

Illness Representations, Coping, and Illness Outcomes in People with Cancer:
A Systematic Review and Meta-Analysis

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Abstract

Objective: Cancer is associated with negative health and emotional outcomes in those affected by it, suggesting the need to better understand the psychosocial determinants of illness outcomes and coping. The Common Sense Model (CSM) is the leading psychological model of self-regulation in the face of illness, and assumes that subjective illness representations explain how people attempt to cope with illness. This systematic review and meta-analysis examines the associations of the CSM's illness representation dimensions with health and coping outcomes in people with cancer.

Methods: A systematic literature search located 54 studies fulfilling the inclusion criteria, with 38 providing sufficient data for meta-analysis. A narrative review of remaining studies was also conducted.

Results: Random-effects models revealed small to moderate effect sizes (Fischer's Z) for the relations between illness representations and coping behaviours (in particular between control perceptions, problem-focused coping, and cognitive reappraisal), and moderate to large effect sizes between illness representations and illness outcomes (in particular between identity,

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consequences, emotional representations, and psychological distress). The narrative review of studies with insufficient data provided similar results.

Conclusions: The results indicate how illness representations relate to illness outcomes in people with cancer. However, more high quality studies are needed to examine causal effects of illness representations on coping and outcomes. High heterogeneity indicates potential moderators of the relationships between illness representations and health and coping outcomes, including diagnostic, prognostic, and treatment related variables. This review can inform the design of interventions to improve coping strategies and mental health outcomes in people with cancer.

Keywords: cancer; oncology; illness perceptions; common sense model of illness representations; systematic review and meta-analysis

Background

Cancer is one of the most prevalent diseases worldwide, with more than 14 million new cancer cases diagnosed annually [1]. Often, people with cancer experience negative health outcomes and face extraordinary coping challenges [2-7]. These outcomes and coping behaviours depend on individual representations of illness [8], but to date, no systematic review and meta-analysis has provided an overview of the complex relationships between illness representations, coping and illness outcomes in cancer to inform the content of psychological interventions based on subjective illness representations.

Illness Representations and the Common Sense Model

The Common Sense Model of Self-Regulation of Health and Illness (CSM) [9] is a widely accepted psychological model of the processes underlying health and coping in people with chronic illness. According to the CSM, individual representations of health threats (i.e., people's common-sense understanding of their illness [9,10]) and the according emotional response guide peoples' coping responses in parallel processes, which are later appraised in terms of their success or failure [8] (Figure 1).

The CSM orders illness representations into distinct dimensions. *Identity* refers to the label of the health threat (e.g. cancer) and its symptoms (e.g. fatigue). *Cause* refers to the individual's beliefs about the cause of the health threat (e.g. genetic weakness). *Timeline* refers to the perceived time-frame of disease development, duration, and recovery (e.g. acute, chronic, or cyclical). *Consequences* (both imagined and real) are beliefs about what effect the health threat may have on an individual's life (e.g. absence from work). *Curability* or *controllability* refers to the degree to which someone believes that the health threat can be controlled or cured by themselves or others (e.g. incurable but controllable with medication) [10]. This dimension has later been revised to represent two distinct dimensions - *personal control* - the amount of control an individual perceives to have over the course of their illness, and *treatment control* - the amount of control the individual believes their treatment has over the illness. *Illness coherence* refers to the extent to which a patient's illness representations provide coherent understanding of the illness, and *emotional representations* describe an individual's emotional responses to the illness [11]. The most widely used instruments to assess illness representations are the Illness Perception Questionnaire (IPQ) [12], the Revised Illness Perception Questionnaire (IPQ-R) [11], and the Brief Illness Perception Questionnaire (B-IPQ) [13]. The IPQ-R has acceptable test-retest reliability, sound discriminant and predictive validity, and good internal reliability [11].

In a seminal systematic review of the CSM, Hagger and Orbell [14] have shown that the IPQ dimensions are related to both coping behaviours (such as avoidance/denial and medication adherence) and illness outcomes (e.g., depression and physical functioning) across a range of chronic and acute illnesses. In particular, greater perceived controllability was associated with more adaptive coping strategies, while perceiving an illness as highly symptomatic with a chronic timeline and serious consequences was associated with more maladaptive coping strategies. Perceptions of the illness as curable and controllable were associated with positive illness outcomes, while perceived negative consequences, chronic timeline, and higher identity (more perceived symptoms) were associated with negative illness outcomes. These relations highlight the importance of subjective representations for understanding how people cope with illness and their illness outcomes. However, Hagger and Orbell's 2003 [14] review included only one study of cancer patients. Further, in the 13 years since this original review, the number of publications examining illness representations in cancer have greatly increased.

Illness Representations in Cancer: The Present Review

Illness representations might be particularly relevant to understanding coping and illness outcomes in the area of cancer, as people hold strong and readily accessible representations of cancer based on common-sense knowledge [15,16]. These representations determine coping and illness outcomes, for example higher levels of control and better understanding have been associated with lower rates of anxiety and depression [17].

However, the size (and occasionally direction) of these associations varies across studies, with one study finding a moderate negative relationship between illness coherence and anxiety [18], whereas another study found a negligible positive relationship between illness coherence and anxiety [19]. Such inconsistent findings warrant a systematic review to determine a consensus on the strength and direction of the relationships between illness representations and health and coping outcomes.

The findings of this review have the potential to inform clinical interventions based on illness representations. Some previous intervention studies in other chronic illness patients (e.g., [20]) support the malleability of coping behaviours and illness outcomes via modifying illness representations, although to date, none have been conducted with cancer patients.

Aims and Hypotheses

The present review aims to provide the first systematic overview of the relationships between illness representations and health and coping outcomes in people with cancer. Consistent with Hagger and Orbell's 2003 findings involving diverse chronic illnesses [14], we hypothesised that higher identity, acute/chronic timeline, cyclical timeline, consequences, and emotional representations, as well as lower personal control, treatment control, and illness coherence, would be associated with more maladaptive coping behaviours (e.g., higher levels of avoidance/denial) and more negative illness outcomes (e.g., higher levels of anxiety). In contrast, lower identity, acute/chronic timeline, cyclical timeline, consequences, and emotional representations, as well as higher personal control, treatment control, and illness coherence, were predicted to be associated with more adaptive coping behaviours (e.g., higher levels of cognitive reappraisal) and more positive illness outcomes (e.g., higher quality of life).

Methods

Literature Search, Inclusion Criteria, and Study Selection

This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Statement [21] (Appendix 1), with no ethical approval required. A systematic literature search was conducted using *Scopus*, *Web of Science*, *PubMed*, *PsycINFO*, and *CINAHL*. In an attempt to locate 'grey literature' additional searches were conducted through *Google Scholar*. For the full search strategy for each database refer to Appendix 2. A manual search of the reference lists of included articles was also completed to identify additional studies. Attempts were made to locate missing data sets by contacting relevant authors.

Studies were eligible for inclusion if they met the following criteria: quantitative design, including any subscale from the IPQ [12], the IPQ-R [11], or the B-IPQ [13], measuring coping behaviours or illness outcomes, adult participants (over 18 years) with a cancer diagnosis, written in English or German, and conducted after 1995 (post IPQ development).

Following three consecutive literature searches and full-text coding by the first author (using a coding manual and coding sheet: see Appendix 3 and Appendix 4), the final number of studies for the systematic review was 54, with 38 included in the meta-analysis (based on relevant data) [5,17-19,22-55]. A flow-chart of the study selection process can be found in Figure 2, with a detailed description of the search process in Appendix 5.

Classification of Coping Behaviours and Illness Outcomes

Categories of coping behaviours were adapted from [14] to include the behaviours most frequently mentioned in the cancer literature. Eleven categories were identified: expressing emotion, cognitive reappraisal, avoidance/denial, problem-focused coping (generic and specific behaviours separately), treatment decision making, medication adherence, adherence to treatment visits, doctor visits, seeking social support, and other (specified) coping behaviour. Only three of these categories (cognitive reappraisal, avoidance/denial, and problem-focused coping [generic]) could be used in the meta-analysis due to a lack of studies measuring or reporting the other categories.

Illness outcomes were also classified using the categories in [14] and extended if necessary. Thirteen categories were identified: affect (negative/positive), anxiety, depression, psychological distress, treatment related distress, decisional uncertainty/regret, psychological well-being, vitality, role functioning, physical functioning, disease state, quality of life, and other (specified) illness outcome. Only seven of these categories (anxiety, depression, psychological distress, psychological well-being, role functioning, physical functioning, and quality of life) were used in the meta-analysis due to a lack of studies measuring or reporting the other categories.

Data Extraction and Meta-Analytic Strategy

We extracted publication date, cancer type, sample characteristics (age and sex), study design, IPQ version, coping behaviours, illness outcomes, and a summary of the relevant results from all identified articles (Appendix 6 shows a summary of studies included in the meta-analysis; Appendix 7 shows a summary of studies included in the narrative review).

To assist in evaluating validity of results, risk of bias was assessed using four criteria relevant to the research aims: (i) whether each version of the IPQ had been administered as recommended; (ii) which IPQ dimensions were reported; (iii) whether equivalent correlational analyses were conducted across studies; (iv) whether adjustments were made for confounding variables.

Zero-order correlations were the most frequently reported effect size, and therefore the average correlation coefficient weighted by sample size and calculated using Fischer's Z transformations (r_z) was used as the measure of effect in the meta-analysis. We interpreted .10 as a small effect, .30 as a moderate effect, and .50 as a large effect [56]. The meta-analyses were conducted in R [57] using the 'metafor' package [58]. A random-effects meta-analysis was performed, which accommodates the assumption that the true effect size (the effect size in the underlying population of studies) may vary from study to study due to heterogeneity [59]. In the present meta-analysis, the studies were likely to be heterogeneous due to differing study designs, cancer types, treatment types, and other sampling characteristics.

To examine heterogeneity between studies, Q and I^2 statistics were calculated. To assess publication bias ('file drawer problem'), funnel plots and the 'fail-safe N' (N_{fs}) were examined, and moderator analyses (random-effects meta-regression) were conducted as appropriate. In these analyses, cross-sectional (0) and longitudinal (1) design were entered as predictors of the effect sizes between studies, and B 's can be interpreted as differences in the

pooled effect sizes between cross-sectional and longitudinal studies. For additional information regarding the meta-analytic strategy used in our review, please refer to Appendix 8.

Results

Study Characteristics

Thirty-six (66.67%) of the studies had a cross-sectional design, two (3.70%) were experimental with only baseline correlations extracted, and 16 (29.63%) were longitudinal with intervals ranging from one week to twelve months. Sample sizes ranged between 43 and 1019, with a mean sample size of 182. Eleven different types of cancer were reported, with the most common breast cancer (15 studies, 27.78%), followed by head and neck cancer (seven studies, 12.96%), and prostate cancer (six studies, 11.11%). Sixteen studies (29.63%) reported heterogeneous cancer populations (multiple cancer types) and were classified as 'not specified'. Other cancer types included colorectal, oesophageal, gynaecological, oral, ovarian, liver, brain, and skin. Cancer stage was coded, but only 19 of 38 studies (50%) in the meta-analysis provided data on participants' cancer stage, which additionally was often based on different staging systems (e.g., TNM, idiosyncratic systems) with no separate results provided for differing cancer stages. In 27 studies (50% of all articles reviewed), the IPQ was adapted to be 'cancer specific', rather than using the generic version. This involved minor changes in wording and the inclusion of cancer specific symptoms and causes. For more key study characteristics refer to Appendix 6 and Appendix 7.

Risk of Bias Assessment

Risk of bias assessment was based on the fidelity of measurement of illness representations and outcomes as well as study design. The majority of studies (42 out of 54) administered the IPQ, IPQ-R, or B-IPQ as recommended, with some studies (12 out of 54) only partially adhering to guidelines by developers. Those studies either used shortened versions of subscales, added items to subscales, or adapted items to suit the sample or cancer patients specifically. Most studies reported the correlations of the illness representation dimensions they had assessed, with those that did not contacted for missing data. However, data was unable to be obtained for three studies omitting cause and three that failed to report non-significant results. In 30 out of 38 studies Pearson's correlation coefficients were reported, with Spearman's correlation coefficients used in two, lagged, point-biserial, and bivariate used in one each, and three studies not specifying a correlation type. Four studies

adjusted for either demographic or cancer-specific confounding variables [28,36,53,54], see Appendix 9.

Relationship of Illness Representations to Coping Behaviours: Quantitative Analysis

Table 1 shows that the relations between coherence, cyclical timeline, consequences, emotional representations and avoidance/denial, and the relations between identity, acute/chronic timeline and generic problem-focused coping, were subject to high heterogeneity, with the remaining I^2 values indicating moderate-low heterogeneity between studies.

The majority of results from the meta-analyses between coping behaviours and illness representations indicate small to moderate effects (Table 1, Forest plots in Appendix 10).

Cognitive reappraisal. The strongest correlate of cognitive reappraisal was personal control, with higher levels of control associated with higher levels of cognitive reappraisal. Other correlates included acute/chronic timeline, emotional representations, and treatment control.

Avoidance/denial. The strongest correlate of avoidance/denial was emotional representations, with higher levels of emotional representations associated with higher levels of avoidance. The other key correlate of avoidance/denial was cyclical timeline.

Problem focused coping (generic). The strongest correlate of problem-focused coping (generic) was personal control, with higher levels of control associated with higher levels of problem-focused coping. The other key correlate of problem-focused coping (generic) was consequences.

Publication bias: Funnel plots and fail-safe N.

Across all relationships between illness representations and coping behaviours, funnel plots (Appendix 11) were generally symmetrical. Although some funnel plots were skewed, it has been recommended that these plots be interpreted with caution, as any skew in the funnel may be explained by considerable heterogeneity amongst studies, indicating that publication bias is unlikely [60]. Fail-safe N was found to range from zero to 151 across the relationships between illness representations and coping behaviours (Table 1).

Relationship of Illness Representations to Illness Outcomes: Quantitative Analysis

High heterogeneity was observed in studies examining psychological distress and emotional representations; role functioning and illness coherence; physical functioning and identity, consequences, coherence, and emotional representations; and quality of life and identity, treatment control, and illness coherence. Overall, there was a wide range of effect

sizes of the associations between illness outcomes and illness representations, from negligible effects to very large effects (Tables 2, 3, and 4).

Anxiety. The strongest correlate of anxiety was emotional representations, with higher emotional representations associated with higher anxiety. Other moderate-strong correlates included consequences, identity, cyclical timeline, and acute/chronic timeline.

Depression. The strongest correlate of depression was emotional representations, with higher emotional representations associated with more depression. Other moderate-strong correlates included identity, consequences, cyclical timeline, treatment control, and acute/chronic timeline. Table 2 contains the full set of analyses regarding anxiety and depression; forest plots can be found in Appendix 10.

Psychological distress. Emotional representations were the highest correlate of psychological distress, with higher emotional representations associated with more distress. Other moderate to strong correlates included consequences, identity, cyclical timeline, and acute/chronic timeline.

Psychological well-being. The strongest correlate of psychological well-being was consequences, with less consequences associated with more psychological well-being. Table 3 contains all analyses regarding psychological distress and well-being; forest plots are shown in Appendix 10.

Role functioning. The strongest correlate of role functioning was identity, with lower identity scores (perceived cancer related symptoms) associated with better role functioning. Other correlates included emotional representations, and consequences.

Physical functioning. The strongest correlate of physical functioning was identity, with lower identity scores associated with better physical functioning. Other correlates included consequences, emotional representations, acute/chronic timeline, and treatment control.

Quality of life. The strongest correlate of quality of life was identity, with lower identity scores associated with better quality of life. Other moderate to strong correlates included consequences, emotional representations, and acute/chronic timeline. Table 4 contains all analyses regarding role functioning, physical functioning, and quality of life; forest plots are shown in Appendix 10.

Illness outcomes and publication bias: Funnel plots and fail-safe N.

Across the relationships, funnel plots (Appendix 11) were generally symmetrical, although this was difficult to assess in plots with small numbers of studies. The number of

studies that fell outside the funnel generally varied between none and three, with one plot displaying four points outside the funnel (psychological distress and illness coherence). Across the relationships between illness representations and illness outcomes the fail-safe N ranged from zero to 3975. The two relationships with a fail-safe N of zero (illness coherence and physical functioning; illness coherence and quality of life) both also had high heterogeneity, suggesting the presence of moderators [61].

Moderator Analyses

Study-level moderators.

We examined whether research design (cross-sectional versus longitudinal) affected the effect sizes (correlations between illness representations and coping as well as outcomes) in random-effects meta-regressions. Most meta-regressions indicated non-significant and negligible moderator effects of study design. However, relationships between depression and identity ($B = -.15$), acute/chronic timeline ($B = -.18$), and consequences ($B = -.15$) were significantly smaller in longitudinal studies. The same pattern of significantly smaller effect sizes in longitudinal studies was also found for the relationships between psychological distress and emotional representations ($B = -.29$) as well as treatment control ($B = .16$; note that the pooled correlation in this case was negative, thus the positive B indicates smaller effects), and between anxiety and acute/chronic timeline ($B = -.17$). Overall, though smaller in effect, these findings suggest that relationships between illness representations, illness outcomes and coping behaviours were mostly stable overtime.

Relationship of Illness Representations to Coping Behaviours: Narrative Review

A narrative review was conducted for the 16 studies where data required for quantitative meta-analysis could not be obtained (see Appendix 7 for a summary of study characteristics). There were five studies [62-66] that examined coping behaviours, four of which [62-65] focused on problem-focused coping via specific behaviours. The results of these studies are in line with the meta-analysis findings, with higher personal control associated with positive outcomes from participating in a cancer community support group [63], particularly in combination with higher emotional representations [62, 63]. More mixed results emerged for illness representations capturing negative consequences of illness; with higher identity scores and cyclical timeline related to better medication adherence [65], while women with more negative illness representations (or a more negative view of their breast cancer) were more likely to miss treatment sessions [64]. This mixed pattern is perhaps most evident in [66], where several coping strategies were associated with each illness

representation, for example higher perceived consequences of cancer and lower levels of illness coherence (understanding) were associated with higher levels of avoidance coping.

Relationship of Illness Representations to Illness Outcomes: Narrative Review

Eleven of the 16 studies not included in the meta-analysis examined illness outcomes [67-77], along with one study examining both illness outcomes and coping behaviours [66]. These findings were also largely in line with the results of the quantitative meta-analysis. Poor role functioning was associated with a perception of more negative consequences of cancer, less perceived personal control over cancer, and more perceived cancer symptoms [68, 76]. Higher levels of anxiety were associated with less perceived personal and treatment control over cancer, a greater emotional impact of cancer (higher emotional representations), and more severe consequences of cancer [67, 69, 71]. Similarly, higher levels of depression were associated with less perceived personal and treatment control over cancer, a greater emotional impact of cancer, more severe consequences of cancer, as well as a more chronic perceived timeline of cancer [69-71, 66]. As expected, higher levels of psychological distress were also associated with a greater emotional impact of cancer, more severe consequences of cancer, a more chronic perceived timeline of cancer, as well as more perceived cancer symptoms [73-75]. Finally, a better quality of life was associated with less perceived cancer symptoms, a less cyclical timeline, less severe consequences of cancer, less emotional impact of cancer, and greater perceived personal and treatment control over cancer [72-74, 76].

Discussion

This systematic review and meta-analysis aimed to determine whether and how coping behaviours and illness outcomes in cancer are associated with illness representations in the Common Sense Model (CSM; [9]). The findings were generally consistent with our hypotheses and provided support for associations between the illness representation dimensions of the CSM, coping behaviours, and illness outcomes in cancer. The findings broadly replicated the patterns of associations between illness representations, coping, and illness outcomes in chronic illness [14], but add a specific cancer perspective, longitudinal data, and a narrative review of relevant studies. These findings have particular implications for the content of illness representation based interventions [78].

Regarding coping behaviours, personal control perceptions appear to be the most promising areas to target to improve adaptive coping responses (cognitive reappraisal and problem-focused coping). In addition, emotional representations were associated with avoidance/denial coping behaviours. These findings are in line with Lazarus's general coping theory [79], as perceptions of control have been identified as preconditions for effective problem-focused coping, whereas emotional representations might foster emotion-focused coping responses to the cancer experience; as outlined in the parallel processing structure of the CSM. However, it is important to note that normative classifications of coping as adaptive or maladaptive are difficult, as factors such as cancer stage, time since diagnosis, and outcome of the coping behaviour, can influence whether a coping strategy (such as avoidance/denial) would be considered adaptive or maladaptive [80].

Regarding illness outcomes, higher levels of identity (perceived symptoms) and consequence perceptions were associated with higher levels of psychological distress, and lower levels of functioning and quality of life. Higher levels of control-related illness perceptions were associated with lower levels of distress and higher levels of functioning and quality of life. The findings for illness coherence had high heterogeneity, suggesting the relationships between coherence and illness outcomes may have been influenced by a moderator, such as treatment type. For example, an examination of the raw data (Appendix 12) suggested that those without an ostomy who had higher levels of illness coherence experienced better quality of life, physical and role functioning (better understanding is associated with better illness outcomes for people without an ostomy). In contrast, those with an ostomy and higher levels of illness coherence experienced poorer quality of life, physical and role functioning (better understanding is associated with worse illness outcomes for people with an ostomy) [45].

In general, the relationship between illness representations and coping behaviours were not as strong as those between illness representations and illness outcomes. This may be due to the fact that there were fewer studies examining coping behaviours than illness outcomes, so there was less power to detect effects [81]. Another explanation may be a potential overlap between illness representations and illness outcomes (e.g., consequences and quality of life or emotional representations and psychological distress). Further, as many studies were cross-sectional, emotional representations were likely to be highly correlated with measures of psychological distress. Finally, the level of specificity of the measures may influence the strength of these relationships, in that illness outcomes (as more general

evaluations of health status) may be more likely to correlate with illness representations than specific coping behaviours.

Implications and Future Research Directions

For many people a cancer diagnosis is associated with acute and/or delayed emotional distress, clinical levels of depression and anxiety, poor role and physical functioning, and a poor quality of life (e.g., [3,5,82,83]). Some cancer survivors experience poor mental and physical health outcomes for up to ten years post diagnosis [4]. Further, coping with cancer is extremely complex [84], with maladaptive coping strategies such as avoidance or denial likely to lead to higher levels of worry, anxiety, and depression [7]. The current systematic review suggests that in order to foster coping behaviours and improve mental health outcomes it may be beneficial for interventions to target patients' maladaptive or unrealistic illness representations. It has been shown that mapping and challenging maladaptive illness representations, while at the same time forming alternative representations, can change both illness representations and role functioning, leading to improved psychosocial outcomes [20]. These findings are promising, and illness representations have been suggested as mediators of psychosocial intervention effects [78]. However, few intervention studies exist and none specifically target people with cancer or provide an explicit rationale for which illness representations to target.

The present review provides some suggestions for which illness representations might be best to target in interventions, though the cross-sectional nature of the majority of included studies precludes judgments regarding causality and suggestions must be considered with caution. Interventions that target perceptions of personal control may be useful to increase use of adaptive coping strategies such as cognitive reappraisal, and reduce maladaptive coping strategies such as avoidance/denial. Further, interventions that aim to adapt timeline perceptions to be less cyclical and chronic, decrease perceptions of the severity of cancer, and decrease the perceived emotional impact of cancer, may reduce psychological distress, and improve role functioning, physical functioning, and quality of life.

In interventions targeting illness representations, it is important to acknowledge that some perceptions about poor illness outcomes may be realistic; for a person with terminal cancer, representations of a chronic timeline, severe consequences, and less personal control may be justified. In these cases interventions could better target illness representations such as emotional representations and coping. Future research should examine how stage of illness influences illness representations, and what type of interventions would be best for cancer

patients at early versus advanced stages.

Strengths and Limitations

Although the CSM has been used extensively to examine health and coping outcomes, the present systematic review is the first to assess illness representations with health and coping outcomes in people with cancer specifically, with the results helping to guide intervention development, particularly by deepening understanding of the nature of cognitive responses associated with the cancer experience. A further strength is the inclusion of a number of unpublished correlations obtained from authors, creating a comprehensive meta-analysis.

The present review has some limitations, including the potential for publication bias, missing correlational data, and the examination of cross-sectional and correlational data. To control for publication bias a random-effects model was used [81]. Although the focus on quantitative data may have potentially impacted on the results of the meta-analysis, the inclusion of the narrative review and synthesis aimed to avoid missing relevant or contrasting findings. In addition, an assessment of included studies suggested a low risk of bias at the study level. However, as the majority of studies used cross-sectional study designs and correlational analyses, judgements regarding causality or predictive relationships between variables are precluded, limiting the conclusions to be drawn from this review. Further, zero-order correlations need to be interpreted with caution as it cannot be assumed that observed associations will remain stable if other illness representations are accounted for in multivariate analyses.

Another limitation is the potential for overlap between measures (i.e. illness representations and illness outcomes). For example, items assessing emotional representations and emotional distress may overlap, making these concepts difficult to entangle. However, the CSM assumes these to be distinct processes, with Moss-Morris et al. [11] suggesting that emotional representations allow researchers to investigate both coping behaviours and illness outcomes. The authors of the IPQ-R claim to have ensured that the emotional representations concept was not simply a measure of general mood by ensuring discriminant validity with both positive and negative affect [11].

Consistent with recommendations by Weinman et al. [12] and Moss-Morris et al. [11] that users adapt the IPQ and IPQ-R to be illness specific, over fifty percent of studies included in the systematic review changed these to be ‘cancer specific’. Though each cancer specific adaptation could influence the reliability and validity of generic versus specific versions of the IPQ, this appears unlikely as the majority of changes involved simply replacing wording (e.g., [26]), or adjusting the identity and causes subscales to include items specifically related to cancer or a specific cancer type (e.g., [19, 27]).

Several fail-safe Ns of zero were found in analyses with small numbers of studies included, suggesting a lack of statistical power [61]. However, as fail-safe N does not take into account heterogeneity, this may be an artefact of the heterogeneous population in the meta-analysis (i.e. differing cancer types, cancer stages, and treatment types) [61]. There was high heterogeneity found across several relationships in the meta-analyses, and psychological distress and adaptability to cancer varies greatly with different types of cancer [85] or cancer stages [86]. However few studies reported this information, precluding moderator analyses on these variables. Similarly, treatment type or toxicity might also have impacted associations, with people at a higher risk for psychological distress when receiving treatment other than surgery or having little role in the treatment decision making process [87,88]; but again there was insufficient data to allow moderator analyses, as underpowered moderator tests may result in failure to detect the true effect of an important moderator [81].

Conclusions

This systematic review has provided support for the validity of the illness representation construct in the CSM, and has summarised the associations between illness representations, coping behaviours and illness outcomes in people with cancer. The review found small to moderate relationships between illness representations and coping behaviours, and moderate to large relationships between illness representations and illness outcomes. These findings suggest that cognitive representations are key factors to understanding individual responses to cancer.

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Table 1 *Meta-Analyses of the Relationships between Illness Representations and Coping Behaviours*

Illness-Representation	Cognitive-Reappraisal							Avoidance/Denial							Problem-Focused-Coping-(Generic)							
	k	N	(95% CI)		I ²	Q	P	k	N	(95% CI)		I ²	Q	P	k	N	(95% CI)		I ²	Q	P	
			r _z	fs						r _z	fs						r _z	fs				
Identity	3	5	.01	.141, .179	.3	6.5	4	7	.02	.125, .169	.9	10	15*	6	5	8	.06	.092, .229	25	1	78*	.7
Cause	4	1	9	.01	.179	0	4	8	5	0	2	0	15*	6	5	8	.06	.092, .229	25	1	78*	.7
Timeliness (Acute/Chronic)	8	0	7	9	1**	6	21	72	0	3	.04	.174	55*	.8	9	3	.02	.162	30	90*	.7	3
Timeliness (Cyclical)	6	5	6	0	4	0	15	.9	8	7*	.06, .37	31	34*	.2	4	1	.05	.161	15	25*	.1	1
Consequences	7	2	6	0	78	6	40	.1	8	.13	.010, .270	27	45*	.4	7	9	.12	3, .22	3	13	.0	1
Personal Control	8	1	7	1	21	5	51	.3	1	4	.00	.072	14	.1	7	3	.06**	8, .39	2	11	.5	8
Treatment	5	7	5	2	3*	7	13	.4	7	7	.02	.075	10	.3	9	7	.00	.179	12	87*	.7	0
Illness-Cohesion	6	5	6	0	4**	2	13	.0	7	5	.0	.042	3	.4	9	8	.08	2, .16	5.9	0	.7	7
Emotional Representations	5	8	5	9	*	4	272	.0	9	2	.07	3, .40	41	.83	2	7	.04	.069	13	17*	.0	4

Note. k = number of studies, N = total sample size across included studies, r_z = effect size, (95% CI) = 95% confidence intervals around the

effect size, N_{fs} = Rosenthal's fail-safe N (measure of publication bias),

Q = measure of heterogeneity (suggests heterogeneity when statistically significant), I^2 = measure of heterogeneity (25% = low, 50% = moderate, 75% = high)

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

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Table 2 *Meta-Analyses of the Relationships between Illness Representations and Anxiety, and Illness Representations and Depression*

Illness- Represent ation	Anxiety							Depression						
	<i>k</i>	<i>N</i>	<i>r_z</i>	(95%CI)	<i>N_{fs}</i>	<i>Q</i>	<i>I²</i>	<i>k</i>	<i>N</i>	<i>r_z</i>	(95%CI)	<i>N_{fs}</i>	<i>Q</i>	<i>I²</i>
Identity	1	17	.360	(.295, .426)	70		39.	16		.470	(.392, .549)	97	17.1	51.
	0	82	***		2	14.53	95	9	15	***		7	8*	73
Cause	1	12	.163	(.067, .259)		14.14	59.		11	.106	(.032, .180)			29.
	6	36	**		54	*	91	6	58	**		21	6.52	89
Timeline- (Acute/Ch ronic)	1	25	.259	(.185, .333)	61	32.09	67.	1	21	.260	(.179, .341)	43	24.8	67.
	2	24	***		9	***	18	0	66	***		3	8***	56
Timeline- (Cyclical)	1	15	.289	(.208, .371)	40	19.58	56.		11	.272	(.175, .370)	17	12.9	56.
	0	56	***		6	*	28	7	48	***		3	6*	04
Conseque nces	1	27	.443	(.374, .512)	25	38.96	65.	1	23	.416	(.353, .479)	16	23.9	49.
	5	77	***		48	***	38	3	88	***		43	0*	66
Personal- Control	1	29	.119	(.068, .170)	19	27.19	4.7	1	25	.195	(.155, .234)	36		
	6	22	***		2	*	3	3	03	***		9	9.62	.05
Treatment -Control	1	24	.192	(.144, .240)	30		24.		19	.261	(.215, .308)	35		4.7
	1	41	***		8	11.77	16	8	42	***		0	7.59	9
Illness- Coherence	1	26	.205	(.125, .285)	42	39.54	73.		20	.155	(.074, .236)	12	23.7	64.
	3	10	***		5	***	02	9	39	***		8	5**	87
Emotional - Represent ations	1	20	.738	(.652, .824)	39	28.52	71.		15	.517	(.468, .567)	10	11.0	
	1	83	***		75	**	05	8	74	***		64	4	.01

Note. *k* = number of studies, *N* = total sample size across included studies, *r_z* = effect size, (95%CI) = 95% confidence intervals around the effect size, *N_{fs}* = Rosenthal's fail-safe N (measure of publication bias), *Q* = measure of heterogeneity (suggests heterogeneity when statistically significant), *I²* = measure of heterogeneity (25% = low, 50% = moderate, 75% = high)

p* < .05, *p* < .01, ****p* < .001

Table 3 *Meta-Analyses of the Relationships between Illness Representations and Psychological Distress, and Consequences and Psychological Well-being*

Illness-Representations	Psychological-Distress							Psychological-Well-Being						
	<i>k</i>	<i>N</i>	<i>r_z</i>	(95%CI)	<i>N_{fs}</i>	<i>Q</i>	<i>I²</i>	<i>k</i>	<i>N</i>	<i>r_z</i>	(95%CI)	<i>N_{fs}</i>	<i>Q</i>	<i>I²</i>
Identity	8	155	.354*	(.268,.441)	471	15.74*	37							
Cause	6	103	.174*	(.086,.261)	61	9.81	92							
Timeline-(Acute/Chronic)	8	169	.185*	(.137,.233)	140	8.75	.01							
Timeline-(Cyclical)	5	735	.249*	(.103,.395)	69	11.34*	40							
Consequences	1	228	.377*	(.336,.418)	112			95	.355*	(.291,.419,-)		13	2.7	.0
Personal-Control	9	192	.091*	(-.158,-.023)	35	15.56*	02	4	6	**		5	1	1
Treatment-Control	9	190	.130*	(-.205,-.055)	88	18.31*	83							
Illness-Coherence	9	197	.172*	(-.266,-.078)	146	29.45*	61							
Emotional-Representations	9	200	.596*	(.496,.696)	201	34.30*	77							

Note. *k* = number of studies, *N* = total sample size across included studies, *r_z* = effect size, (95%CI) = 95% confidence intervals around the effect size, *N_{fs}* = Rosenthal's fail-safe N (measure of publication bias), *Q* = measure of heterogeneity (suggests heterogeneity when statistically significant), *I²* = measure of heterogeneity (25% = low, 50% = moderate, 75% = high)

p* < .05, *p* < .01, ****p* < .001

Table 4 *Meta-Analyses of the Relationships between Illness Representations and Role Functioning, Illness Representations and Physical Functioning, and Illness Representations and Quality of Life*

Illness-Representation	Role-Functioning							Physical-Functioning							Quality-of-Life							
	<i>k</i>	<i>N</i>	<i>r_z</i>	(95% CI)	<i>N_{fs}</i>	<i>Q</i>	<i>I²</i>	<i>k</i>	<i>N</i>	<i>r_z</i>	(95% CI)	<i>N_{fs}</i>	<i>Q</i>	<i>I²</i>	<i>k</i>	<i>N</i>	<i>r_z</i>	(95% CI)	<i>N_{fs}</i>	<i>Q</i>	<i>I²</i>	
Identity Cause	1	-	.384,					1	-	.676,					1	-	.772,					
	1	.30	-	1		28		1	.50	-	3	19.	86		2	.60	-	8	31.	86		
	2	9*	.235	3	3.5	.1		7	5*	.335	5	57*	.9		8	7*	.443	0	04*	.2		
	4	4	**)	6	6	4	4	1	**)	0	**	4	6	9	**)	8	**	2	
Timely (Acute/Chronic)	1	-	.167,					1	-	.378,				1	-	.241,						
	1	.10	-					3	.26	-	1		72		4	.17	-				24	
	0	8*	.049	1		<		2	5*	.152	6	15.	.1		7	6*	.112	9	7.1	.9		
	4	4	**)	1	.60	01	6	3	**)	4	01*	1	8	8	**)	7	3	5	
Timely (Cyclical)																						
								4	.34	-												
								3	7*	.252	7	1.4	<									
								4	9	**)	4	4	01								
Consequences	1	-	.272,					1	-	.481,					1	-	.530,					
	6	.18	-	1	18.	65		6	.36	-	5	28.	79		6	.44	-	8			58	
	8	4*	.096	3	17*	.5		9	7*	.253	9	10*	.3		2	5*	.360	0	16.	.8		
	7	9	**)	3	*	8	8	3	**)	5	**	0	8	1	**)	0	61*	0	
Personal Control	1							1							1							
	4	.07	(.02					3	.11	(.04			39		5	.12	(.04				50	
	6	2*	1,.12		8.5	.0		3	8*	2,.19	3	8.4	.8		0	2*	2,.20	5	13.	.9		
	6	2	*	4)	5	0	1	6	4	*	4)	2	3	9	8	9	*	3)	0	92	1	
Treatment	1							1							1							
	3	.08	(.03					2	.17	(.07			62		3		(.00			22.	75	
	2	8*	4,.14	1	1.9	<		4	8*	8,.27	6	9.5	.2		3	.13	7,.25	6	64*	.8		
	5	0	*	3)	0	1	01	5	4	**	7)	3	9*	7	7	7	0*	4)	3	**	3	
Illness-Coherence	1							1							1							
	3	-	.269,		56.	91		2	-	.179,		38.	87		2		.182,		85.	92		
	4	.06	.132	1	94*	.8		3	.00	.167		13*	.2		9	.04	.267		81*	.8		
	5	6	9)	0	**	8	5	2	6)	0	**	0	6	6	3)	0	**	4	
Emotional-Representation	1	-						1	-						1	-						
	1	.29	(.350,					6	.20	(.312,	1	19.	75		5	.42	(.501,		5		44	
	3	2*	-	1	3.5	.0		3	5*	-	7	73*	.8		3	6*	-		9	9.8	.9	
	4	2	**		6	1	9	7	7	**		6	*	0	7	9	**		2	9	3	

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Note. k = number of studies, N = total sample size across included studies, r_z = effect size, (95% CI) = 95% confidence intervals around the effect size, N_{fs} = Rosenthal's fail-safe N (measure of publication bias),

Q = measure of heterogeneity (suggests heterogeneity when statistically significant), I^2 = measure of heterogeneity (25% = low, 50% = moderate, 75% = high)

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

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