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PSYCHOMETRIC PROPERTIES OF THE STROKE AND APHASIA QUALITY OF LIFE SCALE (SAQOL-39) IN A GENERIC STROKE POPULATION

Abstract

Background: We previously developed the Stroke and Aphasia Quality of Life scale (SAQOL-39) and tested it with people with chronic aphasia. A scale allowing comparisons of quality of life between people with versus without aphasia post-stroke would be of value to clinicians.

Objectives: To evaluate the psychometrics of the SAQOL-39 in a generic stroke sample. Should this process result in a generic-stroke version of the scale (SAQOL-39g), a further aim is to compare the latter and the SAQOL-39 as tested in chronic aphasia.

Design and subjects: Repeated measures psychometric study, evaluating internal consistency, test-retest reliability, construct validity and responsiveness to change. People admitted to hospital with a first stroke were assessed two-weeks, three-months and six-months post-stroke.

Measures: SAQOL-39, NIH Stroke Scale, Barthel, Frenchay Aphasia Screening Test, General Health Questionnaire-12, Frenchay Activities Index.

Results: Of 126 eligible participants, 96(76%) participated and 87(69%) were able to self-report and are presented here. Testing the SAQOL-39 in generic stroke resulted in the SAQOL-39g, which has the same items as the SAQOL-39 but three domains: physical, psychosocial, communication. The SAQOL-39g showed good internal consistency (α=.95 overall score, .92-.95 domains), test-retest reliability (*ICC*=.96 overall, .92-.98 domains), convergent (*r*=.36-.70 overall, .47-.78 domains) and discriminant validity (*r*=.26 overall, .03-.40 domains). It differentiated people by stroke severity and VAS-defined quality of life. Moderate changes (*d*=.35-.49; *SRM*=.29-.53) from two-weeks to six-months supported responsiveness.

Conclusions: The SAQOL-39g demonstrated good reliability, validity and responsiveness to change. It can be used to evaluate quality of life in people with and without aphasia post-stroke.

Health-related quality of life (HRQL) reflects the impact of a health state on a person's ability to lead a fulfilling life[1] and generally incorporates the individual's subjective evaluation of their physical, mental/emotional, family and social functioning. It is multidimensional and subjective in nature. Stroke rehabilitation programmes aim to produce changes in people's sense of well-being and quality of life[2]. Although a number of scales have been developed over the past decade to assess stroke-specific quality of life[3-5], most have been evaluated for psychometric properties in samples of people with stroke that excluded people with aphasia. As people with aphasia are often amongst the most severely affected stroke survivors, with studies documenting high levels of depression[6] and social exclusion[7] and low levels of leisure and other social activities[8], social contacts[9] and quality of life[10, 11], excluding people with aphasia may lead to a positively biased picture of the impact of stroke.

There is a need for a stroke-specific measure of HRQL that is appropriate for use in both people with and without aphasia. Such a measure would allow the inclusion of people with aphasia in stroke outcome studies and comparisons of quality of life between stroke people who have versus do not have aphasia. We aimed to address this need by testing a stroke-specific HRQL scale (the Stroke and Aphasia Quality of Life Scale, SAQOL-39) in a generic stroke sample which included people with and people without aphasia.

The SAQOL-39 was developed by adapting it for use for people with aphasia from the Stroke Specific Quality of Life scale (SS-QOL)[4]. It showed good psychometric properties in a sample of people with chronic aphasia (n=83; ≥ 1 year post-stroke)[12]. It taps the participant's subjective evaluation of functioning in four domains: physical (e.g., 'how much trouble did you have walking?'), psychosocial (e.g., 'did you feel that you were a burden to your family?'), communication (e.g., 'how much trouble did you have finding the word you wanted to say?') and energy (e.g., 'did you feel too tired to do what you wanted to do?'). The SAQOL-39 contains 39 items, each of which is scored on a 5-point scale (two response formats: 1=could not do it at all, 5=no trouble at all; 1=definitely yes, 5=definitely no), and provides an overall score and four domain scores (based on the mean score across items; score range1 to 5). High scores indicate better HRQL.

The primary objective of this study was to evaluate the psychometric properties of the SAQOL-39 in a stroke population, which included people with and without aphasia. This process resulted in a modified version of the scale, the SAQOL-39 generic stroke (SAQOL-39g). We report results on the acceptability, reliability, validity and responsiveness to change of the SAQOL-39g and draw comparisons with the SAQOL-39 tested in chronic aphasia.[12]

METHODS

Design and participants

We carried out a repeated measures cohort study in which people from two Acute Stroke Units based in teaching hospitals were followed for six months. Recruitment took place over a 15-month period in the first unit and a 6-month period in the second. People over 18 years of age who were admitted with a first ever stroke and stayed in hospital at least three days because of the stroke were eligible to take part. People were excluded if they: did not live at home prior to the stroke; had a known history of mental health problems or cognitive decline prior to the stroke; had other severe or potentially terminal co-morbidity; were unable or too unwell to give informed consent; or did not speak English premorbidly (according to self and/or family reports). Participants were interviewed at two weeks, three months and six months (± one week) post-stroke. Test-retest reliability data were collected from one Unit during three 4-month assessment periods. Participants in the retest sample were post-stroke two weeks, three months and six months, respectively, at the three assessment periods. The test-retest interval was seven ± four days.

Procedure and measures

The study was approved by the relevant National Health Service (NHS) Local Research Ethics Committees. All participants provided written informed consent. Figure one highlights participant flow in the study. Stroke severity was determined using the National Institute for Health Stroke Scale (NIHSS)[13]. The Frenchay Aphasia Screening Test (FAST)[14] was used to screen for aphasia. A score ≥ 7/15 on the receptive subtests of the FAST is the cut-off score for self-completion of the SAQOL-39[12, 15]. This means that people with severe *receptive* aphasia cannot self-report on the SAQOL-39, whereas all other people with aphasia can. Those with severe receptive aphasia were asked to nominate a significant other (proxy), who then completed the questionnaires on their behalf. The proxy answered questions as they thought the person with aphasia would have done (proxy responses). Proxy findings are not reported here.

Participants who scored ≥ 7/15 on the receptive subtests of the FAST then completed the following measures for the purposes of this study, in an interview format: the SAQOL-39, the General Health Questionnaire - 12 item (GHQ-12)[16], the Frenchay Activities Index (FAI)[17], the Barthel Index (BI)[18], and a single visual analogue scale (VAS) to assess HRQL after stroke. When necessary, e.g. due to fatigue, the interview was completed over more than one session.

[Figure 1 about here]

Psychometric evaluation and data analysis

Standard psychometric methods[19, 20] were used to evaluate acceptability, internal consistency, test-retest reliability, construct validity (convergent, discriminant and known groups) and responsiveness to change, using a framework developed by Lamping and colleagues[21]. The following criteria were used.

Acceptability, internal consistency and test-retest reliability

Missing data should be <10%; floor/ceiling effects should be <80%; and skewness values should range between 1 and -1 for 75% of items (as some skewness is expected post-stroke). Criteria for internal consistency were: Cronbach's alpha >.70 and item total correlations ≥.30; and for test-retest reliability: intra-class correlation coefficients (ICC) >.75.

Construct validity

Internal: Criteria for within scale analyses were: moderate correlations between domains and overall score and between domains; and evidence from factor analysis that a single construct is being measured and of a conceptually clear factor model. Specific criteria were: in unrotated Principal Components Analysis (PCA) items should load >.20 on the first component; in rotated Principal Axis Factoring (PAF) items should load ≥ .40 and not crossload (i.e., load on two or more factors with values ≥ .40 and with a difference of <.20 between them)[22], and there should be at least 3 items per factor.

External: We evaluated known group differences by testing two hypotheses: SAQOL-39g scores will be higher for people with less severe strokes and for those who score their HRQL high on a single visual analogue scale. Participants were classified in stroke severity groups based on their National Institute for Health Stroke Scale scores. Those scoring 0-1 had a normal/near normal stroke, 2-4 minor stroke, 5-15 moderate stroke, 16+ severe stroke. At 6-months post-stroke no participant was classified as severe. Participants were also split into three groups based on how they rated their HRQL after stroke on a single visual analogue scale going from 0 to 100: low (0-33), moderate (34-66) and high (67-100).

Convergent and discriminant validity hypotheses were: SAQOL-39g overall scores will correlate more highly with measures of stroke severity (NIHSS), psychological distress (GHQ-12), physical ability (BI) and activity (FAI) than with the aphasia measure (FAST). Physical domain scores will correlate more highly with the measures of stroke severity, physical ability and activity than with the psychological distress and the aphasia measure. Psychosocial domain scores will correlate more highly with the psychological distress measure than with the measures of severity, physical ability, activity and aphasia. Lastly, communication domain scores will correlate more highly with the aphasia measure than with the stroke severity, physical ability and activity measures.

Responsiveness

Effect sizes and Standardised Response Means (SRMs) were used to evaluate responsiveness to change from two weeks to three months and six months. We anticipated larger effect sizes and SRMs from two weeks to three months, and two weeks to six months than for three months to six

months. Between two weeks and three months, we also anticipated larger effect sizes and SRMs for the overall score and the physical and communication scores than for the psychosocial score. We also anticipated that the SAQOL-39g physical and communication effect sizes and SRMs would be smaller than those of the functioning measures (BI, FAST), whereas those of the psychosocial domain would be similar to the GHQ-12.

Analyses of test–retest reliability and responsiveness to change used data from all three assessment points. All other psychometric analyses were performed on the six month post-stroke data to allow comparisons with the validation data of people with chronic aphasia[12].

RESULTS

Participants

A total of 126 eligible people were identified and 96 (76%) agreed to take part. Nine participants with severe receptive aphasia required proxy respondents; results for these people are not reported here. Table one presents the characteristics of the 87 (69%) participants who took part in this study. Seventy five participants (86%) had an ischaemic stroke, 65 (75%) were white, 52 (60%) were male and 45 (52%) were married/have a partner. They ranged in age from 18-91 [mean(SD) = 69.7 (14.1)] and 63 (73%) had two or more co-morbid conditions. Of the 87 participants, 76 (87%) were followed-up at three months and 71 (82%) at six months post-stroke. At six months, participants' characteristics were similar to the overall sample, with 52 (73%) being white, 40 (56%) being male and 38 (54%) being married/having a partner. They ranged in age from 18-91 (mean 69.3 ±14.2) and 72% had two or more co-morbid conditions.

Stroke severity improved across time, with participants having a mean (SD) stroke scale score of 5.91 (4.4) at two weeks post stroke, as opposed to 2.04 (2.72) at three months and 1.51 (2.12) at six months. Communication impairment also improved across time. Early post stroke, the aphasia screening test (FAST) total score (SD) was 25.92 (5.28), which rose to 27.72 (3.58) at three months and 27.57 (4.24) at six months. The presence of aphasia was determined using FAST cut-off scores (Enderby et al., 1989): age up to 60, 27/30 points; age 61+, 25/30 points. For those for whom an overall score could not be calculated (e.g., did not do writing section due to hemiparesis), we used short FAST cut-off scores (which comprise only the auditory comprehension and expression scores): age 20-60, 17/20 points; age 61-70, 16/20 points; age 71+, 15 points. For those for whom no FAST score could be calculated (two blind participants, and two, four and three participants with missing data at two weeks, three months and six months post-stroke, respectively), we used the NIHSS aphasia item: researchers scored the participants as aphasic or non aphasic. At two weeks post-stroke, 32 participants (37%) had aphasia and at six months 11 (16%).

Thirty-two participants were invited to participate in the test-retest reliability subsample; 18 (56%) completed both assessments. Seven were two weeks post-stroke, six were three months and five were six months post-stroke. Of the 14 who did not participate, nine declined and five were unable to be interviewed within the seven ± four day test-retest interval. In the test-retest subsample, 12 (67%) were male, 15 (83%) were white and 11 (61%) were married/had a partner. Six people had aphasia (33%) and only one person had a haemorrhagic stoke. Their mean age was 66.2 ± 12.5.

[Table 1 about here]

Psychometric properties

Table two summarises the psychometric properties of the SAQOL-39g compared with those of the SAQOL-39 tested in our previous study of people with chronic aphasia.[12]

In terms of acceptability, no items showed floor effects. Five items – all from the communication domain - showed ceiling effects. Two items marginally failed the criterion for missing data (11.3%). Fifteen items (38.46%) were negatively skewed. There were no missing data and no floor or ceiling effects in the overall and domain SAQOL-39g scores.

The SAQOL-39g showed high internal consistency: Cronbach's alphas were .95 for the overall score and .92 to .95 for domain scores. Item total correlations ranged from .35 to .78 (overall) and from .50 to .85 (domains). Test-retest reliability was good for both the overall (*ICC* = .96) and domain scores (*ICC* = .92-.98).

In terms of internal validity, as hypothesised, inter-correlations between domains were moderate (*r* = .26 to .50). Correlations between domain and overall scores were moderate between the communication domain and overall score (*r* = .52), but higher than expected between the physical (*r* = .84) and psychosocial (*r* = .88) domains and overall score. On PCA, all items loaded > .30 on the first component, confirming that a single construct is being measured. We expected factor analysis to show a similar domain structure between the SAQOL-39g and SAQOL-39. The best model for the SAQOL-39g explained 56.03% of the variance and showed three conceptually clear domains: physical, psychosocial and communication (Table three). One item crossloaded (M4). All items loaded > .40 on a factor, except for item SR5 = .37. Thus, the factor structure of the SAQOL-39g differed from the SAQOL-39 in the following ways: all four items of the energy domain of the SAQOL-39 (T4: having to write things down to remember; E2: feeling tired often; E3: having to stop and rest often; E4: feeling too tired to do what you want) grouped with the psychosocial domain in the SAQOL-39g; and item SR7 on the effect of physical problems on social life moved from the physical to the psychosocial domain.

[table 2 about here]

[table 3 about here]

Results, as shown in table two, supported the external validity of both overall (convergent r = .36-70; discriminant r = .26) and domain scores (convergent r = .47-.78; discriminant r = .03-.40). They also confirmed the hypothesis of better HRQL in people with less severe stroke. Mean (SD) SAQOL-39g scores were significantly different [$F(2,64) = 9.63$, $p<.001$] between those with normal/near normal stroke severity [4.18 (.66); n = 43], minor strokes [3.44 (.37); n = 18] and moderate stroke [3.39 (.85); n = 6]. Pairwise comparisons with Tukey correction showed a significant difference in SAQOL-39g scores for those with normal/near normal vs. minor stroke severity ($p<.001$) and vs moderate stroke severity ($p<.05$) and no significant differences between people with minor vs. moderate stroke. There were significant differences [$F(2,55) = 10.32$, $p<.001$] in mean (SD) SAQOL-39g scores between groups whose VAS-rated HRQL was high [4.14 (.65); n=32], moderate [3.46 (.60); n=21] and low [3.09 (.84); n=5]. On pairwise comparisons with Tukey correction, people who reported high VAS-rated HRQL had significantly higher SAQOL-39g scores than those who reported moderate ($p<.001$) and low ($p<.01$) VAS-rated HRQL. The difference between people who reported moderate and low VAS-rated HRQL was not significant.

Table four shows SAQOL-39g overall and domain scores, at two weeks, three months and six months post-stroke. Effect sizes and SRMs are shown in table five and support the responsiveness to change of the scale. With the exception of the psychosocial domain, SAQOL-39g scores improved moderately from two weeks to three months (d = .25 - .46, SRM = .38 - .64). All SAQOL-39g scores improved moderately from two weeks to six months (d = .35 - .49, SRM = .29 - .53). As expected, there were small changes in SAQOL-39g scores between three months and six months (d = .05 - .16, SRM = .07 - .21). Not surprisingly, Barthel scores showed the most change over time, with large improvements between two weeks and both three and six months, and small improvement between three and six months. FAST and GHQ-12 effect sizes and SRMs showed similar patterns of change with the SAQOL-39g communication and psychosocial scores respectively, but tended to be larger.

[table 4 about here]

[table 5 about here]

Comparison with SAQOL-39

We produced the SAQOL-39g based on our evaluation of the SAQOL-39 in a generic stroke population. The SAQOL-39g includes the same items as the SAQOL-39, but items are grouped into three rather than four domains. We reanalysed SAQOL-39 data obtained in our previous study of people with chronic aphasia[12], imposing the three domain structure of the SAQOL-39g (Table two). Results showed that, in our previous sample of people with chronic aphasia, the imposed 3-domain structure has good acceptability (no floor/ceiling effects at item and scale level), internal consistency (Cronbach's alpha .93 overall, .85 - .94 domains) and test-retest reliability (*ICC* = .98 overall, .94 - .98 domains). Factor analysis offered moderate support for the imposed 3-domain structure, explaining 43.52% of the variance, with one item crossloading (SR7) and three items loading below .40 (T4 = .32, T5 = .39, SR5 = .32). There was good evidence of convergent (*r* = .53-.67) and discriminant (*r* = .06 - .38) validity.

DISCUSSION

We evaluated the psychometric properties of the SAQOL-39 in a generic stroke population, comprising people with and without aphasia. We produced the SAQOL-39 generic stroke scale (SAQOL-39g) which measures health-related quality of life after stroke in three domains: physical, psychosocial and communication. The SAQOL-39g demonstrated good internal consistency, test-retest reliability and validity and adequate responsiveness to change in our sample of people with sub-acute to long-term stroke (two weeks to six months post stroke). We also re-analysed the SAQOL-39 data of people with chronic aphasia, imposing the 3-domain structure of the SAQOL-39g with good results. Our findings suggest that the SAQOL-39g can be used to evaluate health-related quality of life in stroke survivors with and without aphasia. We will raise the limitations of this study before discussing our findings in more detail and raising their clinical implications

One limitation of the study was the low response rate in the test-retest reliability testing. Of 32 participants asked, 18 provided data. This was because the re-test required an extra visit from the researchers. As the participants already gave a considerable amount of time to this project (at a minimum three one-hour interviews), many were reluctant to do the re-test, partly due to the tight time-scale involved. Another issue was that of the 87 people that were recruited, 71 completed the study at six months post stroke. Still, considering that stroke studies tend to have high attrition rates, we managed to follow up 82% of our sample.

In relation to the SAQOL-39g, two of its items had high missing data (11.3%). These items asked about preparing food and finishing jobs that one started. Some people felt these were not applicable to them (e.g. "my wife does all the cooking", "I don't do anything anymore, I don't do any jobs"). These items just failed the 10% criterion for missing data and we decided to keep them in the scale as they added to its content validity. Moreover, although the overall acceptability of the SAQOL-39g was good, at the item level, five items from the communication domain showed ceiling effects. This

pattern is similar in other stroke scales such as the Stroke Impact Scale (SIS)[3] and the SS-QOL (ceiling effects of communication domain 35% and 37%, respectively). People without aphasia scored highly on these items, as they do not have language difficulties. Within the subgroup of people with aphasia, four out of five of these items were well distributed.

One of the strengths of the study was that our sample characteristics were similar to the stroke population of the UK, with the majority at the time of enrolment being male (60%) and over 65 years old (76%). We also managed to include the majority of people with aphasia, with the exception of people with severe receptive aphasia. We chose materials carefully and modified their format to make them more accessible to people with aphasia. Data was collected in an interview format by interviewers trained in communicating with people with aphasia.

Looking at our findings in more detail, the SAQOL-39g showed good internal consistency and test-retest reliability. Our results compare favourably with those of the SIS (test-retest *ICC* = .57 - .92) and the Newcastle Stroke-specific Quality of Life measure (NEWSQOL)[5] (*ICC* = .78 - .92). The SAQOL-39g also showed good validity. Items grouped into conceptually clear domains and the physical and psychosocial domains contributed more to the overall score than the communication domain. The SAQOL-39g differentiated people by stroke severity and VAS-rated HRQL. There was good evidence for convergent and discriminant validity. In comparison, the convergent validity of the SS-QOL language, social roles and thinking domains and the NEWSQOL cognition domain is low.

In terms of responsiveness to change, our results are in line with the reported low to moderate improvements in quality of life after stroke[23] and the natural pattern of recovery after stroke[24, 25]. There is greater improvement in the SAQOL-39g physical and overall scores between acute stroke and three months, with changes beginning to plateau between three months and six months. The pattern is similar for the communication domain, although the *SRM* = .21 between three months and six months suggests that people's perception of their language skills continues to slowly improve. The pattern for the psychosocial domain where moderate effect sizes were observed only between two weeks and six months post-stroke, suggests that psychosocial well-being takes longer to improve post-stroke. Results were similar for the SIS in which significant differences were reported between one month and three months and one month and six months but not between three months and six months, on most domains. Similarly to our study, the emotion domain of the SIS only showed a significant difference between one month and six months.

As expected, the SAQOL-39g physical and communication domain effect sizes and standardised response means are lower than those of the relevant measures of functioning, i.e., the Barthel Index and the aphasia measure (FAST). This supports our original hypothesis which reasoned that the

SAQOL-39g change scores will be lower, as the measure taps on participants' perception and feelings about their functioning rather than functioning itself. However, it is noted that the psychosocial domain of the SAQOL-39g demonstrated lower responsiveness to change than the psychological distress measure (GHQ-12). Still, the similar patterns of change between the Barthel, FAST, GHQ-12 and the SAQOL-39g further support the responsiveness of the measure. The small SAQOL-39g differences between three months and six months seem to reflect a lack of great change in this timeframe (as evidenced by the small differences on the other measures), rather than a lack of sensitivity of the measure to pick up change.

In this study, we also compared the SAQOL-39g with the SAQOL-39. These two measures have the same items but a different domain structure, with all the items of the energy domain of the SAQOL-39 grouping with the psychosocial domain of the SAQOL-39g. This may be due to the fact that these items not only tap into tiredness but also on drive to do things (e.g. 'did you feel too tired to do what you wanted to do'). We reanalysed the SAQOL-39 data from the people with chronic aphasia[12] imposing the domain structure of the SAQOL-39g with acceptable results. This suggests that the SAQOL-39g could also be used with people with long-term aphasia (>1 year) post-stroke.

In summary, the SAQOL-39g shows good internal consistency, reliability and validity as a measure of HRQL after stroke and adequate responsiveness to change. As is common with new measures, further research is needed to confirm its psychometric properties in independent samples. The main advantage of the SAQOL-39g is its appropriateness for use with people with and without aphasia. People with any severity of expressive and mild to moderate receptive aphasia can complete the SAQOL-39g in an interview format. Use of the SAQOL-39g in clinical practice can allow stroke clinicians to consider peoples' views about the impact of stroke on their day-to-day lives in making decisions about care. Use of the SAQOL-39g can also allow people with aphasia to be included in stroke trials, thus minimising positively biased stroke outcomes and allowing comparisons to be drawn between those with and those without aphasia.

Clinical messages

- The SAQOL-39g shows good reliability and validity and adequate responsiveness to change as a measure of health-related quality of life after stroke
- People with any severity of expressive aphasia and mild to moderate receptive aphasia can complete the SAQOL-39g in an interview format.

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Conflicts on interest disclosures: None.

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Figure 1: Participant flow in the study

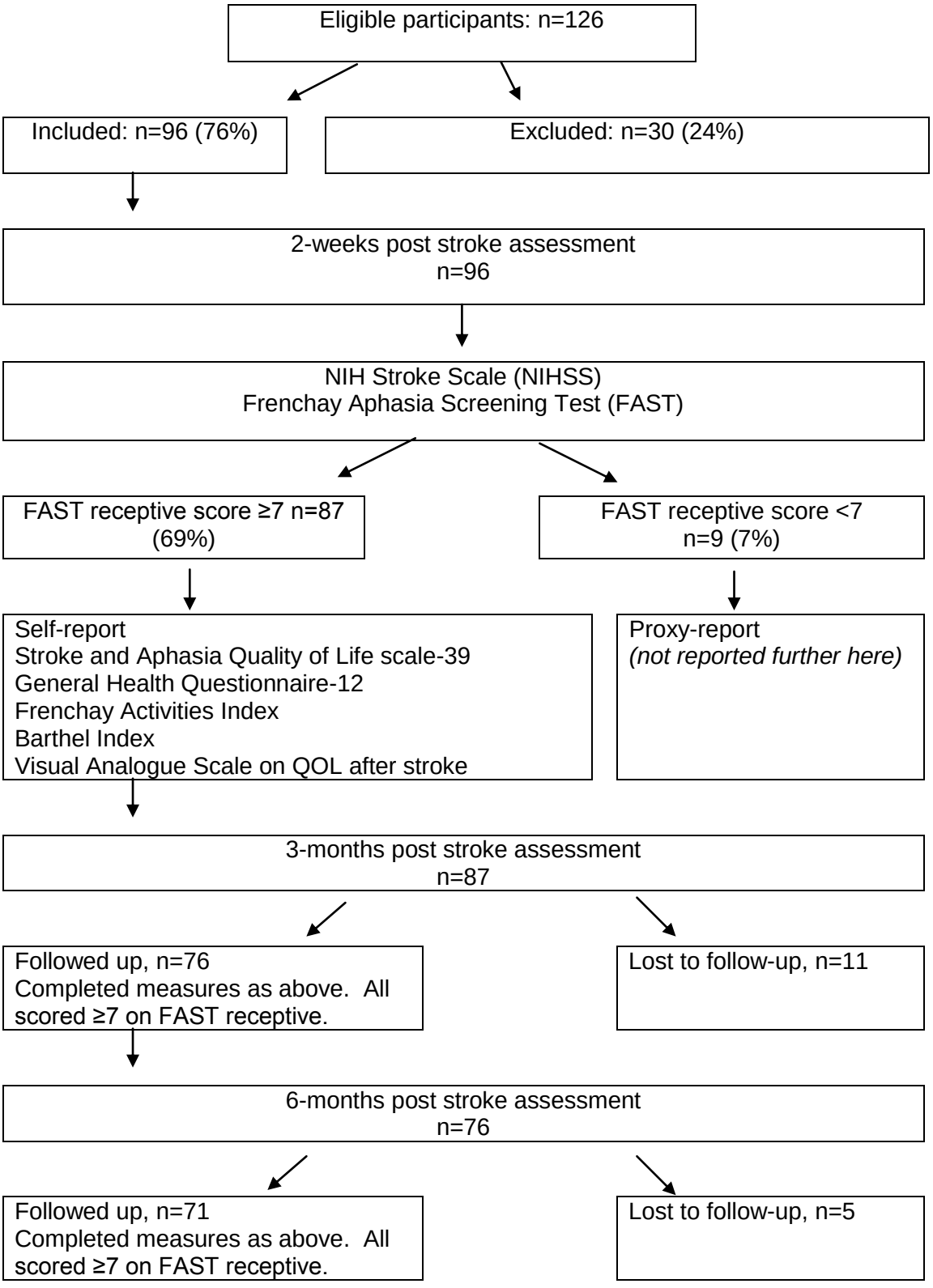

Table 1: Participant characteristics

Variable	Participants n (%)			
	2 weeks	3 months	6 months	Test-retest
Gender	n=87	n=76	n=71	n=18
Female	35 (40)	32 (42)	31 (44)	6 (33)
Male	52 (60)	44 (58)	40 (56)	12 (67)
Age				
Mean [SD]	69.7 [14.1]	69.7 [14]	69.3 [14.2]	66.2 [12.5]
Range				
18-45	7 (8)	6 (8)	6 (8)	2 (11)
46-64	14 (16)	12 (16)	11 (16)	6 (33)
65-74	30 (35)	27 (35)	27 (38)	4 (22)
75+	36 (41)	31 (41)	27 (38)	6 (33)
Stroke type				
Ischaemic	75 (86)	67 (88)	62 (87)	17 (94)
Haemorrhagic	12 (14)	9 (12)	9 (13)	1 (6)
Stroke severity-NIH Stroke Scale				
Mean [SD]	5.91 [4.4]	2.04 [2.72]	1.52 [2.12]	3.71 [4.16]
Range	0-21	0-12	0-10	0-14
Comorbidities				
None	10 (11)	8 (11)	8 (11)	1 (6)
One	14 (16)	13 (17)	12 (17)	3 (16.5)
Two	21 (24)	19 (25)	18 (25)	7 (39)
Three	18 (21)	17 (22)	16 (23)	4 (22)
Four +	24 (28)	19 (25)	17 (24)	3 (16.5)
Ethnic group				
Asian	10 (11)	9 (12)	9 (13)	2 (11)
Black	6 (7)	5 (6.5)	5 (7)	1 (6)
White	65 (75)	57 (75)	52 (73)	15 (83)
Other	6 (7)	5 (6.5)	5 (7)	0 (0)
Marital status				
Married	33 (38)	31 (41)	29 (41)	8 (44)
Has partner	12 (14)	9 (12)	9 (13)	3 (17)
Single	20 (23)	17 (22)	14 (20)	4 (22)
Divorced	7 (8)	6 (8)	6 (8)	2 (11)
Widowed	15 (17)	13 (17)	13 (18)	1 (6)
Communication				
Non-aphasic	55 (63)	62 (82)	60 (84)	12 (66)
Aphasic	32 (37)	14 (18)	11 (16)	6 (33)

Table 2: Psychometric evaluation of SAQOL-39 generic stroke (SAQOL-39g) at 6 months post-stroke and comparison with SAQOL-39[12], with three factor structure imposed.

Property	Results	
	SAQOL-39 generic stroke (n=71)	SAQOL-39 tested in chronic aphasia, with three-domain structure imposed (n=83)
Sample score range (scale range)	2.05-5.00(1.00-5.00)	1.72-4.46 (1.00-5.00)
Mean (SD)	3.87 (.78)	3.26 (.70)
Acceptability		
Missing data (>10%)	2 items (at 11.3%): SC1, W2^	0
Floor effects	0	0
Ceiling effects	5 items: L3, L5, L7, FR9, SR8 (12.82%)	0
Skewness (>±1)	15 items (38.46%)	4 items (10.26%)
Internal consistency		
Cronbach's alpha		
Overall	.95	.93
Domains	Physical = .95 Psychosocial =.92 Communication =.93	Physical = .94 Psychosocial = .85 Communication = .85
Item-total correlations		
Overall	.35-.78	.23-.69
Domains	Physical =.51-.85 Psychosocial =.50-.75 Communication =.70-.85	Physical = .48-.81 Psychosocial = .26-.61 Communication = .40-.74
Test-retest reliability	(n=18)	(n=17)
Overall	.96	.98
Domains	Physical =.98 Psychosocial =.92 Communication =.92	Physical =.98 Psychosocial =.97 Communication =.94
Construct validity		
Internal validity		

Property	Results								
	SAQOL-39 generic stroke (n=71)				SAQOL-39 tested in chronic aphasia, with three-domain structure imposed (n=83)				
Inter-correlations between overall score and domains (*r*)	Physical = .84 Psychosocial = .88 Communication = .52				Physical = .89 Psychosocial = .81 Communication = .56				
Inter-correlations between domains (*r*)	Physical and psychosocial = .50 Physical and Communication = .26 Psychosocial and Communication = .40				Physical and psychosocial = .50 Physical and Communication = .36 Psychosocial and Communication = .27				
Factor analysis	PCA: all items load > .30 on first component PAF: best model derived: three conceptually clear domains: physical, psychosocial and communication (56.03% variance explained). One item crossloading (M4). All items load > .40 on a factor, except SR5 = .37.				PCA: all items load > .20 on first component PAF: three conceptually clear domains: physical, psychosocial and communication (43.52% variance explained). One item crossloading (SR7). All items load > .40 on a factor, except T4 = .32, T5 = .39, SR5 = .32.				
External validity	Overall	Phys.	Psych.	Commun.		Overall	Phys.	Psych.	Comm.
Convergent validity									
Association with NIHSS (n=67)	-.36	-.51							
Association with BI (n=69)	.46	.70							
Association with FAI (n=71)	.52	.69			n=83	.58	.67		
Association with GHQ-12 (n=71)	-.70		-.78		n=83	.53		.62	
Association with FAST (n= 58)				.47	n=82				.55
Discriminant validity									
Association with NIHSS (n=67)			-.16	-.13					
Association with BI (n=69)			.12	.16					
Association with FAI (n=71)			.27	.11	n=83			.34	.21
Association with GHQ-12 (n=71)		-.39			n=83		.38		
Association with FAST (n= 58)	.26	.40	-.03		n=82	.31	.28	.06	

^: For item content refer to table 3.
BI: Barthel Index; FAI: Frenchay Activities Index; FAST: Frenchay Aphasia Screening Test; GHQ-12: General Health Questionnaire -12 item version; NIHSS: National Institute for Health Stroke Scale

Table 3: Factor structure of SAQOL-39g

Items		Item loadings*		
		Factor 1 Physical	Factor 2 Psychosocial	Factor 3 Communication
SC1[†]	Trouble with preparing food	.787		
SC4	Trouble with getting dressed	.706		
SC5	Trouble with taking a bath/shower	.774		
M1	Trouble with walking	.778		
M4	Trouble with keeping balance	.599	.456	
M6	Trouble with stairs	.823		
M7	Trouble with walking with no rest	.728		
M8	Trouble with standing	.664		
M9	Trouble with getting out of chair	.657		
W1	Trouble with doing daily work	.893		
W2	Trouble with finishing jobs	.815		
UE1	Trouble with writing	.462		
UE2	Trouble with putting on socks	.766		
UE4	Trouble with doing buttons	.775		
UE5	Trouble with doing a zip	.606		
UE6	Trouble with opening a jar	.707		
L2	Trouble with speaking			.827
L3	Trouble with using the phone			.804
L5	Trouble with being understood			.869
L6	Trouble with finding words			.666
L7	Trouble with repetition			.887
T4	Having to write things down to remember		.499	
T5	Finding it hard to make decisions		.634	
P1	Feeling irritable		.790	
P3	Feeling that your personality has changed		.614	
MD2	Feeling discouraged		.771	
MD3	Having no interest in people		.443	
MD6	Feeling withdrawn		.739	
MD7	Having little confidence		.662	
E2	Feeling tired often		.681	
E3	Having to stop and rest often		.666	
E4	Feeling too tired to do what you want		.795	
FR7	Feeling a burden to family		.481	
FR9	Language problems effect on family life			.794
SR1	Going out less		.430	
SR4	Doing hobbies less		.471	
SR5	Seeing friends less		.368	
SR7	Physical problems effect on social life		.524	
SR8	Language problems effect on social life			.805

* Loadings < .40 not reported, except for SR5

[†] Item id from original Stroke-Specific Quality of Life Scale[4] and indicate: SC: self-care; M: mobility; W: work; UE: upper extremity; L: language; T: thinking; P: personality; MD: mood; E: energy; FR: family roles; SR: social roles.

Table 4: Mean and standard deviations (SD) of SAQOL-39g scores at 2 weeks, 3 months and 6 months post-stroke (n=71)

SAQOL-39g	Mean (SD)					
	2 weeks	3 months	6 months	Change		
				2 weeks – 3 months	2 weeks – 6 months	3 months – 6 months
Physical	3.36 (1.19)	3.91 (.96)	3.86 (1.01)	-.55 (.86)	-.50 (1.01)	.05 (.67)
Psychosocial	3.26 (.85)	3.41 (.94)	3.56 (1.03)	-.15 (.76)	-.30 (1.02)	-.15 (.86)
Communication	4.24 (1.01)	4.49 (.86)	4.59 (.72)	-.25 (.65)	-.35 (.80)	-.10 (.48)
Overall	3.48 (.79)	3.81 (.74)	3.87 (.78)	-.33 (.54)	-.39 (.73)	-.06 (.55)

Table 5: Responsiveness to change of SAQOL-39g and comparison with other measures

	Responsiveness					
	2 weeks – 3 months		2 weeks – 6 months		3 months – 6 months	
SAQOL-39g (n=71)	d	SRM	d	SRM	d	SRM
Physical	-.46	-.64	-.42	-.50	.05	.07
Psychosocial	-.18	-.20	-.35	-.29	-.16	-.17
Communication	-.25	-.38	-.35	-.44	-.12	-.21
Overall	-.42	-.61	-.49	-.53	-.08	-.11
BI (n = 66)	-1.38	-.94	-1.51	-.95	-.13	-.17
GHQ-12 (n=71)	-.23	-.27	-.41	-.40	-.18	-.20
FAST (n = 48)	-.33	-.59	-.40	-.63	-.10	-.40