

A META-ANALYTIC REVIEW OF THE COMMON-SENSE MODEL OF ILLNESS REPRESENTATIONS

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A meta-analysis of empirical studies ($N=45$) adopting Leventhal, Meyer and Nerenz's (1980) Common Sense Model (CSM) of illness representations is presented. The average corrected intercorrelation matrix for the sample of studies showed that the CSM illness cognition dimensions of consequences, control/cure, identity and timeline followed a logical pattern supporting their construct and discriminant validity across illness types. A content analysis classified coping strategies into seven distinctive categories and health outcomes into six categories. Examining the average corrected correlation coefficients across the studies revealed that perceptions of a strong illness identity were significantly and positively related to the use of coping strategies of avoidance and emotion expression. In addition, perceived controllability of the illness was significantly associated with cognitive reappraisal, expressing emotions and problem-focused coping strategies. Perceptions of the illness as highly symptomatic, having a chronic timeline and serious consequences was significantly correlated with avoidance and expressing emotions coping strategies. Further, perceptions that the illness was curable/controllable was significantly and positively related to the adaptive outcomes of psychological well-being, social functioning and vitality and negatively related to psychological distress and disease state. Conversely, illness consequences, timeline and identity exhibited significant, negative relationships with psychological well being, role and social functioning and vitality. The analyses provide evidence for theoretically predictable relations between illness cognitions, coping and outcomes across studies.

Keywords: Illness cognitions; Self-regulation model; Research synthesis; Classification of coping

An important task for psychological research in health is to understand the factors that influence an individual's adherence to a medical regime or health behaviour for the management of illness and to identify appropriate targets for intervention (Leventhal *et al.*, 1984; Petrie *et al.*, 1996). Much research on adherence has focused on the perceptual and cognitive factors that underlie people's motivation or intention to attend health care appointments or adopt behaviours that are proposed to improve health (Croyle and Barger, 1993; Leventhal *et al.*, 1998). Social cognitive models provide a theoretical framework for the study of illness behaviour and adherence to self-management techniques. One theoretical model that has addressed how cognitive factors influence illness coping behaviours and outcomes is the 'Common Sense' Model (CSM) of illness

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representations proposed by Leventhal, Meyer and Nerenz (1980). The CSM identifies the factors involved in the processing of information by a patient regarding their disease or illness, how this information is integrated to provide a 'lay' view of the illness and how this lay view guides coping behaviours and outcomes. The model has been adopted in the development of instruments to tap cognitive representations of illness and used to examine how these cognitions impinge on the coping strategies adopted and outcomes in people with illness and disease. The purpose of the present article is to establish whether there is consistency in the way in which people cognitively represent illness and whether these representations are consistently associated with coping with the illness and illness outcomes in empirical research studies.

THE COMMON SENSE MODEL

The CSM hypothesises that individuals create mental representations of their illness based on the concrete and abstract sources of information available to them in order to make sense of and manage the problem. It is the *interpretation* of this information that forms the first step in the process of seeking help, engaging in a coping strategy or adopting an illness management regimen (Bishop and Converse, 1986). An illness representation is guided by three basic sources of information (Leventhal *et al.*, 1980; Leventhal *et al.*, 1984). The first source of information is the general pool of 'lay' information already assimilated by the individual from previous social communication and cultural knowledge of the illness. The second source is information from the external social environment from perceived significant others or authoritative sources such as a doctor or parent. Finally, the individual completes her/his illness representation by taking into account their current experience with the illness. 'Current experience' refers to the somatic or symptomatic information based on current perceptions and previous experiences with the illness. Current experience also encompasses knowledge of the effectiveness of previous means used to cope with the illness. Factors such as personality type and cultural background may also be important (Diefenbach and Leventhal, 1996).

Information from all these sources contributes to an individual 'making sense of' or forming a representation of their condition in a two-level process. Leventhal (1990) claims that the process in constructing this representation is a symmetrical one in which links are made between the *abstract* and *concrete* sources of information. For example, experiences of symptoms or somatic information by an individual may compel a search of semantic memory for *abstract* information linking those symptoms with stored diagnoses or labels. This then compels an individual to create a schematic representation of the illness linked with the abstract illness label. This schema is based on *concrete* evidence and inspires a search for concrete body symptoms related to the diagnosed condition. Leventhal implies that this *symmetry rule* linking symptoms with diagnosis is automatic and intuitive. Ultimately, it is the perception and *interpretation* of the different sources of information that leads to the construction of the illness representation via symmetrical conceptual (abstract and prepositional) and schematic (concrete and perceptual) processes.

Using open-ended interviews, researchers have established that the content of an illness representation can be ordered into logical themes or dimensions (Linz *et al.*, 1982; Meyer *et al.*, 1985). These dimensions are: cause, consequences, identity and

timeline. The *cause* dimension represents the beliefs regarding the factors that are responsible for causing the illness or disease. A number of different cause factors have been identified in research on illness representations and a number of underlying dimensions derived intuitively or from factor analysis have been identified. Examples of the dimensions that have been identified are biological cause (causal items pertaining to causes such as immune system, germs and viruses; Heijmans, 1998), emotional cause (causes such as stress and depression; Moss-Morris *et al.*, 1996), environmental cause (causes such as pollution and chemicals; Heijmans, 1998; Heijmans and De Ridder, 1998) and psychological cause (causes such as mental attitude, overwork and personality; Moss-Morris *et al.*, 2002; Rutter and Rutter, in press). There is some overlap in the individual items used to assess the causal dimensions, for example, stress and depression appear as emotional causes as well as under scales representing psychological causes. This has made studies that have examined the causal dimension from different perspectives and their relation to the other illness representation difficult to interpret. Some researchers have used single item measures of each causal dimension to ensure no such conflict occurs (Kemp *et al.*, 1999; Stein *et al.*, 2001). Recent researchers stress the need to factor analyse single item measures of the cause dimension to ensure that meaningful dimensions of the cause dimension for each specific illness can be derived and encourage the construction of illness-specific causal items (Moss-Morris *et al.*, 2002).

The *consequences* of the illness to a person's life refers to beliefs regarding the impact of the illness on overall quality of life or how it may affect functional capacity (e.g. "My illness prevents me doing certain things"). Such statements are often comparative (e.g. "My life is worse than it was because of my illness"). Illness *identity* refers to statements regarding beliefs about the illness label (e.g. "I think I have *influenza*") and knowledge about its symptoms (e.g. "Influenza makes my muscles and joints ache"). However, it is almost always measured by a simple summation of self-reports of experienced symptoms (e.g. "Have you experienced any of the following symptoms during your illness. . .") rather than associative beliefs that make the distinction between beliefs about illness symptom pathology and symptom experience. *Timeline* refers to the individual's beliefs about the course of the illness (e.g. "My illness is chronic") and time scale of illness symptoms (e.g. "The pain is persistent"). Recent research has resulted in the inclusion of further illness representations dimensions; beliefs regarding the *cure* or *controllability* of an illness (Lau and Hartman, 1983). The cure/control dimension refers to the sensation of empowerment regarding performance of coping behaviours (e.g. "If I take this medicine it will help cure my illness") or the efficacy of treatment (e.g. "Taking this medication will be effective in relieving the symptoms of my illness").

Leventhal *et al.* (1980) proposed that the CSM is a 'parallel-processing' model in that people typically make simultaneous cognitive and emotional representations of their illness. Thus an illness representation may not only comprise the cognitive dimensions outlined previously, but also emotional representations, which may be important determinants of emotional outcomes (Moss-Morris *et al.*, 2002). The first section of Fig. 1 provides a schematic representation of the impact of illness stimuli on cognitive and emotional representations of illness in the CSM.

Research on the CSM has indicated an emergent pattern of intercorrelations between the dimensions. This pattern of correlations provides evidence for the construct and discriminant validity of the dimensions. For example, Heijmans (1998, 1999), Heijmans and de Ridder (1998, 1999) and Weinman *et al.* (1996) showed for a number of illnesses

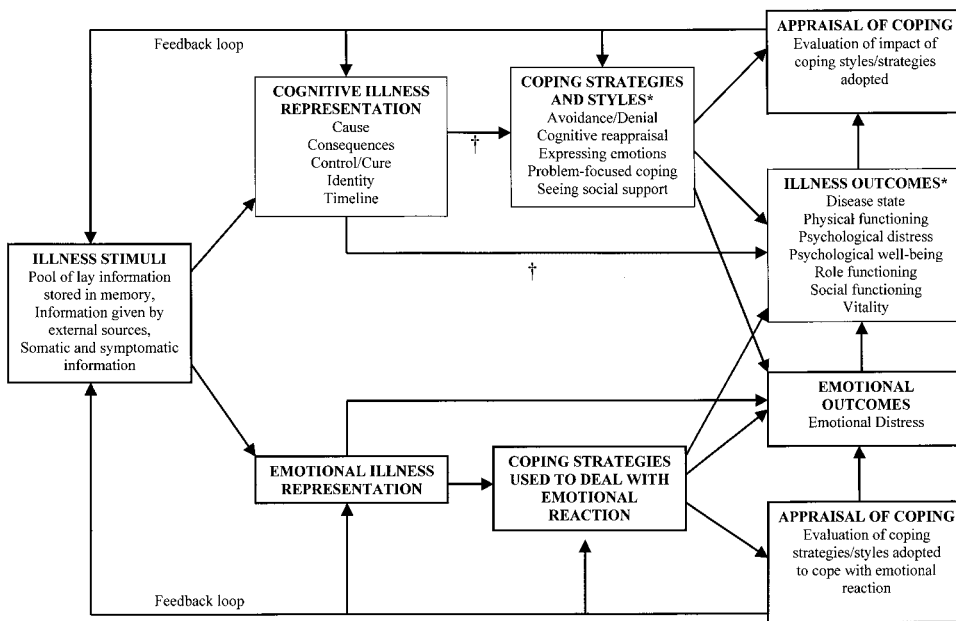


FIGURE 1 Schematic representation of Leventhal *et al.*'s (1980) Common Sense Model of Illness Representations. Note: †Relationships studied in the present meta-analysis; *The coping behaviour categories and the illness outcome categories identified by the classification procedure used in the present study.

that the intercorrelations among the CSM dimensions were strong and significant, but did not exhibit correlations of a magnitude that was indicative of conceptual overlap. Importantly, the correlations were indicative of a systematic and logical pattern of relations. These studies showed that identity was strongly and negatively related to the cure/control dimension but positively related to beliefs about the chronicity and serious consequences of the illness. This suggests that participants who construed their illness as being highly symptomatic and therefore having a *strong illness identity* would have an associated view that the illness was uncontrollable, chronic and had serious consequences for their lifestyle. Analogously, patients who construed themselves as having a high degree of control over their illness would also view their illness as being less chronic with fewer serious consequences. These results provide preliminary evidence that there is a common trend in the manner in which illness sufferers organise their lay beliefs about their illness.

An important caveat here is that Leventhal *et al.* (1980) suggest that individuals will exhibit a characteristic illness representation profile for each illness according to its symptomatic features and chronicity. It is for this reason that some researchers (e.g. Turk *et al.*, 1986; Heijmans, 1999) have argued in favour of factor analysing the theoretically derived items from instruments designed to measure illness cognition in order to arrive at the parsimonious categories about which illness sufferers cluster their lay-views regarding their condition. However, it can be argued that since the theoretically derived dimensions originated from extensive pilot work (Leventhal *et al.*, 1980; Weinman *et al.*, 1996) and the factor analyses usually extract factors that do not deviate greatly from these dimensions, the use of the theoretically derived dimensions is a productive and fruitful endeavour. Further, the theoretically derived

dimensional structure has been adopted by the majority of quantitative investigations into illness representations and the five dimensions of cause, consequences, cure/control, identity and timeline are recognised as the “basic building blocks” (Heijmans and de Ridder, 1998, p. 486) of inquiry into how individuals construct a representation of their illness and plan strategies for coping with an illness. The present study aimed, therefore, to conduct a cumulative synthesis of the available empirical tests of the intercorrelations between the theoretically derived CSM dimensions. It was expected that such a synthesis, using meta-analytic techniques, would provide a quantitative confirmation of a consistent pattern of relationships in people’s illness representations across illnesses thereby supporting discriminant and construct validity.

RELATIONSHIP OF ILLNESS COGNITIONS WITH COPING STRATEGIES

A number of studies have investigated the association between the CSM dimensions and health behaviours that individuals adopt in response to their illness, termed ‘coping behaviours’ and ‘coping strategies’. Leventhal *et al.*’s (1980) model makes an explicit link between illness cognitions and coping behaviours and strategies. The model proposes that the illness representation acts as a filter and interpretive schema for the available sources of information about an illness and how these guide action in response to the illness threat. Further, the model implies that the relationship is causal, that is, the illness cognition will exact an effect on coping behaviours in proportion with the perceived severity of the illness based on the representation derived from the stimuli (see Fig. 1). Empirically, this premise has been supported with both cross-sectional and longitudinal data. For example, Moss-Morris *et al.* (1996) studied the role of illness cognitions in patients coping with chronic fatigue syndrome (CFS). The research revealed that the identity and cure/control dimensions were significantly correlated with active coping, seeking social support and behavioural disengagement. Patients who perceived that their illness had serious consequences had associated positive scores on denial and behavioural disengagement coping subscales. Similarly, Kemp *et al.* (1999) revealed that perceived control over the illness was significantly associated with problem-focused coping in neuroepilepsy patients. In addition, the study showed that severe consequences and a large number of symptoms (strong illness identity) were associated with avoidance and wishful thinking coping strategies. It is important to note that such correlations may be spurious, inflated or confounded by measurement artefacts. For example, illness identity is only likely to be indicative of symptom experience rather than beliefs about the symptoms associated with the illness in question because identity is typically measured using symptom reports. These associations between illness identity and illness outcomes may only reflect relationships relevant to the person’s current experiences with the illness which could be confounded by illness state. In summary, viewing the illness as controllable was related to active coping variables such as problem-focused coping. In contrast, perceiving it as being uncontrollable, chronic and highly symptomatic was associated with avoidance and denial coping strategies.

The present study aimed to identify and classify categories of coping behaviours and strategies examined in illness cognition research to date. Next, we provided a cumulative synthesis of the reported associations of these behaviours with the CSM illness cognitions using meta-analytic techniques. It was expected that coping behaviours would be related to illness representations.

RELATIONSHIP OF ILLNESS COGNITIONS WITH ILLNESS OUTCOMES

Theory and research on illness cognition have made links between illness outcomes such as psychological and physical adjustment, and illness representations. As shown in Fig. 1, Leventhal *et al.* (1980) proposed that illness representations would cause coping responses which, in turn, would influence health outcomes. These proposed relationships represent a mediational model (Baron and Kenny, 1986), in which coping mediates the effect of illness representations on health outcomes. A pre-requisite for any mediation relationship is to establish that the independent variable (in this case, illness cognitions) is related to the dependent variable (health outcomes). This is also an aim of the present study.

Associations between outcome and illness representations have been supported empirically by studies on a number of illnesses. Lacroix (1991), for example, has shown a link between accuracy of symptom perceptions, an assessment of illness identity, and overall function and return work in low back pain and chronic respiratory patients. Further, examining psychological adjustment to illness, Heijmans and de Ridder (1998) and Scharloo *et al.* (1998) showed that patients with chronic illnesses such as CFS, Addison's disease, rheumatoid arthritis, chronic obstructive lung disease (COPD) and psoriasis who perceived their illness as having serious consequences, a strong illness identity and chronic timeline had negative associations with physical, social and social role functioning. Conversely, control/cure was positively related to these adaptive functioning variables. Thus it is expected that adaptive outcomes such as better adjustment and functioning would be negatively related to a chronic timeline, more serious consequences, a strong illness identity or high symptomology but positively associated with higher perceived controllability or curability. The present study aimed to identify and classify illness outcome variables used in research to date and examine the associations between the CSM illness cognitions and illness outcomes across these studies using meta-analytic techniques.

RESEARCH HYPOTHESES

The first aim of the present study was to examine the construct and discriminant validity of the CSM theoretically-derived illness representation dimensions by means of a meta-analytic cumulation of empirical studies using the model. Notwithstanding the debate over the use of factor-analytically derived versus theoretically-derived domains, a characteristic pattern of correlations was expected between the theoretically-derived illness perception domains as shown in other studies (e.g. Weinman *et al.*, 1996; Heijmans, 1998). Specifically, it was hypothesised that individuals who reported a strong illness identity (larger number of symptoms) would also report the illness as having a chronic timeline, as less controllable and as having more serious consequences as shown by Moss-Morris *et al.* (1996), Petrie *et al.* (1996) and Weinman *et al.* (1996). Discriminant validity of the CSM constructs was supported if the corrected correlations were significantly different from zero, that is, if the value of the correlation was less than unity by a margin greater than double its standard error (Bagozzi and Kimmel, 1995).

The second aim of the present study was to examine the relationship between illness representations, coping behaviours and illness outcomes across studies adopting the

CSM in health psychology research. It was expected that perceived control/cure would be positively related to active and problem-focused forms of coping while the causal dimensions, serious consequences, strong illness identity and chronic timeline would be associated with avoidance and expressing emotion forms of coping as indicated by the findings of Heijmans (1998) and Scharloo *et al.* (1998). In terms of illness outcomes, it was expected that perceptions of high control would be expected to be positively associated with the adaptive outcomes of physical, role and social functioning, psychological well-being and vitality (Moss-Morris *et al.*, 1996; Scharloo *et al.*, 1998). It was also anticipated that serious consequences, a strong illness identity and chronic timeline would be negatively related to physical, role and social functioning, psychological well-being, vitality and disease status and positively related to the maladaptive outcome of psychological distress (Heijmans, 1998; Scharloo *et al.*, 1998 and Steed *et al.*, 1999).

METHOD

Literature Search

An electronic literature search was conducted using the *MEDLINE EXPRESS* (1980 – 10, 2002), *psychINFO* (1977 – 10, 2002) and *Web of Science Social Science Citation Index* (1980 – 10, 2002) databases. Keywords used to search the databases were *illness cognition*, *illness representation* and *common sense-model* as well as leading author searches. A manual search was also conducted on pertinent journals, reference lists and conference proceedings available and manual searches of the abstracting journals *Dissertation Abstracts International* and *Psychological Abstracts*. Journals included in the manual search were as follows: *British Journal of Health Psychology*, *Health Psychology*, *Journal of Behavioural Medicine*, *Journal of Health Psychology*, *Journal of Psychosomatic Research*, *Psychology and Health*, *Psychology*, *Health and Medicine* and *Social Science and Medicine*. Book sections and chapters were also included but textbooks with general reviews on illness cognitions were excluded. In addition, attempts were made to locate “fugitive literature” (Rosenthal, 1995, p. 185) by contacting authors to request missing correlations and unpublished data sets.

The raw data collection procedure identified 103 studies on the topic of illness representations¹. Studies were included in the review if they were quantitative empirical tests of Leventhal *et al.*'s (1980) CSM. Fifty-eight articles did not meet these inclusion criteria and these included narrative reviews (e.g. Leventhal *et al.*, 1992; Scharloo and Kaptein, 1997), theoretical articles (e.g. Decruyenaere *et al.*, 2000; Rees *et al.*, 2001a), qualitative research articles (e.g. Lalljee *et al.*, 1993), discursive book chapters (e.g. Leventhal *et al.*, 1984), articles that did not adopt the CSM (e.g. Bishop and Converse, 1986; Echabe *et al.*, 1992; Levine, 1999) and articles for which the necessary effect sizes were not obtainable from the authors. The remaining 45 studies were included in the study and because some studies included multiple data sets the total possible sample size was 57. Details of the characteristics of the studies (sample size, demographics and average age) and the illness types encompassed by the studies are given in Table I. A total of 23 illnesses and conditions were examined by this sample

¹The original list of studies identified in the search is available from the first author.

TABLE I Summary characteristics and findings of studies included in the review

<i>Study</i>	<i>Illness</i>	<i>Sample</i> ¹	<i>Mean Age of Sample (SD)</i>	<i>Constructs Measured (Number of Items)</i> ²	<i>Elicitation of Illness Representation constructs</i> ³	<i>Study Design</i>	<i>Coping Measures</i>	<i>Outcome Measures</i>
Boddington, Myers and Newman (2002)	Irritable Bowel Syndrome (IBS)	24 (83% female)	24(range 21-68)	<i>Illness Perception Questionnaire-Revised (IPQ-R)</i> Consequences (6) Emotional representations (6) Illness coherence (5) Personal control (6) Timeline Acute-Chronic (6) Timeline cyclical (4) Treatment control (5)	None	Cross-sectional	-	Medical Outcomes Study 12-Item Short Form (MOS SF-12)
Cartwright and Lamb (1999).	Diabetes (DB Type I and DB Type II) and hyper-tension (HT)	DB, <i>n</i> = 186; HT, <i>n</i> = 176 (Overall 44% female)	Overall 59 (13.7)	<i>Perception Questionnaire (AIPQ; Modified version of IPQ)</i> Identity (DB = 20; HT = 17) Timeline (3) Control/Cure (6) Consequences (7) <i>Common Sense Measures of Illness Representations</i> Outcome expectations Self-efficacy Impact of diabetes	None	Cross-sectional	COPE inventory	Medical Outcomes Study 36-Item Short Form (MOS SF-36)
Eiser, Riazi, Eiser, Hammersley and Tooke (2001)	DB (Type I and Type II)	Type I, <i>n</i> = 96 (49 female, 47 male); Type II, <i>n</i> = 139 (61 female, 78 male)	Type I = 47.81 (16.67); Type II = 63.89 (11.31)		None	Cross-sectional	-	Well-Being Questionnaire (WBQ)

Fortune, Richards, Main and Griffiths (2000)	Psoriasis	140 (45% female)	41.9 (14.2) range (18–68)	Questionnaire (IPQ) Identity (15) Cause (10) Consequences (7) Timeline (4) Cure/control (6)	None	Cross-sectional	–	Penn State Worry Questionnaire (PSWQ) and Psoriasis Area and Severity Index (PASI) PSWQ, Psoriasis Life Stress Inventory, Psoriasis Disability Inventory (PDI), Hospital Anxiety and Depression Scale (HADS)
Fortune, Richards, Griffiths and Main (2002)	Psoriasis	225 (45% female)	43.3 (12.0) (range 20–77)	IPQ Identity (15) Cause (10) Consequences (7) Timeline (4) Cure/control (6)	None	Cross-sectional	COPE inventory	PSWQ, Psoriasis Life Stress Inventory, Psoriasis Disability Inventory (PDI), Hospital Anxiety and Depression Scale (HADS)
Glasgow, Hampson, Strycker and Ruggiero (1997)	DB Type I and DB Type II	2056 (62% female)	59	<i>Personal Model of Diabetes Interview (PMDI)</i> Seriousness (4) Treatment effectiveness (2 items per treatment) Treatment barriers (7 items per treatment) General barriers (4) Dietary self-management (27)	None	Cross-sectional	Summary of DB Self Care Scale (SDSC)	Self-reported DB Self-management behaviours.
Griva, Myers and Newman (2000)	DB Type I	64 (51.6% female)	20.6 (4.68) (range 15–25)	IPQ Identity Consequences Timeline Cure/control	None	Cross-sectional	Self-reported DB self-management behaviours	Glycolysated haemoglobin (HbA1c) measure of disease status

(continued)

TABLE I Continued

<i>Study</i>	<i>Illness</i>	<i>Sample</i> ¹	<i>Mean age of sample (SD)</i>	<i>Constructs measured (Number of items)</i> ²	<i>Elicitation of illness representation constructs</i> ³	<i>Study design</i>	<i>Coping measures</i>	<i>Outcome measures</i>
Hagger and Chatzisarantis (2002)	Muscular-skeletal injuries	60 (35% female)	32 (11.2) (range 12-60)	<i>IPQ-R</i> Cause (28) Emotional representations (6) Illness coherence (5) Identity (8) Personal control (6) Timeline Acute-Chronic (6) Timeline cyclical (4) Treatment control (5)	None	Cross-sectional	COPE inventory	Medical Study 20-Item Short Form (MOS SF-20); Mental Health Index from MOS-SF 36; Positive and Negative Affect Scales (PANAS)
Hagger and Orbell (2002)	Cervical abnormalities	693 (100% female)	34.23 (10.33) (range 18-78)	<i>IPQ-R</i> Cause (22) Emotional representations (6) Illness coherence (5) Identity (8) Personal control (6) Timeline Acute-Chronic (6) Timeline cyclical (4) Treatment control (5)	None	Cross-sectional	-	State-Trait Anxiety Inventory (STAI)
Hampson, Glasgow and Foster (1995)	DB Type II	78 (46 female, 32 male)	70	<i>PMDI</i> Seriousness (8) Treatment effectiveness (4) Cause (3)	Based on Hampson, Glasgow and Toobert (1990)	Prospective - 4 months	SDSC	MOS SF-20, HbA1c
Hampson, Glasgow and Stryker (2000)	DB (Type I and Type II)	111 (62% female)	62	<i>PMDI</i> Seriousness (3) Treatment effectiveness (3) Perceived control (2)	None	Prospective - 9 and 12 month	-	MOS SF-20; Center for Epidemiologic Studies Depression (CES-D) scale; HbA1c

Hampson, Glasgow and Toobert (1990)	DB (Type II)	46 (100% female)	64 (range 46-79)	<i>PMDI</i> : Seriousness (7) Treatment (7) Cause (3) Symptoms (4)	Interview administered pilot questionnaire using closed and open ended questions. Scales derived from statements and then reduced by item analysis. Open ended-interviews.	Prospective - 2 weeks	SDSC	HbA1c	
Hampson, Glasgow and Zeiss (1994)	Osteo-arthritis (OA)	61 (72% female)	72 (7.8)	<i>Personal Model of OA Interview</i> : Symptoms (4) Seriousness (5) Intensity of pain (3) Cause (2) Control (3)		Prospective - 8 months	Summary of OA management methods (SAMM); Self-reported doctors visits	MOS SF-20	
Heijmans (1998)	Chronic Fatigue Syndrome (CFS)	98 (84 female, 14 male)	41.9 (10.6)	<i>Illness representation interview</i> : Illness identity (20) Cause (15) Timeline (3) Control/cure (2) Consequences (5) <i>After factor analysis</i> : Identity (20) Biological cause (2) Psychological cause (5) Environmental cause (5) Timeline (3) Control/cure (2) Consequences (5)	None	Cross-sectional	Utrecht Coping Questionnaire (UCL)	MOS SF-36	

(continued)

TABLE I Continued

<i>Study</i>	<i>Illness</i>	<i>Sample</i> ¹	<i>Mean age of sample (SD)</i>	<i>Constructs measured (Number of items)</i> ²	<i>Elicitation of illness representation constructs</i> ³	<i>Study design</i>	<i>Coping measures</i>	<i>Outcome measures</i>
Heijmans (1999)	Addison's Disease (AD)	63 (57% female)	41.9 (10.6)	<i>IPO-derived interviews</i> Identity (20) Timeline (3) Control (2) Consequences (5)	Some items for <i>cause</i> scale derived from open-ended questionnaire.	Cross-sectional	UCL	MOS SF-36
Heijmans and de Ridder (1998)	CFS and AD	CFS sample, <i>n</i> =98 (86% female); AD sample, <i>n</i> =63 (57% female)	CFS sample=45.9 (10.5); AD sample=41.9 (10.6)	<i>Structured interview</i> Identity (20) Timeline (3) Control/cure (6) Cause, CFS (6); AD (3) Consequences (4) <i>Factor analysis of CFS sample:</i> Manageability (6) Seriousness (4) Personal Responsibility (5) External Cause (4) <i>Factor analysis of AD sample:</i> Seriousness (7) Cause (3) Chronicity (4) Controllability (4)	Initial assessment elicited identity items. Two different cause measures were developed using elicitation questionnaires due to different disease characteristics. Other scales were derived from existing measures.	Cross-sectional	UCL	MOS SF-36

Heijmans and de Ridder (1999)	CFS and AD	CFS sample, $n=98$ (86% female); AD sample, $n=63$ (57% female)	CFS sample = 45.9 (10.5); AD sample = 41.9 (10.6)	<i>Structured interview</i> Identity (20) Timeline (3) Control/cure (2) Cause, CFS (12); AD (3) Consequences (5)	Cause scale derived from open ended questionnaire	Cross-sectional	Treatment-related variables: visits to paid medicine professionals, use of prescribed medicine, and self-care e.g., exercise and diet changes
Horne, Cooper, Fisher, Buick and Weinman (2001)	HIV	35 (97.1% male)	37.14 (9.27)	<i>IPQ-R</i> Consequences (6) Emotional representations (6) Illness coherence (5) Identity (23) Personal control (6) Timeline Acute-Chronic (3) Timeline cyclical (4) Treatment control (6)	None	Cross-sectional	—
Horne and Weinman (2002)	Asthma	100 (61% female)	49.3 (18.1) (range 16–84)	<i>IPQ</i> Identity (14) Timeline (3) Consequences (7) Cure/Control (5)	None	Cross-sectional	Medication Adherence Report Scale (MARS) Revised
Kemp, Morley and Anderson (1999)	Epilepsy	Recent diagnosis, $n=21$; Chronic clinic-managed, $n=47$; Chronic GP-managed, $n=28$ (45 female, 49 male)	38 (range 16–80)	<i>IPQ-R</i> Identity (22) Cause (14) Timeline (10) Consequences (15) Cure/Control (10)	Some items derived from open-ended questionnaire, others from standard illness representation questions	Cross-sectional	Ways of Coping Checklist (WCCL-R)

(continued)

TABLE I Continued

Study	Illness	Sample ¹	Mean age of sample (SD)	Constructs measured (Number of items) ²	Elicitation of illness representation constructs ³	Study design	Coping measures	Outcome measures
Lau, Bernard and Hartman (1989)	Common Cold	1029 (31% female)	Range 17-18 years	Common sense representations of illness Identity Timeline Consequences Cause Cure	All items developed from open-ended questionnaire stage and were independently coded to develop the scales	Prospective - 1 year	Number of visits to doctors over 1 year	-
Lawson, Bundy, Lyne and Harvey (2000)	DB (Type I)	84 (26.2% female)	37.4 (10.92)	IPQ Internal Cause Consequences Timeline Cure/control	None	Cross-sectional	COPE inventory; Level of diabetes care	-
McCarthy, Lyons, Weinman and Purnell (in press)	Oral surgery (3rd molar extractions)	101 (69 female, 32 male)	27.3 (7.85) (range 16-60)	IPQ Identity (26) Timeline (4) Consequences (7) Cure/Control (2)	Items for identity (symptoms) derived from qualitative research on 3rd molar extraction (Ogden, Bissias, Ruita and Ogston, 1998)	Prospective - 7 days	-	HADS
Moss-Morris, Petrie and Weinman (1996)	CFS	233 (189 female, 44 male)	47.8 (range 18-81)	IPQ Identity (25) Timeline (3) Cure/control(5) Consequences (4) Cause (9) <i>Additional:</i> Emotional attributions (3)	Identity scale augmented by commonly reported symptoms for CFS, other scales derived from Weinman <i>et al.</i> (1996)	Cross-sectional	COPE inventory; Sickness Impact Profile (SIP)	5-item Mental Health Index (MHII-5) from MOS SF-36

Moss-Morris <i>et al.</i> (2002)	Asthma, DB, Rheumatoid Arthritis (RA), Acute Pain	270 (165 female, 105 male)	Asthma sample = 4.19 (15.6); DB sample = 57.4 (13.5); RA sample = 59.0 (15.5); Acute pain sample = 35.7 (12.3)	Accident or chance (2) Consequences (6) Emotional representations (6) Illness coherence (5) Immunity (3) Personal control (6) Psychological attrib. (6) Risk factors (7) Timeline Acute-Chronic (6) Timeline cyclical (4) Treatment control (5)	Factor analysis of items from original IPQ plus items generated from feedback from IPQ studies. Emotional representations and causal dimensions were developed based on previous research findings.	Cross-sectional	–	PANAS			
Orbell, Johnston, Rowley, Espley and Davey (1998)	OA	72 (43 female, 29 male)	68.24 (9.05)	<i>Illness representa- tions questionnaire</i> Consequences (7) Identity (visual analogue scale) Cause (4) Timeline (1) Control (4) <i>Additional:</i> Expectations of surgery (1) <i>IPQ modified for children</i> Identity (1) Timeline (1) Control/cure (1) Consequences (3) Cause (1) <i>IPQ</i> Identity (1) Consequences (9) Timeline (3) Cure/control (6)	Scales devel- oped based on pilot interviews.	Prospective –3 and 9 months	–	Functional activity; Center for Epidemiological Studies Depression scale (CES-D)			
Paterson, Moss-Morris and Butler (1999)	Asthma and Common Cold	182 (108 female, 74 male)	10.84 (2.04)		None	Cross-sectional	–	–			
Petrie, Weinman, Sharpe and Buckley (1996)	Myocardial Infarction (MI)	143 (19 female, 124 male)	53.2 (8.4)		None	Prospective –3 and 9 months	–	MHI-5			

(continued)

TABLE I Continued

<i>Study</i>	<i>Illness</i>	<i>Sample</i> ¹	<i>Mean age of sample (SD)</i>	<i>Constructs measured (Number of items)</i> ²	<i>Elicitation of illness representation constructs</i> ³	<i>Study design</i>	<i>Coping measures</i>	<i>Outcome measures</i>
Rees, Fry and Cull (2001b)	Breast Cancer	117 (100% female)	39.9	<i>IPQ-R</i> Cause (19) Consequences (6) Emotional representations (6) Illness coherence (5) Identity (17) Personal control (6) Timeline Acute-Chronic (6) Timeline cyclical (4) Treatment control (5) Alzheimer disease beliefs and experiences scales Knowledge Threat Treatment optimism <i>IPQ with modified identity scale</i> Identity (10) Psychological cause External cause Consequences (9) Timeline (3) Cure/control (6)	None	Cross-sectional	Impact of Events Scale (IES) – Avoidance Dimension	General Health Questionnaire-30 item version; MOS-SF30
Roberts and Connell (2000)	Alzheimer Disease	203 (75.4% female)	53.5 (10.9) (range 30–92)		None	Cross-sectional	–	IES – Intrusion Dimension
Rutter and Rutter (in press)	IBS and Inflammatory Bowel Disease (IBD)	209 (175 female, 32 male)	53.5 (range 19–88)		None	Cross-sectional	COPE inventory	HADS and World Health Organisation Quality of Life assessment (WHOQOL)
Rutter and Rutter (2001a)	IBS	73 (52 female, 22 male)	47.7 (range 18–70)	<i>IPQ</i> Psychological cause External cause Consequences (9) Timeline (3) Cure/control (6)	None	Cross-sectional and prospective – 8 months	COPE inventory	HADS and WHOQOL

Rutter and Rutter (2001b)	IBS, IBD and CFS	IBS sample, $n=37$ (32 female, 5 male); IBD sample, $n=23$ (15 female, 8 male); CFS sample, $n=21$ (18 female, 3 male)	B sample = 47.7; IBD sample = 50.8; CFS sample = 45.0	<i>IPQ</i> Psychological cause External cause Consequences (9) Timeline (3) Cure/control (6)	None	Cross-sectional	-	-
Rutter and Rutter (2001c)	IBS	35 (28 female, 7 male)	52.6	<i>IPQ</i> Psychological External cause Consequences (9) Timeline (3) Cure/control (6)	None	Prospective months	2	COPE inventory HADS
Scharloo <i>et al.</i> (1998)	RA, Chronic Obstructive Lung Disease (COPD) and Psoriasis	RA sample, $n=84$ (63 female, 21 male); COPD sample, $n=80$ (22 female, 58 male); Psoriasis, $n=80$ (33 female, 47 male)	RA sample = 51.7 (12.6); COPD sample = 64.3 (7.6); Psoriasis = 48.3 (14.0); student sample = not given	<i>IPQ</i> Identity (12) Timeline (3) Consequences (5) Control (3) <i>Additional</i> Emotional attributions (3)	None	Cross-sectional	UCL	MOS-SF36
Schiaffino and Cea (1995)	RA, Multiple Sclerosis (MS) and Human immunodeficiency virus (HIV)	RA sample, $n=63$ (90% female); MS sample, $n=101$ (90% female); student sample, $n=71$	RA sample = 53 (14); MS sample = 42 (12)	<i>Implicit Models of Illness Questionnaire</i> (IMIQ) 44-item pool <i>After factor analysis:</i> Curability (14) Personal responsibility (14) Symptom variability (10) Serious consequences (6)	Factor analysis of IMIQ items	Cross-sectional	-	-

(continued)

TABLE I Continued

Study	Illness	Sample ¹	Mean age of sample (SD)	Constructs measured (Number of items) ²	Elicitation of illness representation constructs ³	Study design	Coping measures	Outcome measures
Schiaffino, Shawaryn and Blum (1998)	RA and MS	RA sample, <i>n</i> = 63 (90% female); MS sample, <i>n</i> = 66 (90% female)	RA sample = 53 (14); MS sample = 42 (12)	IMIO: Cure (14) Responsibility (14) Consequences (6) Variability (10)	None	Cross-sectional and prospective 4 months	—	Arthritis Impact Measurement Scales (AIMS); CES-D
Shiloh, Rashuk-Rosenthal and Benyamini (2001)	Personally relevant illness (participant-specified)	71 (85% female)	33.10 (12.74)	IPQ (modified for personally relevant illness) Timeline Consequences Control/Cure	None	Cross-sectional	—	—
Skinner and Hampson (1998)	DB (Type I)	74 (32 girls, 42 boys)	15.18 (2.01)	PMDI Seriousness (2) Impact (2) Control (2)	Based on Hampson <i>et al.</i> (1990)	Cross-sectional	SDSC	WBQ
Skinner, Hampson and Fife-Schaw (2002)	DB (Type I)	338 (243 females, 95 males)	Female = 21.8 (4.1); Male = 21.8 (4.1)	Complications (2) Personal Models of Diabetes Perceived impact (6) Perceived threat (5) Effectiveness to control diabetes (8)	Based on IPQ (Weinman <i>et al.</i> , 1996) and PMDI (Hampson <i>et al.</i> , 1990)	Cross-sectional	SDSC	—

Author	Condition	N	IPQ (amended to include cure items only)	Based on Weinman <i>et al.</i> (1996)	Cross-sectional	COPE inventory	Psychosocial adjustment to Illness Scale – Self-Report (PAIS-SR); MOS-SF36
Steed, Newman and Hardman (1999)	Atrial Fibrillation	62 (21 females, 41 males)	68 (11 divided into symptomatic (39) and asymptomatic (22) participants)				
Stein, McNicholas and Collis (2001)	Asthma	31 (12 female, 19 male)	11.1 (5.5)	Rephrasing of potentially difficult item statements for children and introduction of <i>cause of exacerbation</i> scale.	Cross-sectional	–	Strengths and Difficulties Questionnaire (SDQ) – Emotional symptoms scale
Theunissen and de Ridder (2001)	Hypertension	186 (59% female)	59.0 (9.7) (range 26–89)	None	Cross-sectional	MARS	–
Wearden <i>et al.</i> (2002)	DB (Type 2)	218 (97 female, 121 male)	60.2	None	Cross-sectional	–	WBQ; HbA1c

(continued)

TABLE I Continued

<i>Study</i>	<i>Illness</i>	<i>Sample</i> ¹	<i>Mean age of sample (SD)</i>	<i>Constructs measured (Number of items)</i> ²	<i>Elicitation of illness representation constructs</i> ³	<i>Study design</i>	<i>Coping measures</i>	<i>Outcome measures</i>
Weinman, Petrie, Moss-Morris and Horne (1996)	MI	104 (13% female)	53.8 (8.2)	<i>IPQ</i> Identity (12) Timeline (3) Control/cure (6) Consequences (7) Cause (10)	Patient-generated items from preliminary interviews.	Cross-sectional and prospective - 3 and 6 months	Number of visits to doctors over 3 months	-

Note: ¹Sample size from data made available by author - in some cases distribution by gender not reported. ²Constructs reported by authors using their terminology, this does not imply equivalence of scales. Where the scales are explicitly derived from previously developed questionnaires, the questionnaire title is provided, italicised and any modifications to the items by the authors provided in parenthesis. Any additional scales to such questionnaires are labelled accordingly. Where the initial scales are subjected to a data reduction; procedure (e.g., exploratory factor analysis), the derived factors are listed and the number of items loading on that factor provided. Again, factor labels are those provided by the authors based on their subjective evaluation of the factor content and do not necessarily reflect equivalence with factors derived in other studies.

of studies, namely acute pain patients (1 study), Addison's disease (3), Alzheimer disease (1), atrial fibrillation (1), asthma (4), cancer (2), cervical abnormalities (1), chronic fatigue syndrome (5), chronic obstructive pulmonary disease (1), common cold (1), diabetes mellitus (12), HIV/AIDS (3), hypertension (1), irritable bowel syndrome (4), myocardial infarction (2), multiple sclerosis (2), muscular-skeletal injuries (1), neuroepilepsy (1), osteoarthritis (2), psoriasis (3), recovery from oral surgery (1), rheumatoid arthritis (4) and tuberculosis (1). The majority of the studies were cross-sectional in design (33), the remainder adopted a prospective approach or a mixed cross-sectional and longitudinal design. As the studies varied in the measures used to tap the illness representations, coping behaviours/strategies and illness outcomes, these are also given in Table I including the questionnaires and number of items used. In addition, the methods by which the constructs were derived are also included. Some studies adopted Leventhal *et al.*'s (1980) approach of using preliminary interviews to elicit the illness representation item measures from first principles, while others adopted the questionnaire methods from previous studies.

Illness Cognition Measures

The present sample of studies used a variety of measures of the CSM illness cognition measures as indicated in Table I. To maximise the homogeneity in measures for the intercorrelations between the illness cognition dimensions and subsequent associations with coping behaviours and illness outcomes, it was important to identify and, if necessary, classify the illness cognition measures into the CSM categories of cause, consequences, control/cure, identity and timeline. A number of studies used standardised, previously validated generic questionnaires to measure the CSM illness cognition dimensions. These measures were the Illness Perception Questionnaire (IPQ; Weinman *et al.*, 1996), the revised Illness Perception Questionnaire (IPQ-R; Moss-Morris *et al.*, 2002), the Implicit Models of Illness Questionnaire (IMIQ; Turk *et al.*, 1986) and the Personal Models of Diabetes Interview (PMDI; Hampson *et al.*, 1990). In addition, several non-generic instruments were adopted.

Collectively there was a great deal of congruence between the measures used in the present sample of studies to tap Leventhal *et al.*'s (1980) theoretically derived illness cognition dimensions of cause², consequences, cure/control, identity and timeline. However, there were some individual deviations from the norm and these needed to be classified correctly in order to ensure the validity of subsequent analyses. As a

²Attempts were made to logically classify the cause components available in the literature into meaningful categories in order to conduct a meta-analysis of the cause dimension with the other illness representation components and the coping and outcome constructs. However, due to the nature of the cause dimension there were many potential categories and much overlap in some of the categories in terms of item content. This created difficulties in arriving at definitive categories and yielded potential categories with too few studies to conduct a meaningful meta-analytic cumulation of the studies. As a consequence it was decided that the cause dimension be dropped from the analysis. It must therefore be recognised that the present analysis is confined only to the CSM dimensions of consequences, cure/control, identity and timeline. The cause component is an integral part of the model and should not be ignored in theory and research on illness representations. As the body of literature on the CSM and illness cognition increases, future analyses may make a quantitative cumulation of the various sub-components of the cause dimension possible for a more complete analysis, permitting researchers to comment on the role of illness cause in the CSM across empirical research in the area. Hypotheses regarding the cause dimension of the CSM were therefore not proposed in the present study.

consequence, a systematic content analysis was conducted on the items from the questionnaires that did not directly adhere to Leventhal *et al.*'s (1980) theoretically derived illness representation dimensions. The collective meaning of the items for each scale was used to determine whether the scales of these questionnaires were equivalent to Leventhal *et al.*'s (1980) theoretically-derived dimensions. This was particularly important for articles such as Heijmans and de Ridder (1998) and Turk *et al.* (1986) who used factor analyses of a pool of items to construct sample-specific scales rather than using the theoretically-derived scales reported by Leventhal *et al.* (1980). It was found that while some items loaded on to factors other than those which they were intended, the factor structure still reflected the original constructs making most of them eligible for inclusion in the analyses. For example, Heijmans and de Ridder's (1998) factor analytically-derived dimensions of *seriousness*, *controllability* and *chronicity* were deemed equivalent to the *consequences*, *control/cure* and *timeline* theoretically-derived CSM dimensions. Similarly, studies using the Personal Models of Diabetes Interview (PMDI) and other Personal Models constructs to measure illness cognitions were also analysed and classified in order to group like measures in the analysis. It was decided that the constructs of *seriousness*, *control* and *symptoms* were equivalent to the CSM theoretically derived dimensions of *consequences*, *control/cure* and *identity*. In order to ensure these variables were classified correctly, two independent raters compared the sets of items against the theoretically-derived CSM categories and achieved perfect agreement on the classification provided here.

In studies adopting the revised version of the Illness Perception Questionnaire (IPQ-R), three scales remained largely unchanged from the original IPQ, namely the cause, identity and consequences scales and these were treated as equivalent to the original. Similarly, the timeline scale from the original IPQ was mirrored by the timeline-acute/chronic scale in the IPQ-R and also deemed equivalent. The only real point of contention was the cure/control scale which, for the IPQ-R, was divided into personal control and treatment control scales. However, the cure/control scale from the original IPQ was dominated by many of the items from the IPQ-R personal control scale and contained only 3 items referring to external influences on illness controllability and 1 item on treatment control. Considering this domination by personal control it was expected that a high degree of congruence existed between the cure/control and the personal control scales and they were therefore classified as equivalent measures of the CSM cure/control dimension.

The measures used to tap the illness representation dimensions all adopt similar scoring systems and operationalised the valence of the dimensions in the same way. The cure/control scales are constructed such that high scores are indicative of greater beliefs in the controllability and curability of the illness. Analogously, the consequences, identity and timeline scales are measured so that higher scores imply more serious consequences, a higher incidence of symptoms and a view that the illness is more chronic than acute. This operationalisation makes intuitive sense, possesses face validity and ensures that the researcher can easily identify patterns of associations between the scales.

Classification of Coping Behaviours

Researchers have identified and measured a multitude of different coping behaviours and strategies used by illness sufferers to deal with the physical and psychological

burden of their illness. In order to conduct a clear, valid, parsimonious and unambiguous analysis of the relationships between the CSM illness cognition dimensions and the coping strategies that patients adopt, it was necessary to identify the coping behaviours and strategies that have been addressed in the present sample of studies and classify them into logical subsets. The present sample of studies was therefore content analysed to identify the coping behaviours and strategies, establish the logical subsets of coping behaviours and strategies common to the sample and assign the coping measures used to these categories. A description of the categories, the associated measures and the subscales (if relevant) that pertain to each category, the source of the measure and the studies from the present sample that have adopted the measure are provided in Table II. The two independent raters were also given the task of reproducing the classification. The raters and research team were unanimous in their assignment decisions when matching the coping behaviours to each category.

Six initial categories of coping behaviours and strategies were identified. Many of the studies in the present sample adopt generic, previously validated measures of coping strategies or styles namely the Utrechtse Coping List (UCL; Scheurders *et al.*, 1993), the COPE inventory (Carver *et al.*, 1989) and the Ways of Coping Checklist (WCCL; Vitaliano *et al.*, 1985) although some report illness-specific self-report measures (Scharloo *et al.*, 1998). These generic coping measures are represented in five of the six coping categories, namely, avoidance/denial, cognitive reappraisal, expressing emotion, problem-focused coping (generic) and seeking social support. In addition, the present sample of studies also reported numerous measures of specific coping behaviours that can be construed as an active, problem-focused, overtly-behavioural means of coping with the illness. Other researchers support the identification of specific and objectively measured behaviours. For example Heijmans (1999) suggests that "it might be better to measure coping in behavioural terms rather than as general strategies" (p. 147). These active coping behaviours were initially combined into a single sixth coping behaviour category termed *problem-focused coping-specific*. Behaviours included in this category at the preliminary stage included visits to doctors (e.g. Lau *et al.*, 1989; Weinman *et al.*, 1996) and adherence to diet and drug routines (e.g. Hampson *et al.*, 1994; Griva *et al.*, 2000). However, it is clear that differences existed in the specification of the focus and purpose of the 'doctors visits' listed in the sample of studies. While some studies make reference to such visits as visits to clinics for the expressed purpose of dealing with the target illness, a coping behaviour that has an overtly stated and problem-focused purpose, other studies refer only to number of visits to a general practitioner or practice doctor for unspecified reasons which has less relevance and has only an implicit relation with illness-specific coping. It was therefore decided that a seventh coping category, named 'doctors visits' be introduced. It was expected that the resulting two coping categories, problem-focused coping-specific and doctors visits, would account for coping behaviours focused on ameliorating the effects of a specific condition and unspecified doctors visits which may or may not have had some purpose toward coping with the target illness³. Overall, these seven distinct coping behaviour categories were used to generate the corrected average relationships across the studies in the meta-analysis.

³The authors are grateful to an anonymous reviewer for making this suggestion.

TABLE II Categories of coping behaviours used in meta-analysis

<i>Category</i>	<i>Description</i>	<i>Questionnaires</i>	<i>Questionnaire Subscales</i>	<i>Questionnaire Source</i>	<i>Illness Cognition Research Adopting Scale</i>
Avoidance/denial	Cognitive or behavioural attempts to ignore or avoid the existence of the problem or illness	COPE	Denial Behavioural disengagement Mental disengagement Alcohol/Drugs disengagement	Carver <i>et al.</i> (1989)	Cartwright and Lamb (1999), Fortune <i>et al.</i> (2002), Hagger and Chatzisarantis (2002), Lawson <i>et al.</i> (2001), Moss-Morris <i>et al.</i> (1996), Rutter and Rutter (in press, 2001a, 2001c), Steed <i>et al.</i> (1999)
		UCL	Seeking distraction Avoiding/Behavioural avoidant coping Passive coping Cognitive avoidant coping	Schreurs <i>et al.</i> (1993)	Heijmans (1998; 1999), Heijmans and de Ridder (1998), Scharloo <i>et al.</i> (1998)
		IES	Avoidance	Horowitz, Wilner and Alvarez (1979)	Rees <i>et al.</i> (2001b)
Cognitive reappraisal	Cognitive efforts to reappraise/seek the problem differently but acknowledging its existence	COPE	Positive reinterpretation and growth Acceptance	Carver <i>et al.</i> (1989)	Cartwright and Lamb (1999), Fortune <i>et al.</i> (2002), Hagger and Chatzisarantis (2002) Lawson <i>et al.</i> (2001), Moss-Morris <i>et al.</i> (1996), Rutter and Rutter (in press, 2001a, 2001c), Steed <i>et al.</i> (1999) Scharloo <i>et al.</i> (1998)
Doctors visits	Visits to general practitioner or doctor for no specified reason	Self-report visits	Fostering reassuring thoughts	Schreurs <i>et al.</i> (1993)	Hampson <i>et al.</i> (1994), Heijmans and de Ridder (1999), Lau <i>et al.</i> (1989), Weinman <i>et al.</i> (1996)
Expressing emotion	Coping by venting or expressing emotional reactions to illness	COPE	Focus on and venting of emotions	Carver <i>et al.</i> (1989)	Cartwright and Lamb (1999), Fortune <i>et al.</i> (2002), Hagger and Chatzisarantis (2002), Lawson <i>et al.</i> (2001), Moss-Morris <i>et al.</i> (1996), Rutter and Rutter (in press, 2001a, 2001c), Steed <i>et al.</i> (1999) Heijmans (1998; 1999), Heijmans and de Ridder (1998), Scharloo <i>et al.</i> (1998)
		UCL	Expressing emotion and venting emotion	Schreurs <i>et al.</i> (1993)	

Problem Focused Coping – Generic	Any active attempt to directly address the illness/problem	COPE	Active coping Planning Suppression of competing activities	Carver <i>et al.</i> (1989)	Cartwright and Lamb (1999), Fortune <i>et al.</i> (2002), Hagger and Chatzisarantis (2002), Lawson <i>et al.</i> (2001), Moss-Morris <i>et al.</i> (1996), Rutter and Rutter (in press, 2001a, 2001c), Steed <i>et al.</i> (1999)
Problem-Focused Coping – Specific	Any active attempts to address the illness making reference to a specific illness-related coping behaviour	UCL	Active coping/problem-focused coping	Schreurs <i>et al.</i> (1993)	Heijmans (1998; 1999), Heijmans and de Ridder (1998), Scharloo <i>et al.</i> (1998) Kemp <i>et al.</i> (1999)
		WCCL	Problem-focused coping	Vitaliano <i>et al.</i> (1985)	
		SDSC	Diet Exercise Glucose testing Insulin-taking	Toobert and Glasgow (1994)	Glasgow <i>et al.</i> (1997), Hampson <i>et al.</i> (1990), Hampson <i>et al.</i> (1995), Skinner and Hampson (1998), Skinner <i>et al.</i> (2002)
		MARS	Adherence to medication prescription	Horne (2001)	Theunissen and de Ridder (2001), Horne and Weinman (2002)
Seeking Social Support	Attempt to seek instrumental and emotional support from others	Self-reported diabetes self-management	–		Griva <i>et al.</i> (2000)
		Level of diabetes care	–		Lawson <i>et al.</i> (2001)
		Adherence to medication	–		Heijmans and de Ridder (1999)
		COPE	Seeking emotional social support Seeking instrumental social support	Carver <i>et al.</i> (1989)	Hagger and Chatzisarantis (2002), Rutter and Rutter (in press, 2001a, 2001c) Lawson <i>et al.</i> (2001), Moss-Morris <i>et al.</i> (1996), Steed <i>et al.</i> (1999)

Note: SDSC = Summary of Diabetes Self-Care; UCL = Utrechtse Coping List; WCCL = Ways of Coping Check List; IES = Impact of Events Scale; MARS = Medication Adherence Report Scale.

Classification of Illness Outcomes

Similarly, logical categories for the measures of illness outcomes was required in order to ensure that the raw correlations used in the meta-analysis were appropriate tests of the relationships between illness cognitions and illness outcomes. An identical content analysis strategy to the one adopted in the coping behaviour classification was used. The illness outcome categories, a description of the categories, the measures and questionnaire subscales (if relevant) relating to the measures, the source reference of the measures and the individual studies that have adopted the measures are shown in Table III. Six illness outcome categories were identified, namely, disease state, physical functioning, psychological distress, psychological well-being, role functioning, social functioning and vitality. The validity of the classification results were supported by the congruence of classification conducted by the research team with that provided by the two independent raters.

Meta-Analytic Strategy

The measure of effect size adopted for evaluation in the present study was the average correlation coefficient across the present sample of studies corrected for statistical artefacts. The meta-analytic strategy reported by Hunter and Schmidt (1990) was used to correct the averaged intercorrelations between the CSM illness cognition dimensions and the correlations between the illness cognitions, coping behaviours and illness outcomes for sampling and measurement error.

In some studies a coping category may have been represented by a number of constructs. For example, the *problem-focused coping-generic* category comprised the *active coping*, *planning* and *suppression of competing activities* scales from the COPE questionnaire (see Table II). In such cases, three correlations were available that expressed the relationship between problem-focused coping-generic category with each illness cognition dimension. This was reduced to provide one test of the relationship for the purposes of the meta-analysis by averaging the correlation coefficients according to recommendations given by Hunter and Schmidt (1990).

Some studies reported the inter-item correlation matrices for the instruments rather than the illness cognitions dimensions. In such cases structural equation modelling using the EQS computer program (Bentler, 1989) was used to analyse the data. The inter-item correlations were defined by a series of latent variables that represented their respective illness cognition dimensions. Factor correlations between these latent variables were then used in the meta-analyses.

RESULTS

Discriminant and Construct Validity

The averaged intercorrelation coefficients corrected for sampling and measurement error for the illness cognition dimensions are presented in Table IV. Results showed that an expected pattern of relationships consistent with study hypotheses and previous research trends observed in individual studies. The present analysis demonstrated significant and positive corrected average correlation coefficients (r_c) for the identity-consequences ($r_c = 0.37$, $p < 0.05$), identity-timeline ($r_c = 0.16$, $p < 0.05$) and

TABLE III Categories of outcome behaviours used in meta-analysis

<i>Category</i>	<i>Description</i>	<i>Questionnaires</i>	<i>Questionnaire Subscales</i>	<i>Questionnaire Source</i>	<i>Illness Cognition Research Adopting Scale</i>
Disease state	Objective measures of illness status	Diabetes illness status	Glycolysated Haemoglobin (HbA _{1c})	—	Griva <i>et al.</i> (2000), Hampson <i>et al.</i> (1990), Hampson <i>et al.</i> (1995), Wearden <i>et al.</i> (2002), Fortune <i>et al.</i> (2000; 2002)
Physical functioning	Scales referring to mobility, physical activity, self-care activities and daily living activities	PASI	Disease severity	Fredriksson and Pettersson (1978)	Horne <i>et al.</i> (2001), Boddington <i>et al.</i> (2002), Cartwright and Lamb (1999), Hampson <i>et al.</i> (1994), Heijmans (1998; 1999), Scharloo <i>et al.</i> (1998), Orbell <i>et al.</i> (1998)
		HIV illness status	CD ₄ count	—	Schiaffino <i>et al.</i> (1998)
		MOS SF-36/20/12	Physical functioning	Stewart, Hays and Ware (1988)	Fortune <i>et al.</i> (2002)
Psychological distress	Scales referring to anxiety, depression, distress and negative affect	Functional activity	—	—	Orbell <i>et al.</i> (1998)
		AIMS	Physical Functioning Index	Meenan <i>et al.</i> (1984)	Schiaffino <i>et al.</i> (1998)
		PDI	Psoriasis Disability	Finlay and Coles (1995)	Fortune <i>et al.</i> (2002)
		CES-D	Depression scale	Radloff (1977)	Orbell <i>et al.</i> (1998), Schiaffino <i>et al.</i> (1998)
		GHQ-30	General health distress	Goldberg and Williams (1991)	Rees <i>et al.</i> (2001b)
		HADS	Anxiety and depression	Zigmond and Snaith (1983)	Fortune <i>et al.</i> (2002), McCarthy <i>et al.</i> (in press), Rutter and Rutter (in press, 2001a, 2001c)
Psychological distress	Scales referring to anxiety, depression, distress and negative affect	IES	Intrusion	Horowitz, Wilner and Alvarez (1979)	Roberts and Connell (2000)
		PAIS-SR	Psychological distress	Derogatis (1986)	Steed <i>et al.</i> (1999), Moss-Morris <i>et al.</i> (2002)
		PANAS	Negative Affect	Watson, Clark and Tellegen (1988)	Fortune <i>et al.</i> (2000, 2002)
		PSWQ	Worry	Meyer, Miller, Metzger and Borkovec (1990)	

(continued)

TABLE III Continued

<i>Category</i>	<i>Description</i>	<i>Questionnaires</i>	<i>Questionnaire subscales</i>	<i>Questionnaire source</i>	<i>Illness cognition research adopting scale</i>
Psychological Distress (continued)		SDQ STAI WBQ	Emotional Symptoms State-Trait Anxiety Inventory Depression/anxiety	Goodman (1997), Spielberger, Gorsuch and Lushene (1970) Bradley (1994)	Stein <i>et al.</i> (2001), Hagger and Orbell (2002)
Psychological Well-Being	Scales referring to calmness, cheerfulness, satisfaction and positive affect	MOS SF-36/20/12	Mental health index	Stewart, Hays and Ware (1988)	Eiser <i>et al.</i> (2001), Skinner and Hampson (1998), Wearden <i>et al.</i> (2002), Boddington <i>et al.</i> (2002), Cartwright and Lamb (1999), Hagger and Chatzisarantis (2002), Heijmans (1998; 1999), Moss-Morris <i>et al.</i> (1996), Petrie <i>et al.</i> (1996)
		PANAS	Positive Affect	Watson, Clark and Tellegen (1988)	Hagger and Chatzisarantis (2002), Moss-Morris <i>et al.</i> (2002)
		WHOQOL	Satisfaction	WHOQOL Group (1998)	Rutter and Rutter (in press, 2001a), Wearden <i>et al.</i> (2002), Cartwright and Lamb (1999), Hagger and Chatzisarantis (2002), Hampson <i>et al.</i> (1994), Hampson <i>et al.</i> (2000), Scharloo <i>et al.</i> (1998), Steed <i>et al.</i> (1999), Cartwright and Lamb (1999), Moss-Morris <i>et al.</i> (1996), Steed <i>et al.</i> (1999)
Role Functioning	Scales referring to difficulty in fulfilling social roles e.g., workplace, school, child care and home management	WBQ MOS SF-36/20/12	Positive well-being Role functioning	Bradley (1994) Stewart, Hays and Ware (1988)	
Vitality	Scales referring to energy or fatigue	PAIS-SR MOS SF-36/20/12	Domestic environment Vitality	Derogatis (1986) Stewart, Hays and Ware (1988)	

Note. AIMS = Arthritis Impact Measurement Scales; CES-D = Center for Epidemiologic Studies Depression scale; GHQ-30 = General Health Questionnaire 30-Item version; MOS SF-36 = Medical Outcomes Study 36-item Short Form mental health inventory; IES = Impact of Events Scale; PAIS-SR = Psychological Adjustment to Illness Scale - Self Report; PANAS = Positive and Negative Affect Scales; PASI = Psoriasis Area and Severity Index; PDI = Psoriasis Disability Index; PSWQ = Penn State Worry Questionnaire; SDQ = Strengths and Difficulties Questionnaire; WBQ = Well-Being Questionnaire; WHOQOL = World Health Organisation Quality of Life Assessment.

TABLE IV Results of the meta-analytical cumulation analysis for the CSM illness representation subscale intercorrelations

Relationship	k	N	r	r _c	z	r' _c	Confidence Interval [†]		Credibility Interval ^{††}		N _{fs}	SD	SE	Variance ^a
							Lower Bound	Upper Bound	Lower Bound	Upper Bound				
							Lower Bound							
Cure/Control-Consequences	48	6484	-0.13	-0.18	-5.55*	-0.02	-0.12	-0.24	-0.50	0.14	125	0.19	0.03	27.41*
Identity-Cure/Control	33	5252	-0.08	-0.11	-2.73*	-0.05	-0.03	-0.20	-0.47	0.24	40	0.22	0.04	19.70*
Identity-Consequences	33	5291	0.28	0.37	9.07*	0.37	0.29	0.45	-0.02	0.71	211	0.21	0.04	18.10*
Identity-Timeline	30	4916	0.12	0.16	3.60*	-0.01	0.07	0.25	-0.20	0.52	66	0.22	0.04	17.12*
Timeline-Cure/Control	37	5205	-0.24	-0.34	-9.46*	-0.28	-0.41	-0.27	-0.64	-0.03	215	0.19	0.04	27.74*
Timeline-Consequences	37	5211	0.31	0.43	11.91*	0.39	0.36	0.50	0.11	0.73	281	0.19	0.04	23.95*

Note: k = Number of studies; N = Sample size (N may differ slightly across relationships because the reported sample size used for some correlation coefficients may have varied by a few cases); r = Mean correlation coefficient corrected for sampling error only; r_c = Mean correlation coefficient corrected for sampling and measurement error; z = Fisher's z test of significance for r_c; r'_c = Semi-partial corrected correlation coefficient controlling for other illness cognition dimensions; †95% Confidence interval of average correlation corrected for sampling error only; ††90% Credibility Interval of average correlation corrected for sampling and measurement error; N_{fs} = Fail safe N, number of null-result studies required to reduce correlation to non-significant value; SD = Standard deviation of mean; SE = Standard error of mean; †Percentage of error variance accounted for by statistical artefacts; *p < 0.05.

timeline-consequences ($r_c = 0.43$, $p < 0.05$) relationships. Significant, negative r_c coefficients were found for the cure/control-consequences ($r_c = -0.18$, $p < 0.05$), identity-cure/control ($r_c = -0.11$, $p < 0.05$) and timeline-cure/control ($r_c = -0.34$, $p < 0.05$) relationships. This pattern of relationships supports the construct validity of the CSM illness cognition dimensions across the present sample of studies, with negative relationships exhibited between the cure/control dimension and the other illness cognition dimensions and positive interrelationships observed between the other dimensions.

The corrected correlations shown in Table IV were all significantly different from zero according to Fisher's z-test of significance. However, as with all meta-analyses of available research, no matter how rigorous the literature search and follow-up procedures to collect fugitive literature⁴, the chance still exists that the study outcomes of the sample are biased due to the lack of inclusion of unobserved studies not available to the researcher. Rosenthal (1979) described this phenomenon as the *file drawer problem* and suggested that publication criteria and bias towards the publication of significant results may artificially inflate effect sizes. He claimed that there may be a number of 'censored' or unpublished samples residing in the file drawers of the researcher who conducted the studies. One means of assessing the potential impact of such censored samples is to estimate how many additional studies with null or non-significant results would need to be found to reduce the effect size observed in the meta-analysis to a critically low value (Hedges and Olkin, 1985). Therefore the number of studies required to overturn the results of the meta-analysis, termed the 'fail-safe N' (N_{fs}), was calculated for each of the corrected correlations in the present analyses and these are shown in Table IV. All the N_{fs} associated with the corrected correlation coefficients equalled or exceeded twice their respective k , with the exception of the identity-cure/control relationship which still exceeded k . This evidence indicates that a sample of studies double the size of the current sample with null findings would have to be located in order to overturn the current results, and this is true for all but one of the relationships. Since it is unlikely that such a large number of studies exists, it can be concluded that the sample of studies is an acceptable estimate of the true relationship in the population.

Empirical support for the discriminant validity of two constructs is given if the correlation coefficient between the two variables in question is greater than 1.96 its standard error below unity (Bagozzi and Kimmel, 1995). Table IV shows that all the correlation coefficients satisfy this criterion providing a statistical test, significant at the 0.05 level, to support the independence of the illness representation dimensions across the present set of studies.

However, this criterion alone is a necessary but not sufficient condition to evaluate the independence of the dimensions. Aside from face validity, an additional check

⁴Our pursuit of 'fugitive' literature for the present study yielded a number of unpublished data sets. In order to check whether there were biases in the data due to their publication status, we conducted a moderator analysis by separating the present sample of studies into published and unpublished articles and conducting a separate meta-analysis on each group. The dichotomous moderator variable was defined as studies published in peer-reviewed journals and unpublished data sets or conference proceedings. Results revealed that there was substantial overlap in the credibility intervals of the corrected correlations from each group, suggesting that no significant differences in the corrected effect sizes existed due to the publication status of the data sets.

was deemed necessary in the present analysis in order to establish whether the correlations between illness representation dimensions remained even in the presence of the other dimensions. As a consequence, semi-partial (disattenuated) correlation coefficients (r'_c) were calculated for each relationship from the corrected correlation matrix and these are shown in Table IV. The analysis revealed that two of the relationships, namely cure/control-consequences and identity-timeline were attenuated to zero. This indicated that these relationships could be entirely accounted for by the other illness representations dimensions. Further, the semi-partial correlation for the identity-cure/control relationship was significantly attenuated ($r'_c = -0.05$, $p < 0.05$) as shown by the lack of overlap of the confidence intervals of the semi-partial correlation coefficient with the original corrected correlation coefficient. This suggests that a portion of unique variance was shared between the identity and consequences constructs despite the attenuation.

Post hoc analyses were conducted to reveal which illness representation dimensions were responsible for the attenuation of these relationships. The semi-partial correlation analysis for the cure/control-consequences, identity-timeline and identity-cure/control relationships were repeated with a systematic elimination of each of the covariate illness representation dimensions. The elimination of the timeline dimension restored the cure/control-consequences correlation to its original value. The consequences dimension resulted in the attenuation of the identity-timeline correlation. Further, both the timeline and consequences dimensions were responsible for the attenuation of the identity-cure/control relationship. It seems, therefore, that the relation between perceived low curability/lack of control and serious consequences of the illness can be explained by the perception that the illness has a chronic timeline. The association between a chronic timeline and a strong illness identity is accounted for by serious consequences. Finally, perceived consequences and a chronic timeline are necessary dimensions to account for a significant proportion of the variance between illness identity and perceived curability/controllability of the illness.

Examining the percentage of the total error variance in each of the corrected correlation coefficients in Table IV accounted for by the statistical artefacts of sampling and measurement error gives an indication of the heterogeneity of the relationships and whether other moderating variables may be responsible for the variation in the correlations across these studies. Hunter and Schmidt (1990) suggest that the statistical artefacts should account for at least 75% of the variance for the researcher to be confident that no moderators are acting on the relationship. A more formal test of this premise is given by the χ^2 test of the difference between the total error and artifactual error. If there is no significant difference between the total error associated with the corrected correlation and the error accounted for by the statistical artefacts corrected for in the analysis, then the researcher can be confident that the correlation is homogenous. However, if the test yields a significant result it is indicative of the presence of a moderator or moderating variables. In the present study, all the corrected correlation coefficients exhibited a significant χ^2 value which is suggestive of the existence of moderating variables influencing the interrelationships of illness representation dimensions.

The credibility intervals for the average sampling and measurement error corrected correlations from this set of studies included the value of zero for the cure/control-consequences, identity-cure/control and identity-timeline relationships. As the

purpose of meta-analysis is to infer the true population relationship from the corrected correlations from the sample of studies, this finding indicates that there is a possibility that these relationships may be zero in the population. This may, however, be a function of two potential artefacts that could result in biases in the corrected correlations observed in the present analysis. The first may be the existence of moderating variables and an analysis that accounted for moderators may restore homogeneity to the corrected correlations and narrow the credibility intervals such that the hypothesis of a null relationship between the two dimensions in the population can be rejected. However, the low number of studies in the present sample precluded a search for moderator variables and is a limitation of the present analysis.

Secondly, it is possible that additional measurement bias, other than internal reliability, may have influenced the intercorrelations. In particular, the significant relationships observed between the identity dimension and the other illness representation dimensions may be biased because measures such as the IPQ and IMIQ tap identity using symptom reports rather than beliefs about illness symptoms. Such reports do not assess cognitive associations made between symptoms and the illness which would be necessary to assess identity beliefs. Symptom reports would be biased towards an illness sufferer's current experiences of the illness symptoms or illness state. Indeed, for illnesses where symptom prevalence is intermittent or for conditions that are largely asymptomatic, such assessments would not be representative of true illness identity beliefs. Thus some of the intercorrelations in the present analysis may be subject to increased variability or bias due to the confounding influence of measurement artefacts not corrected in the meta-analytic process.

Relationship of Illness Cognitions to Coping Behaviours

The average corrected correlations between the CSM illness representation dimensions and the coping behaviours from the present sample of studies can be seen in Table V. The results lend some support for the a priori hypotheses regarding the illness cognition-coping relationships. Control/cure exhibited significant correlations with problem-focused coping – generic ($r_c = 0.27, p < 0.05$), problem-focused coping – specific ($r_c = 0.12, p < 0.05$), cognitive reappraisal ($r_c = 0.20, p < 0.05$) and seeking social support ($r_c = 0.08, p < 0.05$) as expected but not with avoidance/denial, expressing emotions and doctors visits. Consequences on the other hand was significantly related to avoidance/denial ($r_c = 0.23, p < 0.05$) and expressing emotions ($r_c = 0.21, p < 0.05$) as anticipated. Moderate-to-strong correlations were also shown for the identity-avoidance/denial ($r_c = 0.23, p < 0.05$) and identity-expressing emotions ($r_c = 0.23, p < 0.05$) relationships. Timeline was most strongly related to cognitive reappraisal ($r_c = 0.14, p < 0.05$) but also had a modest relationship with avoidance/denial ($r_c = 0.12, p < 0.05$). These results are consistent with the study hypotheses suggesting that the control/cure variable would be positively related to problem-focused coping strategies and consequences, identity and timeline would be positively related to expression of emotions and/or avoidance/denial. Further, 14 of the 28 relationships between the illness representation dimensions and coping strategies had non-significant χ^2 values. This indicates that half of the relationships were homogenous and that the majority of the variance was accounted for by the statistical artefacts, precluding the presence of moderators.

TABLE V Results of the meta-analysis for the correlation of the CSM illness representation dimensions of consequences, control/cure, identity and timeline with coping behaviours

<i>Coping behaviour</i>	<i>Consequences</i>			<i>Control/Cure</i>			<i>Identity</i>			<i>Timeline</i>			
	<i>k</i>	<i>N</i>	<i>r_c</i>	<i>k</i>	<i>N</i>	<i>r_c</i>	<i>k</i>	<i>N</i>	<i>r_c</i>	<i>k</i>	<i>N</i>	<i>r_c</i>	<i>N_{fs}</i>
Avoidance/denial	16	1858	0.23*	16	1858	-0.04 [†]	14	1750	0.23*	16	1858	0.12 ^{†*}	22
Cognitive reappraisal	12	1545	0.03 [†]	12	1545	0.20*	10	1437	0.03 [†]	11	1312	0.14 ^{†*}	20
Expressing emotions	14	1706	0.21*	14	1706	0.12	12	1598	0.23*	14	1706	0.02 [†]	-
Problem focused coping – generic	15	1800	0.02	15	1800	0.27 ^{†*}	13	1692	0.03	15	1800	0.03 [†]	-
Problem focused coping – specific	13	4765	0.01	15	3355	0.12*	21	2457	-0.01	9	2359	0.01 [†]	-
Doctor's visits ^a	5	1949	-0.01	3	1747	-0.02 [†]	5	1946	0.05	4	1888	-0.01 [†]	-
Seeking social support	13	1213	0.05 [†]	13	1213	0.08 ^{†*}	8	1105	0.05	13	1213	-0.04 [†]	-

Note: ^aVisits to General Practitioner or medical centre for unspecified reason; *k* = Number of studies; *N* = Sample size; *r_c* = Cumulative correlation coefficient corrected for sampling and measurement error; *N_{fs}* = Fail safe *N*, number of studies required to reduce correlation to non-significant value, not calculated for non-significant correlations; *Correlation is different from zero based on Fisher's z test of significance ($p < 0.05$); [†]No significant difference between total variance in correlation and error variance accounted for by statistical artefacts.

One source of variance in the corrected correlations between illness representation dimensions and coping strategies may be the inadequacy of the measures used to tap coping by most of the studies in the present sample. The majority of the coping dimensions in the present sample are derived from previously-validated, generic checklist-type coping instruments. While such measures have demonstrated validity, reliability and applicability in cross-sectional studies and clinical practice, there are some inherent problems associated with such measures (Coyne and Racioppo, 2000). These measures have been criticised for their excessive generality and their failure to account for individual differences in coping styles, goals of coping and perceptions of probability of success (Coyne and Racioppo, 2000). Further, when these characteristics are controlled for, relations between coping and outcomes tend to be attenuated (Folkman and Lazarus, 1988). It is thus necessary to acknowledge that the corrected correlations in the present analysis between illness representation dimensions and coping strategies from checklist-type measures of coping strategies like the UCL, COPE and WCCL are limited due to their generic nature. However, other means of assessing coping from more objective, behavioural measures were attempted in the present study and this was represented by the problem-focused coping-specific and doctors visits coping categories.

Relationship of Illness Cognitions to Illness Outcomes

The average corrected correlations derived from the meta-analysis of the illness cognition dimension-illness outcome relations across the present sample of studies are shown in Table VI. As expected the consequences, identity and timeline subscales exhibited significant negative relationships with psychological well-being, role functioning, social functioning and vitality (range: $-0.67 \geq r_c \leq -0.11$). Consequences ($r_c = -0.18$, $p < 0.05$) and identity ($r_c = -0.28$, $p < 0.05$) were also strongly and negatively related to physical functioning but timeline exhibited a non-significant relationship with this outcome. Consequences ($r_c = 0.50$, $p < 0.05$), identity ($r_c = 0.36$, $p < 0.05$) and timeline ($r_c = 0.20$, $p < 0.05$) were significantly and positively related to psychological distress. This is consistent with hypotheses that individuals who perceived their illness to have serious consequences, a chronic timeline and a strong identity tended to score low on adaptive and high on maladaptive illness outcomes. Conversely, average corrected correlations between cure/control and psychological well-being ($r_c = 0.21$, $p < 0.05$), social functioning ($r_c = 0.13$, $p < 0.05$) and vitality ($r_c = 0.24$, $p < 0.05$) were significant and positive. Further, control/cure was significantly and negatively related to psychological distress ($r_c = -0.17$, $p < 0.05$) and disease state ($r_c = -0.17$, $p < 0.05$). This supports the hypothesis that control/cure would be positively related to adaptive outcomes, although it was not related to all adaptive outcomes, and negatively related to maladaptive outcomes. Correlations between objective disease state measures and the CSM illness cognition dimensions all approached zero, the control/cure-disease state correlation excepted. Although only four studies reported correlations between the illness representation dimensions and disease state, three of the correlations exhibited consistency, indicating that the statistical artefacts corrected for in the meta-analysis accounted for the majority of the variance in these relationships (Hunter and Schmidt, 1990).

TABLE VI Results of the meta-analysis for the CSM illness representation subscale correlations with illness outcomes

Outcome category	Consequences				Control/Cure				Identity				Timeline			
	<i>k</i>	<i>N</i>	<i>r_c</i>	<i>N_{fs}</i>	<i>k</i>	<i>N</i>	<i>r_c</i>	<i>N_{fs}</i>	<i>k</i>	<i>N</i>	<i>r_c</i>	<i>N_{fs}</i>	<i>k</i>	<i>N</i>	<i>r_c</i>	<i>N_{fs}</i>
Physical functioning	15	1849	-0.18*	39	15	1846	-0.03	-	11	1529	-0.28*	51	11	1493	-0.10	-
Psychological distress	20	2821	0.50*	180	20	2817	-0.17*	48	13	2279	0.36*	81	14	2182	0.20*	42
Psychological well-being	16	2566	-0.46*	131	16	2566	0.21*	51	11	2051	-0.37*	70	12	2114	-0.08	-
Role functioning	9	1304	-0.43*	68	9	1301	0.04	-	8	1136	-0.56*	82	7	1077	-0.11*	8
Social functioning	11	1468	-0.49*	97	11	1465	0.13*	18	10	1400	-0.48*	86	9	1240	-0.15*	18
Vitality	6	1171	-0.45*	48	6	1171	0.24*	23	6	1171	-0.67*	74	6	1171	-0.18*	16
Disease state	4	457	-0.06 [†]	-	4	457	-0.17*	10	4	457	0.08 [†]	-	4	457	-0.03 [†]	-

Note: *k* = Number of studies; *N* = Sample size; *r_c* = Cumulative correlation coefficient corrected for sampling and measurement error; *N_{fs}* = Fail safe *N*, number of studies required to reduce correlation to non-significant value, not calculated for non-significant correlations; *Correlation is different from zero based on Fisher's z test of significance ($p < 0.05$); [†]No significant difference between total variance in correlation and error variance accounted for by statistical artefacts.

DISCUSSION

The present study aimed to examine the discriminant and construct validity of the CSM illness representation dimensions and to examine the relationships between these dimensions and coping behaviours and illness outcomes across available studies from the health psychology literature. Meta-analytic techniques were used to correct the averaged relationships between the CSM variables for statistical artefacts across 45 studies that satisfied the inclusion criteria. The corrected intercorrelation matrix of the CSM illness cognition dimensions revealed a logical pattern of relationships that was consistent with *a priori* hypotheses. Studies consistently reported strong negative associations between the cure/control dimension and the consequences, identity and timeline dimensions. Conversely positive corrected correlations were found between the consequences, identity and timeline dimensions. In terms of associations with coping behaviours, beliefs in serious consequences and a strong illness identity were positively associated with expressing emotions and avoidance/denial while the control/cure dimension was positively associated with cognitive reappraisal, problem-focused coping-generic and seeking social support. Correlations of the illness representation dimensions with illness outcomes were in line with the study hypotheses. Belief in serious consequences, a strong illness identity and a chronic timeline was negatively related to adaptive illness outcomes, namely, psychological well-being and social and role functioning and vitality, but positively related to the maladaptive outcome of psychological distress. High perceived control over the illness was consistently and positively correlated with psychological well-being and vitality. In summary, the major hypotheses relating to the CSM illness representation dimensions were supported by these results.

The pattern of intercorrelations exhibited between the illness cognition dimensions is consistent with those observed by individual studies on illnesses and with Leventhal *et al.*'s (1980) CSM. In particular it supports the construct and discriminant validity of the CSM illness representation dimensions and the measures adopted to quantify these dimensions. Therefore, measures such as the IPQ (Weinman, *et al.*, 1996), IPQ-R (Moss-Morris *et al.*, 2002), the IMIQ (Turk *et al.*, 1986) and illness-specific measures (e.g. Hampson *et al.*, 1990; Heijmans, 1998, 1999; Schiaffino *et al.*, 1998; Scharloo *et al.*, 1998; Kemp *et al.*, 1999) are all supported by the present cumulative analysis. This provides important corroborative data firstly for the CSM illness representation dimensions and for the instruments used to tap the model dimensions. There appears to be a great deal of consistency in the subjective ratings and patterning that illness sufferers tend to report when developing a 'mental representation' of their illness. This is in keeping with the major premise of the CSM that is based on cognitive theories such as schema theory. Since schemata tend to be hierarchical and relational in nature (French and Richards, 1993), it is no wonder that the present ordering of relationships is congruent across different illnesses. Further, illness-specific measures, even when factor analysed, seem to cluster about the original dimensions derived by Leventhal *et al.* (1980). This cumulative analysis therefore supports the notion that the logical CSM categories elicited from first principles are consistent and largely generalisable.

Further support for the consistency of the pattern of intercorrelations of illness representation dimensions across studies is provided by the semi-partial correlation analysis. The disattenuated correlation coefficients generated by partialling out the

influence of the remaining illness representation dimensions for each pairwise relationship suggested that all but two of the relationships remained significant. This indicates that a high degree of unique variance is shared between each set of variables and that their relationships are unconfounded by the other illness representation variables. This lends support to the discriminant validity of the illness representation dimensions when controlling for other variables, an analysis that has not been conducted previously. An interesting finding is the dependence of the cure/control-consequences relationship on the timeline dimension and the reliance of the identity-timeline relationship on the consequences dimension. Such mediation effects suggest that the zero-order corrected correlations between these variables does not account for the organisational complexity of people's illness representations. This suggests that some of the illness representation dimensions are not orthogonal but inter-dependent.

Finally, there is an important caveat to the arguments in support of the consistency in the illness representation relationships across studies. All but one of the averaged correlations presented in the present meta-analysis reported a significant difference between the total error variance in the correlation and the error variance accounted for by the statistical artefacts of sampling and measurement error. This is indicative of the presence of moderating variables. Therefore, while the correlations are indicative of a strong pattern of relationships and the presence of a logical ordering of the dimensions involved across studies and therefore across illnesses, there may be sub-groups of studies that would better account for the variation in the correlations. Due to the small number of studies available in the present study in each illness category, it would be unwise to conduct moderator analyses. This is because there would be insufficient statistical power and the researcher could not be confident in rejecting a false null hypotheses in the sample of studies under scrutiny. These results must therefore be accepted on the premise that there may be differences in the correlations that could be attributed to moderators such as illness type, severity, chronicity and symptomatic characteristics.

Illness Cognitions and Coping Behaviours

The present results suggest that perceived controllability is related to active coping and cognitive reappraisal. This is logical as self-care behaviours are likely to be enacted to relieve the illness symptoms and treat the illness if they are perceived to be efficacious and easy to perform. This has been reported in a number of cross-sectional investigations and across a variety of illnesses, like CFS (Heijmans, 1998; Heijmans and de Ridder, 1998; 1999), arthritis (Orbell *et al.*, 1998; Schiaffino *et al.*, 1998) and diabetes (Hampson *et al.*, 1994; Griva *et al.*, 2000). In addition, an important finding is that the illness sufferers in this sample of studies also tend to change the way they look at their illness (cognitive reappraisal) if they deem it to be controllable, although causality cannot be directly inferred from these data due to its correlational nature. This suggests that when they have indicated that their illness is controllable, illness sufferers tend to use cognitive strategies which may help them re-appraise the importance of their condition.

Identity was related to avoidance and expressing emotion. These alternative coping behaviours could be considered maladaptive, particularly denial, as they may compel a sufferer not to actively seek assistance for their illness and it may be that the presence

of the illness is not acknowledged (Heijmans, 1998). Further, such coping behaviours, while assisting ability to tolerate the illness, could be associated with the perception that active coping may not be effective. Such 'learned helplessness' may be engendered by the illness itself if it is experienced as having no effective cure or treatment regime (Affleck *et al.*, 1987). This is a consistent finding in illnesses that are not brought under control by medication (Heijmans, 1999). However, if such a perception is present for conditions that do have a readily available and effective treatment or management regime, then the effects of such coping behaviours could be seen as maladaptive.

Interestingly, seeking social support had very small associations with all illness cognition dimensions, even though it was expected that social support would be related to these representational dimensions. This does not mean that social support is not sought by the illness sufferers in the present studies, but it suggests that this particular coping mechanism is not related to the illness representation. It may be that social support seeking as a coping behaviour may be determined by other representational beliefs or social context⁵. In addition, there may be a number of explanations for the low relationships exhibited between the social support construct and illness representation dimensions in the present meta-analysis. The first may be the manner in which social support is measured. Social support was typically assessed using self-report scales that make reference to generic social groups and thus the issue of excessive generalisation cited by reviews of checklist measures of coping strategies may apply (Coyne and Racioppo, 2000). In such cases seeking social support from a generalised, non-specific source may have little relevance or be too far removed to illness sufferers who may be used to a specific named set of social contacts, carers or social support network as sources of social support to cope with their illness.

Secondly, the generic coping inventories do not provide evidence as to the exact types of social support sought and as a consequence may not provide a broader perspective on the sources and extent of the social support provided. Indeed, the relationship may not be one of a consistent linear-response as implied by questionnaires tapping social support. Finally, in the case of some chronic illnesses people often report that their desire to keep up social contacts is reduced because their illness affects their perceived body image and self-esteem. It may be that social contacts are not sought due to the perception that they are impaired by the illness. This is particularly pervasive in illnesses like psoriasis that have associated negative implications for social identity and body image (Scharloo *et al.*, 1998). Such relationships may affect or attenuate the relationships between illness representations and social support seeking coping behaviour for certain illness types as indicated by the heterogeneity exhibited by some of the corrected correlations from the present meta-analysis.

Illness Cognitions and Illness Outcomes

In terms of illness cognitions and relationships with illness outcomes, the present results support the hypothesis that adaptive outcomes, namely role, social and physical functioning, psychological well-being and vitality are associated with lower perceived consequences and a weaker illness identity. These findings underlie the impact of

⁵The authors are grateful to an anonymous reviewer for making this suggestion.

symptoms (identity) and consequences on perceived psychological well-being. Individual studies have found that illness identity, and in particular perception of symptoms, explains the most overall variance in illness outcomes (Scharloo *et al.*, 1998; Kemp *et al.*, 1999). Further, it seems that these adaptive outcomes are also strongly related to the degree of perceived control reported regarding the illness. This is consistent with other individual studies that have shown strong relationships between perceived control and positive illness outcomes (Shillitoe and Christie, 1990; Bradley *et al.*, 1990). To speculate, learning that an illness is within their control may empower people to report more well-being outcomes, although the cross-sectional nature of the data reported in this sample of studies precludes any confirmatory statements regarding the causality of the illness cognition-illness outcome relationships as specified by the CSM.

Limitations of the Study and Avenues for Further Research

A major tenet of the CSM is that a causal relationship exists between illness cognitions and outcomes that is mediated by coping. This premise suggests that the negative influence of illness cognitions such as identity on adaptive outcomes like psychological well-being can only be understood through the influence of a relevant coping strategy that may alleviate illness symptoms such as problem-focused coping. Clearly, the relationships reported in the present sample of studies are largely cross-sectional and this negates the ability to make any judgements regarding causality from these data. While some studies support the prediction that illness cognitions influence illness outcomes over time (e.g. Hampson *et al.*, 2000) and have investigated the mediation hypothesis prospectively (e.g. Hampson *et al.*, 1990), there are few studies that use longitudinal designs. Further, time-lagged hypotheses such as whether current or prospective coping has an impact on time-lagged illness cognition-illness outcome relationships have yet to be addressed. Therefore a primary avenue for further research is to adopt longitudinal designs to test the direction of causality in the relationships between illness cognition, coping and outcome as stipulated by the CSM.

A key aspect of such longitudinal research would be to test the CSM hypothesis that coping mediates the illness cognition-illness outcome relationship. Three cross-sectional studies have attempted to examine the mediation hypothesis using cross-sectional data but these have had limited success. Studies on epilepsy (Kemp *et al.*, 1999), chronic obstructive lung disease, psoriasis and rheumatoid arthritis (Scharloo *et al.*, 1998) and Addison's disease (Heijmans, 1998) have all reported null findings for the mediation hypothesis. These studies found a significant impact of illness representations on illness outcomes with zero or very small additive impacts of coping behaviours. Indeed, this is corroborated by the cumulative analyses from the present study that showed more significant relationships in the corrected correlation matrices for illness representations and outcomes compared with the matrices for illness representations and coping behaviours. A useful addition to the present analyses would have been to subject the corrected correlation matrices to a path analysis to test the mediation hypotheses. This would also have the added advantage of providing further supportive evidence of the predictive validity of the CSM as the correlation analysis in the present study does not provide evidence to support causal relationships such as the proposed mediation hypothesis: illness cognition→coping→outcome. However, the low number of studies providing correlations between coping and outcome variables precluded a

path analysis. As data accumulates, such a review would be possible and may provide a powerful means of assessing the true relationships between cognition, coping and health outcomes.

One possible explanation for the low-to-moderate magnitude of the correlations between the illness representation dimensions and coping behaviours compared with the strong and significant illness representation-illness outcome correlations may lie, in part, in the assessment of coping and the possible confounding feedback effects of outcomes on the representations themselves. As mentioned previously, coping styles measured by checklist are limited due to their lack of specificity and failure to account for personal characteristics. One means to counter these limitations is to use more objective, problem-focused behavioural coping measures such as diabetes management techniques and drug regimen adherence (e.g. Griva *et al.*, 2000; Hampson *et al.*, 1990). These provide illness-specific assessments of coping that are not limited due to their generality. However, such measures may also be subject to bias if the direction or focus of the coping behaviour is not known. For example, doctor's visits may be indicative of a coping response related to the target illness, but since actual reasons for the visits are typically unspecified, the researcher cannot be sure that such a response can be definitively and directly attributed to the target illness. Further, in the CSM, the appraisal of illness outcomes feedback can modify illness representations (see Fig. 1, feedback loop) and such re-evaluations may interfere with the proposed mediation relationship: illness cognition → coping → outcome. It may be that the strong correlations between illness representations and outcomes are due to a causal relationship between outcomes and representations that could be modelled at the appraisal stage.

An alternative hypothesis that has not received much attention in the literature is that influence of cognition on outcomes may be exacerbated or hindered by the coping behaviours. This suggests that a *moderating* effect exists such that the effect of illness cognitions such as controllability on illness outcomes like vitality and psychological well-being may be more influential in the presence of coping behaviours that address controllability such as problem-focused coping. For example, Collins *et al.* (1983) have shown in conditions of low controllability, denial and expressing emotions can be effective in the short term while cognitive reappraisal is the most optimal coping strategy over longer periods. It is therefore recommended that practitioners focus on techniques to foster cognitive reappraisal in patients when control is low and cannot be changed using problem-focused coping strategies such as the adoption of empowering self-management behaviours. Future research will therefore need to focus not only on longitudinal designs, but also on formal tests of the CSM to examine whether coping mediates, or moderates, the influence of illness cognitions on illness outcomes. In addition, a future avenue for investigation might take the appraisal stage of the CSM into account to fully evaluate the complex manner in which illness representations affect coping and illness outcomes. In this way a full evaluation of the true effectiveness of coping behaviours, particularly generic strategies, on illness management can be conducted.

A further potential limitation of the present analysis is that the studies included in the samples focus on a relatively narrow range of illnesses that are generally chronic. Only one study examined an acute illness (common cold, Lau *et al.*, 1989) and there are a disproportionate number of studies examining diabetes. Researchers would therefore do well to exercise caution when using the current findings to infer CSM

relationships for common illnesses not represented in the present analysis such as cancers and sexually transmitted diseases. Conducting tests of the CSM with these illnesses using the present analysis as a guide would, however, be a fruitful endeavour. The availability of studies on a broader range of illnesses may facilitate the investigation of the moderating effects of illness type on the hypotheses of the CSM.

CONCLUSION

In summary, the present cumulative synthesis of the research on illness representations, coping behaviours and illness outcomes provides some support for the construct and discriminant validity of the CSM dimensions. Further, it has provided a system for the classification of coping and outcome measures into logical categories. The study also shows that moderate-to-strong relationships exist between illness cognitions, coping behaviours and illness outcomes as found in individual tests of these relationships. However, subsequent research must (1) address the potential of coping to mediate the illness representation → outcome relationship using longitudinal designs and (2) provide formal tests of the CSM model and the role of appraisal processes therein.

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*Indicates study included in meta-analysis.

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