International Journal of Nursing Studies 94 (2019) 42–50

Contents lists available at ScienceDirect

International Journal of Nursing Studies

journal homepage: www.elsevier.com/ijns

Association between illness representation and psychological distress in stroke patients: A systematic review and meta-analysis

Hsiang-Chu Pai[a,*], Chia-Chi Li[b], Shu-Mei Tsai[c,**], Ya-Ching Pai[d]

[a] Department of Nursing, Chung-Shan Medical University, Chung-Shan Medical University Hospital, Taiwan, ROC
[b] Department of Nursing, Chung-Shan Medical University Hospital, Taiwan, ROC
[c] Department of Nursing, Chung Shan Medical University Hospital, Department of Nursing, Chung Shan Medical University, Taiwan, ROC
[d] Department of Nursing, Chung-Shan Medical University Hospital, Taiwan, ROC

ARTICLE INFO

Article history:
Received 7 November 2018
Received in revised form 11 January 2019
Accepted 24 January 2019

Keywords:
Anxiety
Belief
Cerebrovascular accident
Depression
Distress
Illness perceptions
Illness representation
Meta-analysis
Stroke

ABSTRACT

Aims: This paper aims to systematically review the illness perceptions of stroke patients and to examine the association between illness representation and psychological distress in empirical research studies.
Background: Patients' perceptions of health threats determine their coping behavior. Several recent studies have focused on illness belief and distress in stroke patients. This information is suitable for a meta-analysis to further understand stroke patients' illness perceptions.
Design: Systematic review and meta-analysis.
Method: An electronic literature search was conducted using the CINAHL, MEDLINE, PubMed, Cochrane library, and Google Scholar databases. Search strategies were title (stroke or cerebrovascular accident or CVA or cerebral vascular event or transient ischemic attack or TIA) and keyword (disease or illness) and keyword (perceptions or attitudes or opinion or experience or view or reflection or beliefs). The literature search covers the period of January 1990 to October 2018. Seven articles were included in the meta-analysis and Fisher's *z* was calculated with correlation coefficient or regression coefficient values for eight illness representation dimensions and psychological distress. All statistical analyses were performed using Comprehensive Meta-Analysis (CMA) version 3.0 software.
Results: A total of 49 studies were reviewed, and seven studies with a total of 507 participants were eligible for the meta-analysis. For patients' perceived anxiety and depression, six of seven studies, with 285 to 461 participants, were examined in terms of the average corrected correlation coefficient across the studies. It was found that stroke patients' perception of a strong illness identity, timeline-acute/chronic, timeline-cyclical, consequences, and emotional responses were significantly and positively related to anxiety and depression. The pooled *z*-value ranged from 0.189 to 0.460. Conversely, for protective-related factors, such as stroke patients' perceived personal control, treatment control, and illness coherence, only perceived illness coherence was significantly negatively associated with depression (*z*-value, -0.122; 95% CI: -0.241, -0.002). For patients' perceived overall distress, three of seven studies with 173 participants showed that there were significant and positive associations between identity, consequence, emotions, and distress (*z*-value ranges = 0.493–0.711) as well as a significant and negative association between illness coherence and overall distress (*z*-value, -0.226; 95% CI: -0.379, -0.073).
Conclusion: An association between illness representation and distress exists in stroke patients. Risk factors are the most significant in terms of this relationship, and protective factors do not have a protective health impact. Protection factors need to be promoted to reduce patient distress.

What is already known about the topic?

- Patients' perceptions of health threats determine their coping and behavior, based on patients' illness representation.
- Patients conceptualize their illness and how it influences their physical recovery, psychological well-being, and social functioning.

* Corresponding author at: Department of Nursing, Chung-Shan Medical University, Chung-Shan Medical University Hospital, No.110, Sec.1, Jianguo N.Rd., Taichung City 40201, Taiwan, ROC.
** Corresponding author.
E-mail addresses: pai55215@ms41.hinet.net, pai55215@csmu.edu.tw (H.-C. Pai), cshx383@csh.org.tw (C.-C. Li), csha714@csh.org.tw (S.-M. Tsai), csha1908@csh.org.tw (Y.-C. Pai).

https://doi.org/10.1016/j.ijnurstu.2019.01.015
0020-7489/

- An early meta-analysis on chronic illness indicated that illness consequences, timelines, and identity had significant positive relationships with distress.
- Research indicates that the control representation of patients with chronic illness is significantly negatively related to distress.

What this paper adds

- Meta analysis shows that stroke patients' negative illness representation is positively related to psychological distress (depression and anxiety).
- Of the stroke patients' positive illness representation dimensions, only illness coherence was significantly related to depression and overall distress.
- Stroke patients' personal control and treatment control did not show a significant relationship with any distress outcome.

1. Introduction

An important task for healthcare research in nursing is to determine the factors that affect an individual's health behavior in terms of management of chronic illness and to identify appropriate targets for intervention (Cameron and Leventhal, 2003; Mitchell et al., 1991). The American Nurses Association defines nursing as involving the diagnosis and treatment of human responses to actual or potential health problems (Mitchell et al., 1991). The Common Sense Model of illness representation provides a theoretical framework for the study of illness behavior, which identifies the relevant factors, including patients' view of their disease or illness and how this view guides their coping behavior and outcomes (Leventhal et al., 1983). Many studies adopt this model to examine patients' illness beliefs and to understand how the perceptions relate to the coping strategies adopted and outcomes.

An early meta-analysis of 45 studies focused on the way that patients conceptualize their illness and how it influences their physical recovery, psychological well-being, and social functioning (Hagger and Orbell, 2003). The studies' participants had a variety of diseases but lacked patients who had experienced a stroke. Cameron and Leventhal (2003) also noted that no empirical work has been done on illness representations for patients with neurological disorders. Recently, several studies have focused on illness beliefs and distress in stroke patients. The studies are suitable for a meta-analysis to further understand stroke patients' illness perceptions. Thus, the purpose of this study was to systematically review studies on the illness perceptions of stroke patients and to examine whether illness representations are consistently associated with psychological distress for stroke patients in empirical research studies.

1.1. Common sense model of self-regulation

CMS proposes that patients' perceptions of health threats determine their coping and behavior, based on patients' illness representation (Leventhal et al., 1983, 1997). Illness representations refer to an individual's self-perceptions after an illness or disease occurs. The individual's experience throughout the disease may vary, and the effects of illness representations are cumulative. These representations are expected to be linked to the selection of adaptations, action plans, and outcomes (Hale et al., 2007). Once a person suffers a disease, they need to spend some time trying to understand what is happening to them. How individuals face a problem is based on education, culture, and individual experience. The individuals' perceptions change over time as the disease passes through different stages (Leventhal et al., 1983). Patients' responses to health issues and disease are related to their illness beliefs.

Leventhal et al. (1983) indicated that the conscious processes related to health and disease go through two parallel processes to achieve balance, involving cognitive emotional responses. They proposed five attributes of illness representation: identity, causal, consequences, timeline duration, and control/cure. The attributes of illness coherence and emotional response were added on Moss-Morris et al.'s (2002) recommendation. Moss-Morris et al. also indicated that the cure/control factor should be two separate factors: personal control and treatment control. They also felt that timeline duration should be separated into timeline-acute/chronic and timeline-cyclical. Higher patient scores on consequences, timeline-acute/chronic, timeline-cyclical, and emotional responses reflect a more negative representation. Higher patient scores on personal control, treatment control, and illness coherence reflect a more positive representation (Twiddy et al., 2012).

In general, there are eight illness representation dimensions that relate to patients' responses to their disease. Each dimension is defined below (Cameron and Leventhal, 2003; Leventhal et al., 1997; Moss-Morris et al., 2002; Weinman et al., 1996). Illness identity refers to the patient's ideas about the label of illness and the symptoms the individual views as being part of the illness label, which are related to the patient's disease symptoms and disease development process; causal beliefs are the patient's ideas about the likely cause or causes of the illness; timeline refers to the patient's perceptions of the likely duration of illness, categorized as acute/chronic, and cyclical timeline beliefs; consequences are the patient's beliefs regarding the illness severity and the likely influence on individual social and psychological functioning; personal control reflects the patient's belief and self-efficacy about the degree to which the condition is amenable to control; treatment control is the patient's belief about the degree to which his or her condition is amenable to cure; illness coherence refers to the patient's evaluation of the coherence or usefulness of his or her illness representation; and emotional beliefs are the patient's general mood in response to the illness.

In sum, the Common Sense Model postulates that the individual responds both cognitively and emotionally to health communications which arouse fear (Leventhal et al., 1983). The ongoing illness representations and emotional beliefs help patients to maintain a balance and self-regulation of their beliefs about disease, recovery, and treatment recommendations (Aujla et al., 2018; Joice, 2012).

Although the self-regulation model allows healthcare professionals to understand the individual's perspective on health threats on a multi-faceted basis, it is important to discuss how the patient is acting on the symptoms of the disease and how these factors guide the patient's treatment and behavior choices as well as to understand the patient's illness representation. Such an understanding can help in the planning of professional interventions, especially for stroke patients, who are faced with long-term effects.

1.2. Relationships between illness Representation/Beliefs and psychological distress

Lewis et al. (2001) noted that patients' attitudes toward their illness appear to be associated with survival after stroke. Patients who feel that there is nothing that they can do to help themselves six months after a stroke have a shorter survival time. Stroke patients report that the perceived major consequences of stroke are physical impairments, followed by psychological effects (Clark, 2000). Schröder et al. (2007) found that activity limitation, but not neurological impairment, significantly predict emotions and control cognitions in people with stroke. In other words, stroke

patients present negative emotions of anxiety and depression if they cannot perform their "usual" activities. This consequence also results from perceptions of loss of behavior control and self-efficacy. Previous research has indicated that perceived control (mental representation) predicts recovery from residual disability in stroke patients (Johnston et al., 1999).

An early prospective study showed that patients' self-efficacy is not associated with recovery from activity limitations following stroke (Molloy et al., 2008). Patients' interpretation of illness, however, has an impact on their psychological health and recovery. A systematic review study found that physical disability, stroke severity, and cognitive impairment were consistently associated with depression and suggested the exploration of other factors that may influence stroke patients' psychological distress (Hackett and Anderson, 2005). Hagger and Orbell (2003) conducted a meta-analysis about other chronic illnesses and found that cure/control was significantly and negatively related to psychological distress. Further, illness consequences, timelines, and identity reflected significant negative relationships with psychological well-being and positive relationships with distress. To identify appropriate targets for intervention in stroke patients, we need to understand the relationships between illness belief and psychological distress. Based on the literature to date, we developed the following six hypotheses.

H1. Stroke patients' greater perceived identity, timeline-acute/chronic, timeline-cyclical, consequences, and emotional responses are associated with higher depression.

H2. Stroke patients' greater perceived personal control, treatment control, and illness coherence are associated with lower depression.

H3. Stroke patients' greater perceived identity, timeline-acute/chronic, timeline-cyclical, consequences, and emotional responses are associated with higher anxiety.

H4. Stroke patients' greater perceived personal control, treatment control, and illness coherence are associated with lower anxiety.

H5. Stroke patients' greater perceived identity, consequences, and emotional responses will be associated with higher overall distress.

H6. Stroke patients' greater perceived illness coherence are associated with lower overall distress.

2. Methods

2.1. Literature search

An electronic literature search was conducted using the CINAHL, MEDLINE, PubMed, Cochrane library, and Google Scholar databases. Search strategies were title (stroke or cerebrovascular accident or CVA or cerebral vascular event or CVA or transient ischemic attack or TIA) and keyword (disease or illness) and keyword (perceptions or attitudes or opinion or experience or view or reflection or beliefs). The literature search covered the period of January1990 to October 2018.

The selection criteria included the studies' having considerable data on the relationship between the illness perceptions or attitudes or opinions or experiences or views or reflections or beliefs of patients with stroke. The search identified 1550 studies for which the illness perceptions or attitudes or opinions or experiences or views or reflections or beliefs of patients with diagnosed stroke were elicited. Of these, 1501 studies were excluded that based on title/abstract review topic as clearly not relevant (Fig. 1), leaving a total of 49 studies that examined the relationship between illness perceptions or attitudes or opinions or experiences or views or reflections or beliefs of patients and psychological outcomes. The first author inspected all electronic records retrieved, based on inclusion criterion. Then the first and second authors executed extracted data onto forms with fields that corresponded to those in Table 1.

The meta-analysis focuses on journal papers that report the association between illness representation and score on the Hospital Anxiety and Depression Scale (anxiety and depression) in stroke patients. We employed this systematic review in

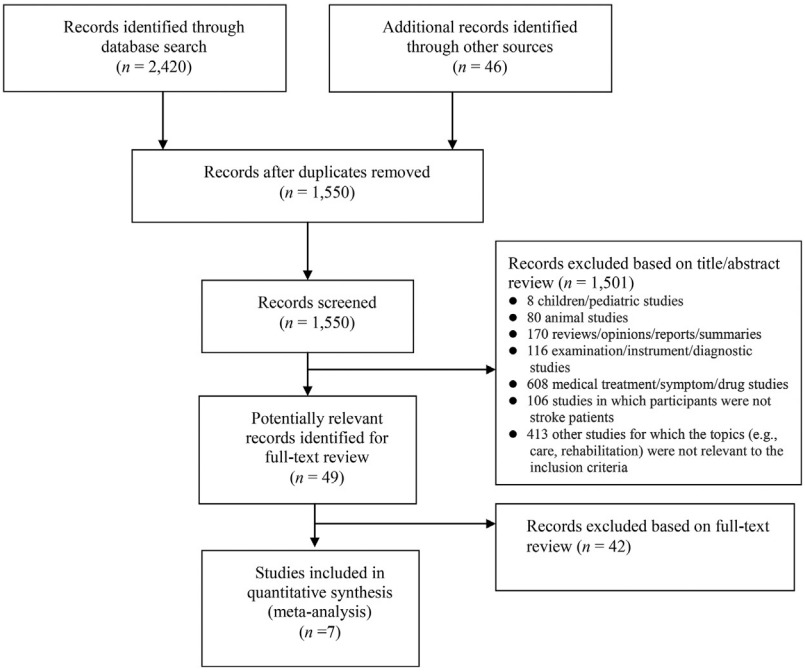

Fig. 1. Selection process for inclusion of empirical research studies in the review.

Table 1
Summary characteristics and findings of previous studies on stroke patients outcome with illness perceptions included in the review.

Study	Time since stroke/ participants	Study design	Assessment measure	Outcome measure	Major findings
Joice (2005)	2 weeks after discharge 57 stroke patients: 27 females Mean age 69.59 (SD = 12.06) 30 males Mean age 65.23 (SD = 10.02)	Longitudinal predictive	Hospital Anxiety and Depression Scale (HADS), Recovery Locus of Control Scale (RLOC), Ways of Coping Questionnaire (WOC), Confidence in Recovery, Desire for the Video, Illness Perception Questionnaire-Revised (IPQ-R)	Anxiety and Depression	Mood was significantly and positively associated with stronger identity, cyclical, consequence, emotional, lower coherence. Higher anxiety was positive correlated with stronger cyclical, emotional, lower coherence. Higher depression was positively correlated with stronger identity, cyclical, consequence, emotional, lower coherence.
Ford (2007) Thesis	2–6 weeks after stroke 40 stroke patients: 17 males, 23 females Mean age 73 (SD = 12.6)	Cross-sectional	Hospital Anxiety and Depression Scale (HADS), Illness Perception Questionnaire-Revised (IPQ-R), Mini Mental State Examination	Anxiety and Depression	Higher depression was associated with negative perceptions of strong illness identity, chronic timeline, serious consequences, and negative emotional representation. Higher anxiety was associated with negative perceptions of the consequences.
Evans (2008) Thesis	Patients discharged into the community directly from acute in-patient care 61 stroke patients: 33 males, 28 females Mean age 68.92 years (SD = 9.47)	Cross-sectional	Illness Perception Questionnaire-Revised (IPQ-R), SRM, coping strategies, anxiety, depression, and positive affect	Depression, Anxiety, and Positive affect	Depression was significantly positively associated with stronger emotional representation. Higher anxiety was associated with negative perceptions of strong illness identity, timeline cyclical, and emotional representation.
Avison (2009) Thesis	Recruited through a Community Stroke Team A total of 51 couples participated Patients: 33 males, 18 females Mean age 64.9 (SD = 9.25)	Correlational	Self-awareness. Patient Competency Rating Scale (PCRS), Illness Perception Questionnaire-Revised (IPQ-R), Hospital Anxiety and Depression Scale (HADS)	Anxiety and Depression	Illness perceptions. There was a statistically significant correlation between anxiety and depression.
Twiddy et al., 2012	4-8 weeks after stroke Stroke patients and carers Couples 42 Patients: 24 males,18 females Mean age 65.12 (SD = 10.2)	Follow up at 3 months (42 patients and carers) and 6 months (32 patients and carers)	Illness Representation Questionnaire-Revised (IPQ-R), Patient disability (Barthel Index), Social support (Significant Other Scale), Distress-general health questionnaire (CHG-28)	Distress	Patient distress was related with both patient and carer illness representation. Patient with stronger illness identity, consequences, and emotional response as well as lower illness coherence presented with higher distress.
Campbell Burton (2012)	Patients in clinic, stroke < 6 month 80 stroke patients: 55 males, 25 females Mean age 69 (SD = 12.7)	Longitudinal cohort study	Illness representation Hospital Anxiety and Depression Scale (HADS).	Anxiety and Depression	Anxiety and depression had a significant positive correlation with identity, timeline, cyclical, consequence, emotional. Depression had a significant negative correlation with coherence. Overall HADS was positive related with identity, consequence, and emotional.
Shifren and Anzaldi (2018)	1–5 years since diagnosis stroke 176 stroke survivors: 79 males, 97 females Mean age 57.83 (SD = 11.64)	Cross-sectional Survey	Center for Epidemiological Studies Depression Scale (CES-D), two items on perceived physical health, Illness Perception Questionnaire-Revised (IPQ-R)	Depression	Depression was significantly positively associated with stronger illness identity. Optimism played a partial mediator role between mental health and overall health.

accordance with a defined set of criteria of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009).

2.2. Selection criteria

Studies were included if they (1) involved adult stroke patients; (2) reported a distress assessment, using a valid scale or index; (3) examined illness representation, using a valid scale or index/IPQ-R; (4) reported associations between illness representation and depression; and (5) were published in Chinese or English. Papers such as case reports, reviews, opinions, or letters were excluded. To complete the methodological quality assessment of included articles, we conducted a modified 11-item cross-sectional assessment provided by the Agency for Healthcare Research and Quality (Rostom et al., 2004). In this study, all included articles scored in the 8-to-11 range. Based on the cross-sectional assessment, we concluded that the quality of these articles was sufficient to be a part of the meta-analysis.

2.3. Data synthesis and meta-analysis

A meta-analysis was conducted to provide an overall correlation between illness representation and psychological outcome at discharge from the stroke ward and at three months after discharge. Before pooling the overall effect-size measure, we

employed Fisher's *z* transformation of the correlation coefficient. If study values for the Pearson correlation coefficient (*r*) were not available, the Pearson correlation coefficient was calculated from existing regression coefficients, using the following formula: $r^2 = t^2/(t^2 + n - 2)$, where *t* = regression coefficient/standard error of regression coefficient (Kim et al., 2018; Zhao et al., 2015). A fixed or random model was undertaken based on the heterogeneity, which was employed to pool study-specific correlations. The Higgins' I^2 statistic was used to examine for heterogeneity. If the I^2 value was above 75%, this indicates high heterogeneity, using a random effects model estimation. To examine publication bias, we calculated Rosenthal's Fail-safe *N* (N_{fs}) for each of the corrected correlations in the present analyses. Fail-safe *N* (N_{fs}) refers to the number of non-significant studies that would be necessary to reduce the effect size to a non-significant value. N_{fs}-associated correlation coefficients that were equal to their respective studies number (*k*) was considered a case of no publication bias (Borenstein et al., 2009). All statistical analyses were performed using Comprehensive Meta-Analysis (CMA) version 3.0 software.

3. Results

As shown in Table 1, of the seven studies included, the total number of participants included in the meta-analysis was 507. The mean sample size of studies was 72.43 (SD = 47.59), ranging from 40 to 176.

3.1. Correlations across different illness representations and depression

Five studies of the seven studies concerned the relationships between all eight domains of illness representation and depression, while one study found a correlation between one illness representation (i.e., identity) and depression. Thus, as shown in Fig. 2, six studies were included in the meta-analysis of correlations between depression and identity. There was a significant positive correlation; the pooled *z*-value was 0.442 (95% CI = 0.349, 0.535), with significant heterogeneity (I^2 = 66.47%). Five studies were included in the meta-analysis of correlations between timeline-acute/chronic and depression. There was a significant positive correlation; the pooled z value was 0.274 (95% CI = 0.155, 0.393), with significant heterogeneity (I^2 = 37.48%). Five studies were suitable for the meta-analysis of correlations between timeline-cyclical and depression; the pooled *z*-value between timeline-cyclical and depression was significant (*z*-value = 0.306; 95% CI = 0.186, 0.425; I^2 = 29.92%). Five studies were used for the meta-analysis of correlations between consequences and depression. The pooled *z*-value between consequences and depression was 0.289 (95% CI = 0.006, 0.571) with considerable heterogeneity (I^2 = 81.82%). Five studies were included in the meta-analysis of correlations between emotional response and depression. There was positive correlation; the

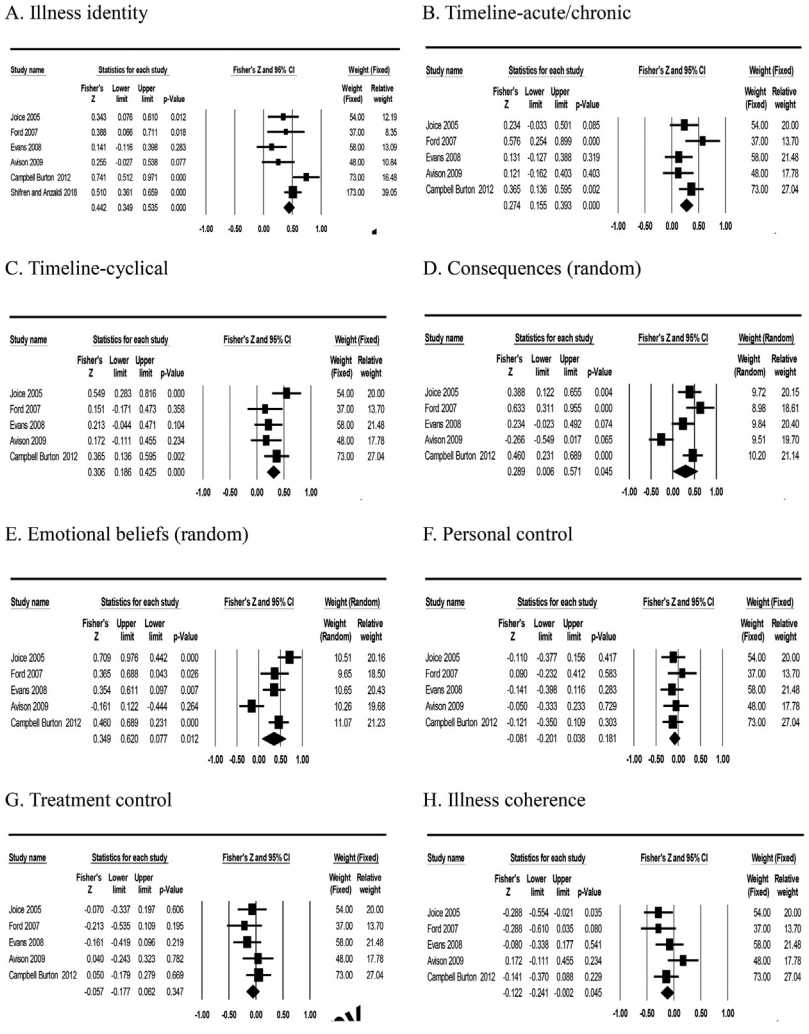

Fig. 2. Forest plots of Fisher's *z*-values with corresponding 95% CIs for the correlation between illness representation dimension and depression.

pooled *z*-value was 0.349 (95% CI = 0.077, 0.620), with significant heterogeneity (I^2 = 80.35%). These findings support Hypotheses 1.

Five studies were included in the meta-analysis of correlations between personal control and depression. Personal control was not associated with depression (*z*-value = -0.081; 95% CI = -0.201, 0.038; I^2 = 0%). Five studies were suitable for the meta-analysis of correlations between treatment control and depression. The pooled *z*-value between treatment control and depression was insignificant (*z*-value = -0.057; 95% CI = -0.177, 0.062) and showed insignificant heterogeneity (I^2 = 0%). Five studies were suitable for the meta-analysis of correlations between illness coherence and depression. Illness coherence was associated with depression (*z*-value = -0.122; 95% CI = -0.241, -0.002) and showed significant heterogeneity (I^2 = 40.87). Of these findings, only illness coherence and depression presented significant negative correlations, providing partial support for Hypothesis 2.

3.2. Correlations across different illness representations and anxiety

Five studies met the eligibility criteria for the meta-analysis of correlations between the eight domains of illness representation and anxiety. As seen in Table 2 and Fig. 3, five domains (identity, timeline-acute/chronic, timeline-cyclical, consequences, and emotional responses) of the illness representation were significantly positively associated with anxiety ($p < .01$), which supports Hypothesis 1. The range of the strength of the association among the five domains was 0.189 to 0.460; the lowest correlation was for the consequences domain and anxiety, and the highest was for emotional responses and anxiety. There was significant heterogeneity; the I^2 ranged from 43.83% to 89.78%. These findings support Hypothesis 3.

In contrast, for the three positive domains (personal control, treatment control, and illness coherence) of illness representation, no significant correlations were observed (*z*-value = 0.035; 0.026; -0.086, $p > .05$). In addition, only the illness coherence domain showed significant heterogeneity (I^2 = 79.63%). The results did not support Hypothesis 4.

3.3. Correlations across different illness representations and overall distress

Although only three studies reported correlations among the four dimensions of illness representation and overall distress, three of the correlations exhibited consistency, and the total number of participants included in the meta-analysis was 173. Table 3 and Fig. 4 present the pooled *z*-value between identity, consequences, emotional responses, illness coherence, and overall distress. As expected, identity, consequences, and emotional responses exhibited a significant positive relationship with overall distress (*z*-value = 0.582; 0.493; 0.711, $p < .001$), which supports Hypothesis 5. Illness coherence was negatively related to overall distress (*z*-value = −0.226; 95% CI = −0.379, −0.073, $p < .01$), which supports Hypothesis 6.

4. Discussion

This study aimed to examine the relationships between the illness representation dimensions and psychological outcomes across available studies from the related health literature database. This is the first meta-analysis to provide evidence of the association between illness representation and distress in stroke patients. Meta-analysis techniques were used to correct the average relationships between illness representations dimensions and psychological outcomes across seven studies that satisfied the inclusion criteria.

Studies consistently reported that illness representation dimensions were positively associated with expressing depression and anxiety. In addition, beliefs in a strong illness identity and serious consequences as well as greater emotional responses were positively associated with expressing overall psychological distress. These findings are consistent with an early meta-analysis on chronic illness that indicated illness consequences, timelines, and identity had significant positive relationships with distress (Hagger and Orbell, 2003). Hagger and Orbell also indicated that patients' control representation was significantly negatively related to distress. Although our study considered positive protective representation, only the illness coherence dimension was negatively associated with depression and overall distress. In other words, patients who perceived greater illness coherence and an understanding of their illness reported lower depression and lower overall distress (Moss-Morris et al., 2002).

In this study, other positive protective factors related to illness representation, such as personal control and treatment control, did not show a significant relationship with psychological outcomes. It seems that negative risk factors related to illness representations affect the stroke patients' psychological outcomes. Apparently, positive factors do not play a protective role in mental health. Control/cure, which refers to patients' beliefs and self-efficacy in regard to their condition, is amenable to change (Cameron and Leventhal, 2003; Leventhal et al., 1997; Moss-Morris et al., 2002). This finding can be considered in two ways. Personal control beliefs are not related to mental health (Aujla et al., 2018); thus, perhaps there is another factor that mediates their relationship, or control beliefs themselves are a moderator (Cameron and Leventhal, 2003). This requires more research, however, for further verification. Patients' beliefs and self-efficacy in regard to their condition in terms of control and cure did not have an effect because patients may lack self-management strategies. This finding echoes that of Ayers and Myers (2010) and Kelly-Irving et al. (2010), who found that knowledge and awareness were lower for stroke than for heart disease patients.

Table 2
Meta-analysis of correlation coefficients between illness representation, and depression and anxiety.

Dimension		Depression					Anxiety					
Variable	*k*	*n*	Fisher's *z*	95% CI	N_{fs}	I^2	*k*	*n*	Fisher's *z*	95% CI	N_{fs}	I^2
Identity	6	461	0.442***	0.349, 0.535	107	66.47	5	285	0.357***	0.238, 0.477	35	60.35
Timeline for acute/chronic	5	285	0.274***	0.155, 0.393	22	37.48	5	285	0.189**	0.070, 0.309	7	0
Timeline for cyclical	5	285	0.306***	0.186, 0.425	26	29.92	5	285	0.329***	0.210, 0.448	32	43.83
Consequence	5	285	0.289*	0.006, 0.571	25	81.82	5	285	0.252***	0.132, 0.371	17	53.23
Emotional representation	5	285	0.349***	0.077, 0.620	39	80.35	5	285	0.460*	0.084, 0.836	75	89.78
Personal control	5	285	−0.081	−0.201, 0.038	0	0	5	285	0.035	−0.084, 0.155	0	0
Treatment control	5	285	−0.057	−0.177, 0.062	0	0	5	285	0.026	−0.093, 0.145	0	0
Illness coherence	5	285	−0.122*	−0.241, -0.002	1	40.87	5	285	−0.091	−0.210, 0.029	0	79.63

Note: *k* = number of studies; *n* = sample size; CI = confidence interval; N_{fs} = fail safe *N*; I^2 = I-squared.
*$p < .05$, **$p < .01$, ***$p < .001$.

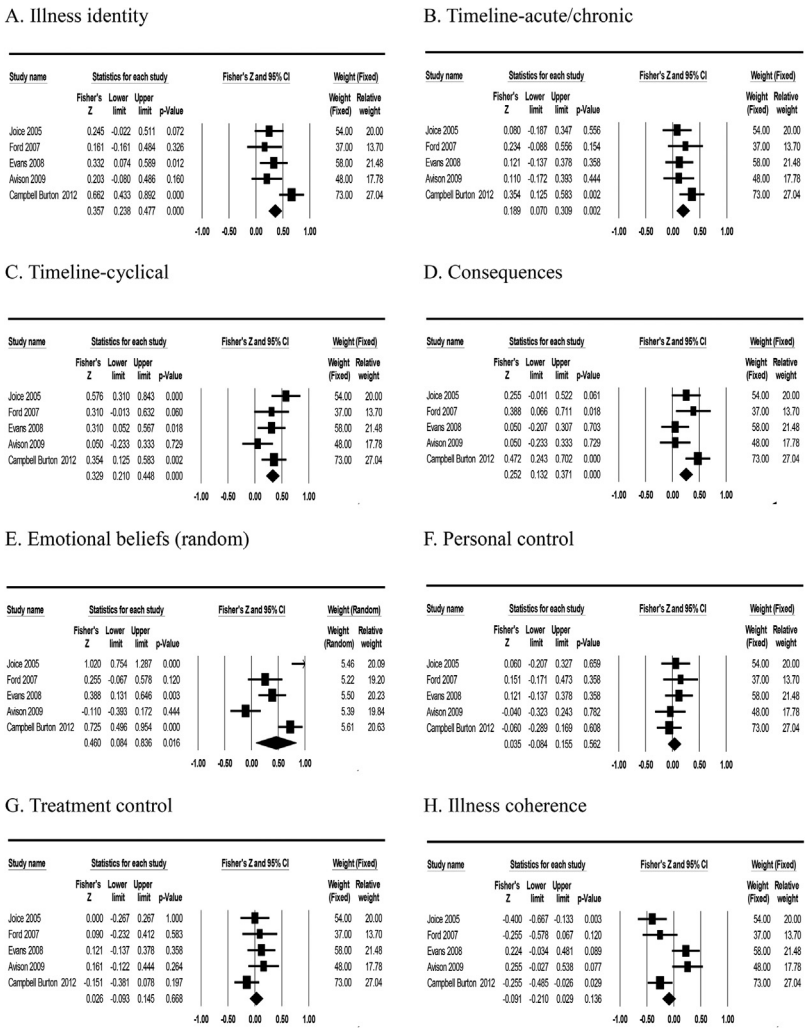

Fig. 3. Forest plots of Fisher's *z*-values with corresponding 95% CIs for the correlation between illness representation dimension and anxiety.

Table 3
Meta-analysis of correlation coefficients between illness representation and psychological distress.

Dimension	Overall Distress					
	k	*n*	Fisher's *z*	95% CI	N_{fs}	I^2
Identity	3	173	0.582***	0.429, 0.735	38	71.33
Consequence	3	173	0.493***	0.340, 0.646	29	5.92
Emotional representation	3	173	0.711***	0.558, 0.864	60	72.99
Illness coherence	3	173	−0.226**	−0.379, -0.073	3	24.89

Note: *k* = number of studies; *n* = sample size; CI = confidence interval; N_{fs} = fail safe *N*; I^2 = I-squared.
*$p < .05$, **$p < .01$, ***$p < .001$.

As noted, patients who feel that there is nothing that they can do to help themselves six months after a stroke have a shorter survival time (Lewis et al., 2001). Previous research also indicated that perceived control could predict recovery and emotional distress (Johnston et al., 1999). Ayers and Myers (2010) conducted a systematic review of research to examine the effects of self-management interventions on the quality of life of patients with stroke and found that there was no effect in the domains of locus of control or mood. They recommend that further research be conducted to focus on identifying key features of effective self-management programs. The findings of our study highlight that improving stroke patients' perceived control beliefs and self-management are crucial for decreasing their psychological distress.

5. Limitations

We performed both a comprehensive systematic review and a meta-analysis. All seven empirical research studies, however, were either cross-sectional or follow-up research. Thus, in this study, there are some limitations that need to be addressed. First, the findings need to be confirmed, and any causal relationship between illness representation and stroke patients need to be further explored in a randomized controlled trial. Second, illness belief may be influenced by changes over time. Thus, a longitudinal study to explore the illness representation across different disease phases is recommended. It is noteworthy that the latest one-year follow-up research showed that stroke patients' illness representation partially changed between 3 and 12 months after stroke (Groeneveld et al., 2019). Groeneveld et al. found that patients with less favorable illness representation trajectories had higher depressive symptoms at 12 months. This confirms other longitudinal research on stroke patients' trajectory of illness representation and the importance of

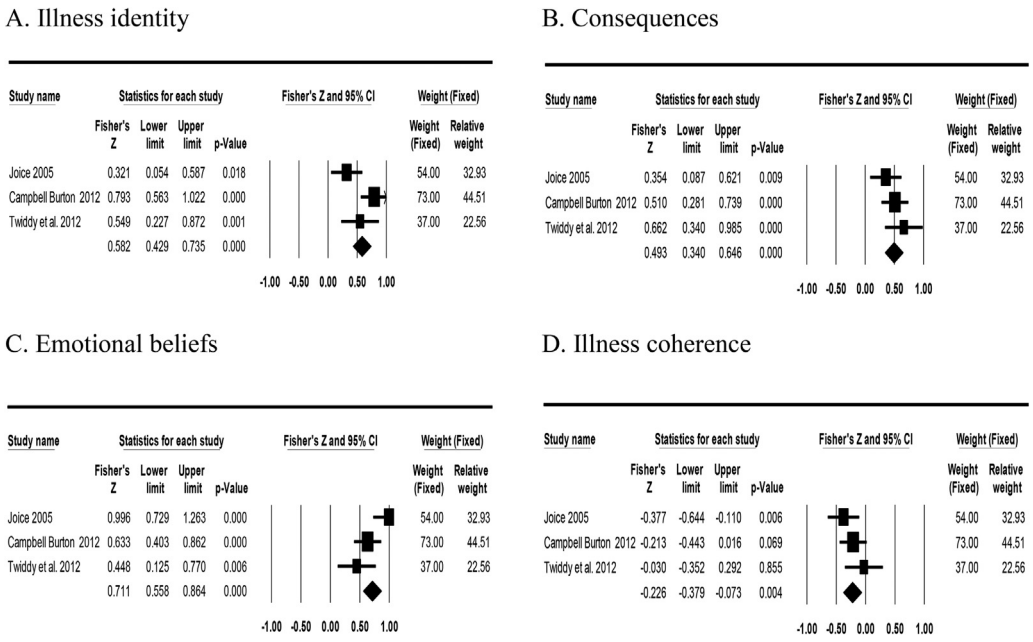

Fig. 4. Forest plots of Fisher's *z*-values with corresponding 95% CIs for the correlation between illness representation dimension and overall distress.

providing appropriate intervention. Third, the studies did not explore whether there was a moderator between illness representation and distress in stroke patients. Thus, more research in regard to a moderator is needed. Despite these limitations, our study provided crucial information for stroke patients' perceived illness representation through both a comprehensive systematic review and a meta-analysis.

6. Conclusions

The current evidence on the Common Sense Model, that a negative illness representation is positively related to psychological distress (depression and anxiety), was supported by this study. In regard to the positive illness representation dimensions that are negatively related to psychological distress (depression and anxiety) for stroke patients, only illness coherence was significantly related to depression and overall distress, whereas personal control and treatment control did not show a significant relationship with any distress outcome. As Groeneveld et al. (2019) noted, illness perceptions could be considered an additional target of treatment. Thus, it would be beneficial for clinical practice to focus on identifying personal control and treatment control as well as illness coherence features of effective self-management programs.

Ethical approval

The study was approved by the institutional review board of Chung-Shan Medical University Hospital (CSMUH No: CS2-18011).

Funding

This research was funded by the Ministry of Science and Technology for funding this study (MOST 107-2314-B-040-002).

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgements

We thank the Ministry of Science and Technology for funding this study (MOST 107-2314-B-040-002).

References

Aujla, N., Walker, M., Sprigg, N., Vedhara, K., 2018. Do individual versus illness belief schema differ in the prediction of post-stroke recovery? J. Health Psychol.. . Retrieve from: https://doi.org/10.1177/1359105318785446 (first online).
Avison, R., 2009. Discrepant Illness Perceptions in Stroke Survivor-partner Dyads: Relationship to Psychological Adjustment and Expressed Emotion. University of Hull, Hull, UK.
Ayers, B.N., Myers, L.B., 2010. Understanding of stroke and coronary heart disease in the UK: an exploratory study. Psychol. Health Med. 15 (4), 474–477.
Borenstein, M., Hedges, L.V., Higgins, J.P.T., Rothstein, H.R., 2009. Introduction to Meta-analysis. John Wiley & Sons, Hoboken, NJ.
Cameron, L.D., Leventhal, H., 2003. The Self-Regulation of Health and Illness Behavior. Routledge, London, UK.
Campbell Burton, C.A., 2012. Anxiety after Stroke: Prevalence, Intervention Effectiveness, and Illness Representations. University of Leeds., Leeds, UK.
Clark, M.S., 2000. Patient and spouse perceptions of stroke and its rehabilitation. Int. J. Rehabil. Res. 23 (1), 19–29.
Evans, S., 2008. Stroke, Psychological Outcomes and the Self-Regulatory Model. Lancaster University, Lancaster, UK.
Ford, C.E.L., 2007. The Relationship between Beliefs About Stroke and Post-stroke Depression. University of East Anglia., Norwich, UK.
Groeneveld, I.F., van der Pas, S.L., Meesters, J.J.L., Schuurman, J.M., van Meijeren-Pont, W., Jagersma, E., et al., 2019. Illness perceptions of stroke survivors: predictors and changes over time—a 1-year follow-up study. J. Psychosom. Res. 116, 54–61.
Hackett, M.L., Anderson, C.S., 2005. Predictors of depression after stroke: a systematic review of observational studies. Stroke 36 (10), 2296–2301.
Hagger, M.S., Orbell, S., 2003. A meta-analytic review of the common-sense model of illness representations. Psychol. Health 18 (2), 141–184.
Hale, E.D., Treharne, G., Kitas, G., 2007. The common-sense model of self-regulation of health and illness: how can we use it to understand and respond to our patients' needs? Rheumatology 46 (6), 904–906.
Johnston, M., Morrison, V., Macwalter, R., Partridge, C., 1999. Perceived control, coping and recovery from disability following stroke. Psychol. Health 14 (2), 181–192.
Joice, S.A., 2005. Adherence in Behavioural Interventions for Stroke Patients: Measurement and Prediction. St. Andrews, Scotland: University of St Andrews.
Kelly-Irving, M., Mulot, S., Inamo, J., Ruidavets, J.B., Atallah, A., Lang, T., et al., 2010. Improving stroke prevention in the French West Indies: limits to lay knowledge of risk factors. Stroke 41 (11), 2637–2644.

Kim, M.J., Moon, S., Oh, B.-C., Jung, D., Ji, K., Choi, K., Park, Y.J., 2018. Association between perfluoroalkyl substances exposure and thyroid function in adults: A meta-analysis. PLoS One 13 (5) e0197244.
Leventhal, H., Safer, M.A., Panagis, D.M., 1983. The impact of communications on the self-regulation of health beliefs, decisions, and behavior. Health Educ. Behav. 10 (1), 3–29.
Leventhal, H., Benyamini, Y., Brownlee, S., Diefenbach, M., Leventhal, E.A., Patrick-Miller, L., Robitaille, C., 1997. Illness representations: theoretical foundations. In: Petrie, K.J., Weinman, J. (Eds.), Perceptions of Health and Illness: Current Research and Applications. Harwood Academic, Amsterdam, Netherlands, pp. 19–45.
Lewis, S.C., Dennis, M.S., O'Rourke, S.J., Sharpe, M., Lewis, S.C., Dennis, M.S., et al., 2001. Negative attitudes among short-term stroke survivors predict worse long-term survival. Stroke 32 (7), 1640–1645.
Mitchell, P.H., Gallucci, B., Fought, S.G., 1991. Perspectives on human response to health and illness. Nurs. Outlook 39 (4), 154–157.
Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., PRISMA Group, 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann. Intern. Med. 151 (4), 264–269.
Molloy, G.J., Johnston, M., Johnston, D.W., Pollard, B., Morrison, V., Bonetti, D., et al., 2008. Spousal caregiver confidence and recovery from ambulatory activity limitations in stroke survivors. Health Psychol. 27 (2), 286–290.
Moss-Morris, R., Weinman, J., Petrie, K., Horne, R., Cameron, L., Buick, D., 2002. The revised illness perception questionnaire (IPQ-R). Psychol. Health 17 (1), 1–16.
Rostom, A., Dubé, C., Cranney, A., Saloojee, N., Sy, R., Garritty, C., et al., 2004. Celiac disease. Evid. Rep. Technol. Assess. (Summ.) 104, 1–6.
Schröder, C., Johnston, M., Morrison, V., Teunissen, L., Notermans, N., van Meeteren, N., 2007. Health condition, impairment, activity limitations: relationships with emotions and control cognitions in people with disabling conditions. Rehabil. Psychol. 52 (3), 280–289.
Shifren, K., Anzaldi, K., 2018. Optimism, well-being, depressive symptoms, and perceived physical health: a study among Stroke survivors. Psychol. Health Med. 23 (1), 46–57.
Twiddy, M., House, A., Jones, F., 2012. The association between discrepancy in illness representations on distress in stroke patients and carers. J. Psychosom. Res. 72 (3), 220–225.
Weinman, J., Petrie, K.J., Moss-Morris, R., Horne, R., 1996. The illness perception questionnaire: a new method for assessing the cognitive representation of illness. Psychol. Health 11 (3), 431–445.
Zhao, X., Wang, H., Li, J., Shan, Z., Teng, W., Teng, X., 2015. The correlation between polybrominated diphenyl ethers (PBDEs) and thyroid hormones in the general population: A meta-analysis. PLoS One 10 (5) e0126989.