



Development and initial psychometric testing of a body-image domain within an electronic pelvic floor questionnaire (ePAQ-pelvic floor)

Kaia Scurr¹ · Thomas G. Gray² · Georgina L. Jones³ · Stephen C. Radley²

Received: 11 December 2019 / Accepted: 27 January 2020 / Published online: 3 March 2020
© The International Urogynecological Association 2020

Abstract

Introduction Urogynaecological conditions have been shown to negatively impact on body image in a number of previous studies. ePAQ-Pelvic Floor (ePAQ-PF) is a patient-reported outcome measure used in clinical practice to assess urogynaecological conditions and their impact on quality of life. This study aimed to develop and undertake initial psychometric testing of a new domain to assess urogynaecological body image within ePAQ-PF.

Methods A patient involvement group, analysis of free-text data from ePAQ-PF and a systematic review of existing PROMs assessing urogynaecological body image informed the content of a new body-image domain within ePAQ-PF. This was administered to 208 patients who consented to the use of their anonymised ePAQ-PF responses for research purposes. These data underwent factor analysis, internal consistency reliability and item-total correlation testing. Evidence-based hypotheses were formulated to test construct validity. Criterion validity was assessed against the Body-image Scale (BIS). Patients completed a separate questionnaire (QQ-11) to measure the face validity of ePAQ-PF.

Results Factor analysis revealed a four-item body-image domain with good internal consistency reliability (Cronbach's $\alpha = 0.899$) and item-total correlation (Spearman's rank $r > 0.40$). ePAQ-PF body-image domain scores correlated significantly with the BIS scores ($r = 0.501$). Age, prolapse, sexual dysfunction, pelvic pain and urinary incontinence scores correlated significantly with body-image domain score. QQ-11 value scores demonstrated good acceptability.

Conclusions Body-image assessment should form part of routine care in urogynaecology. Preliminary results support the validity, reliability and functionality of the body-image domain in ePAQ-PF. Further psychometric testing of this is required, including tests of responsiveness and stability.

Keywords Body image · Patient reported outcome measure · Pelvic floor disorders · Urogynaecology

Introduction

Body image is a multi-faceted psychological experience, encompassing body-related self-perceptions and self-attitudes,

including thoughts, feelings and behaviours [1]. The concept refers particularly, but not exclusively, to appearance and is a contributor to health-related quality of life (HRQoL) [2]. The concept of genital self-image or identity has been previously described as 'self-definitions, self-attitudes and subsequent feelings which arise from specific interactions and experiences, which either indirectly or directly involve the genitals' [3]. It therefore follows that genital self-image could be seen as a component of body image as a whole [4]. This is important to consider in the context of urogynaecological disorders.

Previous studies have shown that urogynaecological disorders, including pelvic organ prolapse, perineal trauma and overactive bladder, have a negative effect on body image as a whole and specifically on genital self-image [5–8]. These studies also demonstrated further effects of body image on both HRQoL and sexual function, including the suggestions

✉ Thomas G. Gray
thomas.gray@doctors.org.uk

¹ Academic Unit of Reproductive & Developmental Medicine, University of Sheffield, Sheffield, UK
² Department of Urogynaecology, Sheffield Teaching Hospitals NHS Foundation Trust, Room 15, Level 4, Jessop Wing, Tree Root Walk, S10 2SF, Sheffield, UK
³ Department of Psychology, School of Social Sciences, Leeds Beckett University, Leeds, UK

that sexual dysfunction is attributable more to body-image perception in women with urogynaecological disorders compared with controls [5]. The impact of urogynaecological disorders on body image may be difficult to assess in clinical practice, especially considering the sensitive and taboo nature of urogynaecological conditions, which often leads to under-reporting of symptoms in clinical consultations [9, 10]. This is why the use of patient-reported outcome measures (PROMs) with good evidence of reliability, validity and functionality in urogynaecology is potentially of such value.

The electronic Personal Assessment Questionnaire-Pelvic Floor (ePAQ-PF) is a web-based self-administered PROM developed to evaluate pelvic floor symptomology and its impact on HRQoL across 19 symptom areas (or domains) [11]. The instrument uses both multiple-choice questions and free-text items to collect data. There is good evidence from multiple studies for the reliability, validity and functionality of this instrument [11–13].

A previous content analysis study of responses to the free-text item in ePAQ-PF, which asks patients ‘Considering the issues that currently concern you the most, what do you hope to achieve from any help, advice or treatment?’, assessed responses from almost 2000 women attending urogynaecology clinics and found that 11% of patients reported body-image concerns via the free text item [14]. Body image is not currently assessed by ePAQ-PF in any of its 19 symptom domain areas, which use multiple choice questions assessing frequency and impact of symptoms.

A systematic review of available PROMs used to assess body image in urogynaecology patients identified two PROMs appropriate for use in patients with pelvic organ prolapse. However, limited evidence was found for appropriately developed and psychometrically tested tools for urogynaecology populations, including both urinary, anal incontinence and perineal trauma [15].

To address the unmet need to assess body image in patients with urogynaecology problems, a new domain within ePAQ-PF was proposed. The aim of this study therefore was to develop and undertake initial psychometric testing of a new body-image domain within ePAQ-PF.

Methods

Ethical approval was obtained from the University of Sheffield Research Ethics Committee (project no. 018432). All data were handled in line with the European Union General Data Protection Regulations (GDPR).

ePAQ-PF

ePAQ-PF consists of four dimensions relating to urinary, bowel, vaginal and sexual symptoms. Within each dimension are

four to five domains, comprising up to seven related items. An algorithm applied to score each domain results in a scale from 0 to 100, where 0 represents the best health status and 100 represents the worst health status. Individual domain scales allow insight into specific symptom areas. The questionnaire also includes a free-text item, asking patients what their main concerns and goals are in their own words. Patients are also asked if they consent to their anonymised responses being used for approved service evaluation, audit or research purposes. For this study, ePAQ was modified to include a new body-image domain within the vaginal dimension of the PROM (Fig. 1).

Content validity: Patient involvement and development of a new body-image domain

The development of a new body-image domain of ePAQ-PF was discussed at the Sheffield Teaching Hospitals Jessop Wing Patient and Public involvement group, where patient and public views were sought.

Content analysis of free text responses to ePAQ-PF identified 160 specific body-image concerns, which were recorded by 136 patients [14]. These body concerns were grouped into themes of smell (16.3%), scarring (6.9%), appearance (37.5%) and emotions (39.3%) [14].

Responses from the patient involvement group, content analysis of free-text from ePAQ-PF and the results from the systematic review of PROMs available to assess body image in urogynaecology [15] informed the content of the domain developed to assess body image in ePAQ-PF. The key themes identified regarding body image in urogynaecology relating to appearance, smell, scarring and emotions led to a five-item domain being drafted and added via software engineering to the existing ePAQ-PF. This was included at the start of the vaginal dimension of ePAQ-PF. The questions asked are shown graphically in Fig. 2.

Determination of scale structure and internal reliability

Patients attending the outpatient urogynaecology department at Sheffield Teaching Hospitals NHS Foundation Trust (STH) are invited to complete ePAQ-PF as part of their routine care. During the study period the new version of ePAQ-PF including the body-image domain was completed by patients attending the urogynaecology clinic. Data from consenting patients who completed this version of ePAQ-PF between 5 March 2018 and 31 May 2018 were analysed using SPSS (version 25.0. Armonk, NY: IBM Corp.) and GraphPad Prism (version 7.0c. San Diego, CA). As well as descriptive statistics such as demographics, item response frequencies, skewness, response rate, and floor and ceiling effects, the following psychometric statistical analyses were undertaken.

ePAQ Pelvic Floor 18c Jodie Surname Completed on 13/05/2019							
Name	Jodie Surname	Date of birth	06/06/1982	NHS Number	123 456 7899 (02)		
Clinician	Not known	Clinic	Test	Hospital Number	123		
Height	1.73 m	Weight	64 kg	BMI	21	Age	36
Treatment?	Yes	Condition change	No change	Children	2	Other pregnancies	0
Treatment type / date	No previous treatment						
Concerns & goals	1. Not worry about bladder 2. Not be scared to have sex 3. Be ale to go for a poo regularly						
Questions	1. Why has this happened? 2. Can I have another child? 3. What surgery can I have?						
Consent to confidential approved use of data?	No						

Urinary	Score (0 - 100)	Impact
Pain	0	
Voiding	33	
Overactive bladder	13	
Stress incontinence	60	
Quality of life	67	

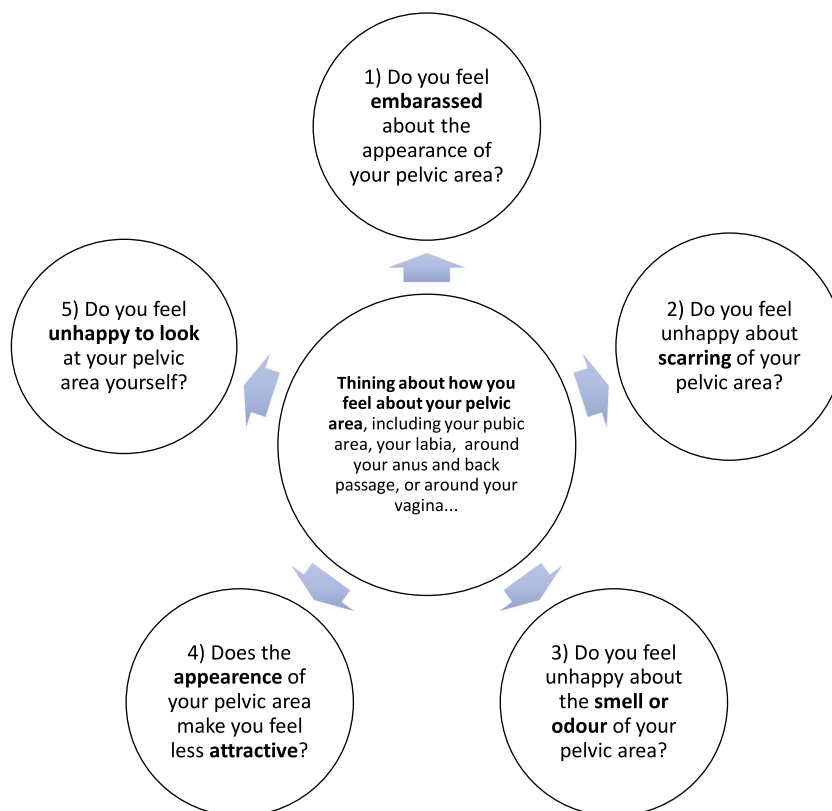
Bowel	Score (0 - 100)	Impact
Irritable bowel	13	
Constipation	44	
Evacuation	48	
Continence	24	
Quality of life	33	

Vaginal	Score (0 - 100)	Impact
Body image	75	
Pain & sensation	33	
Capacity	0	
Prolapse	42	
Quality of life	100	

Sexual	Score (0 - 100)	Impact
Urinary	0	
Bowel	0	
Vaginal	33	
Dyspareunia	13	
General sex life	25	

Fig. 1 Example ePAQ-PF report including the new body-image domain

Fig. 2 Diagrammatic representation of the five proposed items of the new body-image domain



Factor analysis (principal component analysis using varimax rotation) is a statistical procedure to reduce a collected data set into a set of measurement variables (domain scales) based upon correlations [16]. Factor analysis was performed within the vaginal dimension of ePAQ-PF to establish levels of communality for each item, with values of > 0.5 identifying which items could form scored domains [16]. Items obtaining a factor loading of > 0.40 were retained, and the number of suggested domains was indicated by components achieving an eigenvalue (raw sum of the squares) ≥ 1 [17]. Items which should be grouped together to form separate scored domains are described by factor analysis as items loading onto factors or components, the number of which should account for $> 60\%$ of variance of responses [16]. To test statistical power, the Kaiser-Meyer-Olkin measure of sampling adequacy was carried out. Collected data are suitable for factor analysis if > 0.5 , and Bartlett's test of sphericity significance was also undertaken with a value < 0.05 suggesting that there are some relationships between the variables and therefore factor analysis is appropriate.

Cronbach's alpha was used to test internal consistency reliability (how strongly items within a domain are related to each other), with an acceptable value being reported as 0.70–0.95. Item-total correlations (how strongly item scores within a domain are related to the total domain score) were calculated using Spearman's rank (r), with an accepted value being > 0.40 [12].

After finalizing the domain structure as described above, it was then possible to score the questionnaire responses according to the established ePAQ-PF algorithms. A unified score of 0–100 for each domain allows comparison of domain scores irrespective of how many items they include. The primary use of scoring domains for this study was to test criterion and construct validity.

Criterion validity

Criterion validity involves testing a new measure against something that provides an assessment of the true value, often an established measure which has undergone psychometric testing to provide evidence of validity and reliability. This can be challenging as a "gold standard" does not always exist [18]. Outcomes of a systematic review were used to identify the most appropriate existing tool with which to compare the ePAQ-PF body-image domain [15]. The Body-image Scale (BIS) in its original format was selected as the most appropriate comparator PROM [19]. Although psychometric testing for this tool in urogynaecology populations is limited, it is the most widely used instrument to assess body image in urogynaecology patients [15].

Patients attending outpatient urogynaecology clinics from 3 April 2018 until 31 May 2018, who had completed ePAQ-PF incorporating the new body-image domain prior to their appointment, were also invited to complete the BIS. Thier

scores were paired with their corresponding ePAQ-PF body-image domain scores and analysed using Spearman's rank correlation coefficient (r), after confirming non-normally distributed data by means of a Shapiro-Wilk's W test of normality value of < 0.05 .

Face validity

Face validity is a measure of how appropriate, relevant and comprehensible an instrument is to its overall purpose [11]. Patients attending the outpatient urogynaecology clinic from 3 April 2018 until 31 May 2018 who had completed ePAQ-PF in the past 4 weeks were invited to complete the Questionnaire on Questionnaires-11 (QQ-11), an updated version of the QQ-10, a psychometrically tested instrument to measure the value and burden of a PROM from a patient's perspective [20]. A similar, yet not psychometrically tested, tool assessing the clinician's perspective, Questionnaire on Investigations/ Instruments (QI-10), was distributed to all clinicians who had used ePAQ-PF with the new body-image domain with their patients in clinical practice.

Construct validity

Construct validity describes the extent to which a questionnaire measures the 'construct' it was developed to measure. One way to measure construct validity is to test hypotheses based on the expected direction of scores between two constructs, which should ideally be formulated 'a priori' before analysing responses to the instrument. Convergent construct validity is one aspect of this and it refers to the degree to which two constructs that should be related are fact related [21].

To measure an aspect of convergent construct validity for the new body-image domain in ePAQ-PF, outcomes of studies identified by a systematic review of PROMs to assess body image in urogynaecology [15] were used to formulate the following seven hypotheses: poorer body image is associated with (1) pelvic organ prolapse [5, 6], (2) sexual dysfunction [5, 8], (3) younger age [7], (4) poorer HRQoL [6], (5) urinary incontinence [22] and (6) vulvovaginal pain and (7) dyspareunia [23]. Relevant ePAQ-PF domain scores for these seven hypotheses were correlated with the ePAQ-PF body-image domain scores using Spearman's rank (r) after confirming non-normally distributed data by means of a Shapiro-Wilk's W test of normality value of < 0.05 .

Results

Descriptive statistics

Two hundred eight patients completed ePAQ-PF and consented for their anonymised responses to be used for

research purposes. The mean age was 56 years (range 18–87 years) and mean time taken to complete the PROM was 27 min. Mean parity was 2 (range 0 to 6), and mean body mass index (BMI) was 26.7 (range 18 to 41). One hundred eighty-nine patients completed the body-image domain in full, giving a response rate of 90.9% (Table 1). The mean response rates for all 20 domains of ePAQ-PF was 84.6%. The results of the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.825 and Bartlett's test of sphericity significance was 0.000, thus suggesting the sample size was suitable for factor analysis. Item response frequencies to items of the body-image domain are shown in Table 2.

Domain structure and reliability

Communalities after extraction were > 0.5 for all items other than the "smell" item, which scored 0.409. All rotated component matrix values were > 4.0 . Five components had an eigenvalue > 1.0 , which accounted for 69.3% of the variance. Four items of the body-image domain ("embarrassed", "scarring", "feel less attractive" and "unhappy to look at self") loaded onto one component; however, the "smell" item loaded onto a different component. This indicated that the "smell" item should not belong to the same domain as the other four body-image items.

For internal consistency reliability, except for the "pain and sensation" domain (α 0.69), all other values of the vaginal dimension fell between α 0.70– α 0.95. The body-image domain had the highest value of α 0.84.

For item-total correlations, without correcting for overlap, in the existing five-item body-image domain, all values (r) were > 0.40 except the "smell" item (r 0.319), as shown in Table 3. When item-total correlations were calculated for the four-item body-image domain (minus smell) as suggested by factor analysis, all values remained > 0.40 . All domains showed positive skewness towards the best health status. Floor and ceiling effects for the body-image domain were 59.3% and 2.6%, respectively.

For criterion validity, 43 patients completed both the BIS and the ePAQ-PF body-image domain. Mean BIS score was 24 (BIS is scored out of 100, with a higher score indicating worse health status and lower score indicating a better health status), range 0–89. A statistically significant positive correlation ($r = 0.501$, $p < 0.05$) was found between paired BIS scores and ePAQ-PF body-image domain scores.

Forty patients completed both the QQ-11 and ePAQ-PF body-image domain. Mean value score was 76 (this is scored out of 100, with a lower score indicating less attributed value and a higher score indicating greater value). Mean burden score was 22 (also scored out of 100, with a lower score indicating the least burden and a higher score indicating more burden).

Table 1 Descriptive statistics and score distributions for all 20 domains of ePAQ-PF. All domains are scored out of 100, with 0 representing the best health status and 100 representing the worst health status

Dimension	Domain	Response rate (%)	n	Mean	Median	SD	Range	Floor (0%)	Ceiling (%)	Skewness
Urinary	Pain & sensation	97.6	203	13.0	0	18.2	78	57.1	0	1.3
	Voiding	95.7	199	18.0	16.7	20.2	92	36.7	0	1.2
	Overactive bladder	97.6	203	23.6	25.0	20.2	92	19.2	0	0.9
	Stress urinary incontinence	97.6	203	21.6	20.0	24.1	100	35.0	0	1.3
	Quality of life	97.1	202	32.8	22.2	33.1	100	32.2	6.9	0.7
Bowel	Irritable bowel	90.4	188	34.5	33.3	26.9	100	16.0	0.5	0.6
	Constipation	91.8	191	21.9	11.1	22.0	100	24.6	0.5	1.1
	Evacuation	92.3	192	21.7	16.7	21.1	89	27.1	0	1.0
	Continence	91.8	191	16.3	9.5	17.0	90	22.5	0	1.5
	Quality of life	92.3	192	23.3	11.1	31.0	100	44.3	5.7	1.3
Vaginal	Body image	90.9	189	16.4	0	26.6	100	59.3	2.6	1.7
	Pain & sensation	89.9	187	23.6	16.7	21.5	100	23.0	0.5	1.1
	Capacity	89.4	186	7.6	0	18.0	100	77.4	1.6	3.2
	Prolapse	88.9	185	24.8	16.7	27.7	100	37.3	3.2	1.1
	Quality of life	89.4	186	24.2	11.1	28.3	100	39.8	2.7	1.1
Sexual	Sex & urinary	62.5	130	23.8	8.3	30.2	100	45.4	3.1	1.1
	Sex & bowel	63.0	131	16.2	0	27.3	100	62.6	2.3	1.7
	Sex & vagina	60.1	125	31.7	25.0	32.1	100	33.6	4.8	0.7
	Dyspareunia	57.7	120	25.3	20.0	25.0	100	25.0	2.5	1.1
	General sex life	56.3	117	41.9	33.3	29.5	100	12.8	5.1	0.3

Four clinicians completed the QI-10 (which has a similar scoring algorithm to QQ-11), with a mean value score of 87 and a mean burden score of 18.

Positive correlations were found between ePAQ-PF body-image domain scores and all domain scores measuring the seven constructed hypotheses of a relationship between body image and pelvic organ prolapse ($r = 0.365$, $p < 0.05$), sexual dysfunction ($r = 0.423$, $p < 0.05$), impaired quality of life ($r = 0.481$, $p < 0.05$), age ($r = -0.317$, $p < 0.05$), urinary incontinence ($r = 0.2$, $p < 0.05$), vulvovaginal pain ($r = 0.341$,

$p < 0.05$) and dyspareunia ($r = 0.4$, $p < 0.05$), as shown in Table 4.

Discussion

This study reports the development and initial psychometric testing of a new domain to assess body image within ePAQ-PF. We present initial evidence of reliability, content validity, face validity, criterion validity and convergent construct

Table 2 Item response frequencies for the body-image domain. % participants refers to the valid percentage, i.e., it does not include participants with missing data for that item

Item		0 (Not at all)	1 (A little)	2 (Moderately)	3 (A lot)	Total
Do you feel embarrassed about the appearance of your pelvic area?	No. participants	130	27	17	17	191
	% participants	68.1	14.1	8.9	8.9	100
Do you feel unhappy about scarring of your pelvic area?	No. participants	150	19	10	12	191
	% participants	78.5	9.9	5.2	6.3	100
Do you feel unhappy about the smell or odour of your pelvic area?	No. participants	131	30	16	14	191
	% participants	68.6	15.7	8.4	7.3	100
Does the appearance of your pelvic area make you feel less attractive?	No. participants	138	28	9	15	190
	% participants	72.6	14.7	4.7	7.9	100
Do you feel unhappy to look at your pelvic area yourself?	No. participants	137	29	7	17	190
	% participants	72.1	15.3	3.7	8.9	100

Table 3 Item-total correlations (r) and internal consistency reliability values (α) for the body-image domain following factor analysis

Body-image domain items	Spearman's rank (r)	Cronbach's alpha (α)
Do you feel <i>embarrassed about the appearance</i> of your pelvic area?	0.754	0.89
Do you feel <i>unhappy about scarring</i> of your pelvic area?	0.610	
Does the appearance of your pelvic area make you <i>feel less attractive</i> ?	0.804	
Do you feel <i>unhappy to look</i> at your pelvic area yourself?	0.769	
Are you <i>unhappy about the smell</i> or odour of your pelvic area?	0.319	

validity. The item regarding “smell” within the body-image domain will be removed prior to further psychometric testing.

The most symptomatic (i.e., highest scoring) item in the body-image domain was “embarrassment”, with the least symptomatic item being “scarring”. This follows, as scarring would be most relevant to patients following surgical intervention or perineal trauma, whereas ePAQ-PF is mostly completed by new referrals to clinic. Previous content analysis of ePAQ-PF free-text responses reports that 16.3% were concerned about smell and only 6.9% about scarring [14]. Comparing these figures to our results (Table 1) suggests that inclusion of these body-image items has increased symptom disclosure, highlighting the value of questionnaire interviewing in this context.

One of the main findings of this study was that the “smell” item was not found to be statistically related to the other four body-image domain items. It does make sense that the subject of smell is less strongly associated with the idea of body image compared to the other questionnaire items, which are all linked more visual concepts [2]. Interestingly, the “smell” item loaded onto a component with items asking about other senses such as dryness, looseness and feeling of the vagina. However, this component itself did not demonstrate significant reliability. The component which consisted of the four body-image domain items excluding “smell” showed good internal consistency reliability. With the exception of “pain and sensation”, the existing domain themes suggested acceptable internal consistency reliability and item-total correlations for the vaginal dimension of ePAQ-PF. After reviewing the

data and consultation with the urogynaecology multidisciplinary team in the unit, a decision was made to remove the “smell” item from the body-image domain, demonstrating how the process of psychometric testing for a PROM involves synthesising sometimes conflicting results to arrive at the most suitable solution when applied to a clinical situation. This includes taking care not to prioritise statistical significance over clinical significance. In this case, 16% of body-image concerns reported by patients in the free text analysis related to smell, which was why this item relating to smell was initially included, but it has not proven to be reliable or valid when used in the PROM as part of body-image assessment. The smell item will remain within ePAQ-PF as a stand-alone item available as part of the report for the clinician, but will not contribute to domain scoring for body image.

The QQ-11 and QI-10 scores recorded in this study suggest that both patients and clinicians alike find ePAQ-PF to be of value in clinical practice and not unduly burdensome. The vast majority of patients found the questionnaire relevant and useful to facilitate communication and decision making and include all aspects of their condition. The highest-ranking value item was ease of completion, with the lowest value item being enjoyment. Importantly, the majority of patients would be willing to complete it again in future, which is crucial as ePAQ-PF is used routinely for measuring treatment outcomes after conservative, medical or surgical intervention. Few patients found the questionnaire to be too long, upsetting or complicated, and no patients reported it as being too embarrassing, which highlights a benefit of computer interviewing compared with face-to-face consultation alone [24]. Additionally, clinicians found ePAQ-PF to be efficient and useful in clinical practice and that the data, whilst being easy to use in practice, were worthy of costs and resources.

All seven pre-determined hypotheses were confirmed by positive correlations, presenting some initial evidence for convergent construct validity of the ePAQ-PF body-image domain. As the body-image domain accurately measured evidence-based constructs, this suggests the reliability and validity of data produced by ePAQ-PF's body-image domain. There were clear demonstrations in this study of the negative effect of urinary incontinence, pelvic organ prolapse and sexual dysfunction on body image. This also serves to highlight

Table 4 Spearman's rank correlations between ePAQ-PF body-image domain score and domains to test construct validity

Constructed hypotheses of a relationship between body image and:	Spearman's rank (r)
Pelvic organ prolapse	0.365
Sexual dysfunction	0.423
Poorer quality of life	0.481
Urinary incontinence	0.2
Vulvovaginal pain	0.341
Dyspareunia	0.4

the importance of reliable and valid outcome measures to assess this emerging area of urogynaecological assessment. In the same way that sexual function is now routinely assessed and measured in urogynaecology patients, body image also should be.

Ceiling effects < 15% confirms the ability of ePAQ-PF to recognise any worsening of symptoms should the same patient repeat the questionnaire. The floor effect was greater than desired (59.3%). This might be expected in an unscreened study population, as patients present to urogynaecology with a broad variety of symptoms. Therefore, it is not expected that they will score highly across all domains of ePAQ-PF. Furthermore, as surgical interventions for pelvic floor disorders may cause further symptoms or side effects, it is valuable to have baseline data even if their score is at the floor of a domain. The high floor effect demonstrated here may impact upon the responsiveness of the body-image domain and this will require further testing in future studies.

In terms of limitations, the use of QQ-11 to measure acceptability and face validity may not be fully reliable as formal psychometric testing of this tool has not been undertaken since adding an additional item to the QQ-10.

In terms of risks of bias, it is possible that participants were subject to the Hawthorne effect, where the behaviour of participants is affected by the awareness of being studied [25]. However, this would have only been true for those patients answering the BIS to assess criterion validity and QQ-11 to measure acceptability/face validity. Completing the QQ-11 after the appointment as opposed to immediately after completing ePAQ-PF may have biased responses favourably, as positive responses may not have been a reflection of ePAQ-PF alone but a combination of ePAQ-PF and their clinical experience which potentially left them in a positive mind-set about treatment options, with feelings of indebtedness towards the clinician or with relief that their consultation and examination were concluded. It could be argued that as an opportunistic sampling method was used to collect BIS and QQ-11 data, some selection bias may have occurred. Another limitation is the small number of clinicians completing the QI-10, although this did include all the urogynaecology consultants and subspecialty trainee. There may have been some element of responder bias, as clinicians are unlikely to criticise their own service.

As this study has suggested reduction of the body-image domain to four items by removing the “smell” item, further data must now be prospectively gathered and confirmatory factor analysis performed in the context of an ethically approved study. The present study has confirmed the psychometric properties of ePAQ-PF’s body-image domain in a cross-sectional manner. In future studies, the domain must be tested longitudinally in terms of test-test reliability (the ability of an instrument to record the same results if tested in the same population). Measures of responsiveness to detect clinical changes over time or following treatments are also

required. If shown to have good responsiveness, there will be further evidence that this tool is suitable as an outcome measure following interventions which may affect body image, such as physiotherapy or surgery.

Identifying patients with poor body image may also influence recommended treatment options and provide a more holistic approach to their management [26]. It has been suggested that psychosomatic reactions may contribute to severity of symptoms, particularly in urge incontinence [27], and psychological interventions have been suggested as a cost-effective intervention in patients with urinary incontinence [28]. Preliminary research has also shown promise in the use of cognitive behavioural therapy (CBT) in the treatment of sexual pain disorders which are associated with body image and prolapse symptoms [29]. It follows that in patients with poor body image, psychological interventions may be a preferred option or used as an adjunct to surgical interventions, but further research is needed in this area. The new National Institute for Health and Care Excellence (UK) guidelines on the management of urinary incontinence in women have suggested that a clinical psychologist could now form part of the urogynaecology multidisciplinary team for regional centres dealing with complex pelvic floor dysfunction [30].

In conclusion, good evidence for internal consistency reliability, item-total correlation, criterion validity and initial convergent construct validity has been presented. Response rates and tests of face validity showed acceptability and value to patients and clinicians. This study has again confirmed the negative effect of urinary incontinence, pelvic organ prolapse and sexual dysfunction on body image. Further psychometric testing of this instrument is required, including tests of responsiveness and stability. The body-image domain in ePAQ-PF shows significant promise in delivering an unmet need of measuring body-image concerns in all women attending with urogynaecological problems. Further research needs to assess the impact of interventions for urogynaecological problems on body image and also investigate the role of psychological therapies. ePAQ-PF will be well placed as a suitable tool for such studies.

Authors contribution Scurr: Project development, Data collection, management and analysis, Manuscript writing.

Gray: Project development, Data collection and analysis, Manuscript writing.

Jones: Data analysis, Manuscript editing.

Radley: Project development, Manuscript editing.

Compliance with ethical standards

Financial disclaimers/conflict of interest statement Professor Stephen Radley is a director and shareholder of ePAQ Systems Limited, an NHS spin-out technology company largely owned by Sheffield Teaching Hospitals NHS Foundation Trust. Professor Radley did not collect or analyse any data included in this study. The other authors have no financial or commercial interests in ePAQ Systems Limited and no other conflicts of interests to declare. No funding was received for this study.

References

- Cash TF. Body-image: past, present, and future. *Body-image*. 2004;1(1):1–5.
- Tylka TL. Body-image: celebrating the past, appreciating the present, and envisioning the future. *Body-image*. 2018;24:A1–3.
- Waltner R. Genital identity: a core component of sexual- and self-identity. *Journal of Sex Research*. 1986;22:399–408.
- Berman L, Miles M, Pollets D, Powell JA. Genital self-image as a component of sexual health: relationship between genital self-image, female sexual function, and quality of life measures. *Journal of Sex & Marital Therapy*. 2003;29:11–21.
- Lowenstein L, Gamble T, Deniseiko Sanses TV, Van Raalte H, Carberry C, Jakus S, et al. Sexual function is related to body image perception in women with pelvic organ prolapse. *Journal of Sexual Medicine*. 2009;6(8):2286–91.
- Jelovsek JE, Barber MD. Women seeking treatment for advanced pelvic organ prolapse have decreased body image and quality of life. *Am J Obstet Gynecol*. 2006;194(5):1455–61.
- Zielinski R, Low LK, Tumbarello J, Miller JM. Body image and sexuality in women with pelvic organ prolapse. *Urol Nurs*. 2009;29(4):239.
- Handelzalts JE, Yaakobi T, Levy S, Peled Y, Wiznitzer A, Krissi H. The impact of genital self-image on sexual function in women with pelvic floor disorders. *European Journal of Obstetrics & Gynecology and Reproductive Biology*. 2017;211:164–8.
- Gray T, Li W, Campbell P, Jha S, Radley S. Evaluation of coital incontinence by electronic questionnaire: prevalence, associations and outcomes in women attending a urogynaecology clinic. *Int Urogynecol J*. 2018;29(7):969–78.
- Gray T, Vickers H, Jha S, Jones G, Brown S, Radley S. A systematic review of non-invasive modalities used to identify women with anal incontinence symptoms after childbirth. *Int Urogynecol J*. 2019;30(6):869–79.
- Radley SC, Jones GL, Tanguy EA, Stevens VG, Nelson C, Mathers NJ. Computer interviewing in urogynaecology: concept, development and psychometric testing of an electronic pelvic floor assessment questionnaire in primary and secondary care. *BJOG Int J Obstet Gynaecol*. 2006;113(2):231–8.
- Jones GL, Radley SC, Lumb J, Jha S. Electronic pelvic floor symptoms assessment: tests of data quality of ePAQ-PF. *Int Urogynecol J*. 2008;19(10):1337–47.
- Dua A, Jones G, Wood H, Sidhu H. Understanding women's experiences of electronic interviewing during the clinical episode in urogynaecology: a qualitative study. *Int Urogynecol J*. 2013;24(11):1969–75.
- Gray T, Strickland S, Pooranawattanakul S, Li W, Campbell P, Jones G, et al. What are the concerns and goals of women attending a urogynaecology clinic? Thematic analysis of free-text data from a patient reported outcome measure. *International Urogynaecology Journal*. 2018;30(1):33–41.
- Gray TG, Sneyd R, Scurr K, Jones GL, Iles D, Jha S, et al. Patient-reported outcome measures which assess body-image in urogynaecology patients: a systematic review. *International Urogynaecology Journal*. 2019;30(5):673–81.
- Field A. *Discovering statistics using IBM SPSS statistics*, 4th ed. London: Sage Publications; 2013. Section 17.4
- Gray TG, Alexander C, Jones GL, Tidy JA, Palmer JE, Radley SC. Development and psychometric testing of an electronic patient-reported outcome tool for Vulval disorders (ePAQ-vulva). *Journal of Lower Genital Tract Disease*. 2017;21(4):319–26.
- Bolarinwa OA. Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Nigerian Postgraduate Medical Journal*. 2015;22:195–201.
- Hopwood P, Fletcher I, Lee A, Al GS. A body image scale for use with cancer patients. *Eur J Cancer*. 2001;37(2):189–97.
- Moores KL, Jones GL, Radley SC. Development of an instrument to measure face validity, feasibility and utility of patient questionnaire use during health care: the QQ-10. *Int J Qual Health Care*. 2012;24(5):517–24.
- Terwee CB, Bot SDM, De Boer MR, Van Der Windt DAWM, Knol DL, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. *J Clin Epidemiol*. 2007;60:34–42.
- Hunter MM, Nakagawa S, Van Den Eeden SK, Kuppermann M, Huang AJ. Predictors of impact of vaginal symptoms in postmenopausal women. *Menopause*. 2016;21(2):129–39.
- Boyer SC, Pukall CF. Pelvic examination experiences in women with and without chronic pain during intercourse. *Journal of Sexual Medicine*. 2014;11(12):3035–50.
- Bachman JW. The patient-computer interview: a neglected tool that can aid the clinician. *Mayo Clinic Proceedings*. Mayo Foundation for Medical Education and Research. 2003;78(1):67–78.
- McCambridge J, Witton J, Elbourne DR. Systematic review of the Hawthorne effect: new concepts are needed to study research participation effects. *J Clin Epidemiol*. 2014;67(3):267–77.
- McDermott E, Moloney J, Rafter N, Keegan D, Byrne K, Doherty GA, Cullen G, Malone K, Mulcahy HE. The Body-image Scale: A simple and valid tool for assessing body-image dissatisfaction in inflammatory bowel disease. 2018;20(2):286–290.
- Chiara G, Piccioni V, Perino M, Ohlmeier U, Fassino S, Leombruni P. Psychological investigation in female patients suffering from urinary incontinence. *Int Urogynecol J*. 1998;9(2):73–7.
- Debus G, Kästner R. Psychosomatic aspects of urinary incontinence in women. *Geburtshilfe Frauenheilkd*. 2015;75(2):165–9.
- Bergeron S, Morin M, Lord M-J. Integrating pelvic floor rehabilitation and cognitive-behavioural therapy for sexual pain: what have we learned and where do we go from here? *Sex Relatsh Ther*. 2010;25(3):289–98.
- National Institute for health and care excellence (2019). Urinary incontinence and pelvic organ prolapse in women: management NG23. Available at: <https://www.nice.org.uk/guidance/ng123/resources/urinary-incontinence-and-pelvic-organ-prolapse-in-women-management-pdf-66141657205189> [Accessed 10th December 2019].

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.