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Why we eat: Development and validation of a 7-factor Motivations for Eating Profile (MEP-7)

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ABSTRACT

Understanding why people eat is crucial for the prevention and management of overeating and obesity, but existing psychometric tools typically assess a narrow set of motivational constructs. The current study developed a comprehensive, theory-driven questionnaire from a recently validated framework of eating behaviour traits derived from 18 existing eating behaviour scales and evaluated its psychometric properties and external validity. Study 1 used a structured review panel of n = 30 adults and applied item response theory to a survey of n = 1279 adults, to select items from widely used eating behaviour scales and novel items for 'pleasure' and 'health'. Study 2 surveyed a UK-representative adult sample (1042 females, 968 males) to perform exploratory (n = 1005) and confirmatory (n = 1005) factor analyses. Internal consistency, measurement invariance, and associations between latent motives and body mass index (BMI), self-reported weight change, lifetime weight loss attempts, eating rate and physical activity were examined. Exploratory and confirmatory factor analyses revealed a seven-factor, 28-item model (reactive eating, restricted eating, negative emotional eating, positive emotional eating, homeostatic eating, eating for pleasure and eating for health) with good model fit (CFI = 0.993, SRMR = 0.045, RMSEA = 0.046) and good to excellent reliability (ωT = 0.77–0.93). Scalar invariance by sex, age, and education was supported. Latent motives showed theoretically consistent associations with external outcomes: higher reactive and negative emotional eating related to higher BMI and faster eating rate; homeostatic and health motives related to lower BMI and higher physical activity. The 7-Factor Motivation for Eating Profile (MEP-7) provides a brief, psychometrically robust profile of seven eating behaviour motivations with evidence of predictive validity. The MEP-7 supports research and clinical phenotyping and may inform behaviour change strategies for weight management.

1. Introduction

Eating serves multiple purposes. Beyond meeting the body's nutritional needs, it is deeply embedded in many aspects of life including socialising, health, leisure and culture (Poulain, 2017; Warde, 2016). Today's food environment is marked by an abundance of energy-dense, highly palatable foods and is widely considered a major driver of the prevalence of obesity worldwide (Romieu et al., 2017). Rising obesity rates are a pressing public health concern, associated with reduced quality of life and increased risk of noncommunicable diseases (Agha & Agha, 2017). Central to these issues are the motivations that shape eating behaviour, determining not only what and how much people eat, but also why they may overeat. A better understanding of these motivations is essential not only for promoting healthier eating patterns and supporting effective weight management, but also for shaping social behaviour more broadly, including personalised interventions, improving adherence to lifestyle changes, and guiding public health strategies.

Research has consistently suggested that food intake can be guided by internal homeostatic hunger cues, but also that individuals can have a hedonic drive to eat even when they do not have a "physiological need" (Blundell & Finlayson, 2004; Tuomisto et al., 2024). Indeed, approaches to obesity distinguish between physical hunger (reflecting a biological need) and psychological hunger (Lowe & Levine, 2005). There is a large evidence base that eating can be driven by these psychological factors including eating as a coping mechanism (Popkess-Vawter et al., 1998), eating driven by external cues such as the presence of others or sensory aspects e.g. the smell of food (Tuomisto et al., 1994), using food as a

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reward or punishment which can become automatic and habitual (Sutton et al., 2022), and eating to soothe or avoid negative emotions (Lowe & Levine, 2005). Motivations for eating are central to the development and maintenance of eating behaviours, including those that promote excess intake and weight gain. In a qualitative evaluation of a lifestyle intervention for weight reduction, most participants (14 of 15) reported that emotions and factors other than hunger shaped their eating, whereas the sole participant who attributed eating exclusively to hunger achieved the greatest weight loss at two-year follow-up (Adolfsson et al., 2002). Although based on a small sample, this pattern underscores the relevance of non-homeostatic drivers of intake and suggests that, if unaddressed, eating for reasons beyond hunger may impede sustained weight management.

Since the 1950's, researchers have developed theoretical models and associated constructs to explain factors that motivate eating behaviour and facilitate overeating. These constructs termed 'eating behaviour traits' (EBT), refer to individual differences in eating-related tendencies that are often measured using psychometric questionnaires designed to capture motivational tendencies towards eating, as opposed to state measures that assess short-term or momentary eating-related experiences (Dakin et al., 2024a). Many of these EBTs have been associated with overeating and obesity (Dakin, Beaulieu, et al., 2023; French et al., 2012) and are widely used in research to quantify individual differences in eating behaviour and predict weight-related outcomes. For example, higher levels of trait disinhibition have been associated with a higher BMI and less healthful food choices (Bryant et al., 2008). These measures also enable more personalised weight management strategies by tailoring interventions to a person's specific eating motivations e.g. (Cifuentes et al., 2023; Mason et al., 2016; Sherwood et al., 2016). For example Cifuentes et al. (2023) assigned individuals with emotional eating to intensive behavioural therapy, whereas those characterised by impaired satiety responsiveness received dietary strategies targeting portion volume, meal timing, or protein supplementation. The phenotype-tailored intervention led to greater weight loss than a standard lifestyle intervention, demonstrating the potential utility of tailoring interventions to an individual's eating motivations. Indeed, tailoring interventions for weight loss has been shown to have a small but beneficial effect on weight loss (Ryan et al., 2019).

Whilst recognition of the psychological reasons for eating is not new, a consistent limitation across the literature has been the absence of an overarching framework that can integrate the wide array of theories and constructs used to explain why people eat (Dakin et al., 2024a; Popkess-Vawter et al., 1998; Vainik et al., 2015). As a result, numerous questionnaires have been developed to assess supposedly distinct eating behaviour traits; yet many of these traits show substantial conceptual overlap. This overlap has created uncertainty about what each construct truly measures, obscuring our understanding of how EBTs relate to overeating and obesity (Vainik et al., 2015). The Three-Factor Eating Questionnaire (TFEQ) (Stunkard & Messick, 1985) was originally developed to measure restraint, disinhibition, and susceptibility to hunger. However, subsequent research has questioned the factor structure of this questionnaire, particularly regarding the latter two constructs. For example, factor-analytic work in large independent samples has shown that most disinhibition and susceptibility to hunger items load onto a single higher-order factor reflecting uncontrolled or reactive eating (Dakin et al., 2024b, 2024c; Karlsson et al., 2000). Additionally, two studies identified a separate factor relating to emotional eating items (Dakin et al., 2024b; Karlsson et al., 2000).

More broadly, many widely used eating behaviour questionnaires were developed to measure specific motivational constructs and typically assess one or two dimensions of motivation to eat. While this specificity is useful in focused research questions, it presents a challenge when researchers wish to examine broader motivations for eating. In these cases, researchers often rely on administering multiple questionnaires to capture different dimensions of eating behaviour, which increases participant burden, assessment time and put data quality at risk due to respondent fatigue. This is especially true in studies where eating behaviour is not the primary outcome.

To address this gap, we developed an integrated framework of eating behaviour traits (EBTs) designed to bring greater conceptual clarity to the field (Dakin et al., 2024a). Rather than proposing additional constructs, the framework synthesises converging evidence from widely used, validated questionnaires, e.g. (Gormally et al., 1982; Hunot et al., 2016; Kliemann et al., 2016; Lowe et al., 2009; Stunkard & Messick, 1985; Sultson et al., 2017; Tylka, 2006; Van Strien et al., 1986); established psychological theory (e.g. dual-process models (Strack & Deutsch, 2004), externality theory (Schachter, 1967), restraint theory (Herman & Mack, 1975), and behavioural susceptibility theory (Llewellyn & Wardle, 2015)); the physiology of eating behaviour (Blundell et al., 2001, 2020; Speakman, 2014; Stubbs et al., 2004; Stubbs & Turicchi, 2021; Watts et al., 2022) and neurobiological accounts (Berthoud, 2011; Berthoud & Morrison, 2008; Kringelbach, 2004; Kringelbach et al., 2012).

Using this framework and including 18 EBTs from 8 questionnaires, we previously identified four broad domains (reactive, restricted, emotional and homeostatic eating), which significantly predicted self-reported BMI and weight change (Dakin et al., 2024c). However, that analysis was limited by the measures available, which were weighted towards reactive and emotional eating constructs. Additionally, our sum-score approach retained each questionnaire in its original form, and several constructs showed cross-loadings across multiple domains. To address these limitations, we next adopted an item-level approach which deconstructed the scales to determine which items contributed to which latent factors (Dakin et al., 2024b). We compared data-driven and theory-driven solutions, including two hypothesised but previously untested factors (positive emotional eating and eating for pleasure). Both approaches converged on a 6-factor model, however, there was discrepancy over whether the 6th factor reflected eating for pleasure or eating for health. Overall, the findings suggested 6-7 core dimensions of motivations to eat that capture the underlying structure of EBTs: reactive eating, negative emotional eating, positive emotional eating, restricted eating, homeostatic eating, eating for pleasure and eating for health. The framework has since been validated in both general population and weight management samples, where it predicts BMI and weight change (Dakin et al., 2024b, 2024c).

In the present study, we aimed to develop and validate a concise theory-driven questionnaire, the 7-Factor Motivations for Eating Profile (MEP-7) that is directly derived from our seven-factor framework of EBTs, for use in research and clinical practice to systematically assess motivations to eat. The paper reports two studies. In Study 1, we used item response theory and input from expert panellists, weight management researchers and the general population, to select and refine items for the MEP-7 from our existing dataset (Dakin et al., 2024c); In Study 2, we validated the MEP-7 in a UK representative sample of UK adults and evaluated its predictive validity against external outcomes.

2. Methods

2.1. Overall design

We developed the 7-Factor Motivations for Eating Profile (MEP-7) in two stages. Study 1 constructed an initial item pool using items from the large exploratory and confirmatory datasets analysed by Dakin et al. (2024c) and analysed and reduced the number of items using item-response theory (IRT). The reduced pool of items, with additional eating for pleasure items was then reviewed by a panel of academic experts, weight management researchers and the general population. The results from the IRT analysis and review panel were used to select items for the MEP-7. Study 2 validated the final 28-item scale in a representative sample of UK adults with factor-analytic, reliability, invariance and predictive-validity tests.

2.2. Study 1 item pool, review and reduction

The Study 1 item pool came from a dataset of eating behaviour traits in 1677 commercial weight management dieters (WM, n = 1276) and members of the general public (GP, n = 384) (Dakin et al., 2024c). This dataset was used because it contains more EBT questionnaires than our more recent dataset (Dakin et al., 2024b). Recruitment procedures, sampling frames and descriptive characteristics are detailed in Dakin et al. (2024c). Briefly, there were no significant differences in gender, but the WM sample was older and had higher BMI on average than the GP sample. Exclusion criteria in both samples were pregnancy/-breastfeeding in the prior six months, prior eating-disorder history, weight-loss surgery, medical conditions affecting body weight/appetite, and insufficient English proficiency. Informed written consent was obtained before the participants completed the online survey (reference number: PSYC-338/904). More detailed information on this study is available in the previous paper (see Dakin et al., 2024c).

2.3. Questionnaires

Questionnaires included in Study 1 were selected to maximise coverage of widely used, validated questionnaires assessing general motivational tendencies toward eating or not eating in non-clinical populations, consistent with the aim of developing an integrative framework of eating behaviour traits. Measures that assess food-category-specific motivations for eating, disordered eating or food addiction diagnostic frameworks were not included, as these were beyond the conceptual scope of the MEP-7. Eight questionnaires measuring 18 eating behaviour constructs relating to motivation to eat were included in Study 1 (see Dakin et al. (2024c):

- Three-Factor Eating Questionnaire (TFEQ) subscales (Stunkard & Messick, 1985): restraint (21 items, α = 0.63), disinhibition (16 items, α = 0.84), susceptibility to hunger (14 items, α = 0.86).
- Intuitive Eating Scale-2 (IES-2) subscales (Tylka & Kroon Van Diest, 2013): reliance on hunger & satiety cues (6 items; α = 0.85); eating for physical rather than emotional reasons (8 items; α = 0.92); unconditional permission to eat (6 items; α = 0.52); body–food choice congruence (3 items; α = 0.86).
- Dutch Eating Behaviour Questionnaire (DEBQ) subscales (Van Strien et al., 1986): external eating (10 items, α = 0.88); restraint (10 items, α = 0.80).
- Adult Eating Behaviour Questionnaire (AEBQ) subscales (Hunot et al., 2016): satiety responsiveness (4 items, α = 0.63); emotional undereating (5 items, α = 0.92); emotional overeating (5 items, α = 0.90), food responsiveness (4 items, α = 0.77).
- Power of Food Scale (PFS) (Lowe et al., 2009): 15 items, α = 0.92.
- Positive and Negative Emotional Eating Scale (PNEES) subscales (Sultson et al., 2017): positive emotional eating (7 items, α = 0.76); negative emotional eating (12 items, α = 0.94).
- Self-regulation of Eating Behaviour Questionnaire (SREBQ) (Kliemann et al., 2016): 5 items, α = 0.79.
- Binge Eating Scale (BES) (Gormally et al., 1982): 16 items, α = 0.90.

Before factor analyses in Dakin et al. (2024c), items were screened to ensure each item measured a defined EBT that reflected a motivation for eating or not eating, had been formally validated and cited, and not a diagnostic instrument for eating disorders. Items not meeting these criteria were removed. In this context, the Binge Eating Scale (BES) was treated as a dimensional measure of loss of control and extreme overeating behaviour, rather than as a diagnostic screening instrument (Dalton & Finlayson, 2014). The BES was included at the questionnaire level to maximise coverage of eating behaviour traits in Dakin et al. (2024c). However, its items were not retained in subsequent item-level analyses and therefore did not contribute to the development of the MEP-7. This screening process also allowed items to be re-mapped to the most conceptually appropriate domains, forming a 6-factor theoretical model encompassing reactive, negative emotional, positive emotional, restricted, homeostatic and eating for health. The Dakin et al. (2024c) dataset did not include any eating for pleasure items, therefore, only a 6-factor model was analysed at this stage.

2.4. Procedure

Participants completed online the study information and informed consent, demographics, then eating-behaviour questionnaires. Questionnaire blocks and item orders were randomised/counterbalanced; a debrief and contact details were provided at the end. WM participants were entered into a voucher draw.

2.5. Data analysis

All analyses were conducted in R version 4.1.1. At this stage, 129 items measuring 6 domains of motivation to eat (reactive eating, negative emotional eating, positive emotional eating, restricted eating, homeostatic eating, and eating for health), were analysed. Item Response Theory (IRT) is a collection of modelling techniques used to analyse item level data (Edelen & Reeve, 2007), including a detailed analysis of responses and identifying items that are effective at discriminating between individuals who have a high level of a certain trait and those who have a lower level of that trait (Asgeirsdottir et al., 2016; Reise & Henson, 2003). IRT methods are increasingly being used to reduce and refine questionnaires (Edelen & Reeve, 2007; Xia et al., 2019). Using IRT-based methods, items in the current study were reduced and were ranked and assessed in combination with the review panel results to select 4 items per factor for use in Study 2.

2.6. Review panel

After full item pool was reduced using IRT, the remaining items were reviewed by 30 individuals from the general population (n = 10), researchers in a weight management program (n = 12) and academics (n = 8). New items were then created to measure eating for pleasure because analyses of the later dataset (Dakin et al., 2024b) indicated that three of the four pleasure items were not distinct from reactive eating. In addition, one new item was developed to assess eating for health, ensuring that four items were available for review within this domain.

The purpose of the review panel was to gather opinions on which items accurately reflected the 7 domains of motivations for eating. Items were included that measured the 7 domains of motivation to eat. Ethical approval for the review panel was granted from the School of Psychology Research Ethics Committee at the University of Leeds (reference number: PSCETHS-1165, date approved: 26/09/2024).

Participants were asked to rate the extent to which each item reflect the proposed motivation to eat from 0 (does not reflect the eating behaviour) to 100 (perfectly reflects the eating behaviour). The following definitions were developed to be accessible not only to academic experts but also to the researchers and members of the general population who reviewed the items.

2.6.1. Reactive eating

Reactive eating refers to eating (often automatically) in response to external prompts and cues, rather than hunger. These prompts and cues can include environmental cues (e.g., the sight and smell of food), habits, impulses, cravings, and desires. Instead of eating because your body needs food, reactive eating happens because of prompts from something in your environment or feelings that motivate you to eat.

2.6.2. Negative emotional overeating

Eating in response to negative emotions like feeling sadness, guilt, shame, frustration, jealously, anger, fear or stress.

2.6.3. Positive emotional eating

Eating in response to positive emotions, such as joy, happiness, contentment, pride, amusement, love, inspiration.

2.6.4. Restricted eating

Restricted eating refers to deliberately controlling or limiting food and/or energy intake. It involves conscious attempts to ‘restrict’ or constrain energy intake, which could involve eating smaller portions, choosing certain foods to reduce calorie intake, and skipping meals to manage weight. This eating behaviour tends to be cognitively controlled and planned, as it focuses on limiting food intake to achieve a certain weight or body goal.

2.6.5. Homeostatic eating

This eating behaviour refers to eating based on your body's biological signals that indicate hunger and fullness such as symptoms or sensations that may relate to physiological events (hormone levels, nutrient availability, and metabolic demands that can act as cues for eating rather than emotional or environmental triggers. It involves an ability to be aware of and respond to internal cues, reflecting the body's physiological or biological needs. This type of eating behaviour is different from dieting or controlling food intake, as it focuses on in layman's terms “listening to what your body is telling you.”

2.6.6. Eating for pleasure

Eating for pleasure refers to the pleasurable sensations and experiences that motivate eating. This specifically involves food liking and enjoyment of eating foods.

2.6.7. Eating for health

Eating for health refers to making food choice decisions for health-related reasons. This involves making conscious decisions to choose foods that support overall physical well-being and provide essential nutrients that participants believe enables their body to function optimally.

2.7. Item response theory

First, a confirmatory factor analysis (CFA) was conducted for each of the 6 domains and the model fit was assessed. The CFAs were built using the ‘lavaan’ package (Rosseel, 2012) and diagonally weighted least square estimator was used because the responses had a largely non-normal distribution. Items with loadings higher than 0.45 were retained (Hair, 2009). This cut off is reasonable and allows the analyses to keep items that explain considerable variability and are strongly related to each domain of eating behaviour. Next, Cronbach's alpha (CA) of each domain was identified, and any item that reduced the overall CA was removed. Using the retained items, item response theory was used to analyse the models. The IRT models were built using the “mirt” package (Chalmers, 2012). The models were specified as unidimensional (all items load onto one domain). Where items are responded to on a Likert scale, the item type was specified as graded and where items are responded to as yes/no (for the TFEQ), separate models were built and specified as 2 PL and 3 PL, as recommended by Vispoel and Kim (2014). The 2 PL and 3 PL model were compared using an ANOVA to decide which model to use. If one model did not provide a significantly better fit, the 2 PL model was chosen (Vispoel & Kim, 2014).

The factor loadings (F1) are interpreted as the variance accounted for in an item by the latent trait. Items with higher loadings are more responsive to changes in the underlying construct they measure and contribute more to defining that construct than items with lower loadings (Bean & Bowen, 2021). The a-parameter is the discrimination or the slope of the lines. A higher a-value suggests that the item discriminates better between individuals of lower trait levels and individuals of higher trait levels (Reise & Henson, 2003). Lastly, the item information functions (IFFs) are a function of the standard error of the latent score estimate and are a measure of how much information an item provides about an individual's score for various levels of a trait (Xia et al., 2019). The F1 values, a-parameters and IFF's (see Fig. 1) were used to determine which items to retain for the review panel. Twenty items were retained for each domain. If a domain included less than 20 items, all items were retained. See supplementary materials S1 for the results of the IRT analyses.

2.8. Item selection

Items in each of the domains were ranked in descending order by their review panel score and the IRT F1 loadings and a-parameters (see supplementary materials S1). Based on recommendations by Maloney et al. (2011), 4 items were retained from each domain as this allows for an assessment of fit. The highest scoring 4 items based on the review panel score and IRT results were chosen. In a discussion with the research team (authors), if these 4 items were deemed to overlap conceptually, the next best item was chosen to allow for distinction between items.

Once the 28 items for the MEP-7 had been selected, original authors of the questionnaires contacted to seek permission to reproduce item wording where required. For some measures, permission to use the original item wording was either not granted or was limited to specific conditions (including the TFEQ and the DEBQ). In these cases, items were reworded to capture the same underlying constructs while avoiding verbatim reproduction of copyrighted material. All items included in the MEP-7 are therefore either used with permission or adapted to reflect the intended construct without reproducing original wording verbatim. Additionally, the design of the items from TEMS was adapted to align with the originally developed eating for pleasure items. Items that have been adapted are highlighted in Table 1.

3. Study 2 methods

3.1. Participants

We recruited N = 2010 UK adults via Prolific (Prolific, 2023), sampled to be representative by age, sex and ethnicity. Prolific is an online participant pool that is frequently used in social and behavioural research. The platform uses a closed, identity-verified panel rather than an open-access survey link. It includes an eligibility system with bank-grade identity verification, email and phone authentication, and IP validation and deduplication to reduce fraudulent or automated enrolment attempts. Studies have shown that Prolific is able to deliver attentive and reliable responses and that participants are more likely to pass attention checks, provide meaningful answers and follow instructions (Albert & Smilek, 2023; Douglas et al., 2023; Esch et al., 2025). Only verified human participants can access studies. Consistent with recommendations for first-line preventative safeguards in online data collection (Liem, 2025; Storozuk et al., 2020), access to the survey was restricted to Prolific users who met the study's screening criteria. Inclusion/exclusion mirrored the criteria used by Dakin et al. (2024c): adults (18+), sufficient English proficiency; exclusions for pregnancy/breastfeeding in the prior six months, prior eating-disorder diagnosis, weight-loss surgery, and medical conditions affecting body weight/appetite. Ethical approval was granted from the School of Psychology Research Ethics Committee at the University of Leeds (reference number: PSCETHS-1184, date approved: 07/11/2024). Participants were awarded with £9.50 per hour as fair compensation to reduce incentives for fraudulent responding.

3.2. Measures

3.2.1. Demographics

The following demographic information was collected: age, gender, ethnicity, education, height, weight, weight change over the previous 12

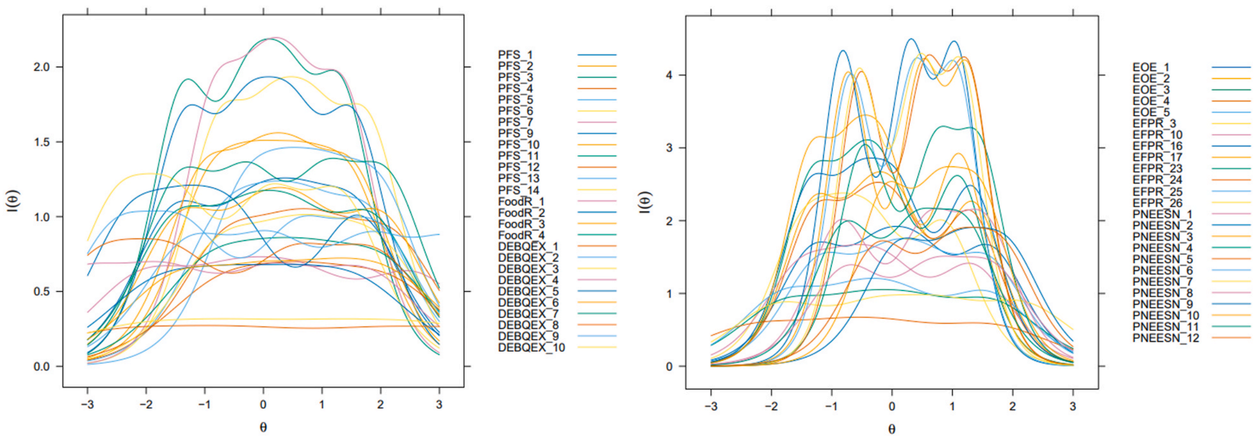

Fig. 1. Reactive eating, graded model, Item Information Curve (left). Negative emotional eating, Item Information Curve (right).

Table 1
Displays the 4 items selected per domain of motivation to eat, including the domain onto which the item loads, the average score, the factor loading and a-parameter values, and a reference for the item.

Item	Description	Factor	Average Score (Review Panel)	Factor Loading	*a*	Reference
Reactive_1	When I know a delicious food is available, I can't help myself from thinking about having some.	Reactive	83.68	0.84	2.60	PFS
Reactive_2	If I see or smell a food I like, I get a powerful urge to have some.	Reactive	78.87	0.79	2.21	PFS
Reactive_3	If I see other people eating, it makes me want to eat.*	Reactive	74.00	0.77	2.06	DEBQ
Reactive_4	The taste of food is sometimes so good, I continue eating even after I'm no longer hungry*	Reactive	73.36	0.83	2.51	TFEQ
Negative_1	I use food to help me soothe my negative emotions.	Negative	82.95	0.88	3.12	IES
Negative_2	I have a tendency to eat when I am sad.	Negative	75.27	0.92	3.98	PNEES
Negative_3	I eat more when I am upset.	Negative	73.64	0.88	3.21	AEBQ
Negative_4	Feeling tense or anxious drives me to eat.	Negative	71.45	0.92	4.00	PNEES
Positive_1	I tend to eat when I get excited about something.	Positive	76.57	0.86	2.85	PNEES
Positive_2	I have a desire to eat when I am joyful.	Positive	74.41	0.82	2.45	PNEES
Positive_3	Feeling confident drives me to eat.	Positive	69.57	0.87	3.04	PNEES
Positive_4	I feel like eating when I am content with myself.	Positive	68.91	0.82	2.44	PNEES
Restricted_1	I intentionally eat less to avoid gaining weight.*	Restricted	84.17	0.79	2.20	DEBQ
Restricted_2	I avoid eating between meals because I am watching my weight.*	Restricted	74.65	0.69	1.64	DEBQ
Restricted_3	I avoid some foods because they make me gain weight.*	Restricted	73.64	0.53	1.06	TFEQ
Restricted_4	I deliberately eat foods that help me lose weight.*	Restricted	67.91	0.49	0.95	DEBQ
Homeostatic_1	I trust my body to tell me how much to eat.	Homeostatic	84.82	0.89	3.28	IES
Homeostatic_2	I rely on my hunger signals to tell me when to eat.	Homeostatic	87.64	0.74	1.84	IES
Homeostatic_3	I trust my body to tell me when to stop eating.	Homeostatic	86.68	0.89	3.40	IES
Homeostatic_4	I rely on my fullness (satiety) signals to tell me when to stop eating.	Homeostatic	86.50	0.84	2.65	IES
Pleasure_2	I want to eat because I like the taste of foods.	Pleasure	85.61	N/A	N/A	Original
Pleasure_3	I want to eat because I enjoy it.*	Pleasure	84.35	N/A	N/A	TEMS
Pleasure_4	I want to eat because it is pleasurable to eat.	Pleasure	81.52	N/A	N/A	Original
Pleasure_1	I want to eat because I like the experience of eating foods.	Pleasure	80.26	N/A	N/A	Original
Health_4	I am primarily motivated to eat for health	Health	79.83	N/A	N/A	Original
Health_3	I eat foods that give my body energy and stamina.	Health	69.52	0.93	4.39	IES
Health_2	I eat foods that make my body perform efficiently (well).	Health	69.04	0.98	9.14	IES
Health_1	I desire to eat nutritious foods.	Health	67.00	0.73	1.80	IES

Note. Items with * have been adapted.

months, weight loss attempts, diabetes status, and weight loss medication/weight loss surgery information.

3.2.2. *MEP-7*

The 7-Factor Motivations for Eating Profile (MEP-7) consists of 28 items with 7 subscales that measure 7 dimensions of MTE (reactive eating, negative emotional overeating, positive emotional eating, restricted eating, homeostatic eating, eating for pleasure, and eating for health (see Table 1). Items are presented in a random order. All items are scored on a 5-point Likert scale (never, rarely, sometimes, often, always). No items were reverse scored, meaning higher scores are indicative of stronger endorsement a dimension of MTE. The subscale scores are constructed by averaging items within the subscale.

3.2.3. *Eating and lifestyle habits*

To gain a deeper insight into the participants eating and lifestyle habits, questions were asked about the following topics: the participant's state level of hunger ("how hungry do you feel right now?" answered on a 100 mm VAS scale), whether the participant is currently a member of a weight management programme, their perceived speed of eating ("how fast is your rate of eating?" answered on a 5 point Likert scale from 'very slow' to 'very fast'), how often they prepare food for themselves, and their level of physical activity (both answered on an 8 point Likert scale from 'never' to 'at least once a day').

3.3. *Procedure*

After online consent, participants completed demographics, eating and lifestyle items and the MEP-7. Items were presented in random order; debrief information and researcher contact details were provided at the end. To minimise invalid or automated responses, in-survey precautions were implemented as second-line defence. These included an attention check item where participants are asked to click the colour 'green' to demonstrate their attention, which is recommended as standard in online behavioural studies (Liem, 2025). We also monitored completion time, as improbable completion speeds have been identified as markers of bot activity (Thompson & Utz, 2025).

3.3.1. Data quality and screening procedure

As third-line defence (post-hoc detection), a set of screening procedures were applied to identify and remove fraudulent, automated, or low-quality completed responses. Following current guidance on bot detection in online research (Liem, 2025; Rodriguez & Oppenheimer, 2024), we used gatekeeping and post-hoc screening procedures. Prolific applied >50 identity and behavioural verification checks prior to and during study access, including liveness-verified identity, IP validation, and monitoring for automation-like behaviour. These platform-level checks have been found to provide comparatively high data quality relative to other online platforms (Douglas et al., 2023; Esch et al., 2025). Only participants who passed these platform-administered checks were able to enter the survey. After participants completed the survey, the responses were screened following recommendations for ensuring online data-quality (Liem, 2025; Storozuk et al., 2020). Twenty-five participants failed the attention checks. Five participants were excluded due to improbably fast completion time (defined as fewer than 15 min). Four participants were excluded due to nonsensical responses, which has been used an indicator of automated responding (Guy et al., 2024). Overall, 34 responses were excluded, leaving a final sample of 2010.

3.4. Data analysis

The full dataset for the online MEP-7 survey (N = 2010) was randomly split into two samples, to produce an exploratory factor analysis dataset (N = 1005) and a confirmatory factor analysis set (N = 1005). For EFA, we conducted parallel analysis to determine factors, then maximum-likelihood EFA (Fabrigar et al., 1999) with oblique rotation (direct oblimin) because factors were expected to correlate (Costello & Osborne, 2005), retaining items with loadings ≥0.32 and minimal cross-loadings (Tabachnick et al., 2013); we selected the solution with strongest fit (highest TLI, lowest RMSEA). For CFA we used DWLS on categorical indicators, allowed latent factors to correlate, handled missingness via pairwise deletion, and evaluated fit with SRMR (<0.08), CFI (>0.95) and RMSEA (<0.06) (Hu & Bentler, 1999). Reliability was estimated with McDonald's ω (Zinbarg et al., 2005)).

Measurement invariance testing was conducted to compare invariance across sex (male vs female) using the full sample (n = 2010). The full sample exceeded the minimum recommendation of 200 participants per group (Meade & Bauer, 2007). For all models, the chi-square model fit test and multiple additional fit indices were reported. To evaluate the overall factor model across groups (male vs female) as well as the configural, metric, and scalar models, the total model chi-square and the CFI, RMSEA and SRMR were reported. The next level of invariance was not supported if the higher-level model increased RMSEA by more than 0.015 or decreased CFI by more than 0.01 (Chen, 2007).

The full sample was used to predict outcomes including BMI, weight change across the previous 12 months, weight loss attempts within the participant's lifetime, state level hunger, self-perceived eating rate and self-perceived physical activity level. All outcome variables were treated as continuous and numerical. Analyses were conducted in R version 4.5.1. The following packages were used: 'lavvan,' (Rosseel, 2012), 'lavaanPlot,' (Lishinski, 2024), 'ggplot2,' (Wickham, 2016), 'dplyr,' (Wickham et al., 2022).

4. Results

4.1. Descriptives

Table 2 displays descriptives for the sample. The sample had a mean BMI of 27.2 kg/m^2, closely aligning with the average BMI of the UK population in 2021, which was 27.4 kg/m^2 (NHS, 2022). The sample also had a slightly higher education level with 58.5% of the sample achieving a Level 4 or above qualification compared to 48.4% of the UK

Table 2
Descriptives for the general population.

Variable	N = 2010
Mean Age (Years)	46 (15)
Sex	
Female	1042 (52%)
Male	968 (48%)
Mean BMI (Kg/M^2)	27.2 (6.2)
Weight Change Category	
No change in body weight	753 (37.5%)
Gained weight	678 (33.7%)
Lost weight	579 (28.8%)
Mean Weight Loss (Kg)	7.3 (5.9)
Mean Weight Gain (Kg)	5.6 (4.1)
Mean State Hunger	37 (26)
Education	
No qualifications	23 (1.1%)
Level 1/entry level (equivalent to 1-4 GCSEs)	120 (6.0%)
Level 2 (equivalent to 5 or more GSCEs)	247 (12.3%)
Apprenticeship	29 (1.4%)
Level 3 (equivalent to 2 or more A levels)	378 (18.8%)
Level 4 (equivalent to degree or higher degree)	1176 (58.5%)
Other	31 (1.5%)
Ethnicity	
Asian	160 (8.0%)
Black	67 (3.3%)
Mixed	35 (1.7%)
Other	34 (1.7%)
White	1714 (85%)
Employment Status	
Due To Start a New Job Within the Next Month	14 (0.7%)
Full-Time	774 (39%)
Not In Paid Work (e.g. Homemaker', 'Retired or Disabled)	332 (17%)
Other	66 (3.3%)
Part-Time	390 (19%)
Unemployed (And Job Seeking)	100 (5.0%)
Weight Loss Attempts	
Never	356 (18%)
1-2 Times	496 (25%)
3-5 Times	474 (24%)
6-10 Times	236 (12%)
More Than 10 Times	448 (22%)
Diabetes	
No	1888 (94%)
Unsure	10 (0.5%)
Yes - Type 1	15 (0.7%)
Yes - Type 2	97 (4.8%)
Weight Loss Surgery (yes)	6 (0.3%)
Weight Loss Medication (yes)	45 (2.2%)
Vegetarian (yes)	191 (9.5%)
Eating Rate	
Very Slow	26 (1.3%)
Relatively Slow	277 (14%)
Medium	828 (41%)
Relatively Fast	756 (38%)
Very Fast	123 (6.1%)
Weight Program	
None	1909 (95%)
Slimming World	25 (1.2%)
Weight Watchers	18 (0.9%)
Better Health (NHS)	11 (0.5%)
The Body Coach (Joe Wicks)	11 (0.5%)
Slimfast	7 (0.3%)
Private Health Coach/Nutritionist/Dietician	6 (0.3%)
Second Nature	2 (<0.1%)
Other	20 (1.0%)

population in 2023 (GOV.UK, 2023).

4.2. Parallel analysis and EFA

Global diagnostic indicators indicated strong factorability of the correlation matrix for the items in the EFA analysis dataset (Kaiser–Meyer Olkin = 0.90, Bartlett's test of sphericity $x^2 = 14455.21$, $p < 0.001$). Initial parallel analysis suggested that there were up to seven factors in the data. We therefore ran exploratory analysis exploring three to seven factor structures. The 3, 4, and 5 factor models were discounted because their fit indices were low, and they contained items that loaded onto other factors. In the six-factor model, several items failed to load (>0.32) onto any factor, indicating that the model did not adequately account for all items. In contrast, the seven-factor model demonstrated the best overall fit (see Table 3). No items were dropped from the model. Additionally, no items had a loading of >0.32 onto another factor. The seven factors were named ‘reactive eating,’ ‘negative emotional overeating,’ ‘positive emotional eating,’ ‘homeostatic eating,’ ‘restricted eating,’ ‘eating for pleasure,’ and ‘eating for health.’

4.3. Internal reliability

The seven subscales: reactive (ωT = 0.74), negative (ωT = 0.92), positive (ωT = 0.84), homeostatic (ωT = 0.83), restricted (ωT = 0.85), pleasure (ωT = 0.87), and health (ωT = 0.79) showed good internal reliability.

4.4. Confirmatory Factor Analysis (CFA)

The CFA on the second dataset demonstrated an excellent fit ($\chi^2(329) = 1118.707$, $p < 0.001$, SRMR = 0.047, CFI = 0.993, RMSEA = 0.049). Inspection of modification indices revealed a high residual covariance between Reactive_4 (“The taste of food is sometimes so good, I continue eating even after I'm no longer hungry”) and Homeostatic_3 (“I trust my body to tell me when to stop eating”) (MI = 79.382). We therefore, allowed the residuals of these items to correlate. The amended model showed a moderately improved fit ($\chi^2(328) = 1038.409$, $p < 0.001$, SRMR = 0.045, CFI = 0.993, RMSEA = 0.046). All factor loadings were significant and positive (βs > 0.601, see Fig. 2).

4.5. Measurement invariance

Based on the model fit of the seven-factor model, we deemed that there was evidence of a seven-factor structure of the 28-item MEP-7 to consider conducting measurement invariance tests. First the seven-factor model in the full sample was tested, which demonstrated good fit, $\chi^2(328) = 1953.920$, $p < 0.001$, CFI = 0.992, RMSEA = 0.050, SRMR = 0.045.

4.5.1. Measurement invariance across sex

The configural model demonstrated good fit, $\chi^2(656) = 2333.343$, $p < 0.001$, CFI = 0.992, RMSEA = 0.050, SRMR = 0.049, indicating that the factor structure was consistent across sex. The metric invariance model, which constrained factor loadings to be equal across sexes, also showed good fit, $\chi^2(677) = 2403.305$, $p < 0.001$, CFI = 0.992, RMSEA = 0.050, SRMR = 0.049. The changes in fit indices were negligible (ΔCFI = 0.000, ΔRMSEA = 0.000, ΔSRMR = 0.000) supporting metric invariance. The scalar invariance model, which additionally constrained item intercepts, yielded $\chi^2(754) = 2481.494$, $p < 0.001$, CFI = 0.992, RMSEA = 0.048, SRMR = 0.049. Changes in fit indices were negligible (ΔCFI = 0.000, ΔRMSEA = −0.002, ΔSRMR = 0.000) supporting scalar invariance, indicating that both the factor loadings and item thresholds are equivalent across sex.

4.5.2. Measurement invariance across age

Age was categorised into three groups reflecting established developmental stages of adulthood: young adulthood (20–40 years, n = 760), middle adulthood (41–60 years, n = 852), and late adulthood (61+ years, n = 398) (Augustus-Horvath & Tylka, 2011; Santrock, 2015). This approach was used to capture theoretically meaningful differences in life stage rather than relying on arbitrary statistical cutoffs. The configural invariance model demonstrated good fit, $\chi^2(984) = 2434.028$, CFI = 0.993, RMSEA = 0.047, SRMR = 0.050, indicating that the seven-factor structure was consistent across young, middle, and late

Table 3
Factor loadings.

Item	ML1	ML2	ML3	ML4	ML5	ML6	ML7	Common	Unique	Complex
Reactive_2							0.71	0.53	0.47	1.02
Reactive_3							0.61	0.46	0.55	1.15
Reactive_1							0.53	0.50	0.50	1.35
Reactive_4							0.33	0.47	0.53	2.88
Negative_2	0.93							0.83	0.17	1.00
Negative_3	0.92							0.81	0.19	1.01
Negative_4	0.81							0.68	0.32	1.01
Negative_1	0.78							0.72	0.28	1.03
Positive_2					0.78			0.64	0.36	1.02
Positive_3					0.75			0.52	0.49	1.02
Positive_1					0.65			0.57	0.43	1.14
Positive_4					0.64			0.46	0.54	1.07
Restricted_1			0.86					0.72	0.28	1.02
Restricted_2			0.78					0.59	0.42	1.04
Restricted_3			0.75					0.61	0.39	1.04
Restricted_4			0.73					0.62	0.39	1.06
Homeostatic_1				0.82				0.71	0.30	1.01
Homeostatic_3				0.81				0.72	0.28	1.03
Homeostatic_4				0.78				0.55	0.45	1.04
Homeostatic_2				0.59				0.34	0.66	1.03
Pleasure_3		0.85						0.69	0.32	1.02
Pleasure_4		0.83						0.72	0.28	1.00
Pleasure_2		0.74						0.62	0.38	1.04
Pleasure_1		0.73						0.59	0.41	1.03
Health_2						0.81		0.64	0.37	1.02
Health_3						0.72		0.53	0.47	1.03
Health_4						0.65		0.50	0.50	1.13
Health_1						0.64		0.48	0.52	1.10

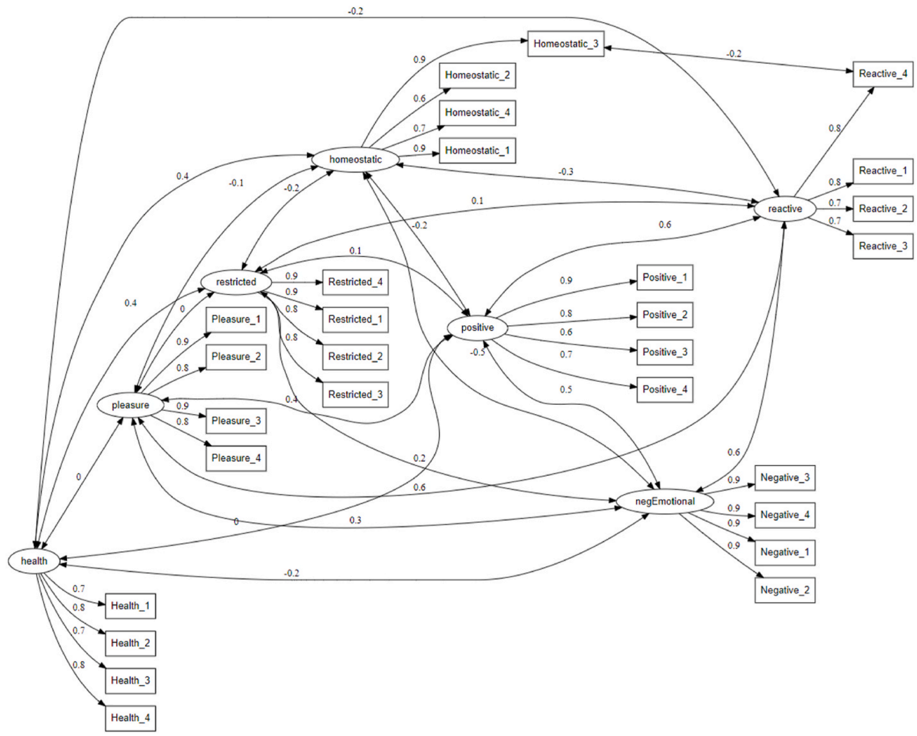

Fig. 2. Factor structure of the 7-Factor Motivations for Eating Profile (MEP-7).

adulthood groups. The metric invariance model also showed good fit, $\chi^2(1026) = 2537.286$, CFI = 0.993, RMSEA = 0.047, SRMR = 0.051. Changes in fit indices relative to the configural model were negligible (ΔCFI = 0.000, ΔRMSEA = 0.000, ΔSRMR = 0.001), supporting metric invariance. The scalar invariance model likewise demonstrated good fit, $\chi^2(1012) = 2537.286$, CFI = 0.993, RMSEA = 0.047, SRMR = 0.051. Changes in fit indices relative to the metric model were minimal (ΔCFI = 0.000, ΔRMSEA = 0.000, ΔSRMR = 0.000), supporting scalar invariance. These findings indicate that both factor loadings and item thresholds are equivalent across young, middle, and late adulthood.

4.5.3. *Measurement invariance across education*

Education was dichotomised into lower education (no qualifications to Level 2 or equivalent; n = 450) and higher education (Level 3 qualifications or above; n = 1554). Six participants did not provide information on their education and were therefore removed from the analysis. The configural invariance model demonstrated good fit, $\chi^2(656) = 2273.154$, CFI = 0.992, RMSEA = 0.050, SRMR = 0.048, indicating that the seven-factor structure was consistent across education groups. The metric invariance model, also showed good fit, $\chi^2(677) = 2335.092$, CFI = 0.992, RMSEA = 0.049, SRMR = 0.049. Changes in fit indices relative to the configural model were negligible (ΔCFI = 0.000, ΔRMSEA = −0.001, ΔSRMR = 0.001), supporting metric invariance. The scalar invariance model, yielded good fit, $\chi^2(670) = 2335.092$, CFI = 0.992, RMSEA = 0.050, SRMR = 0.049. Changes in fit indices relative to the metric model were again negligible (ΔCFI = 0.000, ΔRMSEA = 0.001, ΔSRMR = 0.000), supporting scalar invariance. These findings indicate that both the factor loadings and item thresholds of the MEP-7 are equivalent across lower and higher education groups.

4.6. *Predicting outcomes*

To examine the predictive utility of the seven-factor model, we combined all data (n = 2010) and extended the CFA by regressing outcomes (BMI, weight change, weight loss attempts, self-perceived eating rate, self-perceived physical activity level) onto all seven latent factors. A separate model was run for each outcome, where the outcome variable was allowed to correlate with each latent construct to assess the extent to which individual differences in the dimensions of MTE were associated with variations in BMI, weight change, weight loss attempts, eating rate, and physical activity level.

4.6.1. *BMI*

When the model was asked to predict BMI (χ^2 (349) = 1344.192, $p < 0.001$, SRMR = 0.042, CFI = 0.966, RMSEA = 0.038), all dimensions of MTE except for eating for pleasure were significantly associated with BMI (see Fig. 3).

4.6.2. *Weight change*

When the model was asked to predict weight change (χ^2 (349) = 1294.351, $p < 0.001$, SRMR = 0.042, CFI = 0.967, RMSEA = 0.037), only reactive eating was associated with weight gain and eating for health and restricted eating were associated with weight loss (see Fig. 4).

4.6.3. *Weight loss attempts*

When the model was asked to predict weight loss attempts (χ^2 (349) = 1302.792, $p < 0.001$, SRMR = 0.042, CFI = 0.968, RMSEA = 0.037), all dimensions of MTE were significantly associated with weight loss attempts (see Fig. 5).

4.6.4. *Self-reported eating rate*

When the model was asked to predict self-reported eating rate (χ^2 (350) = 1315.903, $p < 0.001$, SRMR = 0.042, CFI = 0.966, RMSEA = 0.037), reactive eating, eating for pleasure, negative and positive emotional eating were associated with a faster eating rate. Only homeostatic eating was associated with a slower eating rate (see Fig. 6).

4.6.5. *Self-reported physical activity*

When the model was asked to predict self-reported physical activity level (χ^2 (349) = 1303.202, $p < 0.001$, SRMR = 0.042, CFI = 0.967, RMSEA = 0.037), eating for health, restricted eating and homeostatic

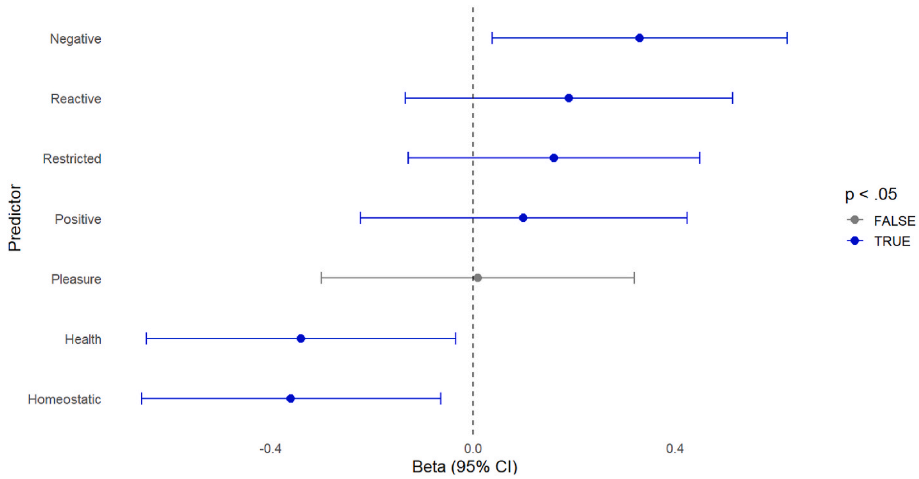

Fig. 3. Predictors of BMI with estimated regression coefficients (Beta) and 95% confidence intervals.
Note. Significant predictors ($p < 0.05$) are displayed in blue. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

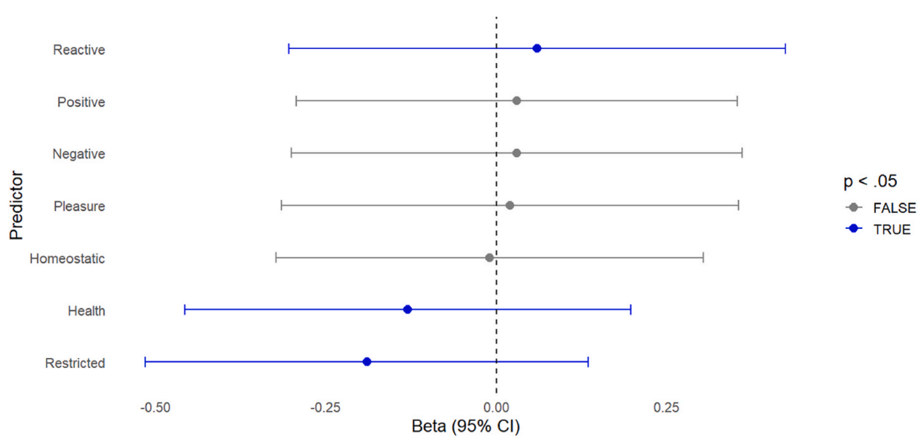

Fig. 4. Predictors of weight change with estimated regression coefficients (Beta) and 95% confidence intervals.
Note. Significant predictors ($p < 0.05$) are displayed in blue. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

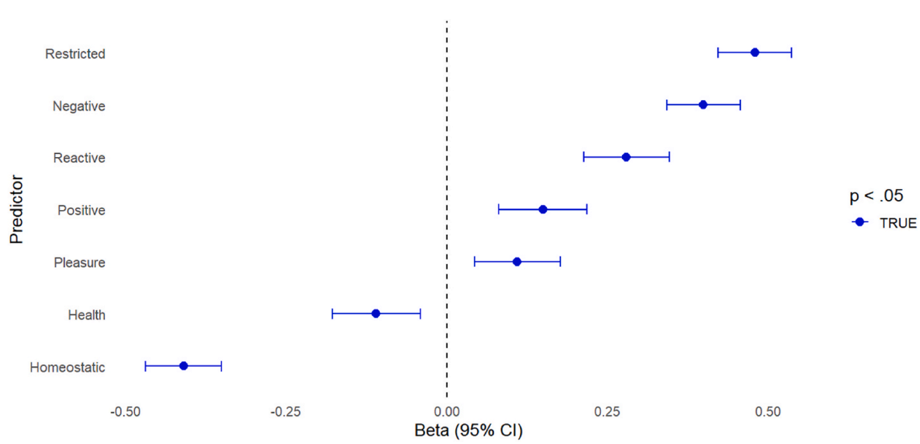

Fig. 5. Predictors of weight loss attempts with estimated regression coefficients (Beta) and 95% confidence intervals.
Note. Significant predictors ($p < 0.05$) are displayed in blue. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

eating were associated with higher levels of physical activity. Positive emotional eating, reactive eating and negative emotional eating were associated with lower levels of physical activity (see Fig. 7).

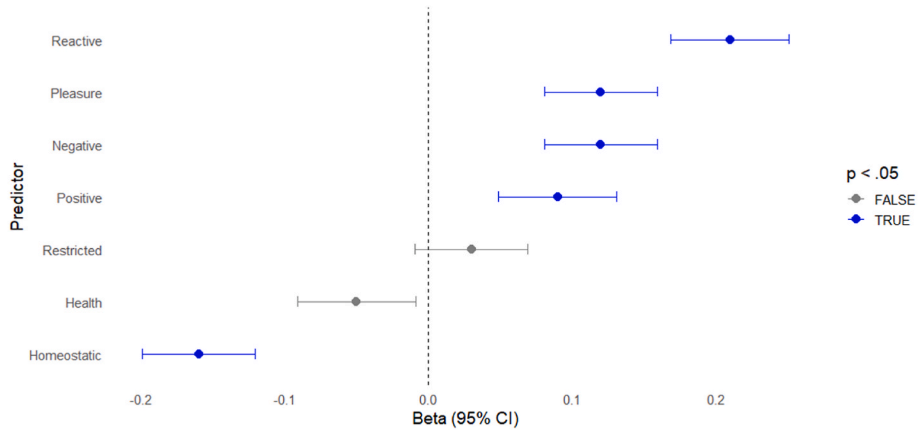

Fig. 6. Predictors of eating rate with estimated regression coefficients (Beta) and 95% confidence intervals.
Note. Significant predictors ($p < 0.05$) are displayed in blue. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

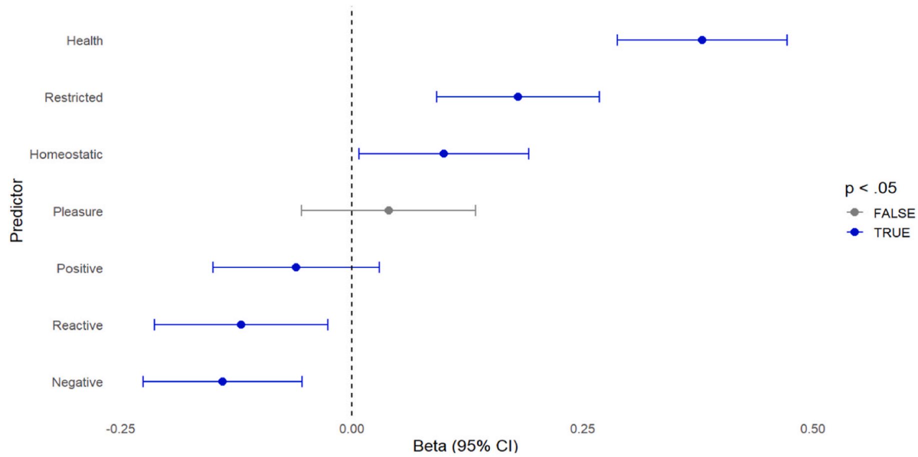

Fig. 7. Predictors of physical activity with estimated regression coefficients (Beta) and 95% confidence intervals.
Note. Significant predictors ($p < 0.05$) are displayed in blue. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

5. Discussion

The aim of this research was to develop an integrated framework of eating behaviour traits (EBTs) designed to bring greater conceptual clarity to the field (Dakin et al., 2024a) by integrating converging evidence from widely used, validated questionnaires. This resulted in seven distinct domains of EBTs and the development of the 7-Factor Motivations for Eating Profile (MEP-7), a theoretically grounded and psychometrically robust tool for assessing these dimensions of motivation to eat. While previous EBT questionnaires have been limited by conceptual overlap and inconsistent theoretical foundations, the MEP-7 was developed to resolve these issues by aligning item content with a comprehensive conceptual framework of motivation to eat (Dakin et al., 2024a). Items were derived from eight highly cited and widely used questionnaires measuring 18 EBTs with original items added to assess eating for pleasure and eating for health. The final scale comprises 28 items organised into seven, four-item subscales: reactive eating, negative emotional eating, positive emotional eating, restricted eating, homeostatic eating, eating for pleasure and eating for health, demonstrating a coherent seven-factor structure. Overall, these findings indicate that the MEP-7 provides a concise and coherent assessment of motivations for eating.

The most widely used eating behaviour questionnaires are arguably the TFEQ (Stunkard & Messick, 1985) and the DEBQ (Van Strien et al., 1986). Both scales have been widely used in studies of eating behaviour in individuals with and without overweight and obesity (French et al., 2012). However, studies have been unable to replicate the factor structure of the TFEQ (Hyland et al., 1989; Karlsson et al., 2000; Mazzeo et al., 2003). Studies have found that the disinhibition subscale loads onto both reactive and negative emotional eating (Dakin et al., 2024c; Hyland et al., 1989). Other analyses have also suggested that the restraint subscale within the TFEQ can be further divided into two forms, flexible and rigid restraint (Westenhoefer, 1991). Shorter versions of the TFEQ have been developed, including an 18 (Karlsson et al., 2000) and 21-item version (Tholin et al., 2005). These shorter versions include more dimensions of motivation to eat than the original TFEQ and are also more suited to clinical trials by reducing the length of time needed to complete questionnaires. However, the TFEQ-R18, TFEQ-R21 and all questionnaires to date are still limited by only measuring typically 1-3 dimensions of motivation to eat. In contrast, the MEP-7 is the first comprehensive assessment of eating motivations, capturing the full breadth of motivations for eating with greater clarity and parsimony than existing measures. Where scales such as the TFEQ or DEBQ combine multiple overlapping constructs within broad subscales, the MEP-7 disaggregates at item-level these constructs into seven distinct domains. This enables previously conflated constructs, e.g. reactive eating, negative emotional eating and eating for pleasure, to be measured more effectively and economically, with fewer items.

5.1. Motivations for eating and associations with external outcomes

All dimensions of motivation to eat were significantly associated with external outcomes. Negative emotional eating and reactive eating were associated with higher BMI. This fits with our previous findings and existing literature that EBTs measuring automatic motivations for eating such as loss of control, external eating and disinhibition are associated with a greater BMI (Bryant et al., 2012; Dakin, Beaulieu, et al., 2023). Conversely, eating for health and homeostatic eating were associated with a lower BMI, which is also consistent with previous evidence (Anderson et al., 2015; Ruzanska & Warschburger, 2020). Interestingly, restricted eating and positive emotional eating were associated with a greater BMI. There is little evidence on the relationship between positive emotional eating and BMI. For restricted eating, our findings support our previous meta-analysis whereby in general, dietary restraint is associated with a higher BMI (Dakin, Beaulieu, et al., 2023). These associations should not be interpreted as causal. Given the cross-sectional nature of the analyses, it could be expected that individuals with higher BMI may be attempting to restrict their energy intake.

For weight change, only reactive eating was associated with weight gain, whilst eating for health and restricted eating were associated with weight loss. Whilst these findings are in line with previous evidence (Christoph et al., 2021; Dakin, Finlayson, et al., 2023; Hays et al., 2002; Hays & Roberts, 2008; Urbanek et al., 2015), the effect sizes were fairly small. However, this could be due to the general population sample, the vast majority of whom were not engaging in a weight management attempt.

Notably, all dimensions were significantly associated with the number of weight loss attempts. The evidence on weight loss attempts and weight outcomes is mixed. Some studies have found that more prior weight loss attempts were linked to poorer weight maintenance, greater BMI, greater weight cycling or higher risk of weight regain (Carraça et al., 2018; Halali et al., 2022; Teixeira et al., 2004). However, other studies have found that more prior weight loss attempts were linked to better weight maintenance outcomes including greater sustained weight loss and lower mortality (Latner & Ciao, 2014; Willis et al., 2020). Our findings suggest that dimensions of motivations to eat could help to explain these inconsistencies. For example, individuals with more weight loss attempts may be driven by more reactive and negative emotional motivations, which could predispose them to poorer weight outcomes. Indeed, we should perhaps expect eating motivations to be complex and at times conflicted in people engaged in weight loss attempts (Greaves et al., 2017; Stubbs et al., 2021).

Faster eating has been identified as a risk factor for overweight and obesity in both children and adults (Ohkuma et al., 2015). Previously, Tang et al. (2025) found that self-reported eating rate (measured via an electronic questionnaire using a five-point scale) significantly predicted a faster eating rate, larger bite size and more chews during the consumption of a standardised test food and an ad libitum lunch meal; demonstrating the validity of self-reported eating rate as a measure of group level differences in oral processing behaviours. The current study utilised the same rating scale and found that faster eating was associated with higher levels of reactive eating, eating for pleasure, negative and positive emotional eating and lower levels of homeostatic eating. Interestingly, the association between eating for pleasure and eating rate showed a wide confidence interval, suggesting substantial individual variability. The current study suggests that eating for pleasure may manifest as either rapid consumption or slower, more mindful eating. However, future research using objective measures of eating rate is needed to more precisely characterise this relationship. Together, these findings suggest that faster eating may represent a behavioural phenotype that could increase the risk of overeating and obesity.

All motivations for eating, except eating for pleasure were associated with self-reported physical activity. Higher levels of eating for health, restricted and homeostatic eating were associated with more physical activity, whilst higher levels of positive emotional eating, reactive eating and negative emotional eating were associated with less physical activity. These patterns are broadly consistent with existing evidence linking physical activity to homeostatic regulation of food intake (Beaulieu et al., 2018), and lower levels of disinhibition, binge eating, and emotional eating (Myers et al., 2017; Riou et al., 2011; Shook et al., 2015). However, Martinez-Avila et al. (2020) reported that more physically active individuals may also endorse higher levels of binge and uncontrolled eating, possibly reflecting a compensatory mindset whereby physical activity is perceived as earning the right to eat more or indulge. Overall, these findings indicate that the MEP-7 shows theoretically coherent associations with external outcomes.

5.2. Measurement invariance

Measurement invariance testing supported configural, metric, and scalar invariance across sex, age and education level, indicating that the seven-factor model operates equivalently for males and females, younger and older adults and lower and higher education levels. This suggests that the dimensions of motivation to eat are conceptualised similarly between groups, and that both the strength of item-factor relationships and item intercepts are consistent. Accordingly, observed differences in motivation to eat scores can be interpreted as reflecting true differences in the underlying constructs, rather than measurement artefacts.

5.3. Strengths, limitations and future directions

The MEP-7 has potential value for both research and intervention development in weight management and obesity by enabling more precise identification of the motives that underlie overeating and weight change. In the present study, the MEP-7 showed excellent model fit, internal reliability, predictive validity, and invariance. The predictive validity tests demonstrated that each domain of motivations for eating was associated with behavioural and weight-related outcomes. These initial findings underscore the discriminatory capability of the scale and its potential utility for research seeking to understand how different motivations contribute to eating behaviour.

An important limitation of the current study is that we did not formally test incremental validity against existing eating behaviour questionnaires. Although MEP-7 domains show conceptual overlap with established constructs for example emotional eating as measured by the AEBQ, we did not assess the degree to which these constructs overlap within the same dataset. We also did not test whether the MEP-7 subscales provide incremental predictive value over existing measures in relation to health outcomes. These analyses were beyond the scope of the current validation study, which aimed to establish the internal structure, reliability and validity of a brief integrative profile. Additionally, age was treated as a categorical variable for the measurement invariance testing. Although age groups were defined based on developmental theory, this approach may lead to a loss of information about individual differences within the age groups and may reduce statistical power (MacCallum et al., 2002). Future research could use continuous approaches, such as Moderated Nonlinear Factor Analysis (MNLFA), which has shown to provide a more flexible model for evaluating measurement invariance (Bauer, 2017).

Furthermore, motivations for eating do not always occur in isolation, meaning individuals may display multiple motivations simultaneously. Person-centred analytic approaches such as latent profile analysis (LPA) could complement the present analyses by identifying behavioural profiles or phenotypes that could provide insights into differences between people (Bauer & Shanahan, 2007). This approach has been conducted to assess eating profiles in children using the Child Eating Behaviour Questionnaire (Wardle et al., 2001). LPA identified four eating profiles that were associated with differences in temperament, feeding practices and food insecurity (Pickard et al., 2023). Future research using the MEP-7 should similarly examine how motivations cluster within individuals and how different motivational profiles relate to health outcomes (e.g. weight change over time).

To enhance data quality, first-line preventative safeguards, second-line in-survey gatekeeping measures, and third-line defence post-hoc detection of fraudulent or low quality responses was applied, which is consistent with current recommendations. Although we employed multi-layered prevention and detection procedures to recruit and screen participants, it is not possible to guarantee that we were able to remove all automated or AI-generated responses. Research shows that bots can have high completion rates, indicating that bots can take web surveys successfully (Höhne et al., 2025) and that AI detection systems may not be effective, which allows AI-generated responses in data analysis (Lebrun et al., 2024). Accordingly, and in line with guidance from *Appetite*, the present findings should be considered exploratory and in need of replication with in-person research.

A further limitation of the MEP-7 is that it measures general motivations for eating rather than specific food category motivations (e.g. sweet, savoury, salty foods). Certain motivations for eating may be more strongly expressed in relation to specific foods and associations between eating motivations and health outcomes e.g. BMI may also be moderated by food type. Therefore, measures that assess food-specific motivations are important for capturing this context level specificity. The current measure was designed to provide a brief, integrative profile of core motivations for eating that apply across eating context, especially in settings where questionnaire length or participant burden limit the feasibility of using multiple questionnaires. Work is currently ongoing that combines the MEP-7 with a food-specific assessment of eating behaviour (Finlayson et al., 2025). This research will examine how general motivations for eating interact with food categories, types and contexts.

While the sample was representative of the UK based on age, gender and ethnicity, it was relatively highly educated and predominately White, which may limit generalisability to more socioeconomically and ethnically diverse populations. Most participants were not engaged in a weight management programme, so it is important for future research to determine the validity of the MEP-7 in other populations and in clinical and intervention settings. Future research should also examine whether measurement invariance is maintained in weight management samples and whether the identified dimensions of motivation to eat differentially predict behavioural or clinical outcomes in these subgroups. It is also important to extend the utility of the MEP-7 by evaluating its predictive power in longitudinal studies and in contexts that include objective behavioural and physiological outcomes. The EMBED study (trial registration: ISRCTN17063535), now in progress, provides the opportunity to test the MEP-7 in a real-world, structured weight-loss intervention.

More broadly, the field currently lacks sufficient longitudinal and test–retest evidence to determine the temporal stability of many eating behaviour trait constructs, including those assessed by the MEP-7. Establishing whether these motivational tendencies show stability, systematic change, or context sensitivity over time will be essential for clarifying their theoretical status and for determining the most appropriate applications of the measure in observational and intervention research. While the present analyses relied on self-reported measures, studies should examine how the seven motivations map onto objectively quantified indices of eating behaviour (e.g., oral processing metrics), free-living energy intake (e.g., food diaries), and energy expenditure (e.g., accelerometry). Including the MEP-7 in appetite and weight management research trials, including those tracking changes in energy balance over time, will help establish its prospective validity and clarify how motivations for eating change during weight loss, maintenance, and potential regain.

5.4. Conclusion

To summarise, the MEP-7 is the first brief, theory-driven measure of motivations for eating, itself derived from a series of studies, which led to a coherent seven-dimension framework based on a systematic review and meta-analysis (Dakin, Beaulieu, et al., 2023), an extensive theoretical review (Dakin et al., 2024a), Dakin et al., 2024bnd a construct level (Dakin et al., 2024c) and item level (Dakin et al., 2024b) analyses of EBTs. By integrating diverse constructs into seven, four-item subscales, the MEP-7 offers a concise yet precise identification of the motives that underlie motivation for eating. The scale showed coherent associations with external outcomes and has potential utility in both research and clinical settings. More broadly, this framework and the MEP-7 may help to improve assessment, outcome monitoring, and participant profiling in appetite and obesity research. The MEP-7 scale and scoring instructions will be made publicly available for use in academic research. Access will be free for non-commercial academic use, with appropriate licensing arrangements in place for other uses. The scale will be hosted via the Fast-Licensing Platform (University of Leeds) and made accessible once the current licensing process is complete.

CRediT authorship contribution statement

Clarissa Dakin: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Graham Finlayson:** Writing – review & editing, Funding acquisition, Conceptualization. **R. James Stubbs:** Writing – review & editing, Funding acquisition, Conceptualization.

Ethical statement

Study 1: Ethical approval for the review panel was granted from the School of Psychology Research Ethics Committee at the University of Leeds (reference number: PSCETHS-1165, date approved: 26/09/2024).

Study 2: Ethical approval was granted from the School of Psychology Research Ethics Committee at the University of Leeds (reference number: PSCETHS-1184, date approved: 07/11/2024).

Declaration of competing interest

Pr. James Stubbs and Dr Clarissa Dakin declare that they consult for Slimming World UK through the University of Leeds. Slimming World were not involved in the analysis or interpretation of this articles. No other authors declare a 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.appet.2026.108699.

Data availability

The dataset cannot be publicly shared at this time due to ongoing commercial due diligence and licensing arrangements and will become accessible through the Fast-Licensing platform of the University of Leeds once this process is complete. Data and code for this study will nevertheless be made available on request. The corresponding author has full access to the data reported in the manuscript.

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