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Development and face validity of the Danish STOB screening tool for early detection of binge eating disorder in children and adolescents

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Abstract

Background Binge Eating Disorder (BED) is prevalent among children and adolescents and is associated with severe psychological and somatic health complications. Early detection and intervention are therefore crucial. This study aimed to develop, pilot test, and validate the STOB screening tool (*S*creening *T*ool for the early detection *O*f *B*ED), designed for use in children and adolescents aged 13–18 in primary care settings using a qualitative face validity approach. Additionally, the study explored the perceived acceptability of a supplementary dialogue tool.

Methods The development, pilot testing, and validation of the screening tool followed a two-phase qualitative process. In phase one, development and pilot-testing of the 6-item STOB tool was conducted. In phase two, the validation process incorporated a survey and semi-structured interviews, both assessing various aspects of the screening tool, including language complexity, usability, acceptability, and the presence of uncomfortable or intrusive terms. A total of 42 participants, aged 14–18 years (mean age = 16.4 years), were recruited from a community sample for the survey (23 females, 19 males). For the interviews, 10 participants (8 females, 2 males; mean age = 15.7 years) from the community sample were included, resulting in seven individual interviews and one group interview. Additionally, two female participants with BED, aged 16 and 17, were recruited for interviews only.

Results A total of 16.7% of survey respondents met the screening tool threshold for possible BED, and 4.8% of the total sample scored positive on all questions, further increasing the suspicion of BED. Both the survey and interviews indicated that the screening questions were generally well-understood. However, a few linguistic challenges were identified during interviews, prompting minor semantic adjustments to enhance clarity and accessibility. The Interviews revealed age-related differences in language perception and notable differences in content comprehension between participants with and without BED.

Conclusion The STOB screening tool demonstrates acceptable face validity and potential for implementation in primary care, particularly when accompanied by the supplementary dialogue tool. This study underscores the

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importance of evaluating self-report questionnaires in terms of terminology and acceptability within the target population. Further validation is recommended across broader adolescent populations.

Trial registration Not applicable.

Plain English summary

Binge Eating Disorder (BED) occurs across all age groups and can lead to negative health consequences both mentally and physically. Early detection of BED is important so that those affected can receive the help they need. This study presents the development, pilot testing, and validation of the STOB screening tool, designed to help identify BED in children and adolescents in primary care settings. The screening tool, along with a supplementary dialogue tool to help general practitioners discuss binge eating behaviors with younger patients, was tested in adolescents both with and without BED to assess whether the tools' terminology and usability were acceptable within the target population. Overall, the screening and dialogue tools were well received and show a lot of promise for implementation in primary care settings.

Keywords Binge eating disorder, Eating disorders, Screening, Early intervention, Face validity, Overweight, Obesity, Children, Adolescents

Background

Binge eating disorder (BED) is a serious eating disorder characterized by recurrent episodes of binge eating (BE) occurring at least once a week over a minimum of three consecutive months. These episodes are defined by a sense of loss of control (LOC) binge eating, leading to an unusually large or atypical intake of food compared to what most people would consume under similar circumstances. LOC episodes can be classified as either objective bulimic episodes (OBE), where the amount of food is perceived excessive to others, or subjective bulimic episodes (SBE), where the amount appears normal to others but feels excessive to the individual [1, 2]. Only OBE is included and define BE in BED. BED is associated with significant distress and negative emotions, such as shame and self-disgust [1]. Individuals with BED often eat in secrecy and use food as a means of emotional regulation, particularly in response to negative emotions such as loneliness, sadness, or anxiety [2–5]. Although children and adolescents with BED often conceal their distress, the disorder is linked to both mental and physical health consequences, with a substantial negative impact on daily life [6, 7]. Unlike bulimia nervosa, BE episodes in BED are not systematically followed by compensatory behaviors aimed at preventing weight gain [1]. Consequently, BED may lead to weight gain over time [2], although individuals with BED can also maintain a normal weight [1, 3].

The diagnostic criteria for BED apply across all age groups [1, 8]. However, in children and adolescents, BE can be difficult to define. This can be attributed to several factors: parental supervision, the challenge in defining what constitutes an objectively large amount of food for younger individuals due to variations in growth and activity levels [3], difficulties for children to articulate LOC and food intake, difficulties in differentiating overeating with and without LOC [9], and the tendency for BE episodes in children and adolescents to occur less frequently and have shorter durations compared to adults [1, 8].

The prevalence of BED is estimated to be between 1% and 5% among children, adolescents, and young adults, depending on the sample and the method used [5, 6]. In a Danish community-based cohort study, a similar prevalence was found among 2,509 adolescents: 8.5% reported weekly BE, and 2.6% displayed symptoms consistent with BED [7]. However, a meta-analysis of children and adolescents aged 5–21 years with overweight and obesity reported a prevalence of up to 26.3% for BE [10]. Thus, BED is prevalent in children and adolescents, with rates comparable to anorexia nervosa and bulimia nervosa in younger populations [6].

Previously, research on BED has primarily focused on adults [7, 11], leaving the prevalence and correlates of BED in children and adolescents less understood [5, 7]. Although BED is often associated with onset in late adolescence or early adulthood [1, 5, 12], studies indicate that BE behaviors can appear at younger ages. For example, a community sample of adolescents aged 13–18 years reported a median onset age of 12.6 years for BED [13]. Another study found the mean age for the first BE onset to be 10.8 years among children and adolescents seeking treatment for obesity [14]. whereas 30% of adults with BE reported BE onset in childhood/adolescents [15]. Furthermore, OE and BE has been observed in children as young as 5 years, indicating a potential risk for developing BED [16, 17]. These findings highlight that early screening of BE behaviors could be relevant in early adolescence.

In summary, the notion that BED is primarily a disorder present in adulthood is misleading. BED, is prevalent in childhood and adolescence, both in the general population and likely at higher rates among children and adolescents with overweight and obesity. However, a study by Swanson et al. [13] found that only 11.4%

of adolescents experiencing BED received treatment, despite 72.6% receiving some form of support for emotional or behavioral problems. A similar pattern was observed for adolescents with subclinical BED [13]. Consequently, undiagnosed and untreated BED represents a considerable threat to the overall health and well-being of children and adolescents [1]. As BED is associated with severe psychological and somatic health issues, early detection and intervention are important. Initial screening for BED may be conducted by general practitioners (GPs) in primary care settings [18, 19]. However, previous studies indicate a lack of recognition of the disorder, with varying practices in screening and referral for specialized diagnosis and care [20–22]. Existing screening tools for assessing BED, such as the BEDS-7 [23], and questionnaires designed to assess eating disorders, including BED, in children and adolescents, such as the Youth Eating Disorder Examination Questionnaire (YEDE-Q) [24], are considered both viable and accessible. However, the BEDS-7 was not developed specifically for children and adolescents, and the YEDE-Q is time-consuming, making it unsuitable for use by GPs in primary care settings. Given the limited time GPs have with each patient, a less time-consuming tool is needed, underscoring the importance of providing a screening tool specifically designed to daily clinical practice [22] as timely detection can further early intervention efforts. Additionally, this tool must be adapted for children and adolescents, using concrete language and examples of what constitutes BE to improve their understanding of the disorder and make the tool easily accessible.

To our knowledge, no screening tool currently exists for assessing BED in children and adolescents in primary care settings using the ICD-11 criteria. To address this gap, we developed the STOB screening tool (*S*creening *T*ool for the early detection *O*f *B*ED), designed for the early detection of BED among children and adolescents aged 13–18 in primary care settings. The screening tool is intended for use when BMI (Body Mass Index) or other factors indicate the need for screening and is accompanied by a dialogue tool that provides suggested phrases and supplementary questions to assist GPs in discussing BE behaviors with young patients they suspect may have BED.

The aim of this study was to develop, pilot test, and validate the STOB screening tool using a qualitative face validity approach to ensure that the tool and its terminology were well understood in a representative sample of Danish children and adolescents aged 13–18 years. Additionally, we aimed to qualitatively explore the perceived usefulness and acceptability of the supplementary dialogue tool among the target group.

Methods

The development, pilot testing, and validation of the screening tool followed a two-phase, qualitative process: Phase one involved development and pilot testing, while phase two focused on assessing face validity (see Fig. 1). Face validity has been defined as the extent to which a measure appears to capture the concept it is intended to reflect [22]. In this study, face validity was evaluated by determining the extent to which the tool captures the intended construct, as perceived by participants. Since face validity is a subjective measure, it relies on observer judgment rather than statistical confirmation [25].

Phase 1 – development and pilot testing

Phase one involved the initial drafting of the screening tool, scoring guidelines, and the supplementary dialogue tool, followed by pilot testing. The screening questions and dialogue tool were developed based on existing literature on BED in children and adolescents, supplemented with information obtained from a systematic search in established screening tools and questionnaires for BED assessment in both children and adults, as described in Background [22–24, 26]. Additionally, interviews with GPs were conducted to understand how the tools could best integrate into their workflow and meet their needs. An expert group consisting of four psychologists specializing in ED, a dietitian with expertise in ED, a communication expert, and a clinical professor specializing in obesity and clinical research provided feedback on the accuracy, relevance, and clarity of the initial drafts of the tools. Before proceeding to phase two, the screening tool was pilot tested, and feedback on the dialogue tool was collected. In brief, the primary objectives of this pilot test were to assess the language, layout, and practical usability of the tools. The pilot test included ten participants: five GPs, three young adults (aged 19–21) diagnosed with BED, one child (aged 12), and one adolescent (aged 14) without BED. All participants participated in individual, in-person semi-structured interviews. Based on the interview data, revisions were made to improve the usability and acceptability of the tools. The revised versions were subsequently approved by the research group (SM, PA, LC, and JMB), resulting in the final version of the screening and dialogue tools before proceeding to the validation phase (phase two). The final version of the STOB screening tool includes an introduction to BED, followed by a six-item self-report questionnaire that includes five yes/no questions and one interval-based response (see Table 1). Each question is intentionally designed to evaluate a specific aspect of BED in children and adolescents [3, 4, 27–29]. The accompanying scoring guidelines specifies that the first three questions establish a threshold score indicating possible BED, while positive

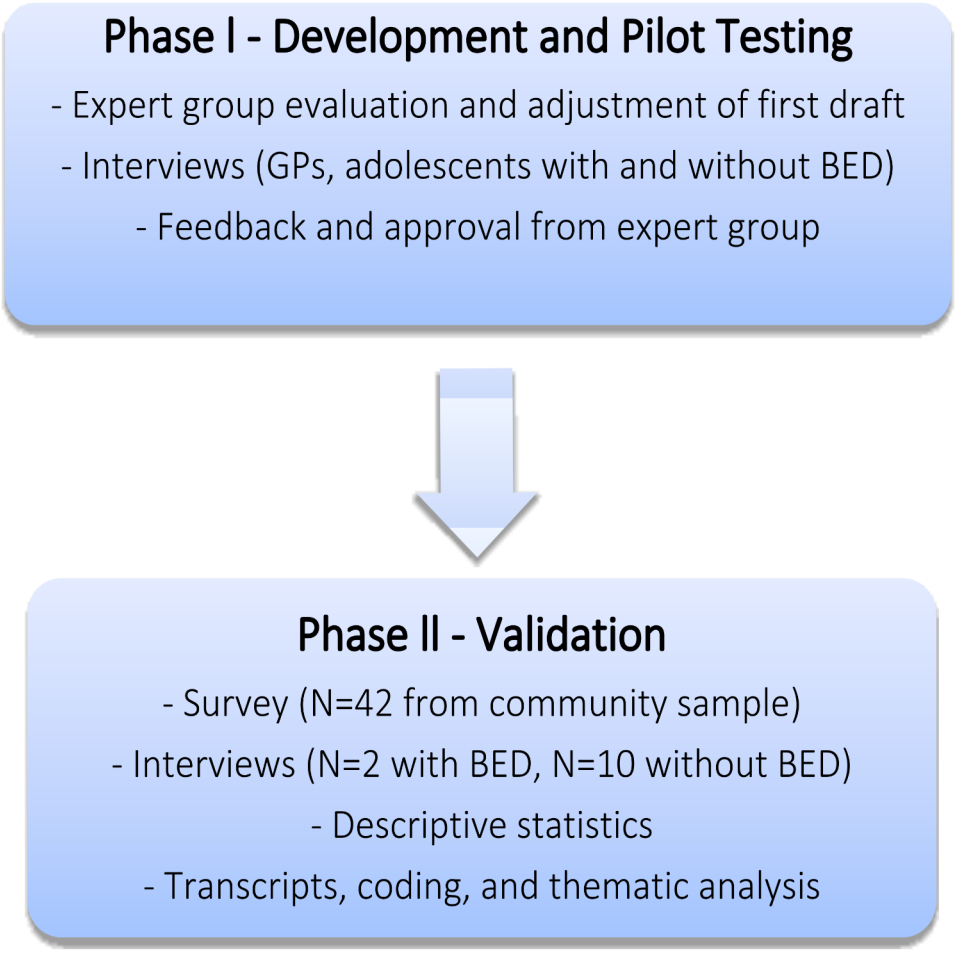

Fig. 1 Phase I and II of the study

Table 1 The STOB screening tool

The STOB Screening Tool
Introduction
Most people occasionally experience some kind of overeating, for example, during holidays, birthdays, or when someone serves food one really enjoys. That kind of overeating is completely normal. However, there is another type of overeating, binge eating, where one may experience losing control over what, how much, or how quickly they eat. In such cases, a person may feel unable to stop eating, even if they are no longer hungry or have developed stomach pain. Some describe it as being on a moving train, and they can't stop it or get off.
This type of binge eating, where one feels a sense of loss of control, can happen in two ways:
1. **In one, a large amount of food is consumed relatively quickly. One may typically search for food in cupboards and drawers and end up eating a lot of food quickly, for example, a sandwich, a roll with toppings, chocolate biscuits and a serving of ice cream.**
2. **In the other, the amount of food consumed may seem normal to others, but the person still feels a loss of control and an inability to manage their eating.**
It is the feeling of losing control while eating that determines if Binge Eating Disorder (BED) is present.
Below are 6 questions that you should answer as best as you can.
Questions
1. In the past 3 months, have you had episodes of binge eating? YES / NO
2. How many times a week have you typically had episodes of binge eating in the past 3 months? Less than once, 1–2 times, 3–4 times; more than 4 times
3. Do you experience a loss of control during a binge eating episode, for example, finding it difficult to control what, how much or how quickly you eat? YES / NO
4. Do you continue to eat when you're not hungry or after you've developed stomach pain? YES / NO
5. Do you binge eat in secret? For example, do you only binge eat when you're home alone, hide wrappers or bags from food or only eat food that's already been opened so that it isn't noticed? YES / NO
6. Do you feel guilty, ashamed or upset after binge eating? YES / NO

responses to the remaining three questions provide additional support for the suspicion.

The dialogue tool provides suggested phrases to help GPs initiate conversations about BED, along with three supplementary questions to be used if possible BED is suspected (Table 2).

Since the screening questions target children and adolescents, one significant indicator for distinguishing BED from bulimia nervosa, the use of compensatory behaviors, was excluded from the screening tool. Instead, it was included in the dialogue tool to prevent raising awareness of compensatory behaviors as an option, thus avoiding the unintended encouragement of young individuals to consider such behaviors. The three supplementary questions are essential for GPs as they help clarify whether the suspicion aligns with BED, another eating disorder, or no disorder at all. Additionally, these questions support the referral process for further assessment and diagnosis. The screening and dialogue tools, along with the accompanying scoring guidelines, are presented in full text in additional files which have been translated from Danish (see Additional File 1 and Additional File 2) and are also available at ncfo.dk/stob.

Phase 2 – validation

In phase two, the screening tool was validated, and feedback on the dialogue tool was collected. The validation process combined a survey and semi-structured interviews. The survey included the STOB screening tool questions as well as additional questions regarding participants' perceptions of the screening tool's language and practical usability. The interviews enabled a more in-depth exploration of participants' views on both the screening and dialogue tools. Participants reviewed Danish versions of the tools, which were subsequently translated into English by a professional translation company specializing in health communication (vidkom.dk). Example quotations from the interviews, included in the Results section, were also professionally translated. Neither translation of the tools nor quotations were back-translated.

Participants

In the survey, a total of 42 participants, aged 14–18 years (23 females and 19 males; mean age = 16.4 years), were recruited from a community sample using convenience sampling. Participants were recruited from two Danish schools: a 1st-year high school class ("Gymnasium" in Danish) and an 8th-grade public school class. None were excluded. This approach ensured a broader representation in terms of age and educational level, capturing a diverse segment of the target group [30]. Initial contact was made with school faculty, who distributed the invitation, information letter, and consent form to potential participants. For those under 15 years of age, written parental consent was obtained.

As part of the consent process, participants were given the option to volunteer for an in-person interview. Sixteen volunteered to participate, and 10 participants (8 females, 2 males; mean age = 15.7 years) were successfully recruited, resulting in seven individual interviews and one group interview, which was preferred by three participants. Additionally, two female participants, aged 16 and 17, who had recently been diagnosed with BED, were recruited from a BED treatment clinic for individual interviews.

Data collection

Surveys and interviews were conducted in May and June 2024. The survey was completed during school hours, with participants accessing it via a QR code and completing it electronically, anonymously, and independently. Before starting, participants provided demographic information, including age, gender, and grade level. Besides the STOB questions, the survey included eight to ten questions assessing participants' views on the language used in the screening tool, focusing on aspects such as language complexity, the presence of uncomfortable or intrusive terms, and the amount of text.

Cognitive interviews, lasting approximately 30–60 min, were conducted by first author (SM) using think-aloud techniques, supplemented by pre-written verbal probes for clarification [31–33]. These interviews aimed to

Table 2 The dialogue tool

The Dialogue Tool
Suggested phrases to help GPs initiate conversations about BED:
1. "I'd like to hear more about your eating behavior and relationship with food. Do you find it difficult to control your eating, for example, what or how much you eat?"
2. "I would like to know a bit more, so I will ask you to complete a short questionnaire about your eating behavior. There are no right or wrong answers, and whatever you answer doesn't necessarily mean that something is wrong. It's important that you try to be as honest as possible because I'll use your answers to understand better how I can help you."
3. "I will send you a link to the questions, which you should complete at home. Then, we'll schedule another appointment where we review your answers together and discuss what the next steps should be."
Supplementary questions for GPs to use if possible BED is suspected after the patients has filled in the STOB screening tool:
1. "Can you give me an example of what a typical binge eating episode looks like for you?"
2. "Can you describe how you experience losing control over your eating?"
3. "Do you compensate for your binge eating, for example, by vomiting, fasting, or excessive exercise?"

provide a more in-depth understanding of participants' perceptions of the screening tool, focusing on their comprehension of the language and their ability to explain key terms in both the introduction and screening questions. Participants were also asked about the presence of uncomfortable or intrusive language and their ability to self-administer the tool in its paper version. Additionally, the interviews examined the dialogue tool, including the suggested phrases and supplementary questions for GPs and the consultation setting. Throughout the interviews, participants were encouraged to verbalize their thoughts, providing transparency about their reasoning to the interviewer [32].

Data analysis

Descriptive statistics were used to determine how many survey participants met the screening tool's threshold for possible BED, as well as to summarize responses to the remaining survey questions. All interviews were audio-recorded and transcribed. Coding and thematic analyses were conducted with the NVivo software [34], using an inductive approach until data saturation was reached, meaning no new information emerged and no additional themes could be identified within or between participants [35]. Two members of the research group (SM and PA) independently reviewed the transcripts, discussed the identified themes, and resolved any discrepancies until agreement was reached. Subsequently, the themes, analyses, and results were discussed by the entire research group to ensure investigator triangulation, thereby strengthening the internal validity of the data [19]. The results presented in this article represent a synthesis of the most important elements that emerged from this work.

Ethics

The study protocol was approved by the local Committee of Ethics (Region Midtjylland, approval no. 1-10-72-124-22) and registered in the Central Research Registry of Central Denmark Region (registration no. 783507). All study procedures and consent forms were approved by legal advisors from the Joint Legal Advisory Office at Aarhus University Hospital. No additional approvals were required under Danish legislation, as no personal data or identifiable information was collected. Survey data were securely stored on the SurveyXact platform [36], while interview data were stored at the secure MidtX database at Aarhus University Hospital.

Results

Survey

Based on the survey results, 16.7% ($n = 7$) of respondents met the screening tool's threshold for possible BED, defined as experiencing 1–2 or more BE episodes with LOC during the past three months. Among these seven respondents, two (4.8% of the total sample) answered "yes" to all five yes/no questions and reported experiencing 3–4 or more BE episodes per week, further increasing the suspicion of possible BED. Additionally, two other respondents, apart from the seven, answered "yes" to questions 1 and 3, which addressed OE and LOC eating, but reported less than one BE episode per week. While this is below the diagnostic cut-off [1], it still indicates possible BE behavior.

Overall, survey respondents found the screening tool introduction appropriate in terms of usability, language level, and text length. Additionally, most respondents considered the language of the screening questions suitable and the content easy to understand. In general, respondents did not find the language uncomfortable or intrusive, and the majority reported being able to complete the screening questions both electronically and independently (see Table 3).

Interviews

The screening tool

The interview data revealed multiple themes related to the screening tool. These themes were grouped into five main categories during the analysis: design and layout, introduction, screening questions, practical aspects and response preferences, and uncomfortable or intrusive language.

Most of the participants found the design and layout of the screening tool appropriate, describing the questionnaire as clear and easy to navigate. However, some participants noted that the amount of text in the introduction seemed cluttered, making it less accessible. Notably, the youngest participants indicated they would prioritize reading only the highlighted text, assuming it contained the most important information.

The introduction was generally found to be useful, with the metaphor "Some describe it as being on a moving train, and they can't stop it or get off" being particularly helpful for understanding BED. All but one participant could clearly explain the concept of LOC eating. However, approximately half of the participants without BED struggled to comprehend and differentiate between the examples of OBE and SBE, finding SBE particularly challenging. Most associated OBE with what they had previously heard about the disorder, while SBE seemed more ambiguous and was often confused with other eating disorders, such as anorexia nervosa or restrictive eating.

Most survey respondents found the screening questions easy to understand, but the interviews offered additional nuance, as the six screening questions were evaluated for both linguistic and content comprehension.

In screening question 1, most could adequately explain key terms such as "episodes" and "binge eating".

Table 3 Survey results

Theme of survey questions	Answers		
1. Length of introduction text	Too short (0%)	Too long (12%, *n* = 5)	Appropriate (88%, *n* = 37)
2. Language complexity of introduction	Too easy (2%, *n* = 1)	Too difficult (2%, *n* = 1)	Appropriate (95%, *n* = 40)
3. Clarity of screening question language	Too easy (2%, *n* = 1)	Too difficult (2%, *n* = 1)	Appropriate (95%, *n* = 40)
4. Usability of introduction	Yes (95%, *n* = 40)	No (5%, *n* = 2)	
5. Clarity of screening question content	Easy (95%, *n* = 40)	Difficult (5%, *n* = 2)	
6. Presence of uncomfortable og intrusive language	Yes (2%, *n* = 1) *Reason: Discomfort with questions 3 and 4 due to uncertainty about BE*	No (98%, *n* = 41)	
7. Experience with electronic completion	Easy (93%, *n* = 39)	Difficult (7%, *n* = 3) *Reason: Technical issues (n = 1) or concerns noted in the 'other' response option (n = 2), such as question complexity or overly narrow questions without the possibility of providing supplementary comments*	
8. Experience with independent completion	Easy (98%, *n* = 41)	Difficult (2%, *n* = 1)	

However, five participants without BED expressed uncertainty about the term "binge eating", even after reading the introductory explanation and rephrasing the term in their own words. Additionally, differences emerged between those with and without BED, as participants with BED were more likely to describe negative emotions associated with BE behaviors:

> *"That [overeating] is when you've eaten more than until you're full. I associate overeating with a stomach ache or, personally for me, a guilty conscience. That I probably know, 'Phew, I've eaten more than I should.'".*
> *— Participant #1, 17 years old, female, diagnosed with BED.*
> *"You eat until you're full. If you eat more after you're full, then you've overeaten."*
> *— Participant #8, 14 years old, male, without BED.*

Most participants found it challenging to recall BE episodes over the past three months, as this duration felt extensive:

> *"I think [...] it was a bit difficult that you had to think back three months. I'm not entirely sure I could remember that."*
> *— Participant #9, 15 years old, female, without BED (group interview).*

In screening question 2, a linguistic challenge emerged during the interview process, requiring a minor semantic adjustment to improve the usability and acceptability of the question. Originally, the question was formulated in reference to question 1: "If yes to question 1, how many times a week have you had episodes of binge eating in the past three months?". However, this caused confusion for most participants, who struggled to understand the connection between the two questions, particularly if they had answered "no" to question 1. In such cases, the majority skipped the second screening question, while some selected the response category with the lowest possible interval. As a result, question 2 was rephrased to be independent of question 1. Additionally, the term "typically" was included to clarify that the question referred to an average, a change that the remaining five participants understood and were able to explain in their own words. Similar to question 1, most reported difficulties recalling OE episodes over the past three months, especially when asked to provide the frequency of weekly OE episodes. The majority offered estimates based on a general sense, and one participant without BED mentioned referring to her calendar, using specific events to prompt her memory. One participant with BED noted that recalling BE episodes was not difficult for her, as BED was a predominant part of her life. Several others, who found recall challenging, stated that a shorter recall period, such as one month, would be helpful.

In screening question 3, the majority were able to rephrase key terms in their own words. However, three participants found the phrasing of "what, how much or how quickly" challenging, as it combined multiple aspects into a single question and reported difficulty

responding if they could recognize only some of the listed aspects:

> *"I actually think it would be easier [to answer them separately] because here you'd think: 'I don't relate to these two, but I relate to that one.' So what should I answer then? Should I say yes or no?"*
> *— Participant #4, 16 years old, female, without BED.*

In contrast, one participant with BED noted that these factors are interconnected and, therefore, should not be separated in the wording of the question.

In screening question 4, all participants were able to rephrase key terms adequately. However, one participant without BED expressed uncertainty about what characterizes BE, as he could relate to eating despite not being hungry or continuing to eat even after experiencing stomach discomfort, as described in the question:

> *"I could figure out that it was related to [...] BED. But it [the question] is also phrased in a way that goes a bit back to normal overeating. I can see some problems with seeing where the boundary [is]. How much more do I have to eat for this to count?"*
> *— Participant #8, 14 years old, male, without BED.*

In screening question 5, all participants were able to rephrase key terms sufficiently and generally noted that the examples were helpful for understanding the meaning of the question:

> *"It makes more sense that there's an example. [Because] when you write: 'Do you overeat in secret?', you might think a bit: 'What is meant by that?' But then the explanation comes, and it's easy enough to answer."*
> *— Participant #5, 16 years old, female, without BED.*

Additionally, the two participants with BED emphasized that the examples reflected their own experiences with secretive eating:

> *"I think these are good examples that fit well with what I've experienced, at least."*
> *— Participant #1, 17 years old, female, diagnosed with BED.*

In screening question 6, the majority reported no issues. However, one participant without BED found the question restrictive and challenging to answer, as it provided examples of only three emotional states, despite the possibility of experiencing a broader range of emotions. Generally, participants struggled to explain the key terms "guilty" and "ashamed". Only a few could provide accurate definitions of these terms, though most recognized their semantic difference and noted that they have distinct meanings in practice. Nonetheless, the majority mentioned that they would use the terms interchangeably.

Regarding practical aspects and response preferences in the screening questions, several participants expressed a preference for answering the questions on paper or in an electronic format that allowed access to the introductory information during the response process. Most preferred to complete the screening questions alone rather than in the presence of their GP or parents:

> *"I think I'd have a harder time if my parents were there because then I'd feel a bit sorry for them if they felt it was their fault."*
> *— Participant #9, 15 years old, female, without BED (group interview).*

All participants found the response categories easy and clear, except for the first interval-based response option, "Less than once," which was noted as challenging by eight out of twelve participants. The majority interpreted it as equivalent to zero episodes, suggesting that the intended meaning, an interval between 0 and 1 episodes on average per week, was not correctly understood. One participant also requested the option to add a free-text space to supplement the existing response categories in all screenings questions.

In terms of uncomfortable or intrusive language, no participants personally found any wording intrusive or transgressive. However, both participants with and without BED identified question 5 as potentially uncomfortable due to its focus on secretive BE and the possibility of confronting parents:

> *"The thing about doing it in secret [is difficult]. Because if your parents haven't really noticed and don't know it is, then it can be quite overwhelming to have to answer."*
> *— Participant #1, 17 years old, female, diagnosed with BED.*

However, the same participant, as citied in this quotation, noted that while the questions could be perceived as offensive for confronting something formerly private, her personal experience was that being asked about BE by a healthcare professional in a safe and confidential environment was not necessarily disturbing, as it indicated being in the process of getting help.

The dialogue tool

The interviews identified multiple themes related to the dialogue tool, which were grouped into two main categories: the importance of a safe and confidential space, and perceptions of being asked about BE behaviors.

All participants emphasized the importance of a safe and confidential space at their GP's office for discussing sensitive issues like BE behaviors. Two main sub-themes emerged as essential for establishing such a space: the importance of seeking consent and the presence of parents when GPs initiate conversations about eating behaviors. Regarding the first sub-theme, most participants expressed a preference for GPs to seek consent before initiating discussions about eating behaviors. Several noted that requesting permission would make it easier to decline the conversation if desired, rather than having to interrupt one that was initiated without consent. This was despite the fact that most felt the request was partly rhetorical, making it difficult to genuinely say no:

> *"It would be good [if the doctor asks for permission]. [But] I think maybe it would be a bit difficult. It's a doctor talking to you, so you can't really say no. [But] it's always good to ask. Even though you know it's a false kind of choice, it's still nice that it's there somehow."*
> *— Participant #7, 16 years old, female, without BED.*

Regarding the second sub-theme, participants expressed varied preferences concerning the presence of parents during discussions initiated by GPs about eating behaviors. The majority preferred to have these conversations without their parents present, citing anticipated discomfort and challenges in providing honest answers in their presence. One participant, who had a history of eating-related issues other than BED, recounted a consultation in which a parent was present. In this instance, the GP failed to establish a safe and confidential environment, leaving the participant unable to speak openly. Consequently, she felt compelled to conceal the truth and provide inaccurate responses. Overall, participants emphasized the importance of receiving prior notice, enabling their parents to leave the room if needed:

> *"I think the doctor should give a brief introduction. Give a kind of warning that you're going to talk about food and your relationship with food […] Because as a young person, you're usually sitting in the doctor's office with your parents, and maybe also say that you can have your parents step out of the room if you feel you need that."*
> *— Participant #2, 16 years old, female, diagnosed with BED.*

An important consideration mentioned by all participants was their inability to ask their parents to leave the room, emphasizing a preference for GPs to take on this responsibility:

> *"You definitely shouldn't ask the young person if the parents should be present while the parents are in the room! Because then you'd be a bit… You'd look at the parents, and they would clearly influence your choice."*
> *— Participant #7, 16 years old, female, without BED.*

The second category of themes related to participants' perceptions of being asked about BE behaviors, and they generally responded positively to the suggested phrases for GPs to use when initiating conversations about eating behaviors. Participants felt the wording reflected genuine concern and created a comfortable setting for discussion. While most did not find the language intrusive, some noted that the initial phrasing was direct and could potentially cause discomfort and they highlighted the importance of obtaining consent to ensure patients do not feel anxious or cornered, as mentioned above.

Regarding the second phrasing, which introduced the screening tool, all participants appreciated the reassurance provided by the GP. One participant covered all relevant comments in the answer:

> *"I think it's fine […] that it says that the doctor will, of course, just do their best to help […] [And] it's always good to have it confirmed that there are no right or wrong answers and that regardless of the answers you give, it doesn't necessarily mean there's something wrong."*
> *— Participant #1, 17 years old, female, diagnosed with BED.*

These factors contributed to a sense of safety, and one participant suggested that this sense of safety could be further strengthened if GPs explicitly stated their commitment to remain engaged until appropriate support was secured. However, a linguistic challenge emerged during the interview process, requiring a semantic adjustment to improve the usability and acceptability of the second phrase. The original phrasing, "[…] ask you a few questions about your eating," caused confusion among most participants, who did not understand it referred to a questionnaire. During the validation process, the wording was revised to "[…] I will ask you to complete a short questionnaire about your eating habits". The remaining participants evaluated both versions and found the revised phrasing clearer and easier to understand.

All participants understood the final practical phrasing and appreciated the step-by-step guide outlining the subsequent steps. However, some participants raised concerns about whether the screening tool link, if provided electronically, would be sent to them or their parents. Due to this uncertainty, several participants expressed a preference for receiving the screening tool in paper format to complete and return at the next consultation.

The three supplementary questions in the dialogue tool were also evaluated. Participants generally found these questions to be more private and intrusive than the suggested phrases, as they directly addressed personal BE behaviors. Participants with BED specifically noted the first question, "Can you give me an example of what a typical binge-eating episode looks like for you?" as both direct and potentially uncomfortable, yet essential to ask. They highlighted the need for GPs to provide a clear explanation of the supplementary questions, their purpose, and to seek consent before proceeding. Initially, the phrasing was: "Can you give me an example of what a typical binge-eating episode looks like?". However; this wording caused confusion, as most participants did not realize it referred to their own experiences rather than BE in general. To address this, the phrase "for you" was added for clarity.

The second supplementary question, "Can you describe how you experience losing control over eating?" was noted by participants with BED as important but difficult to answer, as the concept of LOC can be challenging to explain:

> *"It might be a bit difficult to explain. Because it's not always easy to put into words how your feelings are and how you feel this loss of control."*
> *— Participant #2, 16 years old, female, diagnosed with BED.*

Furthermore, participants without BED anticipated that this question might be particularly uncomfortable and challenging to answer for individuals with BED, as they assumed that LOC was the most shameful aspect of the disorder.

The third supplementary question regarding compensatory behaviors, "Do you compensate for your binge eating, for example, by vomiting, fasting, or excessive exercise?" received mixed responses. Overall, both participants with and without BED considered the question important, but potentially uncomfortable. Notably, the participant with a history of eating-related issues other than BED mentioned that she began vomiting regularly after her GP asked her about this behavior, which made her aware of vomiting as a strategy for weight loss:

> *"One should definitely be cautious with examples because (…) I was asked if I was throwing up. And at that time, I wasn't throwing up, but it gave me the idea to throw up, so I started throwing up."*
> *— Participant #3, 18 years old, female, without BED.*

Approximately half struggled with the term "compensate"; however, supplementary explanations provided during the interviews were met with positive feedback. Many suggested alternative phrasings, such as "Do you make up for your eating" or "Do you do anything to counteract after overeating," as helpful clarifications. However, the wording was not changed, as the research group considered these questions too vague to effectively clarify the diagnostics of BED.

Discussion

This study aimed to develop, pilot test, and validate the STOB screening tool for the early detection of BED in children and adolescents aged 13–18 in primary care settings using a qualitative face validity approach. Additionally, the study explored the perceived acceptability of a supplementary dialogue tool designed to assist GPs in discussing BE behaviors with children and adolescents.

In this study, 16.7% of survey respondents met the screening tool's threshold for possible BED, and 4.8% of the total sample scored positive on all questions, further increasing the suspicion of BED. These findings align with current prevalence rates [5, 6] and with results from a Danish community sample, where 16% of 16-year-old adolescents reported OE at least once per week, 9% reported LOC eating weekly, and 18% reported occasional LOC eating [7]. A meta-analysis of BED in adolescents found that up to 16% met the criteria for BED, while up to 18% met the criteria for subclinical BED [6]. Previous studies show varying accuracy in self-reported BE prevalence within BED samples, with tendencies for both underestimation and overestimation compared to diagnostic interviews [37–39]. These discrepancies highlight the need for further validation of the STOB tool, ideally through comparisons with diagnostic interviews to assess sensitivity and specificity across broader adolescent populations. However, due to the anonymity of the survey, follow-up interviews were not possible in this study.

The survey results from this study indicated that participants generally found the screening tool's language clear, its questions easy to understand, and its format simple to complete independently. The interviews provided nuance, revealing age-related differences in the perception of language and preferences for text length. Additionally, differences emerged between participants with and without BED in their understanding of the content of

the screening questions, with participants without BED expressing more concern and speculation about potential issues related to the questions compared to those with BED. In general, the use of metaphors and examples was appreciated, clarifying key aspects of BED. Importantly, no participants reported discomfort or found the screening tool's language intrusive. While the overall understanding of the screening questions was acceptable, some linguistic challenges were noted, and minor semantic adjustments improved clarity and accessibility. However, participants without BED struggled to distinguish between OE without LOC and BE, a challenge previously linked to limited public familiarity with the BE concepts, complicating differentiation between OE, BE, and LOC [6, 39]. Additional difficulties were noted in distinguishing between OBE and SBE. Participants found SBE to be more ambiguous, aligning with previous findings that SBE is also difficult to recall [40]. Inspiration from the YEDE-Q [24], which incorporates visual aids such as images and vignettes to illustrate objectively large amounts of food and LOC episodes [41], could potentially improve understanding of SBE. Incorporating similar visual elements into the STOB tool may enhance its usability and reduce misunderstandings [3, 6, 24].

Participants reported difficulties recalling BE episodes over a three-month period and suggested shortening the recall period to one month. Challenges in recalling events over time have been found to be more pronounced in children and adolescents [42], and previous studies have recommended aids, such as using a diary, to improve event recall [43]. This aligns with findings from the present study, where one participant suggested using a calendar to prompt her memory. According to diagnostic criteria in both the DSM-5 and ICD manuals, a three-month recall period is standard [1, 44]. However, ICD-11 allows a one-month timeframe if multiple weekly BE episodes occur alongside significant distress [1]. Adapting a shorter recall period for children and adolescents could simplify screening. However, fluctuations in eating behaviors may result in missed cases if only a one-month time period is used, as BE is relatively sensitive to changes in eating patterns, stress, and emotional fluctuations [3, 45].

Combined, these issues highlight the importance of ensuring that key terms and concepts are well understood by the target population. Therefore, while the STOB tool is a valuable resource, it cannot stand alone. As a self-administered questionnaire, adequate guidance is essential. Preferable, GPs should support the screening process with the dialogue tool to ensure participants understand BED before completing the questionnaire. This combined approach enhances the tool's reliability and clinical applicability.

Regarding the dialogue tool, participants generally responded positively to the phrases suggested for GPs discussing BE behaviors with children and adolescents. This aligns with previous findings that non-judgmental and empathetic communication from primary care providers is perceived as helpful by patients managing BED and type 2 diabetes [19, 46]. However, seeking consent before initiating the discussion, as well as ensuring a safe and confidential space for such conversations, was deemed crucial. Preferences regarding parental presence varied, potentially influenced by feelings of shame and the natural transition to adulthood. These findings align with a previous study examining adolescents' perspectives on ED screening in type 1 diabetes, emphasizing the importance of ensuring a safe space and respecting confidentiality [47]. Thus, GPs must balance confidentiality with potential parental involvement during initial consultations, screening, and follow-up [47].

The supplementary questions in the dialogue tool were perceived as more private and intrusive, especially those addressing personal experiences with BE and compensatory behaviors. Therefore, such questions should be introduced cautiously, with opportunities for follow-up dialogue to prevent inadvertently distress in young individuals. GPs are advised to allocate sufficient time for follow-up consultations to address these sensitive topics appropriately.

Strengths and limitations

The significance of this study lies in its contribution to systematic early screening for BED in primary care, facilitating earlier diagnosis and treatment for children and adolescents. Combining survey data with semi-structured interviews provided rich insights into children's and adolescents' perspectives on the screening and dialogue tools. Including adolescents with and without BED across the target age group contributed valuable feedback, ultimately improving the tool's terminology. However, a number of limitations should be noted. STOB is a new tool and still needs to go through an exhaustive series of testing to determine and ensure both validity and reliability. For instance, the small sample size of this study may limit the generalizability and thus the tool needs to be tested in larger populations. Relevant tests to assess sensitivity and specificity in the tool could include determining test-retest reliability as well as assessing BED in the study participants, using a previously validated diagnostic tool. Further, no 13-year-old participants were included, despite the target age range of 13–18 years, and the tool needs to be tested further on all of these age groups. In order to be a screening instrument for primary care, it should also be validated against a diagnostic tool in a primary care setting. The present study has primarily focused on whether the tool

and its terminology were well understood by the chosen age group (13–18 year olds) and only to a minor extent adolescents with BED. Further validation of the screening tool would greatly benefit from focusing on the latter group, and whether the tool captures the constructs of interest as experienced by this population The validation occurred in a research setting, meaning the tools have yet to be tested in clinical practice. A possible limitation of the dialogue tool is whether or not GP's will make use of it in a busy clinical workday. However, we have sought to make the dialogue tool as short and to the point as possible to increase probability of use, and 5 GPs commented on instrument in the developmental phase.

In line with these limitations, future research is encouraged to build on the present findings and further validate the STOB tool. This should ideally involve testing with larger and more diverse populations, in clinical practice, and comparing results with diagnostic interviews. Despite the need for further validation, the STOB tool exhibited good face validity and shows promise for implementation in both primary care and research settings.

Conclusion

This study details the development, pilot testing, and face validation of the STOB screening tool, designed for the early detection of BED in children and adolescents within primary care settings. Undetected and untreated, BED poses significant risks to overall health and well-being, highlighting the critical need for increased awareness of the disorder and the importance of a screening tool designed specifically for daily clinical practice. Based on the findings, the STOB screening tool demonstrates good face validity and potential for implementation in primary care, particularly when accompanied by the supplementary dialogue tool. This study emphasizes the importance of evaluating self-report questionnaires in terms of terminology and acceptability within the target population. Further validation is recommended, ideally through comparisons with diagnostic interviews to assess sensitivity and specificity of the tool across broader adolescent populations.

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions
SM was responsible for the conceptualization, study design, data collection, analysis, and drafting of the original manuscript. PA contributed to the conceptualization, study design, data analysis, and participated in reviewing and editing of the manuscript. LC contributed to the study design, provided consultation, and participated in reviewing and editing of the manuscript. JMB contributed to the study design, provided consultation, and participated in reviewing and editing of the manuscript. All authors have read and ap-proved the final manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
This study protocol was approved by the local Committee of Ethics (Region Midtjylland, approval no. 1-10-72-124-22) and was registered in the Central Research Registry of Central Denmark Region (registration no. 783507). Written informed consent for participation in this study was obtained from participants over 15 in accord with Danish regulations. For participants under 15, written parental consent was obtained.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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