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ORIGINAL REPORT

THE RELATIVE EFFECT OF COPING STRATEGY AND DEPRESSION ON HEALTH-RELATED QUALITY OF LIFE IN PATIENTS IN THE CHRONIC PHASE AFTER STROKE

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Objective: **To investigate the relative associations of coping strategy and depression on health-related quality of life in patients in the chronic phase after stroke.**

Design: **Cross-sectional study.**

Subjects: **A total of 213 patients after stroke (>18 months post-onset), mean age 59 years (standard deviation (SD) 9.86 years), 56% men, mean time post-stroke 53 months (SD 37.8 months).**

Methods: **Coping strategy was measured using the assimilative-accommodative coping scale, depression using the Center for Epidemiologic Studies Depression Scale, and quality of life using the World Health Organization Quality of Life-BREF. Multivariable regression analyses were performed, adjusted for patient characteristics.**

Results: **Depression score was independently related to all domains of quality of life (Psychological Health (B=–0.924; p=0.000), Physical Health (B=–0.832; p=0.000), Social Relationships (B=–0.917; p=0.000), Environment (B=–0.662, p=0.000)). Accommodative coping (B=0.305; p=0.024) and assimilative coping (B=0.235; p=0.070) were independently related to the domain Psychological Health, adjusted for depression and education level.**

Conclusion: **Coping strategies and depression score were independently associated with Psychological Health in patients in the chronic phase after stroke. Patients who prefer an accommodative coping strategy may show less symptoms of depression. Preferable coping strategies may be trained in order to improve both depression score and health-related quality of life in future research.**

Key words: stroke; rehabilitation; coping; depression; quality of life.

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INTRODUCTION

The World Health Organization Quality of Life (WHOQOL) Group defines quality of life as "individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (1). Health-related quality of life (HRQoL) refers to the health-related aspects of quality of life. On average, utility scores of HRQoL after stroke range from 0.47 to 0.68 (utility score equal to death is 0.0 and full health 1.0), which is lower than the value of a healthy reference population (utility score 0.93) (2, 3). Even after 7 years, a large proportion of patients report a poor HRQoL (4). HRQoL after stroke is predicted by functional constraints, age, gender, and psychosocial factors, such as depression and socioeconomic status (2, 5–7). Depression is common after stroke, with an estimated first year prevalence of 30%, and it appears to be more influential than functional constraints (8). A recent systematic review showed a cumulative incidence of depression of up to 52% within 5 years after stroke. Lower quality of life was an outcome of depression in this study (9).

Another important psychosocial factor with regard to HRQoL after stroke is coping style (10–13). Coping style is commonly defined as someone's preferred way of dealing with stressful situations. There are several dominant coping theories in literature; problem-solving vs emotion-focused strategies, avoidance-oriented vs active approach-oriented coping, and dispositional vs situational approaches to coping (14). Brandstädter & Renner (15) use different dimensions; they distinguish two general coping strategies: assimilative and accommodative coping (15). Patients applying the assimilative coping strategy aim to adjust the situation to their personal preferences, trying to continue life as it was before an unpleasant event. This strategy is also called tenacious goal pursuit. Patients applying the accommodative coping strategy aim to adjust their personal preferences to the situation, accepting the consequences of an event. This strategy is also called flexible goal adjustment (15). According to Brandtstädter & Renner (15) both coping strategies may operate simultaneously.

However, they expect that assimilative coping is dominant in the acute phase after an unpleasant event, whereas accommodative coping gradually increases over time. In patients after stroke, these coping strategies have been shown to be related to quality of life. Smout et al. (13) shows that accommodative coping is related to a higher quality of life in patients in the chronic phase after stroke, while assimilative coping is related to a lower quality of life (13). Darlington et al. (11) shows that, depending on the time post-onset, both assimilation and accommodation are positively related to quality of life from a societal perspective, with patients applying both strategies in different situations being most successful (11).

Coping strategy and depression have also been shown to be related. The assimilative and accommodative coping strategies are inversely related to symptoms of depression in a population of healthy adults (15). In patients after stroke, the use of avoidance coping was a predictor of depression before discharge from rehabilitation (16). This is an important finding, because stroke patients make less use of active problem-oriented coping than other brain-damaged patients and thus may be at higher risk of developing depression (17).

Depression and coping are important variables that interact and that both may affect HRQoL after stroke. A few studies investigated the influence of these two psychosocial factors on HRQoL after stroke. One study showed that depression is related to a decreased HRQoL in patients who have had an aneurysmal subarachnoid haemorrhage (SAH) (18). These results may not apply to patients with ischaemic and haemorrhagic strokes, as patients with SAH differ in age and co-morbidity. Furthermore, this study in SAH patients only measured passive coping, which was not significantly associated with HRQoL (18). A literature review described that depression and coping strategies are both determinants of HRQoL after stroke (10). This review did not report the relative contribution of the 2 psychosocial factors. If coping independently affects HRQoL after stroke, an intervention aimed at optimizing coping strategies may be useful in stroke rehabilitation programmes. Therefore, the aim of the present study was to assess the relative effect of coping strategy and depression on HRQoL in patients in the chronic phase after stroke. Because we focused on patients in the chronic stage after stroke, we expected that the accommodative coping strategy (flexibility: accepting the consequences of an event) would be more prevalent than the assimilative coping strategy (tenacity: adjusting the situation) in line with Brandtstädter & Renner (15). Based on the literature we expected that depression is associated with a lower HRQoL after stroke, and that an accommodative coping strategy is related to a higher HRQoL. Despite the inverse relationship between coping strategy and depression, we hypothesized that the relationship between coping strategy and HRQoL is independent of depression.

METHODS

Study design

Patients in the chronic phase after stroke (at least 18 months post-onset) were invited to participate in the study, from April 2008 to September 2010. The participants were former patients of Rijndam Rehabilitation Center in Rotterdam and Heliomare Rehabilitation Center in Wijk aan Zee, both cities in the Netherlands. Inclusion criteria were: "first and only stroke", a minimum of 18 months post-stroke, age between 18 and 80 years, and living independently. Exclusion criteria were: progressive neurological disorders, such as dementia or multiple sclerosis, insufficient understanding of the Dutch language, alcohol or drug abuse, subarachnoid haemorrhage, or subdural haematomas. Eligible patients were approached by their physician and invited to participate in an intervention study to evaluate the effect of a memory training programme (19). Patients were asked whether they subjectively experienced problems in memory functioning as a result of stroke. All patients were included for the baseline measurement, with or without subjective memory problems. The baseline data of this trial were used for this cross-sectional study. Approval was given by the medical ethics committee of the Erasmus MC. Written informed consent was obtained from all participants prior to the study.

Measurement instruments

Patients were assessed at home by a trained research psychologist. Coping strategy was measured using the assimilative-accommodative coping scale (AACS) (15). The AACS consists of two subscales: tenacious goal pursuit (assimilative coping; adjusting the situation to personal preferences) and flexible goal adjustment (accommodative coping; adjusting personal preferences to the situation). Each subscale contains 15 items measured on a 5-point rating scale, ranging from 0 to 4. A sum score was calculated for both subscales, ranging from 0 to 60. The assimilative and accommodative strategies may operate simultaneously, but people mostly show a preference for one of the two strategies, which may change over time. Higher scores on one of the subscales indicate more use of that coping strategy. The internal consistency and validity of the scales are good (15). The questionnaire was translated into Dutch (20).

HRQoL was measured using the WHOQOL-BREF, which is a generic HRQoL questionnaire (1). We used the Dutch version of this questionnaire, which has been shown to be valid and reliable (21). The questionnaire consists of 26 questions resulting in 4 domains of HRQoL: Physical Health (e.g. pain, sleep, energy, mobility, activities of daily living, dependence on medicinal substances or aids, work capacity), Psychological Health (e.g. feelings, cognition, self-esteem, beliefs), Social Relationships (e.g. personal relationships, social support, sexual activity) and Environment (e.g. freedom, home environment, financial resources, health and social care, transport). The items are measured on a 5-point rating scale, ranging from 1 to 5. The domain scores are calculated as the sum scores of items in the domains and are transformed to a 0–100 scale.

Depression was measured using the Center for Epidemiologic Studies Depression Scale (CES-D). This questionnaire consists of 20 items concerning depression, ranging from 0 to 3. Higher scores indicate more depressive symptoms, a score of 16 or higher is considered "depressed" (22). The questionnaire has a range from 0 to 60, and shows good internal consistency and validity in the Dutch population (23).

The presence and severity of aphasia was measured using the short version of the Token Test (24). The validated scale ranges from 0 to 36, a score of 29 or lower indicates aphasic features.

Level of education was classified in a 7-level system, in which 1 refers to some years of basic primary education and 7 refers to a university degree or higher (25). Demographic and clinical characteristics, such as the side and type of stroke, were obtained from patient records and a structured interview by the research psychologist prior to the measurement.

Statistical analyses

Descriptive statistics were used to determine patient characteristics and the responses on the questionnaires. A sample of non-responders available from one of the two participating rehabilitation centres was compared with the study sample for the variables age, gender, type of stroke, side of stroke and time post-onset. The preferred coping strategy of each patient was determined by calculating the ratio be-

Table I. *Descriptive variables*

Variable	
Gender, male, *n* (%)	117 (56)
Educational level (high), *n* (%)	48 (23.3)
Partner (no), *n* (%)	50 (23.9)
Side of stroke, left, *n* (%)	110 (53.7)
Type of stroke, ischaemic, *n* (%)	139 (70.6)
Age, years, mean (SD)	58.97 (9.86)
Time post-stroke, months, mean (SD)	52.95 (37.80)
Aphasia severity[a], mean (SD)	30.60 (6.56)
Depression score[b], mean (SD)	11.83 (10.16)
Accommodative coping[c], mean (SD)	38.62 (6.95)
Assimilative coping[d], mean (SD)	33.25 (6.16)
Psychological Health[d], mean (SD)	63.27 (16.25)
Physical Health[d], mean (SD)	64.51 (18.20)
Social Relationships[d], mean (SD)	65.33 (18.84)
Environment[d], mean (SD)	69.66 (14.55)

[a]Measured using the Token Test.
[b]Measured using the Center for Epidemiologic Studies Depression Scale.
[c]Measured using the assimilative-accommodative coping scale.
[d]Measured using the World Health Organization Quality of Life-BREF; norm scores: Psychological Health: 78.75; Physical Health: 89.38; Social Relationships: 73.75; Environment: 74.38 (26).

tween the sum scores of the two coping strategies (accommodation divided by assimilation); a ratio higher than one indicates more use of accommodative coping. Correlation coefficients were calculated to investigate if the variables HRQoL, coping strategy and depression score were interrelated, and were checked for multi-collinearity. We also studied the correlation of these variables with the following potentially confounding variables: age, gender, living without a partner, level of education (dichotomized into high school or more (≥ 5) vs lower than high school (< 5)), time post-onset, side of stroke, type of stroke, and aphasia.

Multivariable linear regression analyses were performed to investigate the relative contribution of the variables that were significantly correlated with at least one of the domains of HRQoL ($p < 0.10$). We assumed that HRQoL, as measured with the 4 domains of the WHOQOL-BREF (Psychological Health, Physical Health, Social Relationships, Environment), may depend on the depression score and coping strategy. Variables were entered into the model using a blockwise procedure. In the first block both coping strategies were forced into the model. In the second block depression score was entered into the model, to estimate if the contribution of coping on HRQoL changed. In the third block the potentially confounding variables were forced in the model, to adjust for possible confounders. The variance explained for each block (R^2 change) and its significance were estimated. *p*-values of 0.05 were considered statistically significant. Model assumptions of linearity, normality and homoscedasticity were checked. Analyses were performed in SPSS version 19.0.

RESULTS

Inclusion

A total of 1,121 patients were approached for participation in this study, of which 220 signed an informed consent form. Reasons for not participating in the study were non-response ($n = 628$), negative response ($n = 265$), and not meeting the inclusion criteria ($n = 8$). Seven patients were excluded after the baseline measurement due lack of comprehension of the questionnaires and inadequate yes/no responses; we could not analyse the data from these patients due to the high level of missing data as a result of cognitive impairment and aphasia. Therefore, data of 213 patients were analysed. The WHOQOL-BREF and CES-D were completed by all patients, there was one patient missing on the AACS. Of all patients, 73.7% reported subjective memory complaints. The sample of non-responders ($n = 434$) was not significantly different compared with the study participants except for the variables age and time post-stroke; non-participants were older (mean 60.9 years, SD 11.9, $p = 0.041$) and the time post-stroke was longer (mean 76.5 months, SD 38.2, $p < 0.001$) than study participants.

Table I shows patient characteristics and mean outcome scores of the study participants. The HRQoL mean domain scores are lower than those of a Dutch norm population (Table I) (26). In 73.1% of patients the accommodative coping strategy was more prominent than the assimilative coping strategy.

Correlation coefficients

Pearson and Spearman correlation coefficients are shown in Table II. There were no indications for multi-collinearity.

Table II. *Correlation coefficients*

	Psychological Health	Physical Health	Social Relationships	Environment	Depression	Accommodative coping	Assimilative coping
Physical Health	$r = 0.600$**						
Social Relationships	$r = 0.542$**	$r = 0.412$**					
Environment	$r = 0.674$**	$r = 0.531$**	$r = 0.561$**				
Depression score	$r = -0.689$**	$r = -0.513$**	$r = -0.527$**	$r = -0.554$**			
Accommodative coping	$r = 0.456$**	$r = 0.274$**	$r = 0.300$**	$r = 0.299$**	$r = -0.464$**		
Assimilative coping	$r = 0.153$*	$r = 0.056$	$r = 0.089$	$r = 0.138$**	$r = -0.045$	$r = 0.067$	
Age	$r = 0.112$	$r = 0.064$	$r = -0.032$	$r = 0.136$*	$r = -0.214$**	$r = 0.211$**	$r = -0.029$
Gender, male[a]	$r = -0.100$	$r = -0.157$*	$r = 0.084$	$r = -0.083$	$r = 0.073$	$r = -0.081$	$r = -0.014$
Absence of partner[a]	$r = -0.167$*	$r = -0.151$*	$r = -0.234$**	$r = -0.327$**	$r = 0.146$*	$r = 0.040$	$r = -0.035$
Educational level[a]	$r = 0.116$	$r = 0.042$	$r = -0.073$	$r = 0.168$*	$r = 0.028$	$r = 0.020$	$r = 0.092$
Time post-onset	$r = -0.083$	$r = -0.066$	$r = -0.068$	$r = -0.092$	$r = 0.036$	$r = 0.020$	$r = -0.027$
Side of stroke, left[a]	$r = -0.026$	$r = 0.038$	$r = -0.047$	$r = -0.077$	$r = -0.034$	$r = 0.015$	$r = -0.069$
Type of stroke, ischaemic[a]	$r = -0.081$	$r = -0.106$	$r = -0.058$	$r = -0.047$	$r = 0.044$	$r = -0.084$	$r = -0.013$
Aphasia severity	$r = 0.142$*	$r = 0.026$	$r = 0.113$	$r = 0.242$**	$r = -0.056$	$r = 0.086$	$r = 0.092$

*p-value ≤ 0.05 (two-tailed).
**p-value ≤ 0.01 (two-tailed).
[a]Spearman's rho correlation coefficients.

The correlation coefficients showed that both depression and accommodative coping are strongly related to all 4 domains of HRQoL (Table II). Patients with a higher depression score had a lower HRQoL and patients making more use of accommodative coping had a higher HRQoL. The variables depression and the accommodative coping strategy were inversely related. Assimilative coping was only significantly related to the domains Psychological Health and Environment, patients making more use of assimilative coping had a higher HRQoL in these domains. Living without a partner was negatively related to HRQoL in all domains. Patients with a higher age or higher educational level had a higher HRQoL in the domain Environment. Being a male was negatively related to the domain Physical Health. Patients who performed better on the test that measured aphasia had a higher HRQoL in the domains Psychological Health and Environment. Time post-onset, type of stroke and side of stroke were not related to any of the domains of HRQoL, and were therefore not entered in the multivariable regression analysis.

Multivariable analysis

The significant variables were analysed further using multivariable regression analyses for the 4 domains of HRQoL as dependent variables (Table III). In the first block, accommodative coping was significantly related to all domains of HRQoL. Assimilative coping was significantly related to Psychological Health. In the second block, both accommodative and assimilative coping were significantly related to Psychological Health, adjusted for depression score. Depression score was independently significantly related to all domains of HRQoL. In the third block, depression score remained significantly related to all domains of HRQoL (Psychological Health (B = –0.942; $p = 0.000$), Physical Health (B = –0.832; $p = 0.000$), Social Relationships (B = –0.917; $p = 0.000$), Environment (B = –0.62, $p = 0.000$)). Adjusted for depression and educational level, accommodative coping was significantly related to the domain Psychological Health (B = 0.305; $p = 0.024$). Assimilative coping (B = 0.235; $p = 0.070$) was borderline significant in the final model. In the other 3 domains of HRQoL both accommodative coping and assimilative coping were no longer related to HRQoL if depression was also included in the regression model. Living without a partner remained negatively related to the domains Social Relationships and Environment. Higher education also remained positively related to the domains Psychological Health and Environment. A better performance on the aphasia test was positively related to the domain Environment, independently of depression and the other independent variables.

DISCUSSION

This study confirmed our hypotheses that depression and accommodative coping (flexibility) are both independently related to Psychological Health in the chronic phase after stroke. Patients after stroke with a higher depression score had a lower HRQoL, as expected based on earlier studies (27, 28). Accommodative coping was an independent contributor to Psychological Health, adjusted for depression and level of education. This finding indicates that, independent of the presence of depressive symptoms, accommodative coping positively influences Psychological Health. Psychological Health incorporates facets such as feelings, cognition, self-esteem and beliefs (1). Patients with an assimilative coping strategy (tenacity) also had a higher HRQoL in this domain. It appears that the ability to use both coping strategies, flexibility and

Table III. *Multivariable linear regression analyses*

	Psychological Health		Physical Health		Social Relationships		Environment	
	B	*p*-value	B	*p*-value	B	*p*-value	B	*p*-value
Block 1								
Accommodative coping	**0.906**	**0.000**	**0.556**	**0.004**	**0.732**	**0.000**	**0.573**	**0.000**
Assimilative coping	**0.329**	**0.049**	0.105	0.618	0.217	0.312	0.233	0.155
Block 2								
Accommodative coping	**0.267**	**0.045**	–0.014	0.943	0.093	0.627	0.076	0.599
Assimilative coping	**0.290**	**0.027**	0.070	0.709	0.178	0.343	0.203	0.154
Depression	**–0.964**	**0.000**	**–0.860**	**0.000**	**–0.965**	**0.000**	**–0.750**	**0.000**
Block 3								
Accommodative coping	**0.305**	**0.024**	0.036	0.854	0.246	0.191	0.134	0.327
Assimilative coping	0.235	0.070	0.051	0.789	0.105	0.562	0.103	0.434
Depression	**–0.942**	**0.000**	**–0.832**	**0.000**	**–0.917**	**0.000**	**–0.662**	**0.000**
Age	–0.116	0.175	–0.127	0.314	–0.233	0.054	0.027	0.754
Gender (male)	–1.426	0.393	–4.024	0.102	2.927	0.212	0.857	0.614
Absence of partner	–3.203	0.095	–3.630	0.197	**–8.804**	**0.001**	**–8.738**	**0.000**
Educational level (≥5 vs <5)	**4.129**	**0.029**	0.565	0.837	–1.957	0.457	**4.840**	**0.012**
Aphasia severity	0.163	0.191	–0.045	0.806	0.231	0.188	**–0.464**	**0.000**
Model performance								
R^2 change block 1	0.176	0.000	0.044	0.013	0.075	0.001	0.084	0.000
R^2 change block 2	0.324	0.000	0.189	0.000	0.221	0.000	0.227	0.000
R^2 change block 3	0.030	0.045	0.021	0.359	0.073	0.001	0.121	0.000
R^2 total	0.529		0.255		0.369		0.432	

The bold font emphasizes which variables are significant.

tenacity, positively influences Psychological Health, which is in line with the findings of Darlington et al. (11).

In all the other domains of HRQoL, the accommodative coping strategy is also strongly related to HRQoL, but not independent of depression. This may be caused by the inverse relationship between coping strategy and depression: patients who prefer an accommodative coping strategy show fewer symptoms of depression. The results of Schmitz (29) confirm this inverse relationship in a population of patients with chronic pain (29). From this analysis we cannot conclude whether maladaptive coping strategies may lead to depression or vice versa. The domains Physical Health, Social Relationships and Environment appear to differ from the domain Psychological Health because these domains depend more on external factors. Other variables, such as severity of aphasia, living without a partner and higher education were more important than coping strategies in these domains.

This study suggests that coping strategy independently contributes to Psychological Health after stroke. Therefore, it may be beneficial to target patients' coping strategies in post-stroke rehabilitation programmes. Backhaus et al. (30) shows that an intervention was beneficial in changing maladaptive coping strategies in traumatic brain-injured patients (30). In patients after stroke, Darlington et al. (11) shows that with the passing of time, the importance of general functioning in determining HRQoL diminishes, whereas coping becomes more important (11). Coping strategies at discharge of rehabilitation were predictive of QoL after 1 year (12). Depression is an important factor influencing HRQoL after stroke, and should not be neglected. However, the current study suggests that coping strategy may be an important target in post-stroke rehabilitation, and might provide an entry to improve both HRQoL and to decrease depressive symptoms.

The current study had some limitations that should be considered. A multivariable linear regression analysis was used to evaluate the predictive value of depression and coping strategy on HRQoL, which assumes a causal relationship between the independent and dependent variables. Based on the literature, we assumed that HRQoL depends on the psychosocial variables depression and coping strategy (10). However, as we used a cross-sectional study design, it is uncertain whether this assumption holds. To confirm our results, this relationship should be investigated further in a longitudinal study design in future studies. In addition, we used the assimilative-accommodative coping scale to measure coping strategy. Recently, results of a validation study on this questionnaire showed some evidence that the subscales may not clearly distinguish between the two strategies of coping in relatively healthy women (31). However, there is no consensus about which instrument should be used to measure coping after stroke (14). Another limitation of the current study is that a selection bias may have occurred, since only 20% of the potential study participants agreed to participate in the study. The participating patients were younger and had a more recent stroke. Furthermore, most of the patients had memory complaints and were willing to participate in a memory training programme. Only 10–15% of the stroke population in the Netherlands is referred to rehabilitation clinics. In particular, the elderly part of the stroke population is not represented in this study, because these patients often move to nursing homes. We only included patients in the chronic phase after stroke. Therefore, our results should not be generalized to patients in the acute phase after stroke.

This acute phase might be particularly interesting, because coping strategies may change during rehabilitation. Our study population preferred the accommodative strategy of coping, which is in line with results of Brandstädter (15), who shows that assimilative coping is dominant in the acute phase, whereas accommodative coping gradually increases in the chronic phase (15). What will be the best time to start an intervention aimed at improving coping strategy is not yet known. We suggest that it may be best to train effective coping strategies in the acute phase after stroke, because there is more to gain in this phase: more assimilative coping is used, while the use of accommodative coping or the combination of both strategies of coping should be used to positively influence Psychological Health. Thus, training programmes aimed at an effective coping strategy early in the rehabilitation phase after stroke may enhance the process of accepting the consequences of stroke, which may help to optimize HRQoL after stroke. Future intervention studies in stroke patients should investigate whether altering maladaptive coping strategies improves both depressive symptoms and HRQoL.

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