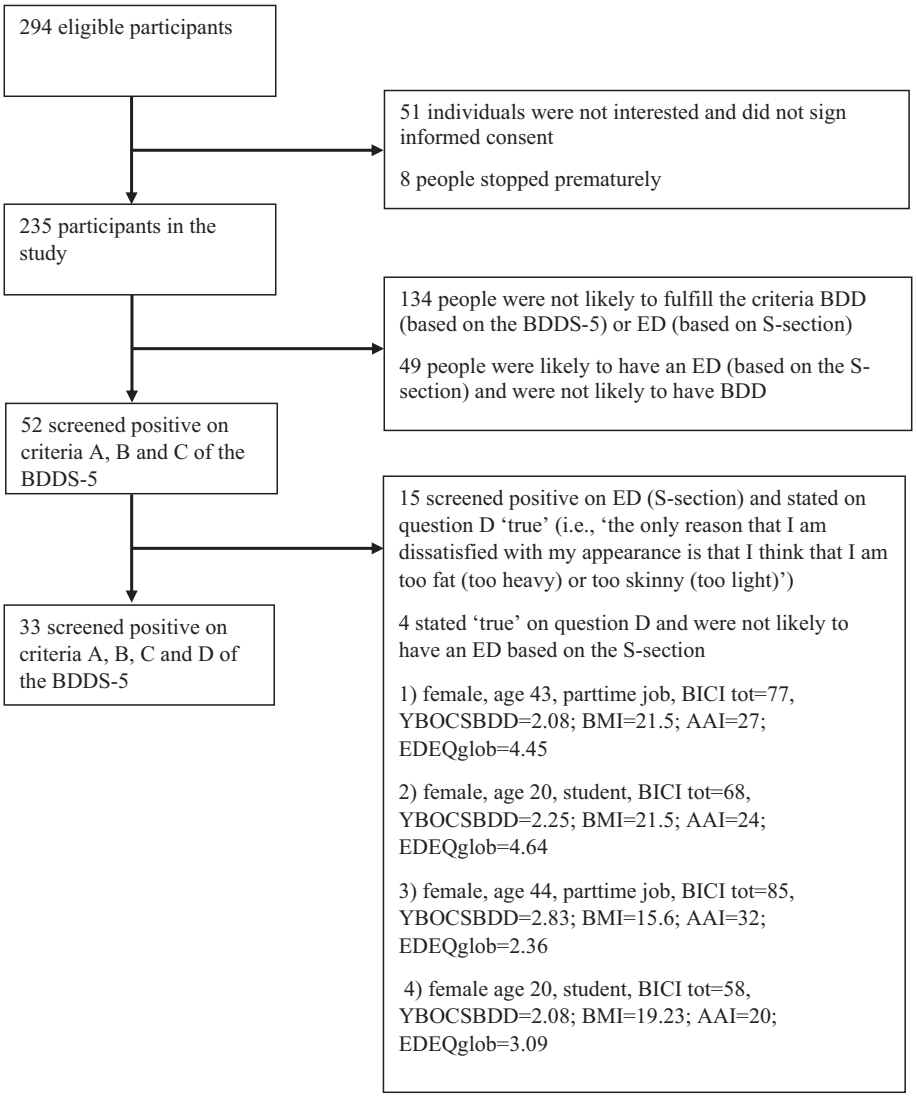

Fig. 1. Flowchart BDDS-5.

3. Results

3.1. Part 1: Development of the body dysmorphic disorder screener DSM-5 (BDDS-5)

Following the DSM-5 criteria, individuals were considered a possible or likely BDD case if they answered positively ('true') to all three questions for criterion A, to at least one question of criterion B, to at least one question of criterion C, and 'not true' on question D. (See Table 2 for the items of the BDDS-5 and the S-section).

Scoring of the BDDS-5 is as follows: All A, B, and C items score 1 for true, and D scores 1 for not true (range: 0–12). In cases where individuals fulfill criteria A, B, and C of the BDDS-5 and the answer to BDDS-5 question D is 'true' but a likely eating disorder is excluded based on section S, the individual will screen positive as a possible or likely BDD case (see Fig. 1 for Flow chart of the study).

3.2. Part 2: Sample characteristics

In total, 294 individuals showed a first interest in the study. Subsequently, 243 signed the informed consent of whom 235 completed all questionnaires. Of the 235 participants were female (78%), with age ranging from 18 to 72 years (Median = 26.0; $M = 31.98$, $SD = 13.24$). The country of residence was the Netherlands (76%), Belgium (24%), or another country (1%). The majority of the sample was unmarried (65%), lived independently (33%), had a university education level (39%), and were still studying (32%). However, all categories for marital status, living situation, education level, and work were represented.

3.2.1. Construct validity

Results of the polychoric factor analysis showed two factors (see Table 3) which accounted for 63.5% of the variance. The first factor accounted for 46.1% of the variance and included all items of criterion A except item BDD5-A3 (two items), criterion B (four items), and criterion C (four items). The second factor accounted for 17.3% of the variance and contained the three additional eating disorder items (S3, S4, and S5) (three items). The correlation analyses of all items including the *p*-value, can be found in Table 4. KMO measure of sampling adequacy is 0.913, indicating that the factor analysis is appropriate for these data. Bartlett's test of sphericity is highly significant ($p < 0.0001$).

3.2.2. Internal consistency reliability

Cronbach's α coefficients were high: Factor 1: α = 0.91 and Factor 2 α = 0.63 (using Pearson correlation). Further analyses demonstrated that the deletion of any item would not (greatly) improve the reliability of the corresponding factors. Cronbach's α was 0.87 for the total scale.

Table 3
Polychoric factor analysis.

Items BDDS-5 items	Factor 1 (BDD)	Factor 2 (Eating disorder)
BDDS_5_A1	**0.906**	0.238
BDDS_5_A2	**0.911**	0.313
BDDS_5_A3	0.140	0.033
BDDS_5_B1	**0.784**	0.556
BDDS_5_B2	**0.634**	0.351
BDDS_5_B3	**0.831**	-0.026
BDDS_5_B4	**0.798**	0.395
BDDS_5_C1	**0.890**	0.422
BDDS_5_C2	**0.794**	0.303
BDDS_5_C3	**0.874**	0.107
BDDS_5_C4	**0.859**	0.223
BDDS_5_D	0.054	-0.403
BDDS_5_S3	0.455	**0.749**
BDDS_5_S4	0.213	**0.591**
BDDS_5_S5	0.446	**0.892**

Table 4
Correlation matrix.

	BDDS_5_A1	BDDS_5_A2	BDDS_5_A3	BDDS_5_B1	BDDS_5_B2	BDDS_5_B3	BDDS_5_B4	BDDS_5_C1	BDDS_5_C2	BDDS_5_C3	BDDS_5_C4	BDDS_5_D	BDDS_5_S3	BDDS_5_S4	BDDS_5_S5
BDDS_5_A1	1,00														
BDDS_5_A2	0.93***	1,00													
BDDS_5_A3	0.10	0.22	1,00												
BDDS_5_B1	0.81***	0.87***	0.18	1,00											
BDDS_5_B2	0.60***	0.70***	0.15	0.75***	1,00										
BDDS_5_B3	0.76***	0.74***	0.40*	0.71***	0.65***	1,00									
BDDS_5_B4	0.77***	0.87***	0.14	0.85***	0.71***	0.71***	1,00								
BDDS_5_C1	0.93***	0.94***	0.10	0.93***	0.68***	0.72***	0.86***	1,00							
BDDS_5_C2	0.73***	0.82***	0.10	0.83***	0.64***	0.59***	0.72***	0.82***	1,00						
BDDS_5_C3	0.79***	0.79***	-0.04	0.79***	0.59***	0.62***	0.70***	0.83***	0.90***	1,00					
BDDS_5_C4	0.76***	0.88***	0.04	0.78***	0.59***	0.63***	0.89***	0.86***	0.77***	0.79***	1,00				
BDDS_5_D	-0.08	-0.03	0.16	-0.17	0.10	0.10	-0.18	-0.14	-0.13	-0.12	0.08	1,00			
BDDS_5_S3	0.65***	0.60***	0.09	0.81***	0.63***	0.45***	0.68***	0.72***	0.58***	0.53***	0.44***	-0.41***	1,00		
BDDS_5_S4	0.38**	0.34**	0.05	0.51***	0.21	0.07	0.37**	0.44***	0.30**	0.36**	0.35**	-0.32**	0.57***	1,00	
BDDS_5_S5	0.61***	0.69***	0.09	0.85***	0.60***	0.34**	0.71	0.77***	0.62***	0.48***	0.58***	-0.33**	0.87***	0.62***	1,00

*p < 0.05; **p < 0.01; ***p < 0.001.

3.2.3. BDDS-5 with and without section S

Of the 235 participants, 52 screened positive on questions A, B, and C (i.e., DSM-5 criteria for BDD) of the BDDS-5 (see Fig. 1). Of these 52, 33 answered negatively on question D (i.e., 'the only reason that I am dissatisfied with my appearance is that I think that I am too fat (too heavy) or too skinny (too light') and thus were screened as likely BDD cases. Nineteen persons were excluded as potential BDD cases because they answered question D of the BDDS-5 positive.

To investigate whether leaving out the additional eating disorder screening questions (S section) affected the detection of potential BDD cases, it was checked whether the individuals who were excluded as potential BDD cases based on question D, were the same as those using the section S. Of the 19 individuals who were excluded as potential BDD cases, 15 did screen positive on the S-section whereas four did not. These four individuals stated 'true' on the D question 'the only reason I am dissatisfied with my appearance is that I think I am too fat (too heavy) or too skinny (too light)'. However, as they did not screen positive on the S-section, that is, they are not likely to suffer from an eating disorder only, they might be potential BDD cases that were missed by the BDDS-5. Concluding, without the S-section, the BDDS-5 appeared to be correct for the majority (92% of the 52 participants), however, in 8% ($n = 4$) of the individuals BDD was probably missed.

3.2.4. Convergent validity

The sum scores of BDDS-5, BICI, Y-BOCS-BDD-sr, and AAI appeared to be positively skewed, however, the skewness and kurtosis statistic values for these four variables were less than 1.0 and could therefore be considered to be normally distributed. Pearson correlations between the sum scores of sections A-D and the sum scores of the BICI ($r = 0.88$), Y-BOCS-BDD-sr ($r = 0.84$), and AAI ($r = 0.85$) were calculated. The correlations were large (r's > 0.50) which means that the BDDS-5 is convergent with these measures.

3.2.5. Divergent validity

The SQ-48 sum scale appeared to be positively skewed however also in this case the skewness and kurtosis statistic value was less than 1.0 and could therefore be considered to be normal. Pearson correlations between the sum scores of sections A-D and the sum scores of the SQ-48 ($r = 0.72$). The correlation between the two measures cannot be considered low ($r < 0.30$) so divergent validity cannot be established.

3.2.6. Concurrent validity

Concurrent validity of the BDDS-5 was established by computing a chi-square test, comparing the number of possible or likely BDD cases with the number of likely BDD cases on the BICI with cut-off values of 55. Eighty-six individuals scored above the cut-off (37%) compared to 33 (14%) with the BDDS-5. Only one person who screened positive on the BDDS-5 had a score below 55 on the BICI and 23% ($n = 54$) screened negative on the BDDS-5 while having a BICI score above 55 ($X = 60{,}3$; $p < 0.001$; Phi = 0.51, $p < 0.001$).

Concurrent validity of the S-section was established by comparing the number of possible (or likely) eating disorder cases based on section S of the BDDS-5 and the number of cases that scored above the clinical cut-off score of the EDE-Q global score (2.17). Nine percent of the cases who screened positive on the S-section (i.e., indicating that they are likely to have an eating disorder), had an EDE-Q global score below the cut-off score whereas 13% screened negative on the S-section but had an EDE-Q global score above the clinical cut-off score ($X = 64{,}8$; $p < 0.001$).

4. Discussion

The aim of the study was twofold. Firstly, to develop a screener - the Body Dysmorphic Disorder Screener for DSM-5 (BDDS-5) - to overcome the limitations of the existing screeners, and secondly to test its psychometric properties. The BDDS-5 was developed according to the DSM-5 criteria and translated from Dutch into English and German. Based on the BDDS-5 (questions A, B, C, and D), 33 persons (14% of 235) were screened as likely BDD cases. Using question D1 (i.e., "The only reason that I am dissatisfied with my appearance is that I think that I am too fat (too heavy) or too skinny (too light)"), nineteen persons answered affirmatively and were excluded as potential BDD cases. Based on the S-section, this turned out to be largely correct for the majority, however, four of the BDD cases were probably missed. We conclude that the D1 question suffices and adding the extra eating disorder questions (S-section) could be distressing or difficult to understand for people not suffering from an eating disorder. As a screener for BDD, the BDDS-5 will be more widely applicable without eating disorder screening questions. However, in case someone screens positive on questions A, B, and C and is excluded as a potential BDD case, based on question D, it is recommended to also follow up on this person using a clinical interview. This follow-up is also important in case of muscle dysmorphia. Individuals suffering from this form of BDD are preoccupied with being insufficiently or lean and in response, may also exhibit unusual eating behaviors (e.g., excessive protein consumption) or engage in excessive exercise (e.g., weight lifting). In these cases, behaviors related to diet and exercise are motivated by a desire to be more muscular rather than to attain or maintain a low body weight.

The convergent validity appeared to be high ($r > 0.80$) with three different measures for BDD severity, i.e., BICI, YBOCS-BDD-sr, and AAI. It is, therefore, very likely that the BDDS-5 captures all the BDD criteria of the DSM-5. An advantage of the present screener is that in comparison to the other questionnaires, more attention is paid to the readability of the screener for those with lower reading skills. Moreover, the answer options are more straightforward since it comprises a dichotomous answer (yes/no) option. The correlation between the SQ-48 total score and BDDS-5 was high ($r > 70$) so divergent validity could not be established using the total score of the SQ-48. However, on the other hand, it is not very surprising that there is a strong association between specific BDD psychopathology and general psychopathology, given the high comorbidity of psychiatric disorders in general [32] and BDD in particular [17,18,20,21,29,41].

One of the strengths of the present study is that the wording of the BDDS-5 is such that it can be understood by 95% of the general population. We expect that the BDDS-5 can even be read and understood by children aged 8 or older. Since BDD starts often at a young age a screener that can be used from the age of 8 years would be very welcome. Secondly, it is the first to compare the results of the screener with other questionnaires determining convergent validity. Thirdly, to our knowledge, it is also the first BDD screener for DSM-5 criteria that is tested for psychometric properties. Furthermore, the BDDS-5 can be used without adding additional eating disorder screening questions which makes it more widely applicable and less stressful to fill out. Fifthly, the dichotomous answer options make the BDDS-5 easy to understand and score. Finally, the relatively large sample size ($N = 235$) used to test the psychometric properties of the BDDS-5, was such that the chance of finding BDD cases was relatively high.

The present study should also be seen in light of a few limitations. A first weakness is that the outcome of the BDDS-5 has not been compared with a gold standard, i.e., the outcome of a structured clinical interview (e.g., Structured Clinical Interview for DSM-5 (SCID-5, [15]. In the present study, it was not possible to investigate the screening accuracy with clinical BDD diagnoses classified using a clinical interview. Secondly, in a future (larger) study the factor structure should be confirmed by using a confirmatory factor analysis. Furthermore, although readability is considered to be good, it may be improved by splitting questions A3 and B1 into separate questions. Next, the stability of the screener over time is not covered in the current design.

Concluding, the present study shows that the BDDS-5 is a valid and widely applicable screener for BDD without additional eating disorder screening questions. Specific attention is paid to the readability of the screener for those with lower reading skills. The BDDS-5 can be used to

screen for BDD in populations where this is of importance, i.e., cosmetic surgery, mental health institutes, and so forth. Depending on the setting one can decide to leave out the D question. For example, in a cosmetic surgery setting, one would like to detect patients with a possible psychiatric disorder that motivates them to seek cosmetic surgery. Whereas in a mental health clinic, one would like to differentiate between those preoccupied with their appearance because of BDD or ED. In this case, one would use the complete BDDS-5. We hope that using this short and simple screener may help in the early detection of BDD and subsequently reduce treatment delay. More studies in the future are needed to further investigate the psychometric properties of the BDDS-5 after this first small study. Screening accuracy should be confirmed in a clinical population using a clinical interview. Furthermore, test-retest reliability should be investigated. Having good test re-test reliability signifies the internal validity of a test and ensures that the BDDS-5 is both representative and stable over time. Next, a confirmatory factor analysis approach is needed to provide stronger evidence for the EFA. Finally, given that the answer options of the BDDS-5 are dichotomous, ideally, Item Response Theory analyses should be done in a much larger sample to confirm the factors found in the present study.

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Contributors

Yanda van Rood and Nina van Wyck designed the study. Yanda van Rood and Nina van Wyck contributed to the data collection. Alexandra Dingemans and Yanda van Rood wrote the first draft of the manuscript. Alexandra Dingemans and Stefan Böhringer conducted the statistical analysis. Anne Möllmann and Nic van der Wee contributed to the present version of the manuscript. All authors approved the final manuscript.

Declaration of Competing Interest

The authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.comppsych.2023.152416.

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