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THE REVISED ILLNESS PERCEPTION QUESTIONNAIRE (IPQ-R)

RONA MOSS-MORRIS[a,*], JOHN WEINMAN[b], KEITH J. PETRIE[a], ROBERT HORNE[c], LINDA D. CAMERON[a] and DEANNA BUICK[c]

[a]*The University of Auckland, Auckland, New Zealand;* [b]*Guy's, King's and St Thomas's School of Medicine, London, UK;* [c]*University of Brighton, Brighton, UK*

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This paper presents a revised version of the Illness Perception Questionnaire (IPQ-R), a recently developed and widely used quantitative measure of the five components of illness representations in Leventhal's self-regulatory model. The revised version stemmed from a need to deal with minor psychometric problems with two subscales, and to include additional subscales, assessing cyclical timeline perceptions, illness coherence, and emotional representations. Item selection was determined by principal components analyses which verified the factorial structure of the questionnaire in a sample of 711 patients from 8 different illness groups. Further analysis provided good evidence for both the internal reliability of the subscales and the short (3 week) and longer term (6 month) retest reliability. The IPQ-R also demonstrated sound discriminant, known group and predictive validity. While it is possible that the new subscales will vary in their applicability in different patient groups, the IPQ-R provides a more comprehensive and psychometrically acceptable assessment of the key components of patients' perceptions of illness.

Keywords: Perceptions of illness; Illness representations; Illness schema; Self-regulatory model; Psychological adjustment; Questionnaire

The Illness Perception Questionnaire (IPQ; Weinman *et al*., 1996) was developed to provide a quantitative assessment of the five components of the illness representation – identity, consequences, timeline, control/cure and cause in Leventhal's Self-Regulatory Model (Leventhal *et al*., 1984, 1997). Since then it has been used in studies of illness adaptation in patients with a wide range of conditions, including heart disease (Cooper *et al*., 1999; Petrie *et al*., 1996; Steed *et al*., 1999), rheumatoid arthritis (Murphy *et al*., 1999; Pimm and Weinman, 1998; Scharloo *et al*., 1999), cancer (Buick, 1997; Buick and Petrie, in press), psoriasis (Fortune *et al*., 2000; Scharloo *et al*., 2000a), chronic obstructive pulmonary disease (Scharloo *et al*., 2000b), chronic fatigue syndrome (Heijmans, 1998; Moss-Morris *et al*., 1996), diabetes (Griva *et al*., 2000) and Addison's disease (Heijmans, 1999). It has also been adapted for use with people undergoing investigations such as coronary angiography and genetic testing,

*Corresponding author. Department of Health Psychology, The Faculty of Medical and Health Sciences, The University of Auckland, Private Bag 92019, Auckland, New Zealand. Tel.: 64-9-3737599 ext. 6756. Fax: 64-9-3737013. E-mail: r.moss-morris@auckland.ac.nz

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and for spouses and carers of people with major health problems (Heijmans *et al.*, 1999; McClenahan and Weinman, 1998; Weinman *et al.*, 2000).

The evidence from studies to date provide quantitative support for the structural relations between the five components of illness representation described by Leventhal (Leventhal *et al.*, 1984, 1997), and for the expected links between illness perceptions and a range of psychological outcomes including coping (Heijmans, 1998; Heijmans and de Ridder,1998; Moss-Morris *et al.*, 1996; Scharloo *et al.*, 1998, 2000), mood (Fortune *et al.*, 2000; Murphy *et al.*, 1999), functional adaptation (Heijmans, 1998, 1999; Moss-Morris, 1997; Petrie *et al.*, 1996; Scharloo *et al.*, 1998) and adherence to a range of medical recommendations (Cooper *et al.*, 1999; Weinman *et al.*, 2000).

Although the measure has been adopted in a variety of studies and has been successful in predicting different aspects of adaptation and recovery in chronic illness, feedback from the accumulated experience of researchers using the IPQ has led to the need to amend and develop the measure in order to improve the measurement properties of some of the existing subscales and to extend its scope. A critical review of the published studies has revealed some variation in the internal consistency of specific subscales. While this may have partly reflected variations in sample size and illness groups, it became apparent that certain improvements could be made. In particular two subscales, namely cure/control and timeline showed some problems with respect to their internal consistency. With the cure/control subscale, re-analysis of these data using factor analyses, revealed that the items loaded onto two separate factors. One component was concerned with personal control and self efficacy beliefs, whereas the other assessed belief in the treatment or recommended advice (i.e. outcome expectancies). Since these two components were found to be only weakly correlated and because of our growing interest in the nature and role of treatment beliefs (Horne, 1997, Horne and Weinman, 1999), it was decided to create two separate subscales. With the timeline subscale, two issues became apparent. Some evidence of lower than desirable internal consistency values suggested the need not only to increase the number of items, but also to develop new items to assess cyclical timeline beliefs, which had been overlooked in the original IPQ.

Another important component of Leventhal's self-regulatory model had been overlooked in the original IPQ, namely emotional representations. The self-regulatory model proposes that in response to illness and other health threats, people develop parallel cognitive and emotional representations which, in turn, will give rise to problem-based and emotion-focused coping procedures, respectively (Leventhal *et al.*, 2001). The original IPQ was designed to investigate only the cognitive components of patients' representations, and this was felt to be a limitation in its capacity to describe patients' responses to illness. However, in developing this measure care needed to be taken to ensure that it was not merely a proxy indicator of patients' general mood but did provide an assessment of the emotional responses generated by the illness. Thus we recognised that one important additional step above and beyond the usual psychometric indicators in evaluating this scale would be needed to demonstrate that it did not completely overlap with standard measures of positive and negative affectivity.

Finally, in planning a revision of the IPQ we were interested in exploring whether we could assess the extent to which a patient's illness representation provided a coherent understanding of the illness. This can be thought of as a type of meta-cognition reflecting the way in which the patient evaluates the coherence or usefulness of his or her illness representation. Hence we have referred to this as the "illness coherence

subscale'' (see below). This paper describes the item selection, principal components analysis and psychometric evaluation of the revised IPQ (IPQ-R).

METHOD

Participants

Eight illness groups were used for the validation of the IPQ-R. Seven of the samples were collected in Auckland, New Zealand and an HIV patient group was recruited from Brighton, United Kingdom. All patients had to read and write English and to have a medical diagnosis of their condition to be included in the study. Three of the patient groups, rheumatoid arthritis (RA), type II diabetes and asthma, were consecutively recruited by a research assistant from Auckland hospital outpatient clinics as they waited for their clinic appointments. Patient response rates were 90%, 92%, and 96% respectively. The chronic pain patients (80% response rate) were recruited from hospital based chronic pain clinics and the acute pain patients (50% response rate) from a private physiotherapy practice. These patients were handed information about the study during their treatment sessions. The chronic pain patients had all experienced pain for longer than three months which was unexplained by medical signs alone. The acute pain group presented with a first-time peripheral painful injury that had been present for less than six weeks. The multiple sclerosis (MS) patients were recruited from a mail out questionnaire survey to two Auckland-based MS support groups (response rate 44%). The myocardial infarction (MI) sample consisted of consecutive admissions to the Coronary Care Unit at Auckland Hospital with a confirmed diagnosis of acute MI (response rate 96%). These patients completed the questionnaire within one week of their MI while in the hospital. The HIV sample was recruited from a large HIV/AIDS clinic in Brighton, United Kingdom. All eligible patients who attended the clinic were invited to participate. Sixty percent of these returned the questionnaire. The characteristics of the eight illness groups are presented in Table I.

MEASURES

Development of the Illness Perception Questionnaire Revised (*IPQ-R*) The IPQ-R is divided into three sections, with the identity and causal dimensions presented separately

TABLE I Characteristics of Patient Samples

Illness Group	*N*	*Gender (% Male)*	*Length of Illness Mean (SD) years except acute pain given in days*	*Age*	*Unemployed (%)*	*Marital Status (% Married or in a permanent relationship)*
Asthma	86	28	26.6 (15.6)	41.9 (13.1)	21.4	53
Diabetes	73	59	9.8 (10.2)	57.4 (13.5)	27.4	59
Rheumatoid Arthritis	76	24	16.3 (11.7)	59.0 (15.5)	32.4	53
Chronic Pain	63	41	9.9 (9.0)	53.9 (11.1)	53.8	91
Acute Pain	35	57	15.2 (13.5)	35.7 (12.3)	5.7	71
Myocardial Infarction	47	81	< 1 week post MI	61.8 (13.4)	6.4	62
Multiple Sclerosis	170	21	11.5 (10.0)	50.9 (13.0)	43.4	63
HIV	161	98	6.42 (4.1)	40.5 (8.8)		

from the remaining dimensions. The identity scale is presented first and consists of the 12 commonly experienced symptoms included in the original IPQ: pain, nausea, breathlessness, weight change, fatigue, stiff joints, sore eyes, headaches, upset stomach, sleep difficulties, dizziness and loss of strength. Two new symptoms, sore throat and wheeziness, were added to the list. The instructions for this scale were also altered. The IPQ (Weinman *et al.*, 1996) included an intensity rating of symptoms. From an operational point of view this may well measure somatisation, or the tendency to report symptoms, rather than the concept of illness identity, which is the process of matching symptoms to an illness label. Consequently, the IPQ-R firstly asks patients to rate whether or not they have experienced each symptom since their illness using a yes/no response format. They are then asked whether or not they believe the symptom to be specifically related to their illness using the same format. The sum of the yes-rated items on this second rating forms the illness identity subscale. The general symptom experience subscale is not included in the IPQ-R but was used in the current study to assess the validity of the identity subscale.

In the following section the identity, consequences, timeline acute/ chronic, timeline cyclical, coherence and emotional dimensions of the IPQ-R are rated on the original 5-point Likert type scale: *strongly disagree*, *disagree*, *neither agree nor disagree*, *agree*, and *strongly agree*. All the original items from the IPQ were included in the initial version of the revised questionnaire. Most of the new items were generated from feedback from studies using the IPQ. Items for the emotional representation subscale were developed to tap into a set of six affective responses, which were found in prior research to be sensitive to differences in illness perceptions and to predict health-related responses such as seeking medical care (Cameron *et al.*, 1993). The illness coherence items were generated by the investigators to represent an overriding dimension of how much patients understand or comprehend their illnesses. This brought the total number of exploratory items in this section of the questionnaire to 50.

Finally, the causal dimension is presented as a separate section which uses the same Likert-type scale. The number of attributional items was extended from 10 to 18. The new items had been generated from illness specific studies using the IPQ (Moss-Morris and Petrie, 2001; Petrie *et al.*, 1996, Pimm and Weinman, 1998). The items retained in the final version of the IPQ-R are presented in Tables II and III.

The Positive and Negative Affect Schedule (PANAS; Watson *et al.*, 1988) was used to determine the discriminant validity of the IPQ-R. The Positive affect (PA) scale measures the degree to which a person feels enthusiastic, active, and alert, while the Negative affect (NA) dimension assesses subjective distress and discomfort. The scales have high internal consistency and are largely uncorrelated (Watson *et al.*, 1988). The trait version of the scale was used in this study where subjects are asked to what extent they generally feel each emotion.

The Ambulatory Index (Hauser *et al.*, 1983), *Sickness Impact Profile* (SIP, Bergner *et al.*, 1981), and *Fatigue Severity scale* (Chalder *et al.*, 1993) were included to assess the predictive validity of the scale in the MS sample. The Ambulatory Index is an observer-rated test used to measure the mobility of the patient. Previous research has shown that changes in MS patients' Ambulatory Index scores are significantly correlated with changes in the number of lesions in an MRI (Khoury *et al.*, 1994). The SIP is a well validated and widely used self-report measure of sickness-related disability. The 14-item fatigue severity scale measures both physical and mental fatigue and has excellent psychometric properties.

TABLE II Principal components analysis of the IPQ-R items

	I	*II*	*III*	*IV*	*V*	*VI*	*VII*
Timeline acute/chronic ($\alpha = .89$)							
My illness will last a short time (r)	**.76**	.05	−.15	−.01	.08	−.04	.07
My illness is likely to be permanent rather than temporary	**.83**	.08	−.05	.02	.12	−.13	.07
My illness will last for a long time	**.86**	.05	−.10	.02	.13	−.13	.07
*This illness will pass quickly (r)	**.75**	.12	−.13	−.09	.16	−.07	−.07
*I expect to have this illness for the rest of my life	**.82**	.01	−.10	.02	.20	−.07	.10
*My illness will improve in time (r)	**.61**	−.08	−.44	.09	.14	−.20	.01
Timeline cyclical ($\alpha = .79$)							
The symptoms of my illness change a great deal from day to day	.01	.08	.03	.11	.13	−.11	**.71**
*My symptoms come and go in cycles	.03	.01	.07	−.08	−.04	.06	**.84**
*My illness is very unpredictable	.07	.08	−.13	.25	.07	−.06	**.72**
*I go through cycles in which my illness gets better and worse	.08	.15	−.02	−.02	.01	−.09	**.73**
Consequences ($\alpha = .84$)							
My illness is a serious condition	.49	.09	−.04	.01	**.57**	−.01	.09
My illness has major consequences on my life	.38	.16	−.12	.04	**.74**	−.02	.05
My illness does not have much effect on my life (r)	.13	.23	−.32	−.06	**.55**	−.05	.05
My illness strongly affects the way others see me	.03	.14	−.13	.14	**.73**	−.17	.01
My illness has serious financial consequences	.24	.25	−.05	.10	**.67**	−.11	.13
*My illness causes difficulties for those who are close to me	.12	.30	−.15	.08	**.70**	−.07	−.04
Personal control ($\alpha = .81$)							
There is a lot which I can do to control my symptoms	.01	−.13	.50	−.08	−.15	**.51**	.14
What I do can determine whether my illness gets better or worse	−.18	−.06	.42	−.11	−.06	**.56**	−.01
*The course of my illness depends on me	−.21	−.14	.50	.01	−.14	**.51**	−.02
*Nothing I do will affect my illness (r)	−.11	−.03	.10	−.10	−.02	**.76**	−.03
*I have the power to influence my illness	−.13	−.15	.38	−.11	.03	**.57**	−.05
*My actions will have no affect on the outcome of my illness (r)	−.07	−.03	.08	−.16	−.12	**.73**	−.08
Treatment control ($\alpha = .80$)							
There is very little that can be done to improve my illness (r)	−.26	−.15	**.56**	−.16	−.11	.30	−.12
*My treatment will be effective in curing my illness	−.53	.04	**.61**	.04	−.05	−.10	−.03
*The negative effects of my illness can be prevented (avoided) by my treatment	−.12	−.03	**.79**	−.07	−.19	.13	.02
*My treatment can control my illness	−.07	−.05	**.81**	−.08	−.14	.19	.04
*There is nothing which can help my condition (r)	−.22	−.08	**.58**	−.18	−.08	.35	−.13
Illness Coherence ($\alpha = .87$)							
The symptoms of my condition are puzzling to me (r)	.02	.17	.10	**.73**	.19	−.09	.24
My illness is a mystery to me (r)	.02	.15	.01	**.86**	.10	−.13	.05
*I don't understand my illness (r)	−.04	.13	−.14	**.86**	.06	−.12	.04
*My illness doesn't make any sense to me (r)	.01	.16	−.10	**.83**	.13	−.18	.09
*I have a clear picture or understanding of my condition	−.01	.18	−.14	**.64**	−.16	−.18	−.03
Emotional representations ($\alpha = .88$)							
*I get depressed when I think about my illness	.06	**.79**	−.03	.12	.21	−.16	.07
*When I think about my illness I get upset	.03	**.83**	.06	.16	.22	−.18	.01
*My illness makes me feel angry	−.02	**.71**	−.01	.12	.25	−.13	.10
*My illness does not worry me (r)	−.03	**.61**	−.22	.02	.20	.11	.13
*Having this illness makes me feel anxious	−.07	**.72**	−.01	.18	.08	.04	.00
*My illness makes me feel afraid	.16	**.70**	−.02	.26	.03	−.09	.14

Note: *denotes new items not included in the original IPQ; (r) = items reverse scored.

TABLE III Principal components analysis of the IPQ-R causal items

	Factor I	*Factor II*	*Factor III*	*Factor IV*
Psychological attributions ($\alpha = .86$)				
Stress or worry	**.76**	.08	.23	−.25
My mental attitude e.g. thinking about life negatively	**.72**	.36	.06	.08
Family problems or worries caused my illness	**.82**	.16	.14	−.08
Overwork*	**.61**	.32	.13	−.06
My emotional state e.g. feeling down, lonely, anxious, empty*	**.79**	.24	.09	−.05
My personality*	**.53**	.41	.03	.18
Risk Factors ($\alpha = .77$)				
Hereditary – it runs in my family	.08	**.61**	.08	−.45
Diet or eating habits	.33	**.60**	.05	−.33
Poor medical care in my past	.23	**.55**	.17	.14
My own behaviour	.42	**.52**	−.16	.26
Ageing*	.13	**.56**	−.27	.04
Smoking*	.25	**.67**	.07	.04
Alcohol*	.24	**.69**	.16	.07
Immunity ($\alpha = .67$)				
A germ or virus	.05	−.12	**.81**	−.12
Pollution in the environment	.33	.41	**.57**	−.05
Altered immunity*	.23	.14	**.75**	−.04
Accident or chance ($\alpha = .23$)				
Chance or bad luck	−.08	−.43	.09	**.66**
Accident or injury*	.01	.25	−.31	**.65**

Note: *denotes new items not included in the original IPQ.

Procedure

After obtaining informed consent, patients were asked to complete the questionnaires. Most participants chose to complete the questionnaires at home and to send them back to the investigators in a stamped self-addressed envelope. Four of the patient groups (RA, diabetes, asthma and acute pain) completed the PANAS following completion of the IPQ-R. The HIV, MS, chronic pain and MI groups completed the IPQ-R as part of larger studies.

The RA group completed the IPQ-R again six months later to allow us to assess the test–retest reliability of the IPQ-R. Seventy-five of the 76 RA patients completed the second IPQ-R. RA was chosen to investigate the stability over this relatively lengthy period as it is a chronic ongoing condition. Thus, while one would expect some alterations in illness representations, there should be an element of consistency. Once the item selection of the IPQ-R was completed, data was also collected from 28 renal dialysis inpatients, from Guy's hospital, London to investigate the short-term test–retest reliability of the questionnaire. The renal patients completed the IPQ-R as two time points three weeks apart.

Predictive validity was investigated using the MS sample because the course of this illness is often variable and unpredictable, and the cause of MS is largely unknown. Therefore, it is a particularly relevant illness to research with regards to patients'

personal representations of their illness and how these might impact on adjustment. The MS group completed the measures of adjustment following the IPQ-R. Illness severity information was also collected in the questionnaire including type of MS (i.e. benign, relapsing-remitting, relapsing-progressive or chronic-progressive), remission status and time since diagnosis. After the questionnaire had been completed, the severity of patients MS was assessed by a trained research assistant using the Ambulatory Index.

RESULTS

Structural Validity and Internal Reliability

To validate the factor structure of the IPQ-R and to determine which of the items best represent each of the dimensions, two separate principal components analyses (PCA) were conducted on the preliminary data collected from the 711 patients. The causal items were entered into a separate PCA as, unlike the other dimensions, they can be grouped into a number of factors. Varimax rotation was used in both analyses and the selection criteria was eigenvalues greater than 1.1. The identity component was not entered into either analysis as it is rated on a different scale.

In the first analysis, the 50 items representing the timeline, control, consequences, illness coherence and emotional representation dimensions were entered into the PCA. This produced 11 factors which together accounted for 68% of the variance. Twelve items which loaded onto more than one of these factors or which did not appear to load on any of the factors were deleted from the scale. The remaining 38 items were then entered into a second PCA. This produced seven factors which accounted for 64% of the variance (see Table II). Items with loadings of greater than 0.5 were interpreted to represent a particular factor. The content of the seven factors, as defined by these item loadings, provided confirmation of the theoretically derived factors labelled timeline (acute/chronic), timeline cyclical, consequences, personal control, treatment control, illness coherence, and emotional representations.

Table II shows that, in the majority of cases, the items loaded exclusively onto one factor. One exception was the consequences item ''my illness is a serious condition'', which loaded .49 onto the timeline factor as well as .57 on the consequences factor. In addition, two of the personal control items loaded onto the treatment control factor. These items, ''there is a lot which I can do to control my symptoms'' and ''the course of my illness depends on me'' both loaded .50 on treatment control and .51 on personal control. None of the treatment control items loaded onto personal control, suggesting while there may be some overlap, it still appears to be valid to separate control into these two categories.

All the subscales demonstrated good internal reliability. The Cronbach alpha's for each of the subscales are presented in Table II. These ranged from 0.79 for the timeline cyclical dimension to 0.89 for the timeline acute/chronic dimension.

Another PCA was computed on the 18 causal items. Varimax rotation produced four factors which accounted for 57% of the total variance. The factor loadings for the individual items and their factors are presented in Table III. All the items loaded greater than 0.5 onto one factor and less than 0.45 on any other factor. The first factor, labeled psychological attributions, accounted for a large 33% of the total variance. This factor included six of the seven psychological items. The remaining psychological item

"my own behaviour" loaded more strongly onto the second factor which we labelled risk factors. Risk factors accounted for 11% the variance and included heredity, poor medical care, ageing and the health-related behaviours. The third factor, labelled immunity, accounted for 7% of the variance and included only three items, "a virus", "pollution" and "altered immunity". The final factor, labelled accident or chance, accounted for 6% of the variance. Although these items loaded onto the same factor, the correlation between them was low, suggesting that it may be better to treat them as distinct factors. The Cronbach alpha's for the other factors (see Table III) ranged from .86 for the psychological attributions to .67 for immunity.

Validity and Internal Reliability of the Identity Subscale

The validity of the identity subscale was tested in two ways. First we conducted a paired samples *t*-test using the symptoms experienced subscale and the identity subscale. This analysis showed a significant difference between the symptoms patient's experienced versus those they associated with the illness (t (15.94), $p < .001$), providing support for the conceptual difference between somatisation and identity. Second, we investigated the frequencies with which different symptoms were endorsed as part of patients' illness identity. All the symptoms were endorsed by a percentage of the patients, confirming the validity of the range of symptoms included in the identity subscale. Fatigue was the most frequently endorsed symptom with 76% of patients identifying it as a symptom specific to their illness. Pain, loss of strength, sleep difficulties and stiff joints were also endorsed by over 50% of the patients. A sore throat was only endorsed by 13% of patients while the remaining eight symptoms were all endorsed by more than 25% of the patient group.

Because the identity subscale consists of disparate symptoms and certain of these symptoms will be more relevant to particular illnesses than others, internal consistency of this scale is less relevant than in the other subscales. Nevertheless, the subscale does demonstrate a relatively high degree of internal reliability, with a Cronbach's alpha of .75. This suggests that patients either attribute a relatively high or low number of symptoms to their illness.

Inter-Correlations Between IPQ-R Dimensions

Pearsons' correlation coefficients were computed to investigate the inter-relationships between the IPQ-R dimensions (see Table IV). The identity dimension correlated most strongly with psychological and immune attributions, and was less associated with risk factor attributions. Identity was positively correlated with the two control dimensions and the coherence dimension. This was in contrast to the findings for the other more pessimistic illness beliefs, timeline and consequences, where the control dimensions showed consistent negative associations. The control and coherence dimensions showed strong positive associations with one another and were negatively associated with emotional representations. On the other hand, chronic and cyclical timeline and serious consequences were positively correlated with emotional representations and negatively with illness coherence. Beliefs about the seriousness of the illness were also strongly related to chronic timeline beliefs and, to a lesser extent, with cyclical beliefs. Immune attributions were consistently related to the negative illness beliefs and to a poorer sense of treatment control. Risk factor and psychological attributions,

TABLE IV Correlation Matrix of the IPQ-R dimensions

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1. Identity												
2. Timeline (acute/chronic)	−.05											
3. Timeline (cyclical)	−.09*	.14***										
4. Consequences	.07	.51***	.24***									
5. Personal control	.14***	−.29***	−.11**	−.25***								
6. Treatment control	.13**	−.42***	−.10**	−.32***	.61***							
7. Emotional representations	.04	.21***	.30***	.53***	−.20***	−.16***						
8. Illness coherence	.18*	−.29**	−.16**	−.28**	.56**	.74**	−.24**					
9. Psychological attributions	.26***	−.01	.24***	.07	.11**	.11**	.21***	.06				
10. Risk factor attributions	.13**	−.07	.16***	−.05	.27***	.33***	.09*	.26**	.64***			
11. Immune attributions	.31***	.25***	.25***	.28***	−.08	−.13**	.13**	−.08	.43***	.28***		
12. Chance attributions	−.01	−.06	−.02	.01	−.12**	−.06	.16***	−.11*	−.07	.04	−.19***	

Note: $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

on the other hand, were positively related to both a sense of personal and treatment control. All the attributional factors showed a positive association with emotional representations, but risk factor beliefs were positively related to a sense of coherence, while chance attributions were negatively related to coherence. Chance attributions showed a small negative association to a sense of personal control and to immune attributions. Psychological, risk factor and immune attributions were all positively correlated with one another.

Test–Retest Reliability

Data from the renal dialysis inpatients was used to investigate the test–retest reliability of the final version of the IPQ-R over a three-week period. Pearson's correlations were computed between the IPQ-R completed at the two time points. The dimensions of IPQ-R generally showed good stability over this period with correlations ranging from .46 to .88 (see Table V). Personal control was the only dimension to show a correlation less than .5. Attributional and identity beliefs appear to remain the most consistent over this time period.

The six-month retest reliability of the IPQ-R was investigated within the RA sample. The data presented in Table V confirm that the IPQ-R has acceptable consistency over this lengthy time period. Except for cyclical timeline all the correlations between the time one and time two data were greater than .5. Once again the attributional beliefs appeared to be most consistent, as did patients' emotional representations.

Discriminant Validity

In order to determine that the IPQ-R dimensions are not just a reflection of affective dispositions, Pearson's correlations were computed between the subscales of the

TABLE V Test–retest reliability

	Renal patients (n = 28) (3 weeks)	*Rheumatoid arthritis (n = 75) (6 months)*
Identity	.80***	.57***
Timeline (acute/chronic)	.76***	.55**
Timeline (cyclical)	.72***	.35**
Consequences	.74***	.74***
Personal control	.46**	.57***
Treatment control	.63***	.50***
Emotional representations	.70***	.81***
Illness coherence	.60***	.53***
Psychological attributions	.87***	.82***
Risk factor attributions	.88***	.72***
Immune attributions	.78***	.58***
Chance attributions	.86***	.53***

Note: $^{**}p < .01$; $^{***}p < .001$.

TABLE VI Correlations between the IPQ-R dimensions and trait positive and negative affect

	Positive Affect	*Negative Affect*
Identity	−.19**	.30***
Timeline (acute/chronic)	−.13*	.35***
Timeline (cyclical)	.01	.12*
Consequences	−.17**	.36***
Personal control	.18**	−.07
Treatment control	.19**	−.08
Emotional representations	−.26***	.54***
Illness coherence	−.26***	.28***
Psychological attributions	.01	.35***
Risk factor attributions	.04	.27***
Immune attributions	.09	.17**
Chance attributions	.08	.01

Note: $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

IPQ-R and the PANAS. Table VI shows that the correlations were generally small to moderate in size. The most significant association was between emotional representations and NA ($r = .54$) suggesting that trait NA accounts for around 29% of the variance in the emotional upset generated by the illness. NA also demonstrated positive associations with a strong illness identity, chronic and cyclical timeline, beliefs in serious consequences, and psychological, risk factor, and immune attributions. These correlations ranged between .17 and .35. Personal and treatment control beliefs and chance attributions were unrelated to NA. Control beliefs did show, however, a small positive association with trait PA. PA was also negatively associated with emotional representations, illness coherence, illness identity, and chronic timeline with r's ranging from −.19 to −.26. PA was unrelated to any of the attributional beliefs or cyclical timeline.

Known Group Validity

Known group validity was assessed by comparing the illness beliefs of the acute and chronic pain patients. The data from the independent samples *t*-tests computed on each of the dimensions of the IPQ-R and the four attributional factors are presented

TABLE VII Comparisons between chronic and acute pain patients responses on the IPQ-R

	Chronic Pain (M, SD) n = 63	*Acute Pain (M, SD) n = 35*	*T*
Identity	6.19 (2.40)	2.81 (1.73)	5.41***
Timeline (acute/chronic)	23.12 (4.41)	13.40 (5.38)	9.67***
Timeline (cyclical)	12.87 (3.89)	9.37 (2.58)	5.63***
Consequences	23.45 (3.89)	14.23 (4.44)	10.68***
Personal control	18.42 (4.01)	22.94 (3.52)	−5.59***
Treatment control	14.22 (3.36)	19.43 (3.28)	−7.41***
Emotional representations	19.75 (4.15)	16.12 (4.03)	4.12***
Illness coherence	13.37 (4.78)	9.31 (3.00)	5.16***
Psychological attributions	12.48 (5.21)	8.92 (2.96)	4.20***
Risk factor attributions	15.32 (4.79)	12.28 (3.80)	3.20**
Immune attributions	5.98 (2.45)	4.00 (1.37)	4.32***
Accident/chance attributions	6.54 (1.82)	8.03 (1.85)	−3.80***

Note: $^{**}p < .01$; $^{***}p < .001$.

in Table VII. The groups were significantly different on all of the dimensions. As expected, the chronic pain patients had a stronger illness identity, a more chronic and cyclical timeline, and they perceived their pain as having more serious consequences and being less controllable than the acute pain patients. Chronic pain patients were also more distressed by their pain condition and had a less coherent understanding of their condition. Chronic pain patients were more likely to make psychological, risk factor, and immune attributions for their pain, while acute pain patients were more likely to attribute their pain to an accident or to chance.

Predictive Validity

Data collected from the MS sample was used to determine whether the IPQ-R could predict adjustment to illness. Adjustment was measured using the SIP, a measure of sickness-related dysfunction, and the Fatigue scale. Fatigue was included as a separate outcome because it is a major complaint for many MS patients. In these analyses, the fatigue item was dropped from the identity subcale to avoid the possibility of confounding the predictor and outcome variables. Three separate linear regressions were computed with each of these outcomes. Measures of illness severity were entered on the first step and the illness representation dimensions on the second step. This enabled us to assess the impact of the illness representation while controlling for the severity of the illness. Severity measures included the Ambulatory Index, the type of the patient's MS, remission status, and time since diagnosis.

Because a number of the illness representation dimensions are highly correlated, to avoid the problem of collinearity, exploratory correlations were computed between the dimensions and the outcome variables. The attributional factors were generally unrelated to outcome and were not included in the regressions.

The results of these analyses are presented in Table VIII. The illness severity measures accounted for 42% of the variance in SIP scores, with the Ambulatory Index being the most significant factor. The illness representation dimensions accounted for a further 15% of the variance, with the identity score being the most significant predictor. Objective illness severity was generally unrelated to the fatigue scores, but illness representations accounted for a significant 27% of the variance in physical fatigue

TABLE VIII Illness representations as predictors of adjustment in MS

	SIP β	*Physical Fatigue* β	*Mental Fatigue* β	*Emotional Reps.* β
Control variables				
Type of MS	0.17	0.16	0.14	0.07
Remission status	0.01	0.03	0.01	0.13
Time since diagnosis	0.01	−0.05	0.15	−0.06
Ambulatory Index	0.56***	0.09	−0.11	−0.1
	Adj $R^2 = 0.42$ $F = 15.26$***	Adj $R^2 = -0.01$ $F = 1.12$	Adj $R^2 = -0.03$ $F = .51$	Adj $R^2 = 0.06$ $F = 2.21$
Cognitive representations				
Identity	.28**	.24*	.23	.03
Personal control	−.11	−.38**	.17	.07
Treatment control	−.12	.17	−.24*	.06
Consequences	.07	.34*	.1	.41**
Timeline	−.05	−.07	.04	.1
Timeline cyclical	.16	.05	.28*	.28*
Coherence	.02	.03	.04	.25*
	R^2 change = .15 $F = 3.75$**	R^2 change = .27 $F = 3.87$***	R^2 change = .20 $F = 2.48$*	R^2 change = .36 $F = 6.56$***

*$p < .05$; **$p < .01$; ***$p < .001$.
Note: The fatigue item was deleted from the identity subscale in the regression analyses where physical and mental fatigue were the outcome variables.

and 20% of the variance in mental fatigue. The identity, control, consequences and timeline cyclical dimensions were significant predictors.

In a final regression equation we investigated whether the cognitive representations of illness could explain the variance in patients' emotional representations. From a theoretical point of view these are separate but interlinked constructs. Table VII shows that whereas severity of MS was minimally related to emotional representations, illness representations accounted for a significant 36% of the variance. Consequences, timeline cyclical, and illness coherence were all significant predictors of emotional distress generated by the illness.

DISCUSSION

This paper has presented a revision of the IPQ, a scale widely used to assess patients' representations of their illness. The IPQ-R has strengthened the psychometric properties of the original scale in a number of ways including improving the reliability of the subscales. In the original IPQ, the internal reliabilities of the control/cure and timeline scales were lower than those of the other dimensions. These have been improved with the inclusion of the new items, and all the subscales now show good internal reliability. The test–retest data of the IPQ-R is in line with the data presented for the IPQ (Weinman *et al.*, 1996) and shows that the IPQ-R has acceptable levels of stability over three weeks and six months. Data from the PCA provides further empirical support for the theoretically derived dimensions of patients' illness representations. Of particular importance is the finding that the cognitive dimensions of the illness representation can be separated from both the emotional representation and from positive and negative affective traits.

The format of the scale has been improved to further separate the causal and identity subscales from the rest of the scale. The identity scale has been modified in an attempt to separate the concept of illness identity from the process of somatisation. Rather than measuring the perceived frequency of each symptom, patients are asked firstly to identify symptoms they experience and then to identify which of these symptoms they specifically associate with their illness. The causal scale has extended the range of available causal items and the results suggest that causes in many settings may usefully be divided into psychological attributions, risk factors, immune system factors and chance factors. However, as with the original IPQ, researchers should feel free to modify the causal and identity scales in order to suit particular illnesses, cultural settings or populations. For instance in a recent study where we investigated cultural differences in beliefs about diabetes mellitus, we added "God's will" to the causal scale (Barnes, 2001). In a study on patients with MS, numbness, clumsiness and speech impediment were added to the identity scale (Jopson, 2000).

The IPQ-R has also been extended to include measures of illness coherence and the emotional representation of illness. Illness coherence may prove to be a useful dimension to researchers interested in the importance of how the illness "makes sense" as a whole to the patient and may play an important role in longer term adjustment and the response to symptoms. The IPQ-R will also allow researchers to investigate the way in which emotional representations affect coping behaviours and ultimately illness outcomes. The data presented here from a sample of patients with MS suggests that emotional representations are largely unrelated to actual severity of the illness. On the other hand, cognitive beliefs that the illness has severe consequences, is cyclical in nature and out of one's personal control seem to strongly affect patients' emotional responses.

The IPQ-R has improved the ability of researchers to assess the perceived timeline of illness by firstly increasing the reliability of the original acute/chronic timeline subscale and secondly by including a cyclical timeline subscale. The latter subscale will be particularly useful to researchers working with patients whose illness cannot be adequately captured on a simple acute/chronic dimension such as menstrual disorders and some auto-immune and skin conditions.

The IPQ-R also provides some support for Horne's (1997) argument that the control dimension can be divided into personal and treatment components. This may be particularly relevant for future work into the relationships between illness representations and treatment adherence. While there was some overlap between the items of personal control and treatment control, this may reflect the fact that the distinction will be less important in some illnesses than in others. For instance, in MS where no specific treatment may be prescribed, patients may view treatment choices as a personal decision of how best to manage or control their condition. On the other hand, in illnesses such as HIV where medical treatment is very prescriptive, beliefs about the effectiveness of this treatment may be more conceptually distinct from beliefs about personal ways of controlling or managing the illness. Clearly, more work is needed in this area to unravel some of the complexities of control beliefs.

The new and revised IPQ-R dimensions appear to show logical inter-relationships. Beliefs in treatment and personal control and a sense of illness coherence were inversely related to pessimistic beliefs about the timeline and consequences of the illness as well as to negative emotional representations. The more positive beliefs of control and coherence were also inter-correlated, as were the more negative beliefs and

emotional representations. There were also positive relationships between the attributional factors and illness identity. This is congruent with previous work which has shown that patients with more severe symptoms report a greater number of attributions for their illness (Affleck *et al.*, 1987). Psychological and risk factor attributions were also related to an increased sense of personal and treatment control. This suggests that people feel more in control of their illness if they endorse behavioural and psychological causal factors such as smoking, diet, alcohol, stress, or overwork. On the other hand, immune attributions, which incorporated the causal factors with a more external locus of control including germs, pollution and altered immunity, was related to a poor sense of treatment control, a chronic and cyclical timeline and serious consequences. Patients who made more psychological attributions also had a tendency to view their illness as chronic and were more distressed by their illness.

This paper also demonstrated that cognitive illness representations account for a significant proportion of the variance in levels of disability, fatigue, and emotional distress in MS patients. However, the data were collected at one time point. Further prospective studies are needed to confirm the associations between illness representations and adjustment to illness over time.

The authors of the IPQ have always encouraged researchers to adapt the scale to their particular illness and research setting. We continue to believe this to be important because of the powerful influence unique characteristics of an illness and particular cultural factors can play in understanding patients' perceptions. Currently a number of different illness versions and language versions of the scale exist. The IPQ has also been successfully adapted to measure spouses beliefs about their partners illness (Weinman *et al.*, 2000) and we would continue to encourage researchers to share their versions with other users. The facility for this exists on the IPQ website[1]. We would also like to see the scale used in conjunction with other less structured assessment techniques in order to provide more data on the strengths and weaknesses of different approaches.

The publication of the IPQ in 1996 has enabled researchers interested in exploring the role of illness perceptions to outcome and psychological adjustment to readily assess these concepts that were previously only assessed through interview or through the use of specially constructed scales. Since the publication of the scale research in the illness perception area has increased dramatically. It is hoped that this revision of the IPQ will further stimulate research in this area and facilitate improvement in the theoretical understanding of the dimensions on which the scale is based.

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[1]http:/www.auckland.ac.nz/hpsy/scales.html

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