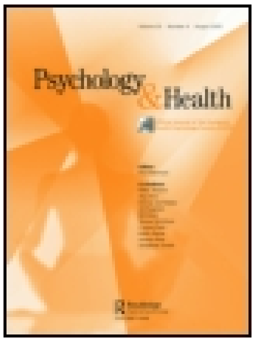

Psychology & Health

ISSN: 0887-0446 (Print) 1476-8321 (Online) Journal homepage: http://www.tandfonline.com/loi/gpsh20

Self-efficacy for health-related behaviour change in patients with TIA or minor ischemic stroke

Dorien Brouwer-Goossensen, Lenneke van Genugten, Hester F. Lingsma, Diederik W. J. Dippel, Peter J. Koudstaal & Heleen M. den Hertog

PSYCHOLOGY & HEALTH
https://doi.org/10.1080/08870446.2018.1508686

Self-efficacy for health-related behaviour change in patients with TIA or minor ischemic stroke

Dorien Brouwer-Goossensen[a], Lenneke van Genugten[a], Hester F. Lingsma[a], Diederik W. J. Dippel[a], Peter J. Koudstaal[a] and Heleen M. den Hertog[b*]

[a]Department Neurology and Public Health, Erasmus MC, University Medical Center, Rotterdam, The Netherlands; [b]Medical Spectrum Twente, Enschede, The Netherlands

ABSTRACT

Objective: To assess levels of self-efficacy for health-related behaviour change and its correlates in patients with TIA or ischemic stroke.

Methods: In this prospective cohort study, 92 patients with TIA or ischemic stroke completed questionnaires on self-efficacy for health-related behaviour change and fear, social support and depressive symptoms. Relations between fear, social support, depressive symptoms, cognitive impairment, vascular risk factors and history and demographic characteristics and low-self-efficacy were studied with univariable and multivariable logistic regression.

Results: Median total self-efficacy score at baseline was 4 (IQR 4–5). Older age (OR 1.05, 95% CI 1.01–1.09), depressive symptoms (OR 1.09, 95% CI 1.03–1.16), presence of vascular history (OR 2.42, 95% CI 0.97–6.03), higher BMI (OR 1.15, 95% CI 1.01–1.30), fear (OR 1.06, 95% CI 1.01–1.12) and low physical activity (OR 1.49, 95% CI 1.01–2.21) were significantly associated with low self-efficacy.

Conclusion: Patients with recent TIA or ischemic stroke report high self-efficacy scores for health-related behaviour change. Age, vascular history, more depressive symptoms, higher BMI, less physical activity and fear were correlates of low self-efficacy levels.

Practice implications: These correlates should be taken into account in the development of interventions to support patients in health behaviour change after TIA or ischemic stroke.

KEYWORDS
Stroke; TIA; health-related behaviour; self-efficacy

Background

The modification of health behaviour is an important part of cardiovascular disease risk management. Secondary prevention programs focusing on lifestyle modification,

CONTACT Dorien Brouwer-Goossensen d.goossensen@erasmusmc.nl Department Neurology and Public Health, Erasmus MC, University Medical Center, PO Box 2040, 3000 CA Rotterdam, The Netherlands
The corresponding author also completed the statistical analysis.
This study is not industry-sponsored.
*Department Neurology, Isala Hospital, Zwolle, The Netherlands.

such as cardiac rehabilitation have positive effects on health outcomes. However, for patients with stroke or TIA (defined by Easton et al., 2009 as brief episodes of neurological dysfunction resulting from focal cerebral ischemia not associated with permanent cerebral infarction), insufficient data are available on the effect of lifestyle modification and current guidelines were drawn on data extrapolated from epidemiological studies or cardiac rehabilitation (Ellis, Rodger, McAlpine, & Langhorne, 2005; European Stroke Initiative Executive Committee et al., 2003; Lawrence, Kerr, Watson, Paton, & Ellis, 2010; Lennon, Galvin, Smith, Doody, & Blake, 2013; Maasland, Koudstaal, Habbema, & Dippel, 2007; Rodgers et al., 1999; Sit, Yip, Ko, Gun, & Lee, 2007). Moreover, studies have shown that the majority of people with cardiovascular disease fail to sustain lifestyle modification in the long-term.

The social cognitive theory describes how cognitive, behavioural, personal and environmental factors determine behaviour and motivation (Bandura, 1986; Wood & Bandura, 1989). One of the factors that play a central role in this process is perceived self-efficacy. Self-efficacy (a person's confidence to carry out behaviour necessary to reach a desired goal) is an important precondition for successful self-management (Bandura, 1998; Sol, van der Bijl, Banga, & Visseren, 2005) In our previous study (Brouwer-Goossensen et al., 2016), we found that self-efficacy was the strongest determinant of intention to stop smoking, increase physical activity and improve healthy diet. Self-efficacy was also a powerful predictor of intention to change in other cardiovascular studies (Garcia & Mann, 2003; Sniehotta, Scholz, & Schwarzer, 2005; Sol et al., 2005; Sol, van der Graaf, van Petersen, & Visseren, 2006; Vries, Dijkstra, & Kuhlman, 1988). It has been found to have a direct effect on health-related behaviour and is the strongest predictor of health-related behaviour change (Schwarzer & Fuchs, 1995; Vries et al., 1988). Hence, increasing self-efficacy could be a way to support health-related behaviour change in patients with TIA or ischemic stroke. Modulation of self-efficacy has proven to be effective in changing health related behaviour in patients with overweight and in healthy individuals of different ages (Bandura, 1998; Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Brouwer-Goossensen et al., 2016; Garcia & Mann, 2003; Schwarzer & Fuchs, 1995; Sniehotta et al., 2005; Sol et al., 2006; Vries et al., 1988) and is for example possible by means of self-management interventions. There is growing evidence that these self-management approaches are effective in increasing self-efficacy (Barlow et al., 2002). The literature on 'self-management' after stroke is limited. Nevertheless, a systematic meta-review based on 13 systematic reviews which studies core elements of self-management support including problem solving, decision making and goal setting found high quality evidence that therapy rehabilitation incorporating these elements delivered soon after a stroke improves ADL and extended ADL and reduces the risk of dependence and mortality. As far as we know, there is no clear evidence how to improve self-management for behaviour change in stroke patients. At present also, little is known about correlates of self-efficacy for health related behaviour change in patients with stroke or TIA and it may be different from other vascular conditions, as stroke patients are generally older and often have cognitive and/or functional impairment. Studies on self-efficacy in patients with TIA or ischemic stroke have shown that patients with high self-efficacy report significantly fewer depressive symptoms, were more likely to meet exercise recommendations, were younger and not overweight (Jones & Riazi, 2011; Korpershoek, van der Bijl, & Hafsteinsdottir, 2011; Robinson-Smith, Johnston, & Allen, 2000; Shaughnessy, Resnick, & Macko, 2006). However, these studies did not focus on health-related behaviour change. In patients with cardiovascular diseases, diabetes and smoking were related to low levels of self-efficacy (Sol et al., 2006). It is unknown yet if diabetes and smoking are associated with self-efficacy in patients with TIA or ischemic stroke as well.

Self-efficacy can be developed by mastery experiences (successes build a robust belief in one's personal efficacy), vicarious models (role models), social persuasion (social support) and psychological and emotional arousal(Bandura, 1998). Social support is therefore an important requirement for health-related behaviour change by adequate self-management (Bandura, 1998; Marks, Allegrante, & Lorig, 2005). Social support is known to influence physical activity after stroke, but it is unclear whether it has a role in improving self-efficacy (Adeniyi, Idowu, Ogwumike, & Adeniyi, 2012; Morris, Oliver, Kroll, & Macgillivray, 2012; Prout, Mansfield, McIlroy, & Brooks, 2017).On the other hand, fear and depression can also affect self-efficacy and are often present after stroke and (Dawood et al., 2008; Gerber et al., 2011). An earlier study showed that fear was independently associated with intention to change health-related behaviour (Sniehotta et al., 2005) and depression is known to influence health behaviour change in myocardial infarction patients.

At present, it is unclear how to support patients in changing health-related behaviour after TIA or ischemic stroke. Insight in the correlates of self-efficacy can be helpful by developing interventions to increase self-efficacy and thereby support patients with TIA or minor ischemic stroke with health-related behaviour change and to select patient groups on which the interventions should be focused. In this study, we aimed to describe levels of self-efficacy of health-related behaviour change and identify correlates of self-efficacy in patients with ischemic stroke or TIA.

Methods

All patients included in the present study participated in the DECIDE study. Detailed methods of the DECIDE study have been described earlier (Brouwer-Goossensen et al., 2016). In short, DECIDE was a prospective study on determinants of intention to change health-related behaviour and actual change in patients with TIA or ischemic stroke. Patients of 18 years or older with a clinical diagnosis of TIA, including amaurosis fugax, or minor ischemic stroke with a modified Rankin Scale score (mRS) 2 or less were included during admission on the stroke unit or outpatient clinic.

Baseline data

We recorded data on clinical features of TIA or ischemic stroke, quantification of stroke severity according to the National Institutes of Health stroke scale (Schlegel et al., 2003; NIHSS, a 15-item scale with scores that range from 0 to 42 and higher values indicating greater severity), demographic data, vascular risk factors and history, weight, length, BMI and use of medication. Patient were assessed at baseline (directly after inclusion) and 3 months later in the DECIDE study. However, as self-efficacy did not change in this 3-months follow up, we only used baseline data in this study. The assessment included self-reported questionnaires on self-efficacy, fear, social support, depressive symptoms, health-related behaviour and social support. Furthermore, all patients underwent a cognitive assessment. The following questionnaires were completed:

- Self-efficacy was measured with the self-efficacy scale, a 7-item scale with scores that range from 1 to 5 (Bijl, Poelgeest-Eeltink, & Shortridge-Baggett, 1999). Higher values indicate more confidence to carry out the behaviour necessary to reach the desired goal. Cronbach's α of the self-efficacy questionnaire was 0.75. This scale has been used successfully before in in vascular patients (Sol et al., 2005, 2006; Sol, van der Graaf, van der Bijl, Goessens, & Visseren, 2011; Sol, van der Graaf, van der Bijl, Goessens, & Visseren, 2008).
- Fear was assessed with eight questions. Patients were asked on a scale of 1 to 5 how nervous they are when thinking of getting another stroke, how upset they get, depressed or jittery, if their heart beats faster, an if they feel uneasy or anxiou (Champion et al., 2004).
- Social support was evaluated with the aspects of Active engagement, Protective buffering and Overprotection (ABO) social support questionnaire for Dutch coronary heart disease patients (Buunk, Berkhuysen, Sanderman, Nieuwland, & Ranchor, 1996). This questionnaire includes five statements about active involvement, eight statements concerning protective buffering and six about overprotection, of which respondents can respond on a 5-point scale, ranging from (0) 'very often' to (4) 'never'.
- Depressive symptoms were assessed with the CES-D (centre for Epidemiologic Studies Depression Scale) for both depression and anxiety (Beekman et al., 1997; Beekman, van, Deeg, Wouters, & van, 1994). Higher scores indicate more depressive symptoms.
- Physical activity was assessed with the International Physical Activity Questionnaire short (IPAQ-S) questionnaire. Patients were asked to report activities performed for at least 10 minutes during the last 7 days, and time spent in physical activity performed across leisure time, work, domestic activities and transport at each of three intensities: walking, moderate and vigorous (Plotnikoff, 1998). We used reported minutes of moderate and vigorous physical activity to calculate a total physical activity score of minutes a day. As included patients had a mRS score of 2 or less they were able to walk without assistance and look after their own affairs without assistance.
- Dietary behaviour was assessed with the short Food Frequency Questionnaire (FFF). This 14-item scale assesses the intake of saturated fatty acids, unsaturated fatty acids and fruits and vegetables over the week before the visit. An overall cardiovascular dietary score was calculated, ranging from −17 to +19, the higher the score, the more favourable the dietary pattern (Mahe et al., 2010).
- Smoking status was assessed with questions on current smoking status, how many years they have smoked and how much cigarettes a patient smokes a day. Smoking was defined as current smoking.

Table 1. Baseline characteristics and dichotomised self-efficacy at baseline and its determinants ($N = 92$).

	Overall	High	Low	*p*
Age (years), mean (SD)	64 (12)	61 (52–70)	69 (61–75)	**.02**
Sex (male), n (%)	55 (60)	38 (61)	17 (57)	.68
Event characteristics:				
Event type (TIA), n (%)	49 (53)	34 (55)	15 (50)	.67
Right hemisphere	38 (44)	13 (57)	23 (40)	.19
NIHSS scorea, median (IQ) scores from 0-42	3 (1–5)	2 (1–5)	3 (1–5)	.41
mRS, median (IQ)	1 (0–2)	1 (0–2)	1 (0–2)	.24
Vascular history, n (%)				
Vascular historyb	48 (52)	28 (45)	20 (67)	**.05**
TIA	16 (17)	13(19)	3 (13)	.47
Ischemic stroke	14 (15)	8 (12)	6 (25)	.12
Ischemic heart disease	33 (36)	21 (31)	12 (50)	.10
Atrial fibrillation	11 (12)	7 (10)	4 (17)	.41
Peripheral arterial disease	6 (7)	5 (7)	1 (4)	.59
Cognition and depression:				
MoCAc, median (IQ) scores from 0 to 30	24 (21–26)	25 (22–26)	23 (20–25)	.09
CES-Dd, median (IQ) scores from 0 to 30	7 (5–13)	7 (4–10)	13 (6–19)	**.00**
Lifestyle:				
Smoking, n(%)	32 (35)	21 (34)	10 (33)	.96
Alcohol abuse, n (%)	5 (5.6)	4 (7)	1 (3)	.54
Physical exercisee (min/day), median (IQ)	137 (62–219)	166 (73–283)	99 (42–180)	**.05**
Dietscoref, median (IQ) range –17 to +19	0 (–2 to 2)	0 (–2 to 2)	1 (–2 to 4)	.42
BMI (kg/m^2), mean (SD)	26.6 (3.6)	26.0 (3.1)	28 (4.4)	**.03**
Vascular risk factors:				
Hypertensiong, n (%)	61 (66)	39 (63)	22 (73)	.33
Systolic blood pressure (mmHg), mean (SD)	136 (23)	135 (125–145)	135 (121–148)	.64
Diastolic blood pressure (mmHg), mean (SD)	79 (13)	80 (72–89)	79.5 (70–86)	.53
Hypercholesterolemiah, n (%)	75 (82)	52 (84)	23 (77)	.41
Total cholesterol level (mmol/l), mean (SD)i		5.2 (3.9–6.1)	4.9 (4.3–5.3)	.66
Blood glucose level (mmol/l), mean (SD)j	6.0 (1.5)	5.6 (5.1–6.2)	5.7 (5.2–6.6)	.42
Diabetes Mellitusk, n (%)	28 (30)	17 (27)	11 (37)	.37
	Overall	High	Low	*p*
Fearl, median (IQ) scores from 0 to 32	16 (8–21)	13 (7–18.5)	17 (12–23)	**.02**
*Social support*l:				
Active involvement, median (IQ)	15 (12–17)	15 (12–17)	17 (10–16)	.50
Protective buffering, median (IQ)	11 (7–14)	11 (7–14.5)	12 (8–14)	.72
Overprotection, median (IQ)	7 (4–11)	6 (4–11)	9 (4–12)	.18

[a]Quantification of stroke severity according to the National Institutes of Health stroke scale (NIHSS), a 15-item scale with scores that range from 0 to 42 and higher values indicating greater severity.
[b]Classification of subtype of acute ischemic stroke developed for the Trial of Org 10172 in Acute Stroke Treatment (TOAST).
[c]Assessed with the Minimal Mental State Examination and Montreal Cognitive assessment (MoCA).
[d]Scored with the Centre for Epidemiologic Studies Depression Scale (CES-D)
[e]Measured with the International Physical Activity Questionnaire short (IPAQ-S) questionnaire.
[f]Evaluated with the short Food Frequency Questionnaire (FFF). The higher the score, the more favourable the dietary pattern.
[g]Hypertension has been defined as systolic blood pressure higher than 140 mmHg and diastolic higher than 90 mmHg or antihypertensive medication use at baseline.
[h]Hypercholesterolemia has been defined as a total cholesterol of 6.0 mmol/l and/or statine use at baseline.
[i]Measured between day 2 and 5 after admission or at visiting date of outpatient clinic
[j]Diabetes mellitus has been defined as fasting glucose level higher than 6.9 mmol/l, and/or glucose lever higher than 11 mmol/l after oral glucose in tolerance test, and/or diabetes mellitus in history and/ or antidiabetic medication use at baseline.
[k]Fear measured with 8 questions, asking on a scale of 1–5 how nervous patients are when thinking of getting another stroke, how upset they get, depressed or jittery, if their heart beats faster, they feel uneasy or anxious.
[l]Measured with the Active engagement, Protective buffering and Overprotection (ABO) social support questionnaire for Dutch coronary heart disease patients (Buunk et al., 1996).

Table 2. Self-efficacy for behaviour change.

	Baseline
Total, median (IQ)	4.3 (3.9–4.7)
Medication, median (IQ)	5 (5–5)
Smoking, median (IQ)	4 (3–5)
Diet at home, median (IQ)	5 (4–5)
Diet when not at home, median (IQ)	4 (4–5)
Physical activity, median (IQ)	5 (4–5)
Weight maintenance, median (IQ)	4 (4–5)
Weight reducing, median (IQ)	4 (3–5)

Table 3. Relations between dichotomised self-efficacy and correlates of behaviour change univariable and multivariable logistic regression analysis.

	OR (95% CI)	*p*	aOR (95% CI)	*p*
Age	0.95 (0.92–0.99)	.02	0.95 (0.90–1.00)	.07
Vascular history	0.41 (0.17–1.02)	.06	0.61 (0.19–2.05)	.43
CES-D	0.92 (0.86–0.97)	.01	0.91 (0.84–0.99)	.03
BMI	0.87 (0.77–0.99)	.03	0.79 (0.65–0.96)	.02
Fear	0.94 (0.89–0.99)	.02	0.96 (0.89–1.03)	.26
Physical activity	1.49 (1.01–2.21)	.05	1.58 (0.95–2.64)	.08

Table 4. Relations between correlates and self-efficacy, univariable and multivariable regression analysis.

	Beta (CI)	*p*	aBeta (95% CI)	*p*
Age	−0.00 (−0.02 to 0.00)	.14	−0.00 (−0.02 to 0.00)	.07
Vascular history	−0.21 (−0.48 to 0.07)	.14	0.05 (−0.21 to 0.32)	.69
CES-D	−0.04 (−0.05 to −0.02)	.00	−0.02 (−0.04 to 0.01)	.01
BMI	−0.05 (−0.09 to −0.01)	.01	−0.05 (−0.10 to −0.02)	.01
Fear	−0.03 (−0.04 to 0.01)	.00	−0.02 (−0.03 to 0.00)	.06
Physical activity	0.03 (−0.08 to 0.14)	.56	0.04 (−0.07 to 0.15)	.50

- Cognitive impairment was assessed with Montreal Cognitive assessment (MoCA), a rapid screening instrument for cognitive impairment, in particular for stroke patients (Nasreddine et al., 2005)

Statistical analysis

Self-efficacy was dichotomised into high self-efficacy and low self-efficacy based on the median self-efficacy score. Differences in demographic data, event characteristics, vascular history and risk factors, health-related behaviour, cognition, depressive symptoms, fear and social support, between low and high self-efficacy were studied with *t*-tests. Non-normal distributed data were analysed with Mann-Whitney *U* tests. We studied the relation between correlates of behaviour change and low self-efficacy with univariable logistic regression analysis. Physical activity was unequally distributed and was log transformed, before the univariable linear regression analysis. Correlates with a p value of $<.06$ were further analysed with multivariable logistic regression. The relation between correlates and continuous self-efficacy score was also analysed in univariable and multivariable linear regression. Statistical analysis was performed with STATA 12.1 statistical package (Statacorp, College Station, Texas).

Results

Ninety-two patients were included between February and October 2012. Mean age was 64 years (SD 12), 55 (60%) of the patients were male and 49 (53%) had a TIA (Table 1). Patients had a moderately healthy lifestyle; median physical exercise was 137 minutes a day (interquartile range 62–219), mean BMI was 27 (SD 3.6) and median overall diet score 0 (interquartile range −2 to 2), Only 5 (6%) patients used more alcohol than advised and 32 (35%) of the patients were smokers.

Median total self-efficacy score at baseline was 4.3 (IQR 3.9–4.7, Table 2) and self-efficacy did not change in 3 months follow-up (data not shown). Thirty patients (33%) had low self-efficacy scores for health-related behaviour change.

Older age (OR 1.05, 95% CI 1.01–1.09), depressive symptoms (OR 1.09, 95% CI 1.03–1.16), vascular history (OR 2.42, 95% CI 0.97–6.03), higher BMI (OR 1.15, 95% CI 1.01–1.30), higher fear (OR 1.06, 95% CI 1.01–1.12) and low physical activity (OR 1.49, 95% CI 1.01–2.21) were significantly associated with low self-efficacy for improving health-related behaviour change, with BMI and depressive symptoms as the strongest correlates (Tables 3 and 4).

Discussion and conclusion

In this study, we found that patients with recent TIA or ischemic stroke report high self-efficacy scores for health-related behaviour change. Older patients, and those with vascular history, more depressive symptoms scores, higher BMI, less physical activity and increased fear had lower levels of self-efficacy for health-related behaviour change. Of these prognostic factors, depressive symptoms and BMI were the strongest (Table 4).

This is one of the first studies that assessed correlates of self-efficacy for health-related behaviour change in patients with TIA a minor ischemic stroke. Self-efficacy for behaviour change appeared to be high in our patients as earlier studies using the same self-efficacy scale (Sol et al., 2011, 2008, 2006) found comparable total self-efficacy scores, but disaggregated self-efficacy scores were lower. In line with our results, two other studies showed that patients with high self-efficacy had significantly less depressive symptoms (Jones & Riazi, 2011; Korpershoek et al., 2011; Robinson-Smith et al., 2000), were more likely to meet exercise recommendations (Korpershoek et al., 2011; Shaughnessy et al., 2006; Sol et al., 2011) were younger, and not overweight (Shaughnessy et al., 2006; Sol et al., 2006). In studies with patients with vascular disease (coronary heart disease, cerebrovascular disease or peripheral artery disease) having diabetes and smoking were significantly associated with lower levels of self-efficacy in contrast to our results (Sol et al., 2006, 2011). We found only one study in which vascular history as determinant of self-efficacy for health related behaviour change was studied in patients with vascular diseases. In this cross-sectional study with 236 patients, no association between vascular history and self-efficacy was found (Sol et al., 2006). As far as we know, fear has not been studied in relation to self-efficacy for health-related behaviour change in patients with TIA or ischemic stroke or other vascular diseases. Earlier studies in general populations showed a significant interaction between threat (fear) and self-efficacy, such that threat only had an motivating effect when high efficacy is present (Peters, Ruiter, & Kok, 2013). The association between low self-efficacy scores for behaviour change and depressive symptoms has also been earlier described in general populations (Bandura, 1997; Kavanagh, 1992). Social support is considered to be an important requirement of health-related behaviour change by adequate self-management (Bandura, 1998; Marks et al., 2005), but in our study we found no relation between social support and self-efficacy.

A strength of our study is that we collected detailed information on potential correlates of self-efficacy. This included both patient characteristics and correlates of health-related behaviour change. Our study also has some limitations. First, we studied patients for a relatively short period of time after their TIA or minor ischemic stroke. In this period, patients possibly did not adequately appraise their situation. On one hand this effect may not be very strong, because self-efficacy did not change over a period of 3 months. On the other hand, patients often rehabilitate in the first months after discharge. The positive feed-back and support in this period can provide a boosting effect on self-efficacy. Second, self-efficacy for health-related behaviour change appeared to be high in patients with TIA or minor ischemic stroke. The self-efficacy scale used in our study has only been applied in three earlier studies by Sol et al. (2006, 2008, 2011) in patients with symptomatic vascular diseases (cerebrovascular disease, abdominal aortic aneurysm or peripheral arterial disease). In these studies, total self-efficacy was comparable to our findings, but disaggregated self-efficacy scores were lower. Furthermore, social desirability bias during questionnaire completion may also have played a role as self-efficacy is high in these patients where our earlier study showed that most patients do not actually change their behaviour, due to the intention-behaviour gap (Brouwer-Goossensen et al., 2016; Sheeran, 2002). Sol et al. (2008) described how subsequent underestimation of the difficulty of self-management of vascular risk can be another explanation for high self-efficacy scores. The questions seem simple, causing high scores while the tasks are very difficult. We analysed several correlates in this study which can lead to type 1 errors. Also it cannot be completely excluded that our results were affected by possible confounders. Although for instance the low mRs and NIHSS suggests that these patients are mildly or not impaired, factors such as fatigue, visual loss or inactivity can affect the relation between physical activity and self-efficacy as well. There was also a small (but not significant difference) in cognition between patients with high-self efficacy and low self-efficacy. However, in linear regression analysis (adjusted for age, data not shown) we found no significant relation between self-efficacy and cognition.

The results of our study suggest that vulnerable patients have lower self-efficacy scores. Older patients often experience more physical discomfort that may result in feeling less confident. Also vascular history or depressive symptoms can affect the patients' perception of their physical and mental capability, resulting in low self-efficacy. Patients with higher fear had lower self-efficacy levels. In contrast to our study, a meta-analysis of fear studied in different populations and different behaviours has shown a significant interaction between threat (fear) and efficacy, in these studies threat only had a motivating effect when high efficacy is present (Peters et al., 2013). Possibly, fear results in counterproductive behaviour in our patients, and leads to avoidance- or denial-based forms of coping, explaining the association with low self-efficacy. We expected social support to play a role in building self-efficacy, as it plays a role in self-management. However, we found no relation between social support and self-efficacy. Possibly social support influences self-management in a different kind than by improving self-efficacy. For example, the effect of old age, vascular history and fear on self-efficacy can be so intense that the social support patients experience cannot compensate the effects of these correlates.

At present, the mechanism of building self-efficacy is not completely clear. On the one hand, factors as vascular history, age, depressive symptoms and fear can influence self-efficacy. On the other hand, self-efficacy may influence these factors as well. For example, lack of confidence and low self-efficacy can possibly lead to less control of health-related related behaviour resulting in overweight, less physical activity and continuing smoking. Vice versa, being overweight, less physical active or not being able to quit smoking can also affect the sense of control over one's life with consequently low self-efficacy.

Self-efficacy is an important precondition for behaviour change. Therefore, increasing self-efficacy could be a way to support health behaviour change in patients with TIA or ischemic stroke. As far as we know, a few studies focused on improving self-efficacy or self-management in patients with TIA or ischemic stroke (Huijbregts, Myers, Streiner, & Teasell, 2008; Johnston et al., 2007; Jones, Mandy, & Partridge, 2009; Kendall et al., 2007), but we identified only one study which focused on self-efficacy for health-related behaviour change (Sol et al., 2008). In this study, self-efficacy for healthy food and physical exercise improved by the nursing intervention. As self-efficacy can be developed by mastery experiences (successes build a robust belief in one's personal efficacy), vicarious models (role models), social persuasion (social support) and psychological and emotional arousal (Bandura, 1998), these self-management programs should be built on these factors. Motivational interviewing can also be used to help patients exercise more, lose weight, reduce problematic substance use and stimulate self-efficacy in their ability to make health-related behaviour changes(Lundahl et al., 2013).

Our study provides insight in self-efficacy and factors associated with self-efficacy in patients with a recent TIA or minor ischemic stroke. Future studies should focus on interventions that can influence self-efficacy and should focus on the effects of supporting these patients in health-related behaviour change by increasing self-efficacy.

In the development of interventions to support patients in health behaviour change after TIA or ischemic stroke, the correlates of self-efficacy can be taken into account. Patients of older age, vascular history, more depressive symptoms scores, low physical activity, higher BMI and increased fear deserve additional attention in these programs, for example by extra visits or more intense support. Self-efficacy can be easily measured and could provide an early and direct indication of patients' capability to change and the intensity of support needed. Therefore, a tailored self-management program using motivational interviewing could be a very promising method to support patients in health-related behaviour change after TIA or ischemic stroke.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Adeniyi, A., Idowu, O., Ogwumike, O., & Adeniyi, C. (2012). Comparative influence of self-efficacy, social support and perceived barriers on low physical activity development in patients with type 2 diabetes, hypertension or stroke. *Ethiopian Journal of Health Sciences*, *22*(2), 113–119.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W.H. Freeman Company.

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology & Health*, *13*(4), 623–649.

Barlow, J., Wright, C., Sheasby, J., Turner, A., & Hainsworth, J. (2002). Self-management approaches for people with chronic conditions: a review. *Patient Education and Counseling*, *48*(2), 177–187.

Beekman, A. T., Deeg, D. J., van, L. J., Braam, A. W., De Vries, M. Z., & van, T. W. (1997). Criterion validity of the Center for Epidemiologic Studies Depression scale (CES-D): results from a community-based sample of older subjects in The Netherlands. *Psychological Medicine*, *27*(1), 231–235.

Beekman, A. T., van, L. J., Deeg, D. J., Wouters, L., & van, T. W. (1994). [A screening tool for depression in the elderly in the general population: the usefulness of Center for Epidemiological Studies Depression Scale (CES-D)]. *Tijdschrift voor Gerontologie en Geriatrie*, *25*(3), 95–103.

Bijl, J. V., Poelgeest-Eeltink, A. V., & Shortridge-Baggett, L. (1999). The psychometric properties of the diabetes management self-efficacy scale for patients with type 2 diabetes mellitus. *Journal of Advanced Nursing*, *30*(2), 352–359.

Brouwer-Goossensen, D., Genugten, L. V., Lingsma, H., Dippel, D., Koudstaal, P., & Hertog, H. D. (2016). Determinants of intention to change health-related behavior and actual change in patients with TIA or minor ischemic stroke. *Patient Education and Counseling*, *99*(4), 644–650.

Buunk, B. P., Berkhuysen, M. A., Sanderman, R., Nieuwland, W. & Ranchor, A. V. (1996). Actieve betrokkenheid, beschermend bufferen en overbescherming. *Gedrag & Gezondheid*, *24*, 304–312.

Champion, V. L., Skinner, C. S., Menon, U., Rawl, S., Giesler, R. B., Monahan, P., & Daggy, J. (2004). A breast cancer fear scale: psychometric development. *Journal of Health Psychology*, *9*(6), 753–762.

Dawood, N., Vaccarino, V., Reid, K. J., Spertus, J. A., Hamid, N., Parashar, S., & Investigators, P. R. (2008). Predictors of smoking cessation after a myocardial infarction: the role of institutional smoking cessation programs in improving success. *Archives of Internal Medicine*, *168*(18), 1961–1967.

Easton, J. D., Saver, J. L., Albers, G. W., Alberts, M. J., Chaturvedi, S., Feldmann, E., … Interdisciplinairy council on peripheral vascular, D. (2009). Definition and evaluation of transient ischemic attack: a scientific statement for healthcare professionals from the American Heart Association/American Stroke association Stroke Council; Council on Cardiovascular Surgery and Anesthesia; Council on Cardiovascular Radiologyand Intervention; Council on Cardiovascular Nursing; and the Interdisciplinary council on Peripheral Vascular Disease; The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists. *Stroke*, *40*(6), 2276–2293.

Ellis, G., Rodger, J., McAlpine, C., & Langhorne, P. (2005). The impact of stroke nurse specialist input on risk factor modification: a randomised controlled trial. *Age and Ageing*, 34(4), 389–392.

European Stroke Initiative Executive Committee, EUSI Writing Committee, Olsen, T. S., Langhorne, P., Diener, H. C., Hennerici, M., Bath, P. (2003). European Stroke Initiative Recommendations for Stroke Management-update 2003. *Cerebrovascular Diseases*, *16*(4), 311–337.

Garcia, K., & Mann, T. (2003). From 'i wish' to 'i will': social-cognitive predictors of behavioral intentions. *Journal of Health Psychology*, *8*(3), 347–360.

Gerber, Y., Koren-Morag, N., Myers, V., Benyamini, Y., Goldbourt, U., Drory, Y., & Israel Study Group on First Acute Myocardial Infraction. (2011). Long-term predictors of smoking cessation in a cohort of myocardial infarction survivors: a longitudinal study. *European Journal of Cardiovascular Prevention & Rehabilitation*, *18*(3), 533–541.

Huijbregts, M. P., Myers, A. M., Streiner, D., & Teasell, R. (2008). Implementation, process, and preliminary outcome evaluation of two community programs for persons with stroke and their care partners. *Topics in Stroke Rehabilitation*, *15*(5), 503–520.

Johnston, M., Bonetti, D., Joice, S., Pollard, B., Morrison, V., Francis, J. J., & Macwalter, R. (2007). Recovery from disability after stroke as a target for a behavioural intervention: results of a randomized controlled trial. *Disability and Rehabilitation*, 29(14), 1117–1127.

Jones, F., Mandy, A., & Partridge, C. (2009). Changing self-efficacy in individuals following a first time stroke: preliminary study of a novel self-management intervention. *Clinical Rehabilitation*, *23*(6), 522–533.

Jones, F., & Riazi, A. (2011). Self-efficacy and self-management after stroke: a systematic review. *Disability and Rehabilitation*, *33*(10), 797–810.

Kavanagh, D. J. (1992). *Self-efficacy and depression*. New York, NY: Taylor and Francis.

Kendall, E., Catalano, T., Kuipers, P., Posner, N., Buys, N., & Charker, J. (2007). Recovery following stroke: the role of self-management education. *Social Science and Medicine*, *64*(3), 735–746.

Korpershoek, C., van der Bijl, J., & Hafsteinsdottir, T. B. (2011). Self-efficacy and its influence on recovery of patients with stroke: a systematic review. *Journal of Advanced Nursing*, 67(9), 1876–1894.

Lawrence, M., Kerr, S., Watson, H., Paton, G., & Ellis, G. (2010). An exploration of lifestyle beliefs and lifestyle behaviour following stroke: findings from a focus group study of patients and family members. *BMC Family Practice*, 11, 97.

Lennon, O., Galvin, R., Smith, K., Doody, C., & Blake, C. (2013). Lifestyle interventions for secondary disease prevention in stroke and transient ischaemic attack: a systematic review. *European Journal of Preventive Cardiology*, 21(8), 1026–1039.

Lundahl, B., Moleni, T., Burke, B. L., Butters, R., Tollefson, D., Butler, C., & Rollnick, S. (2013). Motivational interviewing in medical care settings: a systematic review and meta-analysis of randomized controlled trials. *Patient Education and Counseling*, *93*(2), 157–168.

Maasland, E., Koudstaal, P. J., Habbema, J. D., & Dippel, D. W. (2007). Effects of an individualized multimedia computer program for health education in patients with a recent minor stroke or transient ischemic attack - a randomized controlled trial. *Acta Neurologica Scandinavica*, *115*(1), 41–48.

Mahe, G., Ronziere, T., Laviolle, B., Golfier, V., Cochery, T., De Bray, J. M., & Paillard, F. (2010). An unfavorable dietary pattern is associated with symptomatic ischemic stroke and carotid atherosclerosis. *Journal of Vascular Surgery*, *52*(1), 62–68.

Marks, R., Allegrante, J. P., & Lorig, K. (2005). A review and synthesis of research evidence for self-efficacy-enhancing interventions for reducing chronic disability: implications for health education practice (part I). *Health Promotion Practice*, *6*(1), 37–43.

Morris, J., Oliver, T., Kroll, T., & Macgillivray, S. (2012). The importance of psychological and social factors in influencing the uptake and maintenance of physical activity after stroke: a structured review of the empirical literature. *Stroke Research and Treatment*, 2012, 195249.

Nasreddine, Z. S., Phillips, N. A., Bedirian, V., Charbonneau, S., Whitehead, V., Collin, I., & Chertkow, H. (2005). The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. *Journal of American Geriatrics Society*, *53*(4), 695–699.

Peters, G. J. Y., Ruiter, R. A. C., & Kok, G. (2013). Threatening communication: a critical re-analysis and a revised meta-analytic test of fear appeal theory. *Health Psychology Review*, 7, S8–S31.

Plotnikoff R, H. N. (1998). Protection motivation theory and the prediction of exercise and low-fat diet behaviors among Australian cardiac patients. *Psychology and Health*, *13*(3), 411–429.

Prout, E. C., Mansfield, A., McIlroy, W. E., & Brooks, D. (2017). Patients' perspectives on aerobic exercise early after stroke. *Disability and Rehabilitation*, *39*(7), 684–690.

Robinson-Smith, G., Johnston, M. V., & Allen, J. (2000). Self-care self-efficacy, quality of life, and depression after stroke. *Archives of Physical Medicine and Rehabilitation*, *81*(4), 460–464.

Rodgers, H., Atkinson, C., Bond, S., Suddes, M., Dobson, R., & Curless, R. (1999). Randomized controlled trial of a comprehensive stroke education program for patients and caregivers. *Stroke*, *30*(12), 2585–2591.

Schlegel, D., Kolb, S. J., Luciano, J. M., Tovar, J. M., Cucchiara, B. L., Liebeskind, D. S., & Kasner, S. E. (2003). Utility of the NIH Stroke Scale as a predictor of hospital disposition. *Stroke*, *34*(1), 134–137.

Schwarzer, R., & Fuchs, R. (1995). *Changing risk behaviors and adopting health behaviord: The role of self-efficacy beliefs* (pp. 259–288). Cambridge, UK: Cambrige University Press. (Self-efficacy in changing societies, Bandura).

Shaughnessy, M., Resnick, B. M., & Macko, R. F. (2006). Testing a model of post-stroke exercise behavior. *Rehabilitation Nursing*. *31*(1), 15–21.

Sheeran, P. (2002). Intention-behavior relations: a conceptual and empirical review. *European Review of Social Psychology*, 12(1), 1–36.

Sit, J. W., Yip, V. Y., Ko, S. K., Gun, A. P., & Lee, J. S. (2007). A quasi-experimental study on a community-based stroke prevention programme for clients with minor stroke. *Journal of Clinical Nursing*, *16*(2), 272–281.

Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2005). Bridging the intention-behaviour gap: planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology & Health*, *20*(2), 143–160.

Sol, B. G., van der Bijl, J. J., Banga, J. D., & Visseren, F. L. (2005). Vascular risk management through nurse-led self-management programs. *Journal of Vascular Nursing 23*(1), 20–24.

Sol, B. G., van der Graaf, Y., van der Bijl, J. J., Goessens, N. B., & Visseren, F. L. (2006). Self-efficacy in patients with clinical manifestations of vascular diseases. *Patient Education and Counseling*. *61*(3), 443–448.

Sol, B. G., van der Graaf, Y., van der Bijl, J. J., Goessens, B. M., & Visseren, F. L. (2008). The role of self-efficacy in vascular risk factor management: a randomized controlled trial. *Patient Education and Counseling*. *71*(2), 191–197.

Sol, B. G., van der Graaf, Y., van Petersen, R., & Visseren, F. L. (2011). The effect of self-efficacy on cardiovascular lifestyle. *European Journal of Cardiovasc Nursing*, *10*(3), 180–186.

Vries, H. D., Dijkstra M, Kuhlman P. (1988). Self-efficacy: the third factor besides attitude and subjective norm as a predictor of behavioural intentions. *Health Education Research*, *3*(3), 272–282.

Wood, R., & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of Management Review*, *14*(3), 361–384.