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The emetophobia questionnaire (EmetQ-13): Psychometric validation of a measure of specific phobia of vomiting (emetophobia)

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ABSTRACT

This study reports on the development and psychometric evaluation of a self-report assessment of the severity of symptoms of emetophobia. Using a sample of 95 individuals with emetophobia, and a matched sample of 90 control participants, a 13-items inventory was developed that showed a clear three-factor structure. The EmetQ-13 had good internal consistency ($\alpha = .82$ in the clinical sample, and $\alpha = .85$ in the control sample), and one-week test–retest reliability ($r_{xx} = .76$). The EmetQ-13 showed significant correlations with another measure of emetophobia symptoms, the Specific Phobia of Vomiting Inventory, and related constructs such as disgust sensitivity. The measure showed excellent ability to classify emetophobic and non-emetophobic individuals, with correct assignment in 96.2% of cases. The EmetQ-13 also correlated significantly with a behavioural approach test using a vomit-like stimulus. The initial evaluation of the EmetQ-13 suggests that it is a reliable and valid measure for the assessment of emetophobia.

1. Introduction

Emetophobia (specific phobia of vomiting) is an anxiety disorder characterised by a preoccupation with fear that oneself or others may vomit (Boschen, 2007). Individuals may avoid people, places, foods or other stimuli that they associate with increased risk of nausea or vomiting. Specific data on prevalence is limited with clinical levels of specific phobia of vomiting having an estimated lifetime and 12 month prevalence of 0.2%, and a point prevalence of 0.1% (Becker et al., 2007). The condition is much more common in females (Veale & Lambrou, 2006). Limited available data suggests that emetophobia typically has an onset before adulthood, and a chronic course (Lipsitz, Fyer, Paterniti, & Klein, 2001). Emetophobia is also associated with considerable functional impairment (Veale and Lambrou, 2006) and interference in eating (Veale, Costa, Murphy, & Ellison, 2012c). There is some evidence for associative learning in emetophobia whereby vomiting becomes associated with an unrelated life event or an aversive consequence (Veale, Murphy, Ellison, Kanakam, & Costa, 2012b).

Previous authors have specified a range of theoretically-derived treatment techniques that may be useful in the treatment of emetophobia (e.g., Boschen, 2007; Veale, 2009). Despite this, however, there remain no large studies, which assess the efficacy of these treatment methods. Most investigations of emetophobia treatment have been case studies (e.g., Hunter & Antony, 2009; Lesage & Lamontagne, 1985; McFadyen & Wyness, 1983), and the largest study to date has involved only seven patients (Philips, 1985).

While general measures exist to assess the broad range of specific phobias, there are no measures which provide an assessment of the specific symptoms of emetophobia. A precursor to conducting larger scale treatment outcome research is the existence of a reliable, valid measure of emetophobia. Previous case reports have assessed outcome using either behavioural methods, or other individualised outcomes such as progress through an exposure hierarchy. While these individualised measures of outcome are suitable for case studies, they are not a viable option for conducting treatment of groups of individuals. Furthermore, although they demonstrate good face validity, their psychometric properties are unknown.

One major impediment to the development of a psychometrically validated measure of emetophobia is the low prevalence of the condition. Full psychometric assessment of the reliability and validity of a new measure of emetophobia requires samples that are much larger than those used in all previous studies of the condition.

One previous scale has been developed to assess severity of emetophobia symptoms. The Specific Phobia of Vomiting Inventory (SPOVI; Veale et al., 2012a) was developed independently of

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the measure presented in the current paper, with eventual collaboration between these two research groups after these scales were developed. Although there is overlap in some symptoms of emetophobia that are assessed by each of these scales, there is also divergence between the two scales in some areas of focus. For example, the SPOVI includes items related to monitoring of vomit-related threat, while the EmetQ differentiates between avoidance of situations/movement/travel and avoidance of others who may be at perceived increased risk of vomiting.

The current study aimed to conduct the preliminary psychometric investigation of a self-report measure of emetophobia symptoms. From an initial item pool, factor analysis was used to arrive at a brief measure with a sound factor structure. Following this, the psychometric properties of the scale were assessed.

2. Study one—Method

2.1. Participants

2.1.1. Emetophobic sample

We recruited participants with emetophobia ($N = 95$) either from patients seeking treatment ($n = 25$) or three internet support groups (Gut Reaction, International Emetophobia Society, and Anxiety UK; $n = 70$). All participants had to fulfil DSM-IV criteria for emetophobia diagnosed with the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 1996) using a face-to-face interview or over the telephone. Interviewers using the SCID were either psychologists or psychiatrists experienced in its use, or a clinical research worker trained in the use of the SCID. Inter-rater reliability of these diagnoses was not assessed.

Although the SCID was not used to confirm the absence of an emetophobia diagnosis, we included individuals who self-reported fear of vomiting. Additionally, we planned to exclude participants with any condition that may increase the likelihood or frequency of vomiting (e.g., pregnancy, current prescription medication or illicit drugs, or other health/medical problems), however no participants were excluded on the basis of these criteria. A total of 95 individuals with emetophobia were recruited, with a mean age of 32.61 years (SD = 12.09). As expected, the majority (89, 93.7%) were female. A total of 55.8% were married or cohabiting, with 38.9% being single. Demographic details including employment and marital status are presented in Table 1. A total of 63.4% of the emetophobic group had no comorbid diagnoses, while 21.1% had one comorbid diagnosis, and 15.5% had two or more comorbid diagnoses. Comorbid conditions in patients from the emetophobia sample were major depressive disorder ($n = 8$, 11.3%), generalized anxiety disorder ($n = 8$, 11.3%), obsessive–compulsive disorder ($n = 6$, 8.5%), somatisation disorder ($n = 5$, 7.0%), panic disorder without agoraphobia ($n = 4$, 5.6%), social anxiety disorder ($n = 4$, 5.6%), agoraphobia without a history of panic disorder ($n = 2$, 2.8%), hypochondriasis ($n = 1$, 1.4%), and other specific phobia ($n = 1$, 1.4%).

2.1.2. Control sample

For comparison, a control sample was recruited using the Mind-Search database of the Institute of Psychiatry at King's College London, a database of over 3500 community volunteers who have previously registered to participate in research studies. Individuals were recruited with the aim of providing a sample which was similar in demographics to the emetophobic sample. Individuals with greater risk of vomiting (e.g., presence of eating disorder including vomiting behaviour, recent overdose with vomiting, regular binge drinking and vomiting, use of illicit drugs or prescription medication, presence of a medical disorder such as migraine, or current pregnancy) were excluded in order to match the frequency of vomiting to the emetophobia group. A total of 90 individuals completed the questionnaire package through an online website. The Control group participants had a mean age of 32.47 years (SD = 11.00), and the majority (86%, 95.6%) were female. Demographics for the Control sample are presented in Table 1.

2.1.3. Anxious control sample

To ensure the specificity of the EmetQ-13 to emetophobic individuals, a comparison sample of 20 anxious individuals with other (non-emetophobia) disorders were recruited. Basic demographic details are provided in Table 1. There were 12 participants with a primary diagnosis of obsessive–compulsive disorder, 4 with body dysmorphic disorder, 2 with panic disorder with agoraphobia, and 2 with social phobia. These participants were recruited from a specialist anxiety and body dysmorphic disorder treatment service. All were screened for the presence of emetophobia using a clinical interview. Other diagnoses in addition to the primary diagnosis were not recorded, except to rule out the presence of emetophobia.

2.2. Materials and procedure

Participants from all samples completed a collection of questionnaires, either online or in a pen-and-paper format. Measures were selected for the purpose of assessing the validity of the new scale, and measuring associated psychopathology and functioning. All responses were entered onto a computer for statistical analysis.

2.2.1. Emetophobia questionnaire (EmetQ-13)

The EmetQ-13 was derived as a brief self-report measure of symptoms associated with specific phobia of vomiting. An initial item pool of 21 items was generated based on case reviews of 8 individuals previously diagnosed with emetophobia. Each item was constructed in the form of a Likert-type scale in which the respondent read the item (e.g., "I avoid children who may be likely to vomit.") by circling a number ranging from 1 ("Strongly Disagree) to 5 ("Strongly Agree"). A total score was computed by summing scores for all 13 individual items.

2.2.2. Specific phobia of vomiting inventory (SPOVI)

The SPOVI (Veale et al., 2012a,b,c) is a 14-item self-report measure of symptoms associated with specific phobia of vomiting. It is the only other standardized measure of emetophobia, and has established sound reliability ($\alpha = .91$), and validity in the assessment of emetophobia symptoms.

The SPOVI was developed independently of the EmetQ, with subsequent collaboration after data collection between the two research groups. While the EmetQ and SPOVI overlap in assessment of some emetophobia symptoms, the SPOVI includes additional items related to threat-monitoring, while the EmetQ differentiates avoidance into avoidance of situations/movement/travel and avoidance other others who may be at risk of vomiting.

2.2.3. Disgust scale—Revised (DS-R)

The DS-R (Olatunji et al., 2007; van Overveld, de Jong, Peters, & Schouten, 2011) is a 25-item self-report measure of an individual's propensity to experience disgust. The DS-R asks the respondent to rate whether certain stimuli would be perceived as disgusting, as well as their level of disgust to a list of situations.

2.2.4. Obsessive–compulsive inventory (OCI)

The OCI (Foa, Kozak, Salkovskis, Coles, & Amir, 1998) is a 42-items self-report measure of symptoms of obsessive–compulsive disorder. The OCI covers a wide range of OCD symptoms, and has established reliability and validity in the assessment of OCD.

Table 1
Demographic characteristics of the emetophobia and control samples.

Variable	Emetophobia group ($N = 95$)	Community control group ($N = 90$)	Anxious control group ($N = 20$)
Age	$M = 32.61$ SD = 12.09	$M = 32.47$ SD = 11.00	$M = 29.01$ SD = 7.13
Sex			
Male	6 (6.3%)	3 (3.3%)	0 (0.0%)
Female	89 (93.7%)	86 (95.6%)	20 (100.0%)
Unrecorded	0 (0.0%)	1 (1.1%)	0 (0.0%)
Marital status			
Single	37 (38.9%)	47 (52.2%)	Not
Married or co-habiting	53 (55.8%)	37 (41.1%)	recorded
Divorced	4 (4.2%)	2 (2.2%)	
Widowed	0 (0.0%)	4 (4.4%)	
Unrecorded	1 (1.1%)	0 (0.0%)	
Employment status			
Unemployed	5 (5.3%)	5 (5.6%)	Not recorded
Long-term sick leave	4 (4.2%)	1 (1.1%)	
Student	15 (15.8%)	21 (23.3%)	
Employed/Self-employed	55 (57.9%)	55 (61.1%)	
Homemaker	7 (7.4%)	5 (5.6%)	
Other	7 (7.4%)	2 (2.2%)	
Unrecorded	2 (2.1%)	1 (1.1%)	

2.2.5. Patient health questionnaire (PHQ-9)

The PHQ-9 (Kroenke, Spitzer, & Williams, 2001) is a brief self-report measure of depressive symptoms, based on nine DSM-IV symptoms of major depressive disorder. The instrument has good reliability ($\alpha = .86 - .89$), and is a valid measure of severity of depression symptoms.

2.2.6. Generalized anxiety disorder (GAD-7)

The GAD-7 (Spitzer, Kroenke, Williams, & Löwe, 2006) is a seven -item instrument designed to screen for GAD symptoms, and quantify their severity. It has high sensitivity and specificity to GAD, as well as strong reliability and validity in the assessment of GAD symptoms.

2.2.7. Health anxiety inventory (HAI)

The HAI (Salkovskis, Rimes, Warwick, & Clark, 2002) is a 14-item self-report measure designed to assess symptoms of health anxiety and hypochondriasis. The measure shows high reliability, differentiates between health anxiety and other conditions, is sensitive to change during treatment, and correlates highly with clinician ratings.

2.2.8. Work and social adjustment scale (WSAS)

The WSAS (Mundt, Marks, Shear, & Greist, 2002) is designed to assess an individual's current functioning using a brief, five-item, self-report questionnaire. The measure shows acceptable internal consistency, and correlates with severity measures of depression and obsessive–compulsive disorder. The measure is also sensitive to treatment effects.

3. Study one—Results

3.1. Item reduction and factor analysis

The current study was the first investigating the EmetQ-13, and as such exploratory factor analytic methods were used to reduce an item pool to a subset of items which yielded a robust, interpretable factor structure. Beginning with the original 21-items pool, a series of exploratory factor analyses were conducted using only the emetophobic sample. At each iteration, maximum likelihood factor extraction was used, followed by a promax rotation with Kaiser normalization. The number of factors extracted was based on a cutoff eigenvalue of 1.0. At each stage, items were retained only if they met all of the following criteria: communality >.3; factor loading on at least one factor of >.4; no complex factor loadings, indicated by loading on a single factor only of >.4. After each factor analysis, items which did not meet all of these criteria were eliminated before running the next iteration. A total of 4 iterations were required to produce a final subset of 13 items which loaded on 3 separate factors. Table 2 shows the items which were eliminated at each step, as well as measures of adequacy of sampling variance. The final 13-items 3-factors solution accounted for 64.07% of the variance. Loadings of individual items, as well as final communality statistics, are shown in Table 3.

Factor I included 6 items and described avoidance symptoms, focused on travel, movement, or locations where there are no facilities or medical help. Factor II was comprised of 3 items which centred on themes of dangerousness of exposure to vomit stimuli. Factor III consisted of 4 items which were predominantly focused on avoidance of others who may vomit. Subscale totals were computed by finding the arithmetic mean of the items for each subscale, based on their primary factor loadings from Table 3. A total EmetQ-13 score was computed by summing the score for all 13 items. Correlations between subscales and the total score, for both the clinical and control samples, are presented in Table 4.

3.2. Reliability—Internal consistency

Separate evaluations of internal consistency were conducted for the EmetQ-13 in the emetophobic and control samples. Cronbach's alpha for the 13-itemsscale was $\alpha = .82$ for the clinical, and $\alpha = .85$ for the control sample, indicating good internal consistency without substantial item redundancy. Cronbach's α for the other scales used in this study are presented in Tables 5 and 6.

3.3. Reliability—Test–retest

Temporal stability of the measure was assessed by examining scores by the same participants taken 1 week apart. All participants from the Study 1 emetophobic group were invited to participate in the retest phase, with a total of 31 participants completing the EmetQ-13 at both time points. Test–retest reliability for the total scale was .76 ($p < .001$), while test–retest reliabilities for the three subscales were .79, .76, and .63 (all $p < .001$).

Table 2
Sequence of factor analyses to obtain reduced item pool.

Iteration	Items	Factors	KMO index	Bartlett's test of sphericity	Items eliminated
1	21	6	0.737	$\chi^2 = 858.65$, $df = 210$, $p < 001$	I notice my stomach begins to turn when exposed to vomit[a] I become anxious when I feel nauseous[a,b] It is dangerous to feel nauseous[a] I worry when I feel nausea I may vomit[a] I avoid eating poultry food like chicken because I may vomit[a]
2	16	4	0.714	$\chi^2 = 691.18$, $df = 120$, $p < 001$	My concern about vomiting increases when I get anxious[a,b] I avoid places like fish markets because I may vomit[a]
3	14	4	0.732	$\chi^2 = 635.79$, $df = 91$, $p < 001$	I notice when I am anxious, my stomach gets upset[a]
4	13	3	0.728	$\chi^2 = 608.93$, $df = 78$, $p < 001$	

[a] Eliminated due to having no loading on any factor of >.4.
[b] Eliminated due to having communality <.3.

Table 3
Factor loadings and communalities for the final three-factor solution.

Item	Factor loadings			Communality
	I	II	III	
I avoid air travel because I may become nauseous/vomit	.79			.58
I avoid other forms of transport because I may become nauseous/vomit	.75			.48
I avoid sea travel (boats, etc.) because I may become nauseous/vomit	.70			.48
I avoid places where there are no facilities to cater if I become nauseous/vomit	.59			.62
I avoid places where there is no medical attention, because I may become nauseous/vomit	.54			.55
I avoid fast-moving activities like rides at the theme park, because I may vomit	.51			.34
If I see vomit, I may be sick myself		1.00		.91
If I smell vomit I may be sick myself		.96		.91
Exposure to vomit can cause sickness and/or illness		.54		.37
I avoid adults who may be likely to vomit			.86	.63
I avoid children who may be likely to vomit			.80	.57
I avoid places where others may vomit			.71	.51
I notice physical anxiety symptoms when exposed to vomit			.52	.31

Note: Only loadings >.4 are shown.

Table 4
Correlations between EmetQ-13 subscales and total score.

	Emetophobic sample			Control sample		
Subscale	I	II	III	I	II	III
II	.37***			.33**		
III	.21*	.19		.39***	.53***	
Total	.88***	.69***	.48***	.71***	.75***	.83***

* $p < .05$.
** $p < .01$.
*** $p < .001$.

3.4. Validity—Concurrent and discriminant

One assessment of the validity of the EmetQ-13 is to examine its concurrent validity through correlations with related measures of psychopathology and other constructs. We examined the relationship between the EmetQ-13 and the only other measure of emetophobia symptoms, the SPOVI. Correlations between these two measures were $r = .45$ ($p < .001$) in the clinical

Table 5
Correlations between EmetQ-13 total and related measures (emetophobic sample).

	EmetQ-13	SPOVI	DS-R	OCI	PHQ-9	GAD-7	HAI	WSAS
EmetQ-13	(.82)							
SPOVI	.45***	(.91)						
DS-R	.33**	.34**	(.82)					
OCI	.38**	.49***	.34**	(.94)				
PHQ-9	.35**	.47***	.24*	.57***	(.92)			
GAD-7	.38***	.55***	.19	.53***	.83***	(.92)		
HAI	.43***	.60***	.30**	.54***	.52***	.59***	(.91)	
WSAS	.50**	.52***	.28*	.43***	.49***	.49***	.42***	(.69)

* $p < .05$.
** $p < .01$.
*** $p < .001$.
Note: Cronbach's α coefficients for the emetophobia sample are displayed in parentheses along the diagonal. EmetQ-13 = emetophobia questionnaire, SPOVI = specific phobia of vomiting inventory, DS-R = disgust sensitivity—revised, OCI = obsessive compulsive inventory, PHQ-9 = personal health questionnaire, GAD-7 = generalized anxiety disorder 7, HAI = health anxiety inventory short version, WSAS = work and social adjustment scale.

Table 6
Correlations between EmetQ-13 total and related measures (control sample).

	EmetQ-13	SPOVI	DS-R	OCI	PHQ-9	GAD-7	HAI
EmetQ-13	(.85)						
SPOVI	.25*	(.81)					
DS-R	.56***	.30**	(.89)				
OCI	.37**	.19	.36**	(.97)			
PHQ-9	−.24	.19	.04	.45***	(.94)		
GAD-7	.10	.27*	.15	.71***	.84***	(.95)	
HAI	.26*	.41***	.40***	.50***	.18	.47***	(.88)

* $p < .05$.
** $p < .01$.
*** $p < .001$.
Note: Cronbach's α coefficients for the control sample are displayed in parentheses along the diagonal. EmetQ-13 = emetophobia questionnaire, SPOVI = specific phobia of vomiting inventory, DS-R = disgust sensitivity—revised, OCI = obsessive compulsive inventory, PHQ-9 = personal health questionnaire, GAD-7 = generalized anxiety disorder 7, HAI = health anxiety inventory short version, WSAS = work and social adjustment scale.

sample, and $r = .25$ ($p = .02$) in the control sample. The correlation between the EmetQ-13 subscales and the SPOVI in the emetophobia sample was .41 ($p < .001$), .21 ($p = .047$), and .26 ($p = .013$) for Factor I, II, and III respectively. The EmetQ-13 correlated significantly with disgust as measured by the DS-R in both the emetophobic samples ($r = .33$, $p = .002$) and the control sample ($r = .56$, $p < .001$). Health anxiety symptoms measured by the HAI also showed significant correlations with emetophobia symptoms in the clinical and non-clinical samples ($r = .50$, $p < .001$ and $r = .26$, $p = .02$, respectively). Correlations between the EmetQ-13 and other measures of psychopathology such as depression, generalized anxiety, obsessive–compulsive symptoms were all significant in the clinical sample (see Table 5). In contrast, in the non-clinical sample EmetQ-13 scores were only significantly correlated with obsessive–compulsive symptoms (see Table 6).

3.5. Validity—Theory-consistent group differences

A key test of the validity of the new measure was whether it showed differences in scores between a group of individuals diagnosed with emetophobia and a control group which did not have the condition. We examined each of the EmetQ-13 subscales, as well as the total score, comparing scores between the emetophobic and control groups using independent *t*-tests. As is shown in Table 7, each of the subscales demonstrated a significantly higher score in the emetophobic group compared to the control group. The same significant difference was observed between the groups on the overall EmetQ-13 total score (see Table 7).

A similar comparison was made between the emetophobia group, and a group of 20 anxious individuals. Individuals from the emetophobia group had significantly higher EmetQ-13 total scores than individuals with other non-emetophobic disorders, as well as on Factors I and III (see Table 7).

3.6. Validity—Diagnostic classification

We assessed whether the subscales of the EmetQ-13 were able to reliably classify participants into either the emetophobic or control groups using a logistic regression with the subscales entered simultaneously as predictors, and group as the dependent variable. Results demonstrated that the EmetQ-13 was successful at predicting diagnostic status (Nagelkerke $R^2 = .95$, $\chi^2 = 227.65$, $p < .001$). When the resulting regression equation was used to classify individuals as either emetophobic or control participants, an overall accuracy of 96.2% was obtained, indicating excellent ability of the instrument to differentiate between clinical and control participants. A total of 86 (95.6%) of the control group were correctly identified as being non-clinical, while 90 (96.8%) of the emetophobic group were correctly identified as belonging to the clinical sample.[1]

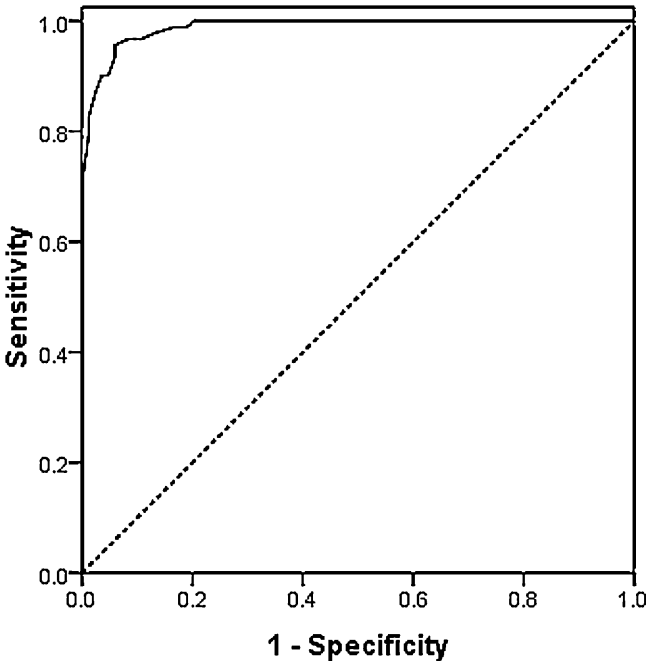

Fig. 1. ROC curve for EmetQ-13 total score

Examination of the sensitivity and specificity of the EmetQ-13 in determining caseness was conducted using a receiver operating curve procedure. Fig. 1 shows the ROC curve of the EmetQ-13. The total area under the curve determined in the ROC analysis was 0.988 ($p < .001$). As can be seen, the instrument displays a good ability to balance sensitivity and specificity.

A range of clinical cut-off scores were considered based on the results of the ROC analysis. Table 8 presents the sensitivity and specificity for a range of different cut-off scores, with a score of >22 being determined as the most appropriate cut-off score to balance sensitivity and specificity.

[1] A reviewer suggested that we also test the ability of the EmetQ-13 to differentiate between our emetophobia group and the combined control and anxious control groups. The EmetQ-13 is also able to successfully differentiate between these two groups in a logistic regression (Nagelkerke $R^2 = 0.75$, $\chi^2 = 159.32$, $p < .001$, 87.7% correctly classified).

Table 7
Means and standard deviations for each EmetQ-13 subscale and total score.

	Emetophobic $M \pm SD$	Control $M \pm SD$	Comparison of means
Subscale I*	2.33 ± 1.04	0.39 ± 0.55	$t = 15.75$, $df = 181$, $p < .001$, $d = 2.44$
Subscale II*	2.68 ± 1.20	1.39 ± 1.02	$t = 7.79$, $df = 182$, $p < .001$, $d = 1.16$
Subscale III*	3.76 ± 0.52	1.01 ± 0.93	$t = 24.79$, $df = 182$, $p < .001$, $d = 3.79$
Total†	37.25 ± 8.91	10.58 ± 7.63	$t = 21.19$, $df = 173$, $p < .001$, $d = 3.23$
	Emetophobic M ± SD	Anxious M ± SD	Comparison of means
Subscale I*	2.33 ± 1.04	1.81 ± 0.72	$t = 2.13$, $df = 111$, $p = .035$, $d = 0.59$
Subscale II*	2.68 ± 1.20	2.63 ± 0.94	$t = 0.15$, $df = 112$, $p = .883$, $d = 0.05$
Subscale III*	3.76 ± 0.52	2.08 ± 0.96	$t = 11.04$, $df = 112$, $p < .001$, $d = 2.27$
Total†	37.25 ± 8.91	27.05 ± 8.90	$t = 4.64$, $df = 109$, $p < .001$, $d = 1.15$

Note: Subscale scores are computed as the mean of individual item scores, to allow for comparison between subtests with different numbers of items. The total score is computed as the total of individual item scores.

3.7. Validity—Sensitivity to treatment effects

The use of the EmetQ-13 as a measure of treatment outcome requires it to be sensitive to changes in symptom severity in successful treatment of emetophobia. A total of 12 individuals diagnosed with emetophobia by a clinical psychologist or psychiatrist specialising in treatment of the condition were treated using a cognitive behavioural intervention based on the principles outlined by Boschen (2007) and Veale (2009), including imagery rescripting, exposure to situations and stimuli associated with vomiting, reducing safety behaviours, and cognitive restructuring. These participants were a subset of those used in the Study 1 analyses. Each participant received up to 12 weekly 1-h sessions. Individuals showed significant reduction in emetophobia symptoms, as measured by the EmetQ-13, between pre-treatment and post-treatment assessments ($M_{Pre} = 52.00$, $SD_{Pre} = 8.64$, $M_{Post} = 43.33$, $SD_{Post} = 6.89$, $d = 1.117$, Wilcoxin Signed Ranks Test $Z = 3.063$, $p = .002$). Additionally, changes in EmetQ-13 scores during treatment were strongly correlated with changes in SPOVI scores ($r = .70$).

4. Study two—Method

4.1. Participants

To assess the relationship between the EmetQ-13 and a behavioural measure of ability to approach a vomit stimulus, a mixed sample of student and clinical individuals were recruited. The use of a combined sample was conducted to ensure that there would be a range of scores on both the EmetQ-13 and the behavioural approach test. The combined sample consisted of 116 undergraduate psychology students, 10 individuals with panic disorder (with and without agoraphobia) recruited from a local support group, and 6 individuals with emetophobia recruited from a private clinical psychology practice in Brisbane, Australia. All diagnoses were made by an experienced clinical psychologist on the basis of a clinical interview. The combined participant group consisted of 100 females and 32 males, with a mean age of 24.11 years (SD = 11.91).

Table 8
Sensitivity and specificity for EmetQ-13 cutoff scores.

EmetQ-13 cut-off	Sensitivity	Specificity
>10	1.00	.51
>15	1.00	.74
>20	.97	.89
>22	.96	.94
>25	.90	.95
>30	.79	.99
>35	.55	1.00
>40	.37	1.00

4.2. Measures and procedure

Participants completed the EmetQ-13 in addition to a Behavioural Approach Test (BAT) designed to assess their ability to approach a vomit-like stimulus. The stimulus was mixed according to the formula used by previous authors in their treatment of an individual with vomit phobia (McFadyen & Wyness, 1983). Approximately 2 l of the substance was contained in a plastic container 4 m from the entrance to a room. Participants were given instructions as detailed in Appendix B. Higher scores on the BAT reflected higher levels of avoidance of the vomit-like substance. Participant instructions and scoring criteria for the BAT are detailed in Appendix B.

5. Study two—Results

5.1. Validity—Behavioural approach test

Correlations between the EmetQ-13 total and subscale scores, and the results of the behavioural approach test were compared as a test of validity of the new scale against an external behavioural task. The EmetQ-13 was significantly correlated with both an individual's predicted ability to approach the vomit stimulus ($r = .36$, $p = .003$), and their actual approach score ($r = .39$, $p = .001$).

6. Discussion

The current report describes the development and initial psychometric evaluation of a self-report measure of emetophobia symptoms. From an initial item pool of 21 items, a series of factor analyses were used to derive a short, 13 items questionnaire in which all items clearly loaded on only one of the three factors. The scale showed good levels of internal consistency, especially given the small number of items. Temporal stability over one week was also acceptable. The EmetQ-13 correlated with other measures of related symptoms, including the only other measure of emetophobic symptoms. As expected, EmetQ-13 total and subscale scores were higher in individuals diagnosed with emetophobia. A particular strength of the EmetQ-13 was its ability to differentiate between individuals with emetophobia and a control sample, and the scale showed high levels of sensitivity and specificity to the diagnosis of emetophobia. Additionally, the EmetQ-13 was sensitivity to the effects of treatment in a small group of individuals treated for emetophobia. Finally, the EmetQ-13 shows a significant

relationship with a behavioural measurement of avoidance of a vomit stimulus.

The correlation between the EmetQ and the only other validated measure of emetophobia symptoms, the SPOVI, was significant but moderate in strength ($r = .45$). This suggests that while the EmetQ and SPOVI assess some similar symptoms of emetophobia, they are not assessing precisely the same features. Both instruments assess emetophobia symptoms, although the focus of each measure is different. The EmetQ overlaps on the factor of avoidance but separates into two distinct factors of avoidance of situations and movement, and avoidance of people who may vomit. The EmetQ also includes a third factor on misinterpretation of seeing or smelling vomit in anticipation of vomiting by oneself, which does not occur on the SPOVI. The SPOVI, alternatively, covers some symptoms of avoidance, but also contains items that assess an individual's monitoring of the threat of vomiting (for example excessive worry about vomiting; ruminating about reasons feeling nauseous or being self-focussed monitoring whether one feels ill; seeking reassurance about vomiting). The moderate correlation between the two measures is likely to be a reflection of this imperfect overlap in item content. Weak correlations between the SPOVI and EmetQ Factor II and III subscales also demonstrates that the EmetQ and SPOVI are assessing different aspects of emetophobia symptoms.

The EmetQ also showed a range of correlations with other measures of psychopathology and functioning. The strongest correlation (in the clinical sample) was between the EmetQ and the WSAS. This strong relationship between emetophobia symptoms and work and social adjustment is likely to reflect the impact of emetophobia symptoms on everyday functioning. Emetophobia is known to significantly impair functioning, causing marked distress (Lipsitz et al., 2001), and this correlation is consistent with this previous research.

The next strongest relationship in the clinical sample was observed between emetophobic symptoms and symptoms of hypochondriasis. This correlation is likely to be the result of concerns about becoming ill, where the individual may be exposed to increased risk of vomiting as part of that illness. This correlation was also significant in the non-clinical (community) sample.

Significant relationships in the clinical and community samples between emetophobia symptoms and disgust sensitivity (the propensity to experience disgust and find this experience aversive) are also consistent with previous findings (van Overveld, de Jong, Peters, van Hout, & Bouman, 2008) and models of emetophobia (e.g., Boschen, 2007). Individuals with emetophobia may be predisposed to developing the condition as a result of increased experience and aversiveness of disgust reactions. When individuals experience more severe and frequent disgust reactions, this may lead to stronger tendencies to avoid stimuli and reactions associated with these, such as nausea.

Associations between emetophobia symptoms and symptoms of other conditions such as depression, generalized anxiety disorder, and obsessive–compulsive disorder are consistent with correlations observed between anxiety and depression measures previously (e.g., Boschen & Oei, 2006, 2007; Clark & Watson, 1991). These relationships are generally attributed to a non-specific general distress factor, also referred to as negative affectivity, shared across the anxiety and depressive disorder spectrum. As such, the correlations observed in the current study are consistent with these.

Differences in correlations between the community and clinical (emetophobic) samples are most likely due to the restriction in range in the non-clinical samples scores. The non-clinical (community) sample reported low levels of specific psychopathology symptoms on measures such as the OCI, PHQ-9, and GAD-7. Where measures have greater variability in non-clinical samples (e.g., in disgust sensitivity as measured by the DS-R), the relationships between this variable and emetophobia symptoms are preserved.

The current research has several implications that are noteworthy. The development of a brief self-report measure of emetophobia symptoms allows for the reliable and valid measurement of these symptoms in a variety of contexts. In research settings, the ability to reliably measure emetophobia symptoms allows for these symptoms to be measured in larger cohorts, as part of treatment outcome studies. Within clinical contexts, the EmetQ-13 can be used to assess severity of emetophobia symptoms, and to evaluate changes in these that may occur during treatment. The high levels of sensitivity and specificity of the instrument also suggest a use as a screening measure for the presence of emetophobia in either clinical or research contexts.

Despite the strengths of the measure, there are several limitations that should be acknowledged, both in the measure itself, and the methodology of the current study. Firstly, the elimination of several items during the repeated iterations of factor analysis means that several symptoms of emetophobia that were covered by the larger item pool are no longer assessed. Although this has left a final questionnaire that is brief, and has a robust factor structure, it does mean that the revised measure is not as broad in its coverage of emetophobia symptoms. This may have implications for the use of the measure in research and clinical contexts. For example, if treatment of an individual with emetophobia is more effective in reducing symptoms that are not covered by the 13-item EmetQ-13, than those that are retained in the shorter measure, then this may underestimate the amount of change that has occurred due to treatment. As such, it is recommended that the EmetQ-13 be used in conjunction with detailed clinical interviews that cover the full range of symptoms, or other measures of emetophobia symptoms such as the SPOVI.

The second set of limitations concern the need for further psychometric investigation of the EmetQ-13. There is a need to replicate the three-factor structure to ensure that the structure is not peculiar to our sample. The low prevalence rate of emetophobia, and the difficulty in recruiting large sample sizes with which to conduct confirmatory factor analysis, is something that may be addressed in future through larger scale research projects, and possibly online assessment and treatment of individuals with emetophobia from other parts of the world. The issue of sample size is also present in our assessment of the relationship between the EmetQ-13 and the BAT, which was limited in the number of emetophobic individuals who were available to participate in the BAT. Additionally, our tests of differences between pre-treatment and post-treatment individuals, and between emetophobic and other anxiety disorders, were based on small samples. Although these comparisons yielded the expected results, with noteworthy effect sizes, replication of these results with a larger sample would provide stronger evidence of the validity of the EmetQ-13.

7. Conclusion

The EmetQ-13 is a brief, 13-item, self-report questionnaire designed to measure the severity of symptoms of emetophobia (specific phobia of vomiting). Preliminary assessment of its factor structure, internal consistency, temporal stability, concurrent validity, sensitivity to group differences, sensitivity to treatment effects, and sensitivity/specificity to a diagnosis of emetophobia are promising. Further research is warranted to provide additional support for the psychometric qualities of the measure especially in those who have another anxiety disorder who experience nausea as a symptom of their anxiety or who have a fear of vomiting but do not reach criterion for a specific phobia.

Appendix A. Appendix A The emetophobia questionnaire (EmetQ-13)

Instructions. The following questionnaire is designed to measure the severity of fear of vomiting *over the past week, including today*. Please read each question carefully and, on the 1 to 5 scale indicate your response by circling the appropriate number next to each question.

1	2	3	4	5
Strongly disagree	Disagree	Unsure	Agree	Strongly agree

1	I avoid air travel because I may become nauseous/vomit	1	2	3	4	5
2	I avoid other forms of transport because I may become nauseous/vomit	1	2	3	4	5
3	I avoid sea travel (boats, etc.) because I may become nauseous/vomit	1	2	3	4	5
4	I avoid places where there are no facilities to cater if I become nauseous/vomit	1	2	3	4	5
5	I avoid places where there is no medical attention, because I may become nauseous/vomit	1	2	3	4	5
6	I avoid fast-moving activities like rides at the theme park, because I may vomit	1	2	3	4	5
7	If I see vomit, I may be sick myself	1	2	3	4	5
8	If I smell vomit I may be sick myself	1	2	3	4	5
9	Exposure to vomit can cause sickness and/or illness	1	2	3	4	5
10	I avoid adults who may be likely to vomit	1	2	3	4	5
11	I avoid children who may be likely to vomit	1	2	3	4	5
12	I avoid places where others may vomit	1	2	3	4	5
13	I notice physical anxiety symptoms when exposed to vomit	1	2	3	4	5

Appendix B. Appendix B The emetophobia behavioural approach test scale

Instructions: You are to enter this room where there is a clear plastic container, 4 m from the doorway. In the container there is an amount of vomit or vomit-like liquid. You are to enter the room, walk slowly to the vomit container, immerse both your hands into the liquid, and raise some of the liquid towards your face, to a level at which you can clearly smell the odour. Once you enter the room, you may stop your approach at any stage where you feel you can go no further. You should not feel compelled to complete the task, but please do as much as you can.

Score	Level of approach
10	Withdraws from the task after the task is described
9	Agrees to the task, but then refuses to enter the stimulus room
8	Enters the room, just inside the doorway
7	Stands no more than 3 m from the vomit stimulus
6	Stands no more than 2 m from the vomit stimulus
5	Stands no more than 1 m from the vomit stimulus
4	Stands within 1 m of the vomit stimulus
3	Immerses one hand into the vomit stimulus
2	Immerses both hands into the vomit stimulus, for less than 30 s
1	Immerses both hands into the vomit stimulus, for at least 30 s
0	Immerses both hands and raises the vomit stimulus to the point where the odour is detectable

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