Association of eating behaviour with symptoms of pelvic floor disorders in middle-aged women: An observational study

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Abstract

Objective To investigate associations of eating behaviour with symptoms of pelvic floor disorders (PFD), i.e., stress urinary incontinence (SUI), urge urinary incontinence (UUI), faecal incontinence (FI), constipation or defecation difficulties (CDD), and feeling of pelvic organ prolapse (POP) among middle-aged women. **Design** A cross-sectional, observational study. **Setting** University Research Laboratory. **Sample** A population sample of 1 098 Finnish women aged 47 to 55 years. **Methods** Eating behaviour, demographical, gynaecological, and physical activity variables were assessed using self-report questionnaires. Simple and multiple logistic regression models were used to assess the associations of eating behaviour and symptoms of PFD. Models were adjusted with demographical, gynaecological, and physical activity variables. **Main outcome measures** Prevalence of symptoms of CDD, FI, POP, SUI, UUI. **Results** After controlling for confounding, middle-aged women with restrictive eating style were more likely to experience the symptoms of CDD (OR 1.73, CI 1.03–2.90, p=0.039). Women with evening-oriented eating pattern were more likely to experience symptoms of UUI (OR 2.01, CI 1.32–3.07, p=0.001) while maintaining healthy eating patterns was associated with lower risk of UUI (OR 0.45, CI 0.24–0.85, p=0.014) in adjusted models. **Conclusions** This study provides proof-of-concept evidence to the hypothesis that eating behaviour is associated with perceived pelvic floor disorders, particularly CDD and UUI, warranting further studies to investigate causality.

INTRODUCTION

Pelvic floor disorders (PFD) in women includes conditions that compromise urinary and faecal continence mechanisms and pelvic organ support.[1] Oestrogen deprivation during menopause, natural aging, reproductive history, factors increasing intra-abdominal pressure, and lifestyle may lead to structural and functional failure in the pelvic floor.[1,2] Lifestyle choices, such as quality of nutrition and eating behaviour, may have a significant effect on the mechanisms of pelvic floor disorders.[2]

Some macro- and micronutrients, such as protein[3], vitamin D[4] and omega-3 fatty acids[5], are important for proper skeletal muscle function. Disordered eating may result in a lack of these important nutrients, and therefore, may weaken skeletal muscles, including the pelvic floor muscles.[6] In addition, it has been hypothesized that low-energy availability is associated with development of PFD.[7] When studying middle-aged women, it is also worth noting that menopause status might be a specific factor associated with eating behaviour.[8] Oestrogens have an important effect on normal food intake, and therefore they may have a functional role in disordered eating.[9]

Previous studies have focused on the effect of a single diet factor on pelvic floor disorders, but little is known about the effects of eating behaviour in a broader sense. Therefore, further studies related to the association of symptoms of pelvic floor disorders with different aspects of eating behaviour are warranted. The objective of the current study is to investigate associations of five types of eating styles; restrictive eating and overeating,

snacking, health-conscious eating, emotional eating, and externally cued eating, with perceived symptoms of pelvic floor disorders, including stress urinary incontinence, urge urinary incontinence, faecal incontinence, constipation or defecation difficulties, and feeling of pelvic organ prolapse among middle-aged women. We hypothesized that some eating styles may predispose to the symptoms of pelvic floor disorders, especially to constipation or defecation difficulties. In addition, eating styles that are likely to predispose to overweight, may also predispose to the symptoms of pelvic floor disorders. While other eating styles, such as health-conscious eating, may have a beneficial effect on the overall health and therefore might protect from the symptoms of pelvic floor disorders.

METHODS

Study design and participants

The data reported are from the cross-sectional, observational study, Estrogenic Regulation of Muscle Apoptosis (ERMA) (data set: https://doi.org/10.17011/jyx/dataset/83491). The study data collection has been described in detail in Kovanen et al.[10] Briefly, out of the 6 878 randomly selected women aged 47 to 55 years living in Central Finland, 3 064 women returned written consent and prequestionnaire that included questions on symptoms of pelvic floor disorders. Exclusion criteria included conditions or use of medications affecting ovarian function, self-reported body mass index [BMI] > 35 kg/m^2, and medications or symptomatic diseases affecting muscle functions. From the eligible participants, 1 393 gave fasting blood samples and 1 102 of them answered to the main questionnaire survey that included eating behaviour questions. Four questionnaires were lost due to technical errors. Therefore, the final sample size of the present study is 1 098. The study was conducted according to the Declaration of Helsinki and was approved by the Ethics Committee of the Central Finland Health Care District (KSSHP Dnro 8U/2014) before the onset of data collection.

Pelvic floor disorders

Participating women were asked to provide a dichotomized response (yes/no) to questionnaire assessing if they had experienced symptoms of PFD within a month preceding data collection. The symptoms of PFD included in the questionnaire were stress urinary incontinence, urge urinary incontinence, faecal incontinence, constipation or defecation difficulties, and feeling of pelvic organ prolapse.[11]

Eating behaviour

Restrictive eating and overeating were assessed with the question[12]: "Which of the following best describes you?" and participants were asked to select one of the following four options: "It's easy for me to eat about the amount I need to"; "I quite often eat more than I actually need"; "I often try to restrict my eating", and "At times, I'm on a strict diet, at others I overeat". Following the original publication[12], we named these eating styles as normal eating, overeating, restrictive eating, alternating restrictive/overeating, respectively, and used normal eating as reference category in the statistical analyses.

A 12-item questionnaire[12] was used to assess the different eating styles. *Snacking* behaviour was assessed using five items: "During mealtimes I eat sufficiently – I don't need to snack between meals.", "My meals are often replaced by snacks.", "My food consumption is highest in the evening.", "I graze throughout the evening." and "While I am eating, I watch TV, etc.". *Health-conscious eating* was assessed using three items: "I attempt to maintain healthy eating patterns.", "I avoid fatty foods." and "I avoid calories.". *Emotional eating* was assessed using two items*:* "I reward myself often with good food." and "I console myself by eating or drinking.". *Externally cued eating*was assessed using one item*:* "My eating is triggered by seeing food, food advertisements, etc.". *Night eating* was assessed using one item: "I wake up to eat at night.", however, this eating style was not included in the analysis of current study, since similar to earlier findings[12], it emerged rarely among the participants. For each item, participating women were asked to choose one of the four options that best describes their overall eating style: usually, often, sometimes, seldom. Responses were dichotomized by combining usually/often and sometimes/seldom.

Demographical, physical activity, and gynaecological variables

Participants' demographical, gynaecological, and physical activity variables have been described in detail previously.[11]Shortly, age was calculated from the date of birth to the date of answering to the prequestionnaire. BMI was calculated as body mass (kg) divided by height squared (m^2). Level of education was self-reported with a structured question and participants were classified into two groups based on their answers: those with bachelor level or higher education and those with education lower than bachelor level. Work-related physical activity was assessed with a structured question and participants were classified into the following groups: mainly sedentary work, work that includes standing and walking, and heavy work that includes also lifting.

Physical activity at the age of 17 to 29 years was assessed with the question: "What kind of regular physical activity have you done at different stages of your life?"[13] Participants were asked to specify their participation by selecting one or more of the following four options: no physical activity, regular independent leisure-time physical activity, regular competitive sport and related training, and regular other supervised physical activity in a sports club, etc. Current physical activity was evaluated with a self-reported questionnaire[14] including four questions about the frequency, intensity and duration of leisure-time physical activity bouts as well as the average time spent in active commuting. Based on the answers, a metabolic equivalent of hours per day (MET-h/d) for current physical activity was calculated.

Participants were assigned to premenopausal, early and late perimenopausal, and postmenopausal groups based on the FSH concentrations and self-reported menstrual bleeding diaries using the slightly modified Stages of Reproductive Aging Workshop (STRAW+10) guidelines.[15] Self-reported data on gestations, parity, and whether a participant had undergone hysterectomy were collected.

Missing data

The total number of missing data values for the analytical sample including 1 098 participants was 338 out of 29 646 (1.1%). The percentage of missing values varied from 0 to 10% between the variables (Table S1). The data was missing due to the invalid or missing measurements and unclear or incomplete questionnaire response. Thus, missing data were assumed to occur at random. Multiple imputation was used to create and analyze 50 multiply imputed data sets with 50 iterations for chained equations for each[16]. The model parameters were estimated separately for each data set. Multiple imputation and pooling of the model estimates were carried out in R[17] using the standard settings of the "mice" package.[16] For comparison, we also performed complete case analysis and there was no significant differences in the results.

Statistical analysis

The associations of eating behaviour with symptoms of pelvic floor disorders were analyzed using simple (Model 1) and multiple logistic regression models (Model 2). Model 2 was adjusted with age, BMI, education, physical workload, previous physical activity (age 17–29), current physical activity (MET-h/d), menopausal status, parity, and hysterectomy. Correlation analysis, residual plots and scatter plots between each continuous predictor and the logits values were used for testing the model assumptions. Statistical analyses were performed using R and IBM SPSS Statistics 22.0 (SPSS Inc., Chicago, IL). The level of significance was set at p[?]0.05.

RESULTS

Participants' demographical, gynaecological, and physical activity status in total sample and in different pelvic floor disorder subsamples have been reported previously[11]. The frequencies of various eating styles among women with different symptoms of pelvic floor disorders are presented in Table S1.

In comparison to women reporting normal eating, women with overeating (OR 1.49, CI 1.14–1.96, p=0.004) and restrictive eating (OR 1.63, CI 1.09–2.44, p=0.017) behaviour were more likely to experience symptoms of stress urinary incontinence (Table 1: Model 1), but these associations attenuated after controlling for confounding factors (Table 1: Model 2). Restrictive eating was also associated with constipation and defecation difficulties in Model 1 (OR 1.90, CI 1.18–3.07, p=0.008) and Model 2 (OR 1.73, CI 1.03–2.90, p=0.039).

No snacking between meals (OR 0.69, CI 0.50–0.95, p=0.022) and grazing throughout the evening (OR 1.59, CI 1.09–2.31, p=0.016) were associated with symptoms of stress urinary incontinence in Model 1 (Table 2). In addition, no snacking between meals (OR 0.43, CI 0.20–0.90, p=0.025) was associated with symptoms of faecal incontinence in Model 1. Women who had reported to have highest food consumption in the evening were more likely to experience symptoms of urge urinary incontinence according to both Model 1 (OR 1.84, CI 1.23–2.76, p=0.003) and Model 2 (OR 2.01, CI 1.32–3.07, p=0.001).

Attempting to maintain healthy eating patterns was associated with symptoms of stress urinary incontinence (OR 0.60, CI 0.36–0.99, p=0.047) and urge urinary incontinence (OR 0.48, CI 0.26–0.88, p=0.018) in Model 1 (Table 3). The association remained statistically significant for symptoms of urge urinary incontinence (OR 0.45, CI 0.24–0.85, p=0.014) when adding confounding factors in Model 2.

DISCUSSION

Main findings

This study examined the association of eating behaviour with symptoms of pelvic floor disorders in middle-aged women. We found that women who had reported to have restrictive eating style were more likely to experience the symptoms of constipation or defecation difficulties. Similarly, women with highest food consumption in the evening were more likely to experience symptoms of urge urinary incontinence. Attempting to maintain healthy eating patterns was associated with lower risk of symptoms of urge urinary incontinence.

Strengths and limitations

The present study had several strengths and limitations which we have already discussed in our previous paper investigating the associations of past and current physical activity with symptoms of pelvic floor disorder in this same study population.[11] Now we were able to utilize knowledge gained from the previous study in considering potential confounding factors, i.e., to control also for past and current physical activity in addition to demographical and gynaecological factors. Overall, extend of this study is exceptional, since we were able to study five different symptoms of pelvic floor disorders among the large homogenous cohort of Caucasian women.

The experienced symptoms of pelvic floor disorders were asked in an early stage of the study, which may result in underreporting, especially when the subject may be considered sensitive. The questionnaire used was not validated, however, it is simplistic and commonly used in clinics. Unhealthy eating habits and pelvic floor disorders have both been associated with higher BMI,[18,19,20,21] however, women with BMI>35 kg/m^2 were excluded from the study, thus the results cannot be generalized to individuals with severe obesity. In addition, the assessment of eating behaviour based on self-reporting can be biased by social desirability,[22]i.e., the tendency to assess one's own eating styles critically, which affects women more than men.[23] This may cause respondents to overestimate healthy behaviors and underestimate the undesirable ones.[24,25] The study was cross-sectional and cannot therefore reveal women's long-term eating habits and whether they have a causal effect on the development of the symptoms of pelvic floor disorders or if reverse causality exists.

Interpretation

Disordered eating, characterized by maladaptive eating attitudes and behaviours, seem to be common among middle-aged women in Western societies.[26] The causes might lie in the biological (e.g. BMI and menopausal status), psychological (e.g. aging anxiety) and sociocultural factors (e.g. perceived pressure to be thin).[26,27] It has been hypothesized that menopausal transition increases vulnerability to eating-related conditions, such as eating disorders and negative body image,[28,29] and, in contrary, that disordered eating or body image concerns do not differ between menopausal phases.[30,31] However, there is substantial evidence that reproductive hormones play an important role in eating behaviour:[32,33,34,35,36] In women, the control of food intake is largely regulated by oestradiol, which acts as an inhibitor by decreasing meal size and advancing satiety.[32,33,34,37]

Restrained eating or dieting refers to intentional and sustained restriction of food intake for the purposes of

weight loss or weight maintenance.[38,39] Restrained eating appears to be relatively common behaviour among middle-aged women[8]. In the study of Drobnjak et al.[8] 10.7% of normal-weight women aged between 40 and 66 reported to engage in extreme dietary restraint. The authors described that postmenopausal women reported higher levels of restrained eating compared to premenopausal women. Another study[40] examined overweight middle-aged women and showed also increased restrained eating after menopause. The present study is in line with the previous, since postmenopausal women reported to restrict their eating more than pre- and perimenopausal women. Overall, 10.6% of the women reported to restrict their eating.

According to a previous large study in women aged 31 to 61 years, higher dietary fibre intake is associated with a decreased prevalence of constipation[41]. Restrictive eating style could possibly result in lower fibre intake, which may partly explain our results of its association with constipation or defecation difficulties. Restrictive eating style may also lead to deficient caloric intake, which has been shown to cause or exacerbate constipation both in older community-dwelling population[42] and in women aged 18 to 40 years with eating disorders.[43]

In general, negative snacking habits are known to have adverse health effects.[18,44] In our sample, women with different types of pelvic floor disorders consistently reported negative snacking behaviour compared to total sample. Evening-oriented eating was most commonly reported. For instance, of the women with perceived urge urinary incontinence, 26.2% reported to have highest food consumption in the evening corresponding to the 17.5% of the women in total sample. Furthermore, we found that this kind of eating style was associated with urge urinary incontinence even after controlling for BMI and other confounding factors. Keski-Rahkonen et al. have studied the association of highest food consumption in the evening with overweight and obesity[23] as well as with intentional weight loss[12] in young adults. To our knowledge, there are no previous studies investigating this eating style in middle-aged women neither women with pelvic floor disorders. Therefore, further studies are needed for learning more about this phenomenon.

In our study, health-conscious eating style, especially attempting to maintain healthy eating was highly prevalent (in total sample "usually" or "often" reported by 94.2%), however, it was little less common among women with symptoms of urge urinary incontinence (89.9%). Interestingly, women who attempted to maintain healthy eating patterns had lower risk of urge urinary incontinence than women who had not reported this eating style. Healthy eating patterns are likely to provide macro- and micronutrients that are important for skeletal muscle function, including proper function of pelvic floor muscles, as suggested by Carvalhais et al.[6] Previous studies have also shown that carbonated drinks, artificial sweeteners, caffeine, and alcohol are bladder irritants.[45,46,47] In addition, higher intake of total fat, saturated fat, cholesterol, vitamins B12 and C as well as calcium are shown to associate with increased risk of urinary incontinence onset.[48,49] Some studies show that higher intake of vitamin D is associated with decreased risk of urinary incontinence,[50,51] while others do not support the finding.[52,53] Women with lower risk for urge urinary incontinence may have more favourable diet for supporting the health of the pelvic floor muscles, however, we were not able to study this with the data available.

Although the number of women having urinary incontinence and constipation or defecation difficulties in our sample are in line with previously reported population frequencies[54,55,56,57,58] our sample included a rather small number of women experiencing low-frequency pelvic floor disorders, such as faecal incontinence (34 cases) and pelvic floor prolapse (56 cases). Therefore, our results of not finding significant associations cannot be considered conclusive. Although only few variables turned out to be statistically significant, it is notable that variables assessing the same sector of eating behaviour similarly either protected from the pelvic floor disorders or increased their risk. It is likely that the associations would get stronger with larger data. Emotional and externally cued eating styles emerged rarely, and no significant associations with the symptoms of pelvic floor disorders were found, which may also be related in the small size of the data.

CONCLUSION

This study was exploratory in nature. Eating behaviour has scantly been studied as potential risk factor for pelvic floor disorders, and thus our aim was to test the proof-of-concept. Since we found some eating

styles to associate with perceived pelvic floor disorders, our study provides justification for further studies to investigate causality. Particularly, we found the restrictive eating style to associate with a higher risk to experience problems with bowel function, while regarding urge urinary incontinence the evening-oriented food consumption was associated with a higher and attempting to maintain healthy eating patterns with a lower risk.

Disclosure of interest

The authors report no conflict of interest.

Contribution to authorships

MAK and MH contributed to data analysis, data interpretation and manuscript writing. PA and EKL contributed to the study design, data interpretation and manuscript editing. MAK, MH, HL, PA, E-MH and EKL contributed to critical manuscript revision. All authors agree with the final version and agree to be accountable for the integrity of the data published.

Ethics approval

The Ethics Committee of the Central Finland Health Care District approved the study; 9 October 2014 (KSSHP Dnro 8U/2014).

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Supporting Information

Table S1.

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Table 1. RESTRICTIVE / OVEREATING − Pooled logistic regression model estimates (n =1098)

	Stress urinary incontinence	**Stress urinary incontinence**	**Urge urinary incontinence**	**Urge urinary incontinence**	**Fecal incontinence**	**Fecal incontinence**	**Constipation or defecation difficulties**	**Constipation or defecation difficulties**	**Feeling of pelvic organ prolapse**
	OR (95 % CI)	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**
Model 1:									
Normal eating (ref)	1		1		1		1		1
Overeating	1.49 (1.14–1.96)	**0.004**	1.07 (0.72–1.57)	0.744	1.74 (0.79–3.79)	0.166	1.26 (0.88–1.79)	0.206	1.33 (0.76–2.34)

	Stress urinary incontinence	**Stress urinary incontinence**	**Urge urinary incontinence**	**Urge urinary incontinence**	**Fecal incontinence**	**Fecal incontinence**	**Constipation or defecation difficulties**	**Constipation or defecation difficulties**	**Feeling of pelvic organ prolapse**
Restrictive eating	1.63 (1.09–2.44)	**0.017**	1.23 (0.71–2.16)	0.459	2.44 (0.91–6.55)	0.077	1.90 (1.18–3.07)	**0.008**	0.68 (0.24–1.99)
Alternating restrictive/overeating	1.71 (0.86–3.39)	0.124	1.68 (0.71–3.99)	0.239	2.76 (0.60–12.76)	0.194	1.68 (0.74–3.81)	0.218	– [a]
Model 2:									
Frequent overeating	1.09 (0.81–1.49)	0.562	1.00 (0.65–1.55)	0.992	1.29 (0.54–3.05)	0.569	1.10 (0.74–1.63)	0.646	0.93 (0.49–1.78)
Restrictive eating	1.22 (0.79–1.88)	0.372	1.10 (0.60–2.00)	0.762	1.53 (0.52–4.53)	0.438	1.73 (1.03–2.90)	**0.039**	0.51 (0.16–1.58)
Alternating overeating and restricting	1.12 (0.54–2.29)	0.766	1.70 (0.69–4.20)	0.249	2.34 (0.46–11.95)	0.307	1.31 (0.55–3.09)	0.538	– [a]

Model 1: Simple logistic regression

Model 2: Adjusted with age, body mass index, education, physical workload, physical activity (age 17–29), current physical activity (MET-h/d), menopausal status, parity, and hysterectomy.

[a] no cases

Table 2. SNACKING –Pooled logistic regression model estimates (n =1098)

	Stress urinary incontinence	**Stress urinary incontinence**	**Urge urinary incontinence**	**Urge urinary incontinence**	**Fecal incontinence**	**Fecal incontinence**	**Constipation or defecation difficulties**	**Constipation or defecation difficulties**	**Feeling of pelvic organ prolapse**
	OR (95 % CI)	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**
Model 1: No snacking between meals	0.69 (0.50–0.95)	**0.022**	0.67 (0.44–1.02)	0.064	0.43 (0.20–0.90)	**0.025**	0.71 (0.48–1.05)	0.082	0.61 (0.33–1.15)

	Stress urinary incontinence	**Stress urinary incontinence**	**Urge urinary incontinence**	**Urge urinary incontinence**	**Fecal incontinence**	**Fecal incontinence**	**Constipation or defecation difficulties**	**Constipation or defecation difficulties**	**Feeling of pelvic organ prolapse**
Model 2: No snacking between meals	0.84 (0.60–1.18)	0.314	0.70 (0.45–1.09)	0.113	0.49 (0.22–1.09)	0.080	0.78 (0.51–1.17)	0.224	0.78 (0.40–1.53)
Model 1: Frequent snacks replace meals	1.41 (0.84–2.37)	0.197	1.63 (0.84–3.14)	0.148	1.09 (0.26–4.68)	0.905	1.07 (0.55–2.10)	0.839	0.62 (0.15–2.62)
Model 2: Frequent snacks replace meals	1.19 (0.69–2.06)	0.521	1.55 (0.79–3.05)	0.198	0.96 (0.21–4.37)	0.958	1.00 (0.499–1.99)	0.990	0.49 (0.11–2.16)
Model 1: Highest food consumption in the evening	1.30 (0.95–1.79)	0.098	1.84 (1.23–2.76)	**0.003**	1.49 (0.67–3.36)	0.330	1.14 (0.76–1.70)	0.536	1.16 (0.59–2.29)
Model 2: Highest food consumption in the evening	1.13 (0.81–1.57)	0.480	2.01 (1.32–3.07)	**0.001**	1.45 (0.62–3.40)	0.389	1.05 (0.69–1.59)	0.831	0.98 (0.48–2.02)

	Stress urinary incontinence	**Stress urinary incontinence**	**Urge urinary incontinence**	**Urge urinary incontinence**	**Fecal incontinence**	**Fecal incontinence**	**Constipation or defecation difficulties**	**Constipation or defecation difficulties**	**Feeling of pelvic organ prolapse**
Model 1: Grazing throughout the evening	1.59 (1.09–2.31)	**0.016**	1.42 (0.86–2.34)	0.165	1.12 (0.39–3.20)	0.832	1.53 (0.98–2.41)	0.062	1.53 (0.73–3.20)
Model 2: Grazing throughout the evening	1.30 (0.88–1.93)	0.189	1.46 (0.87–2.45)	0.154	1.05 (0.35–3.14)	0.933	1.40 (0.87–2.24)	0.162	1.24 (0.57–2.72)
Model 1: Eating while watching TV	1.06 (0.77–1.45)	0.737	1.30 (0.84–1.99)	0.239	0.89 (0.34–2.32)	0.805	1.30 (0.88–1.93)	0.190	1.17 (0.59–2.31)
Model 2: Eating while watching TV	0.91 (0.65–1.27)	0.576	1.29 (0.83–2.02)	0.254	0.84 (0.31–2.28)	0.733	1.25 (0.83–1.88)	0.283	1.14 (0.56–2.31)

Model 1: Simple logistic regression

Model 2: Adjusted with age, body mass index, education, physical workload, physical activity (age 17–29), current physical activity (MET-h/d), menopausal status, parity, and hysterectomy.

Table 3. HEALTH-CONSCIOUS EATING – Pooled logistic regression model estimates (n =1098)

	Stress urinary incontinence	**Stress urinary incontinence**	**Urge urinary incontinence**	**Urge urinary incontinence**	**Fecal incontinence**	**Fecal incontinence**	**Constipation or defecation difficulties**	**Constipation or defecation difficulties**	**Feeling of pelvic organ prolapse**
	OR (95 % CI)	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**

	Stress urinary incontinence	**Stress urinary incontinence**	**Urge urinary incontinence**	**Urge urinary incontinence**	**Fecal incontinence**	**Fecal incontinence**	**Constipation or defecation difficulties**	**Constipation or defecation difficulties**	**Feeling of pelvic organ prolapse**
Model 1: Attempting to maintain healthy eating patterns	0.60 (0.36–0.99)	**0.047**	0.48 (0.26–0.88)	**0.018**	1.00 (0.23–4.27)	0.999	0.89 (0.46–1.70)	0.712	1.09 (0.33–3.59)
Model 2: Attempting to maintain healthy eating patterns	0.69 (0.40–1.17)	0.169	0.45 (0.24–0.85)	**0.014**	1.05 (0.23–4.76)	0.953	0.98 (0.50–1.93)	0.956	1.32 (0.38–4.62)
Model 1: Avoiding fatty foods	0.84 (0.64–1.10)	0.203	0.99 (0.67–1.46)	0.966	0.67 (0.32–1.37)	0.267	0.93 (0.66–1.32)	0.680	1.43 (0.74–2.75)
Model 2: Avoiding fatty foods	0.92 (0.69–1.23)	0.586	0.95 (0.63–1.41)	0.785	0.61 (0.29–1.31)	0.206	0.99 (0.69–1.43)	0.963	1.58 (0.80–3.14)
Model 1: Avoiding calories	0.96 (0.75–1.23)	0.733	1.15 (0.81–1.63)	0.448	1.09 (0.55–2.19)	0.804	1.31 (0.95–1.80)	0.097	0.92 (0.53–1.61)
Model 2: Avoiding calories	0.96 (0.74–1.24)	0.746	1.15 (0.80–1.64)	0.456	1.04 (0.51–2.11)	0.922	1.31 (0.95–1.82)	0.102	1.01 (0.57–1.81)

Model 1: Simple logistic regression

Model 2: Adjusted with age, body mass index, education, physical workload, physical activity (age 17–29), current physical activity (MET-h/d), menopausal status, parity, and hysterectomy.

Table 4. EXTERNALLY CUED AND EMOTIONAL EATING –Pooled logistic regression model estimates (n =1098)

	Stress urinary incontinence	**Stress urinary incontinence**	**Urge urinary incontinence**	**Urge urinary incontinence**	**Fecal incontinence**	**Fecal incontinence**	**Constipation or defecation difficulties**	**Constipation or defecation difficulties**	**Feeling of pelvic organ prolapse**
	OR (95 % CI)	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**	p **value**	**OR (95 % CI)**
Model 1: Visual cues (seeing food or food ads) prompt eating	3.45 (0.89–13.45)	0.074	2.73 (0.70–10.69)	0.149	3.45 (0.42–28.10)	0.247	1.19 (0.25–5.65)	0.827	2.06 (0.26–16.63)
Model 2: Visual cues (seeing food or food ads) prompt eating	2.78 (0.67–11.49)	0.159	4.13 (0.99–17.30)	0.052	4.84 (0.39–60.11)	0.220	1.19 (0.25–5.65)	0.827	1.48 (0.16–13.56)
Model 1: Food used as a reward	1.02 (0.67–1.56)	0.931	1.27 (0.72–2.25)	0.401	1.35 (0.46–3.91)	0.585	0.83 (0.47–1.48)	0.538	0.17 (0.02–1.27)
Model 2: Food used as a reward	0.86 (0.55–1.33)	0.487	1.26 (0.70–2.26)	0.440	1.35 (0.44–4.12)	0.596	0.79 (0.44–1.43)	0.436	0.14 (0.02–1.08)
Model 1: Comfort eating	1.41 (0.83–2.37)	0.201	1.15 (0.55–2.39)	0.707	1.04 (0.24–4.43)	0.963	1.75 (0.97–3.18)	0.064	0.29 (0.04–2.17)

	Stress urinary incontinence	Stress urinary incontinence	Urge urinary incontinence	Urge urinary incontinence	Fecal incontinence	Fecal incontinence	Constipation or defecation difficulties	Constipation or defecation difficulties	Feeling of pelvic organ prolapse
Model 2: Comfort eating	1.07 (0.61–1.85)	0.822	1.14 (0.53–2.45)	0.730	0.73 (0.16–3.35)	0.681	1.53 (0.82–2.85)	0.184	0.21 (0.03–1.61)

Model 1: Simple logistic regression

Model 2: Adjusted with age, body mass index, education, physical workload, physical activity (age 17–29), current physical activity (MET-h/d), menopausal status, parity, and hysterectomy.

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