Psychological Medicine, 2002, **32**, 843–853. © 2002 Cambridge University Press
DOI: 10.1017/S0033291702005822 Printed in the United Kingdom

The Health Anxiety Inventory: development and validation of scales for the measurement of health anxiety and hypochondriasis

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ABSTRACT

Background. A self-rated measure of health anxiety should be sensitive across the full range of intensity (from mild concern to frank hypochondriasis) and should differentiate people suffering from health anxiety from those who have actual physical illness but who are not excessively concerned about their health. It should also encompass the full range of clinical symptoms characteristic of clinical hypochondriasis. The development and validation of such a scale is described.

Method. Three studies were conducted. First, the questionnaire was validated by comparing the responses of patients suffering from hypochondriasis with those suffering from hypochondriasis and panic disorder, panic disorder, social phobia and non-patient controls. Secondly, a state version of the questionnaire was administered to patients undergoing cognitive-behavioural treatment or wait-list in order to examine the measure's sensitivity to change. In the third study, a shortened version was developed and validated in similar types of sample, and in a range of samples of people seeking medical help for physical illness.

Results. The scale was found to be reliable and to have a high internal consistency. Hypochondriacal patients scored significantly higher than anxiety disorder patients, including both social phobic patients and panic disorder patients as well as normal controls. In the second study, a 'state' version of the scale was found to be sensitive to treatment effects, and to correlate very highly with a clinician rating based on an interview of present clinical state. A development and refinement of the scale (intended to reflect more fully the range of symptoms of and reactions to hypochondriasis) was found to be reliable and valid. A very short (14 item) version of the scale was found to have comparable properties to the full length scale.

Conclusions. The HAI is a reliable and valid measure of health anxiety. It is likely to be useful as a brief screening instrument, as there is a short form which correlates highly with the longer version.

INTRODUCTION

Using the Structured Clinical Interview for DSM, the SCID (First *et al*. 1995), hypochondriasis is usually identified as a categorical diagnostic entity. However, recent work has suggested that hypochondriasis may be better conceptualized as an extreme form of health anxiety (Barsky & Klerman, 1983; Salkovskis & Warwick, 1986; Warwick & Salkovskis, 1990; Barsky *et al*. 1993; Sacco & Olczak, 1996). Cognitive-behavioural theories (Warwick & Salkovskis, 1990; Salkovskis & Bass, 1997) propose that people experience particularly severe and persistent health anxiety ('Hypochondriasis') because they have an enduring tendency to misinterpret bodily variations and other ambiguous health-related information (including the results of medical consultation and

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tests) as indicating that they may be suffering from a serious physical illness. Such misinterpretation can also involve perceiving the consequences of developing a physical illness as being particularly serious (Salkovskis, 1996). This theory has been used to develop a treatment for hypochondriasis, which has now been validated in controlled trials (Warwick *et al.* 1996; Clark *et al.* 1998).

Salkovskis & Rimes (1997) proposed a corollary to the cognitive-behavioural theory of severe anxiety. If patients experience severe health anxiety because they have an enduring tendency to misinterpret ambiguous medical information as a sign of physical illness, it would follow that those with relatively high levels of health anxiety should be more likely to misinterpret ambiguous medical information such as medical consultations, health screening procedures and information about illnesses described in the mass media or the Internet. There are, therefore, a number of important reasons to develop and validate a continuous measurement of health anxiety that is sensitive to normal levels of health concern as well as clinical hypochondriasis.

If health anxiety and hypochondriasis do form a continuum, measurement of health anxiety requires reliable measurement strategies that are independent of clinical diagnostic interviewing. In addition, such a scale should not rely on items such as 'I believe that I am physically ill', as patients who are ill but not suffering from elevated levels of anxiety would tend to score highly. What is required is a validated scale that is sensitive across the full range of health anxiety, which can be used to help identify people who will meet diagnostic criteria without the requirement for separate medical examination. Several questionnaires have been used in the past, particularly the Illness Behaviour Questionnaire (IBQ) (Pilowsky & Spence, 1975), the Illness Attitudes Scale (IAS) (Kellner *et al.* 1987) and the Minnesota Multi-phasic Personality Inventory (MMPI) (Butcher *et al.* 1989).

The Whiteley Index (Pilowsky, 1967) was devised in order to clarify the symptom clusters that are seen in clinical hypochondriasis by using factor analysis. Three factors were identified – 'bodily preoccupation', 'disease phobia' and 'conviction of the presence of disease with non-response to reassurance'. The scale has adequate test–retest reliability (0·81). The Whiteley Index includes some items that do not seem to be directly measuring hypochondriasis and are likely be answered positively by some people who do not have the condition, such as, 'Is it easy for you to forget yourself and think about all sorts of other things?'. There is no evidence that the Whiteley Index can discriminate between hypochondriacal patients and psychiatric patients who are matched for levels of anxiety. The Illness Behaviour Questionnaire was developed from the Whiteley Index. The IBQ is not solely concerned with hypochondriasis – it was introduced as a way of measuring 'abnormal illness behaviour' or inappropriate ways of responding to the state of one's health in a range of clinical groups. The IBQ has seven scales: (1) general hypochondriasis; (2) disease conviction; (3) psychological *versus* somatic perception of illness; (4) affective inhibition; (5) affective disturbance; (6) denial; (7) irritability. The scales have been criticized for containing items that do not all measure the same aspect of illness behaviour (e.g. Kellner *et al.* 1987). The IBQ was developed with pain clinic patients and there have been no studies examining the extent to which the IBQ or scales from it can identify hypochondriacal patients.

The original Hypochondriasis scale of the MMPI contains a number of items that are unrelated to hypochondriasis or somatization. A later version of the scale contains items related only to somatic complaints (Welsh, 1952) and does not mention hypochondriacal fears or beliefs. The MMPI scale therefore seems to be a scale of somatization rather than of hypochondriasis (Kellner, 1986).

The Illness Attitude Scale (Kellner, 1986; Kellner *et al.* 1987) purports to measure 'psychopathology which tends to be associated with hypochondriasis and which can be responsible for abnormal illness behaviour'. The questions were constructed from statements made by patients who were either diagnosed as having hypochondriacal neurosis or who showed abnormal illness behaviour. The IAS consist of seven scales as follows: (1) Worry about illness; (2) Concerns about pain; (3) Health habits; (4) Hypochondriacal beliefs; (5) Thanatophobia; (6) Disease phobia; (7) Bodily preoccupations. The scales show good test–retest reliabilities

(0·9). Some of the items on the IAS do not relate to hypochondriasis, such as the ones assessing smoking and healthy eating. Two of the scales, Hypochondriacal beliefs and Disease phobia, have been shown to yield characteristic responses in hypochondriacal patients. Kellner suggests that a score of 3 or 4 on any of the six items in the Hypochondriacal beliefs and Disease phobia scales may identify people who are clinically hypochondriacal although such scales should not be used by themselves for the purpose of diagnosis according to Kellner *et al.* (1987) found that hypochondriacal patients scored more highly on the IAS than other non-psychotic psychiatric patients. However, the hypochondriacal subjects were also more anxious in general than the control group so the group difference on the IAS may reflect general anxiety levels rather than health-related anxiety.

More recently, Warwick & Salkovskis (1989) reported the preliminary development and validation of a scale intended to measure the full range of health anxiety, referred to in its development here as the Health Anxiety Inventory (HAI). The items chosen were closely based on the cognitive theory of health anxiety and hypochondriasis (Warwick & Salkovskis, 1990; Salkovskis & Bass, 1997), and were found to distinguish between patients with hypochondriasis and non-clinical controls. The first study in the present paper describes the further validation of this scale by the use of comparisons of hypochondriacal patients with equally anxious groups, including socially anxious patients. Panic disorder patients were included as a comparison group of anxious patients with prominent somatic symptoms and preoccupations. In the second study, the sensitivity to treatment effects of a 'state' type version of the scale is evaluated, together with an assessment of convergent validity with other measures of health anxiety outcomes. In the third study, the validation of a further extension and refinement of the scale (intended to reflect more fully the range of symptoms of and reactions to hypochondriasis) is described. In the fourth study, the development and validation of a short version of the refined scale is described. In the fifth study, the characteristics of a subscale intended to measure perceived negative consequences (as a clinically and theoretically relevant variable) are evaluated.

STUDY 1

As part of the preliminary development of a health anxiety measure, Warwick & Salkovskis (1989) reported differences between hypochondriacal patients and non-clinical controls. However, the important comparison needs to be between the scores obtained by people suffering from hypochondriasis and control groups which include people who suffer from diagnosable psychiatric conditions and who have comparably elevated levels of other psychopathology, particularly anxiety and depression. Study 1 therefore describes the further validation of this first version of the scale in which comparisons are made between hypochondriacal patients and equally anxious groups, including socially anxious patients. As the most stringent test of specificity, a group of panic disorder patients was also included, as these are people experiencing anxiety associated with intense somatic symptoms and in whom there is evidence of preoccupation with illness-related ideas (Clark *et al.* 1997). In addition, the internal consistency and test–retest reliability of the scale were evaluated.

Method

Participants

Clinical participants were recruited from patients referred for treatment to departments of clinical psychology or psychiatry. Diagnoses were made according to DSM-III-R (American Psychiatric Association, 1987), using the SCID-III-R. Thirty-three individuals diagnosed with hypochondriasis, 59 with hypochondriasis and panic disorder, 26 with panic disorder, 22 anxious controls (social phobics) and 22 non-patient controls were included in this study. Age and gender for the samples are summarized in Table 1. There was a significant main effect of age ($F(4, 160) = 3{\cdot}7$, $P < 0{\cdot}05$). Multiple comparisons (Bonferroni) indicate that this is accounted for by the anxious controls being younger than all other groups.

Procedure and measures

Participants were given a pack of questionnaires to complete, and were asked to complete all of these on the same day. The pack included a 23-item version of the Health Anxiety Inventory (HAI) (the final version of the HAI is shown in

https://doi.org/10.1017/S0033291702005822 Published online by Cambridge University Press

Table 1. *Sample characteristics*

Group	Hyp Mean (S.D.)	Hyp + Panic Mean (S.D.)	Panic Mean (S.D.)	Anx control Mean (S.D.)	Control Mean (S.D.)
Age	40·6[a] (13·2)	34·5[a,b] (9·9)	40·5[a] (14·4)	29·9[b] (7·2)	38·9[a,b] (16·7)
Women, %	64	58	81	50	68

Values that share a superscripts do not differ significantly from each other.
Hyp, Hypochondriasis; Hyp + Panic, hypochondriasis and panic disorder; Panic, panic disorder; Anx control, anxious control group.

Appendix 1, previous versions may be obtained from the first author). This scale was headed 'Illness questionnaire', and began with the following statement.

Each question in this section consists of a group of four statements. Please read each group of statements carefully, and then select the one which best describes your feelings over the last six months. It may be that more than one statement applies, in which case please ring any that are applicable.

Items for this scale were scored from 0 to 3, and the total was used. Where more than one item was endorsed, the score for the highest was used. Two additional separately scored subscales were included, specifically designed to measure reassurance seeking and avoidance behaviours. There are variables closely related to the phenomenon of health anxiety, and comprised 10 and 8 items respectively. Each item is rated on a nine-point scale, anchored every two points; for avoidance the anchors are: 'Would not … (avoid it)', 'slightly …', 'definitely …', 'markedly …' and 'always …'; and, for the reassurance scale, 'Never, rarely, sometimes, often, daily'. Reassurance ratings were for different sources of reassurance (e.g. 'family doctor', 'reading books', 'hospital out-patient clinic'); avoidance ratings were of situations which health anxious patients typically tend to avoid (e.g. 'watching TV programmes about illness', 'talking about illness', 'going to a hospital for treatment'). Totals for each were scored. In addition, participants completed the Beck Depression Inventory (BDI) (Beck *et al.* 1961), the Beck Anxiety Inventory (BAI) (Beck *et al.* 1988) and the Spielberger State Anxiety Inventory (STAI-State) (Spielberger *et al.* 1983).

Results

Internal consistency

The alpha coefficient for the HAI was good: 0·95 for all participants together. For the separate groups the alpha coefficients were also all satisfactory (hypochondriacals, 0·88; hypochondriacal with panic disorder, 0·88; panic, 0·92; anxious controls, 0·82; and, non-patient controls, 0·71).

Test–retest reliability

Twenty-nine hypochondriacal patients were asked to complete the HAI on two occasions a week apart. For those patients, the Pearson product-moment correlation coefficient was 0·90, indicating a very high level of test–retest reliability.

Group differences on measures of psychopathology

Means and standard deviations were calculated for the measures of depression, anxiety, health anxiety and the ratings of reassurance seeking and avoidance in illness related situations. The mean scores and standard deviations for each of the five groups are given in Table 2.

All group comparisons yielded significant effects (HAI, $F(4, 161) = 56{\cdot}2$, $P < 0{\cdot}0005$; Reassurance scale, $F(4, 160) = 11{\cdot}3$, $P < 0{\cdot}0005$; Avoidance scale, $F(4, 159) = 6{\cdot}6$, $P < 0{\cdot}0005$; BDI, $F(4, 159) = 7{\cdot}7$, $P < 0{\cdot}0005$; BAI, $F(4, 161) = 20{\cdot}8$, $P < 0{\cdot}0005$ and STAI-State, $F(4, 117) = 12{\cdot}2$, $P < 0{\cdot}0005$). Multiple comparisons (Bonferroni) indicated that, as expected, the clinical groups all score significantly higher on measures of anxiety and depression than the non-clinical controls. The clinical groups did not differ from each other in terms of anxiety and depression measures, indicating that they were appropriate control groups. Scores for the two hypochondriacal groups on the HAI were significantly higher than all groups. The anxious and non-clinical controls did not differ from each other, with the panic disorder group scoring significantly higher than the other control groups and significantly lower than

Table 2. *Means and standard deviations for score on the Health Anxiety Inventory*

Group	Hyp Mean (S.D.)	Hyp + Panic Mean (S.D.)	Panic Mean (S.D.)	Anx control Mean (S.D.)	Control Mean (S.D.)
HAI-total	35·5[a] (8·8)	39·3[a] (9·4)	24·4[b] (11·7)	16·2[c] (6·5)	12·5[c] (4·8)
Reassurance	23·2[a] (9·9)	22·8[a] (10·4)	16·9[a,b] (9·3)	12·3[b] (7·8)	10·7[b] (7·3)
Avoidance	21·1[a,b] (13·3)	23·2[b] (16·2)	19·8[a,b] (15·2)	12·8[a,c] (10·9)	7·3[c] (5·9)
BDI	15·2[a,c] (9·9)	19·2[a] (9·2)	20·8[a] (10·7)	14·5[a,c] (9·3)	7·9[c] (6·4)
BAI	21·7[a] (10·4)	29·4[b] (12·2)	30·2[b] (10·0)	19·7[a] (7·1)	8·4[c] (5·7)
STAI-State	49·6[a] (12·1)	52·7[a] (12·2)	51·9[a] (10·7)	45·7[a] (10·0)	33·5[b] (8·0)

STAI-State questionnaire: data only available for 21 Hyps and 27 Hyps + Panic.
Values that share a superscript do not differ significantly from each other.
Hyp, Hypochondriasis; Hyp + Panic, hypochondriasis and panic disorder; Panic, panic disorder; Anx control, anxious control group.

patients meeting diagnostic criteria for hypochondriasis. The reassurance seeking scale showed similar results, except that the panic disorder patients differed from neither the hypochondriacal groups nor the other controls groups. Specificity was least evident for avoidance scale; the clinical groups differed significantly only from the non-clinical controls apart from the panic and hypochondriasis group being higher than the anxious controls.

STUDY 2

Sensitivity to change in health anxiety due to treatment

Clearly, a scale that uses 6 months as its referent is unlikely to be sensitive to actual change over time, with or without treatment. A minor modification was therefore evaluated. Twenty-two hypochondriacal patients from a treatment trial (Clark *et al*. 1998) completed a version of the HAI that contained the same items as the version described above, but which asked the participants to rate their feelings over the past week rather than past 6 months. Fourteen of these patients received treatment and eight were in the waiting-list condition. Those who received treatment showed a significantly larger reduction in their HAI scores, pre- to post-treatment than those on the waiting list, who were assessed at the equivalent points in time 16 weeks apart (mean change of 14·2 (S.D. 5·9) *versus* mean change of 0·75 (S.D. 6·2); $t(20) = -13{\cdot}5$, $P < 0{\cdot}0005$).

As part of the treatment trial, a clinically trained assessor had interviewed the hypochondriacal patients, and used a 0–8 scale to rate global impairment due to hypochondriasis. This measure correlated extremely well with the HAI score ($r(28) = 0{\cdot}85$, $P < 0{\cdot}0001$), providing further good evidence of the clinical validity of the measure.

STUDY 3

Although the measure as developed performed satisfactorily, the range of symptoms assessed was relatively restricted, and it was considered that it would be helpful to expand these in order to evaluate the full range of phenomena encountered in health anxiety. This was done by identifying *a priori* factors suggested as likely to be important both by the phenomenology of hypochondriasis and by cognitive-behavioural theory. Other items were included to ensure a full range of sensitivity (i.e. to reflect variations in the intensity of health anxiety across the full spectrum of severity of health anxiety, from mild concern about health through to severe and disabling hypochondriasis). The factors identified were: Disease conviction (items from longer scale 35, 38, 25 and 12); Perceived vulnerability to illness (items 10, 26, 29, 33 and 36); Fear and worry about illness (items 1, 8, 37 and 39); Preoccupation, interference and bodily awareness (items 2, 3, 5, 9, 16, 18, 20, 23, 32 and 44); Psychological reactions to bodily sensations (items 4, 7, 27, 40 and 43); Deliberate action after a bodily sensation (items 11, 14, 19, 24, 31, 34 and 42); Avoidance and reassurance (these are 0–3 scored items contained within the body of the questionnaire, distinct from the specific 0–8 ratings contained in the avoidance and reassurance subscales attached to the end of the questionnaire) (items 15, 17, 22 and 28); Concerns about death (items 6, 13, 21, 30 and 41) and Attitudes of self and others towards health anxiety (45, 46 and 47). Cronbach's alpha

https://doi.org/10.1017/S0033291702005822 Published online by Cambridge University Press

Table 3. *Sample characteristics and demographics*

	Hyp	Anxious	Controls	Students	GP	Gastro	MRI
Age, mean (S.D.)	37·7[a,b,d] (10·1)	39·5[a,c] (10·1)	47·7[c] (14·0)	21·9[e] (4·3)	38·4[a] (15·9)	47·0[e] (16·2)	45·3[c,d] (15·3)
Women, %	58	90	73	63	100	65	57
Has partner, %	57	58	65	37	45	75	—
Education, %							
Age 16	10	47	34	2	31	—	—
Age 18	40	21	31	77	27		
College/University	50	32	34	21	42		
Occupation, %							
Unemployed	35	37	6	0	9	17	—
Student*	9	0	1	100	24	4	—
Non-professional	17	53	46	0	30	42	—
Professional	39	11	46	0	37	37	—

Values are percentages unless stated otherwise.
Values that share the same superscript do not differ significantly from each other.
* For students, years of education are given as those that they will have on completion of their present course.
Hyp, Hypochondriasis; GP, general practitioner; Gastro, gastroenterology; MRI, magnetic resonance imaging scan.

for these scales ranges from 0·70 to 0·82, indicating adequate internal consistency. These factors have received broad empirical support in a factor analytical study (Rimes, 1996).

The version of the scale described above was validated by comparison with other groups of anxious patients and non-patients. However, one of the problems with a scale measuring health anxiety is its ability to discriminate between groups of people who are known to be hypochondriacal and other people who are either suspected or known to be physically ill. This is not surprising, since such scales tend to rely for validity on the response to statements such as 'I have a serious physical illness', which would be endorsed both by people suffering from hypochondriasis and people who do indeed have a serious physical illness. This type of assessment is kept to a minimum in the HAI. In the validation study reported in this part of the paper only one group of anxious controls was included, but a range of patients with actual or probable physical illness was also assessed in order to address this issue.

Method

Participants

Twenty-four individuals diagnosed with hypochondriasis, 19 anxious controls (14 with panic disorder and five with social phobia), 159 non-clinical control, from a community subject pool, 66 students and 107 women attending a general practice clinic completed the Health Anxiety Inventory. In addition, 267 people attending a gastroenterology clinic, 97 people attending a MRI scan, 190 non-anxious controls and 66 students completed the short version of the HAI. Age, gender, education and occupation for the samples are summarized in Table 3.

The clinical participants were recruited from a range of sources. Twenty participants with hypochondriasis and five patients with social phobia had been referred for treatment to departments of clinical psychology or psychiatry. Three hypochondriacal patients were recruited from a radio request for people who worried too much about their health. From a self-help organization for people with anxiety problems, one hypochondriacal patient and 14 patients with panic disorder were recruited. In all cases of hypochondriacal participants, diagnoses were made according to DSM-III-R, using the SCID-III-R and the social phobic patients were assessed using DSM-IV.

Procedure and measures

Participants were given a pack of questionnaires to complete, and were asked to complete all of these on the same day. This pack included either the long version of the HAI (47 items in the main scale and 17 negative consequences items) or the short version (SHAI), which has 14 items with four negative consequences items. In addition, some of the participants completed the Beck Depression Inventory (BDI), the Beck Anxiety Inventory (BAI) and the Spielberger State or Trait Anxiety Inventory (STAI-State/Trait). Twenty-three students completed the

https://doi.org/10.1017/S0033291702005822 Published online by Cambridge University Press

Table 4. *Scores on measures of psychopathology (including HAI scales) across comparison groups*

	Hyp Mean (S.D.)	Anxious Mean (S.D.)	Controls Mean (S.D.)	Students Mean (S.D.)	GP Mean (S.D.)	Gastro Mean (S.D.)	MRI Mean (S.D.)
HAI							
Total	92·8[a] (18·2)	45·3[b] (18·7)	28·9[c] (11·5)	30·7[c] (11·8)	35·9[d] (12·6)	—	—
Negative consequences	25·1[a] (7·9)	14·4[b] (6·2)	12·7[b] (6·5)	14·4[b] (5·1)	14·1[b] (6·3)	—	
SHAI							
Main section	30·1[a] (5·5)	14·9[b] (6·2)	9·4[c] (5·1)	9·6[c,d] (4·5)	11·2[b,d,e] (4·6)	11·4[b,f] (6·3)	10·6[c,e,f] (5·6)
Negative consequences section	7·8[a] (2·8)	3·6[b,c] (2·2)	2·8[c] (2·1)	3·0[c] (1·8)	3·2[c] (2·0)	2·4[b] (1·9)	—
Total (main + negative consequences) sections	37·9[a] (6·8)	18·5[b] (7·3)	12·2[c] (6·2)	12·6[c,d] (5·0)	14·5[b,d] (5·9)	13·9[d] (7·4)	—
Reassurance	24·9[a] (7·9)	17·1[b,c] (7·3)	14·9[b] (7·9)	13·7[b] (7·5)	18·9[c] (7·8)	17·5[c,d] (8·5)	14·8[b,d] (7·9)
Avoidance	24·2[a] (13·3)	17·6[a,b] (13·4)	9·2[c,d] (8·8)	11·2[b,c] (9·0)	10·0[c,d,e] (8·3)	12·0[b,e] (10·0)	11·2[b,d] (10·5)
BDI	19·9[a] (8·7)	15·5[a] (7·9)	7·1[b] (6·2)	8·8[b,c] (7·5)	9·9[c] (9·1)	—	
BAI	23·2[a] (7·4)	19·0[a] (10·5)	8·1[b] (8·1)	10·4[b] (6·9)	—	—	
STAI-trait	55·7[a] (9·1)	54·9[a] (7·4)	38·8[b] (10·8)	41·2[b,c] (9·1)	43·7[c] (12·0)	—	
STAI-state	50·5[a] (11·5)	45·1[a] (11·7)	34·4[b] (11·8)	37·2[b] (10·7)	—	—	

Values that share a superscript do not differ significantly from each other.
HAI, Health Anxiety Inventory; SHAI, short version HAI; BDI, Beck Depression Inventory; BAI, Beck Anxiety Inventory; GP, general practitioner; Gastro, gastroenterology; MRI, magnetic resonance imaging scan.

HAI twice, with a mean of 22 days between occasions, in order to assess test–retest reliability.

Results

Internal consistency

The alpha coefficient for the HAI was good: 0·95 for all participants together. For the different groups the alpha coefficients were also all satisfactory (hypochondriacals, 0·94; anxious controls, 0·82; non-patient controls, 0·71). For the Avoidance scale the alpha coefficient was 0·81 and for the Reassurance scale it was 0·75.

Test–retest reliability

For the 23 participants who completed the HAI on two occasions, the Pearson product-moment correlation coefficient was 0·76, indicating a satisfactory level of test–retest reliability (mean scores were 8·7 on the first occasion of measurement, 8·3 on the second).

Group differences on measures of psychopathology

Means and standard deviations were calculated for the measures of depression, anxiety, health anxiety and ratings of reassurance seeking and avoidance in illness related situations. Means and standard deviations were calculated for each of the groups, and are shown in Table 4.

All measures of psychopathology showed a significant group effect. Main effects of group were as follows: HAI-total, $F(4, 436) = 140{\cdot}4$, $P < 0{\cdot}0005$; Reassurance scale $F(6, 940) = 12{\cdot}8$, $P < 0{\cdot}0005$; Avoidance scale $F(6, 950) = 10{\cdot}7$, $P < 0{\cdot}0005$; Beck Depression Inventory $F(4, 489) = 19{\cdot}5$, $P < 0{\cdot}0005$; Beck Anxiety Inventory $F(3, 289) = 27{\cdot}7$, $P < 0{\cdot}0005$; Spielberger Trait-Anxiety Inventory ($F(4, 490) = 22{\cdot}1$, $P < 0{\cdot}0005$) and Spielberger State-Anxiety Inventory $F(3, 333) = 15{\cdot}8$, $P < 0{\cdot}0005$. Multiple comparisons (Bonferroni) indicated that, on the general measures of psychopathology, hypochondriacal and anxious controls did not differ from each other, but did from the other groups. The specificity of the long version of the health anxiety measure to hypochondriasis was again evident. Reassurance ratings also showed such specificity, with high avoidance scores being apparent in the anxious control group but not the other controls.

STUDY 4

Development and validation of the short version of the Health Anxiety Inventory

Having identified a comprehensive set of items useful for the assessment of health anxiety, a short version of the HAI was derived. The aim was to maintain specificity between patients suffering from health anxiety on the one hand, and other anxiety disorders and physically ill patients on the other. This was done by taking 14 items that had the highest item – total

https://doi.org/10.1017/S0033291702005822 Published online by Cambridge University Press

correlation in the hypochondriacal patients and reflected different symptoms of hypochondriasis. The means and standard deviations for scores on the short version of the HAI are shown in Table 4 (some participants completed only the short version of the HAI as part of another study). The alpha coefficient of the short version (0·89) indicated a satisfactory level of internal consistency for the main scale across groups. Means are given in Table 4. There was a significant main effect of group on the scores for the short version of the HAI ($F(6, 1087) = 59{\cdot}7$, $P < 0{\cdot}0005$); multiple comparisons again indicate considerable specificity. It is notable that the short HAI scores are not substantially elevated in a group of physically ill patients.

STUDY 5

'Negative consequences' subscale

The cognitive theory of health anxiety suggests that perceived negative consequences of being ill are important, because threat is a function not only of likelihood but also of anticipated burden or 'awfulness'. A further subscale was therefore developed in order to evaluate this dimension, i.e. the second section of the scale in Appendix 1 (see preamble preceding question 15).

This subscale has 16 items in the full version, and was administered to participants in the studies above; the results are given in Table 4. Scoring was the same as the main section of the questionnaire (0–3, with the highest score being taken if more than one item were endorsed). Those participants who completed a short version of the main HAI scale also completed a short (4 item) version of the negative consequences subscale. This was compiled by taking the 4 items that had the highest item – total correlation in the hypochondriacal patients. Internal consistency was again good for this short version, with the alpha coefficients being 0·84 for the full version and 0·72 for the short version. Analysis of variance indicated main effect of group on both the full version ($F(4, 434) = 21{\cdot}1$, $P < 0{\cdot}0005$) and the short version ($F(5, 974) = 33{\cdot}1$, $P < 0{\cdot}0005$). Multiple comparisons (Bonferroni) suggest that the negative consequences of illness subscale has particularly high specificity in health anxiety as compared with other anxious groups and people with physical illness. Similar results are obtained when the main section and negative consequences are totalled (main effect of group, $F(5, 970) = 76{\cdot}9$, $P < 0{\cdot}0005$).

Finally, a principal components factor analysis (employing a varimax rotation) was conducted for the HAI main and negative consequences section combined. This was done for both the short and long versions separately. In both instances, the scree plots indicated two factor solutions, with all of the main section items loading most heavily on the first factor and all of the negative consequences items loading on the second factor. Correlations between the scores on these sections were $r = 0{\cdot}479$ ($P < 0{\cdot}0001$) for the full HAI, and $r = 0{\cdot}405$ ($P < 0{\cdot}0001$) for the short HAI. Taken together, these results provide support the addition of the negative consequences section of the scale.

DISCUSSION

This paper described the further development of the health anxiety inventory (HAI) as a measure of clinical and non-clinical health anxiety. The scale was found to have good criterion validity in comparisons of hypochondriacal patients with equally anxious groups (social phobic patients) and panic disorder patients (anxious patients with somatic pre-occupation). The HAI was also found to be sensitive to treatment effects in a version in which a referent of 'over the last week' was used. The severity of health anxiety and associated degree of disability as assessed and rated by a clinician in the course of an interview designed to evaluate this was found, in a group of hypochondriacal patients, to be very highly correlated with scores on the HAI. Both internal consistency and test–retest reliability of the scales were found to be high. The addition of a second component evaluating the perception of negative consequences of illness was supported. The data suggest that this is a relatively independent factor in hypochondriasis, consistent with current cognitive theories (Salkovskis, 1996).

A major reason for developing the scale was the need for a measure of health anxiety that could be applied in medical contexts. Most scales that measure health anxiety tend to emphasize the endorsement of statements concerning the belief that one is seriously ill, which,

of course, tend to be particularly elevated in those who have been provisionally or actually diagnosed as having a serious disease. The HAI was developed to reduce this factor to minimal level. The low scores obtained by patients undergoing MRI scans and those consulting a gastroenterology department suggest that we were successful in this aim. The use of a shortened version (14 items in the main section, 4 items in the negative consequences section) is particularly important, as the intended use of the HAI as a screening instrument in patients in a medical setting requires brevity.

In the course of developing and refining this scale, it has been successfully used to predict the response to medical screening and consultation. Its use in this way was based on a corollary of the cognitive hypothesis of health anxiety. If people experience persistent anxiety about health because they have an enduring tendency to misinterpret ambiguous medical information in a particularly negative way (e.g. as a sign of severe physical illness; Salkovskis *et al*. 2002), then pre-existing health anxiety should predict the tendency to make negative interpretations of ambiguous medical information (Salkovskis & Rimes, 1997). Consistent with the hypothesis, Rimes & Salkovskis (2002) found that a high rating on the HAI completed at the time when an appointment was sent for a bone density scan was significantly associated with the experience of anxiety about osteoporosis at 1 week, 3 months and 1 year after the scan.

Since the development of this scale, another scale measuring health anxiety (the Health Anxiety Questionnaire) has been developed (Lucock & Morley, 1996) with similar validation data, although the sensitivity to treatment of this scale is not known. This scale also predicts the response to medical reassurance (Lucock *et al*. 1997). Comparative studies of the HAI and the HAQ are needed.

The scale described here not only discriminates between patients diagnosed as suffering from hypochondriasis and patients suffering from anxiety disorders, but is also not elevated in physically ill patients. There is evidence that this scale is sensitive to effective treatment, and that in its short form it predicts the psychological outcome of health screening.

APPENDIX 1

Short Health Anxiety Inventory

Negative consequences items begin at item 15. The longer version can be obtained on request from the first author (or, see supplementary information).

HAI (short version)

Each question is this section consists of a group of four statements. Please read each group of statements carefully and then select the one which best describes your feelings, over the past six months. Identify the statement by ringing the letter next to it, i.e. if you think that statement (a) is correct, ring statement (a); it may be that more than one statement applies, in which case, please ring any that are applicable.

1. (a) I do not worry about my health.
   (b) I occasionally worry about my health.
   (c) I spend much of my time worrying about my health.
   (d) I spend most of my time worrying about my health.
2. (a) I notice aches/pains less than most other people (of my age).
   (b) I notice aches/pains as much as most other people (of my age).
   (c) I notice aches/pains more than most other people (of my age).
   (d) I am aware of aches/pains in my body all the time.
3. (a) As a rule I am not aware of bodily sensations or changes.
   (b) Sometimes I am aware of bodily sensations or changes.
   (c) I am often aware of bodily sensations or changes.
   (d) I am constantly aware of bodily sensations or changes.
4. (a) Resisting thoughts of illness is never a problem.
   (b) Most of the time I can resist thoughts of illness.
   (c) I try to resist thoughts of illness but am often unable to do so.
   (d) Thoughts of illness are so strong that I no longer even try to resist them.

5. (a) As a rule I am not afraid that I have a serious illness.
   (b) I am sometimes afraid that I have a serious illness.
   (c) I am often afraid that I have a serious illness.
   (d) I am always afraid that I have a serious illness.
6. (a) I do not have images (mental pictures) of myself being ill.
   (b) I occasionally have images of myself being ill.
   (c) I frequently have images of myself being ill.
   (d) I constantly have images of myself being ill.
7. (a) I do not have any difficulty taking my mind off thoughts about my health.
   (b) I sometimes have difficulty taking my mind off thoughts about my health.
   (c) I often have difficulty in taking my mind off thoughts about my health.
   (d) Nothing can take my mind off thoughts about my health.
8. (a) I am lastingly relieved if my doctor tells me there is nothing wrong.
   (b) I am initially relieved but the worries sometimes return later.
   (c) I am initially relieved but the worries always return later.
   (d) I am not relieved if my doctor tells me there is nothing wrong.
9. (a) If I hear about an illness I never think I have it myself.
   (b) If I hear about an illness I sometimes think I have it myself.
   (c) If I hear about an illness I often think I have it myself.
   (d) If I hear about an illness I always think I have it myself.
10. (a) If I have a bodily sensation or change I rarely wonder what it means.
    (b) If I have a bodily sensation or change I often wonder what it means.
    (c) If I have a bodily sensation or change I always wonder what it means.
    (d) If I have a bodily sensation or change I must know what it means.
11. (a) I usually feel at very low risk for developing a serious illness.
    (b) I usually feel at fairly low risk for developing a serious illness.
    (c) I usually feel at moderate risk for developing a serious illness.
    (d) I usually feel at high risk for developing a serious illness.
12. (a) I never think I have a serious illness.
    (b) I sometimes think I have a serious illness.
    (c) I often think I have a serious illness.
    (d) I usually think that I am seriously ill.
13. (a) If I notice an unexplained bodily sensation I don't find it difficult to think about other things.
    (b) If I notice an unexplained bodily sensation I sometimes find it difficult to think about other things.
    (c) If I notice an unexplained bodily sensation I often find it difficult to think about other things.
    (d) If I notice an unexplained bodily sensation I always find it difficult to think about other things.
14. (a) My family/friends would say I do not worry enough about my health.
    (b) My family/friends would say I have a normal attitude to my health.
    (c) My family/friends would say I worry too much about my health.
    (d) My family/friends would say I am a hypochondriac.

For the following questions, please think about what it might be like if you had a serious illness of a type which particularly concerns you (such as heart disease, cancer, multiple sclerosis and so on). Obviously you cannot know for definite what it would be like; please give your best estimate of what you think might happen, basing your estimate on what you know about yourself and serious illness in general.

15. (a) If I had a serious illness I would still be able to enjoy things in my life quite a lot.
    (b) If I had a serious illness I would still be able to enjoy things in my life a little.
    (c) If I had a serious illness I would be almost completely unable to enjoy things in my life.
    (d) If I had a serious illness I would be completely unable to enjoy life at all.
16. (a) If I developed a serious illness there is a good chance that modern medicine would be able to cure me.
    (b) If I developed a serious illness there is a moderate chance that modern medicine would be able to cure me.

(c) If I developed a serious illness there is a very small chance that modern medicine would be able to cure me.
(d) If I developed a serious illness there is no chance that modern medicine would be able to cure me.

17. (a) A serious illness would ruin some aspects of my life.
(b) A serious illness would ruin many aspects of my life.
(c) A serious illness would ruin almost every aspect of my life.
(d) A serious illness would ruin every aspect of my life.

18. (a) If I had a serious illness I would not feel that I had lost my dignity.
(b) If I had a serious illness I would feel that I had lost a little of my dignity.
(c) If I had a serious illness I would feel that I had lost quite a lot of my dignity.
(d) If I had a serious illness I would feel that I had totally lost my dignity.

Paul Salkovskis conducted this work as a Wellcome Trust Senior Research Fellow; David M. Clark was a Wellcome Trust Principal Research Fellow. Katharine Rimes was supported by the Medical Research Council of the UK.

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