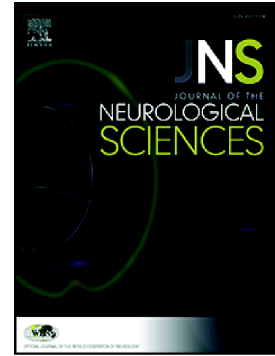


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Validation of the Self-rated Dimensional Apathy Scale in Community Stroke Survivors

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Abstract

Apathy, a disorder of motivation observed in up to 40% of stroke survivors, is negatively associated with stroke rehabilitation outcomes. Different apathy subtypes have been identified in other conditions, but there is currently no validated multidimensional measure of post-stroke apathy (PSAp). The Dimensional Apathy Scale (DAS) assesses apathy across three subtypes: Executive, Emotional and Initiation apathy. The aim was to determine if the DAS is a valid and reliable tool to detect and characterise apathy in stroke. Fifty-three stroke survivors, (45.3% males, median age 54), and 71 people without stroke (26.8% males, median age 45) completed measures of apathy (DAS, Apathy Evaluation Scale, AES), depression (Patient Hospital Questionnaire, PHQ-9) and anxiety (Generalised Anxiety Disorder scale, GAD-7) as part of an online survey. The DAS showed high internal consistency and convergent validity with the current gold standard unidimensional assessment for apathy (AES) and divergent validity with depression (PHQ-9) and anxiety (GAD-7). Stroke survivors scored significantly higher on the total score of the DAS and all subscales, compared with controls. There were however no significant differences on depression and anxiety scores between the two groups. Our results suggest the DAS is a valid screening tool to detect and characterise PSAp.

Keywords: apathy, stroke, Dimensional Apathy Scale, validity, reliability, depression

Profiling Apathy After Stroke

Apathy affects many stroke survivors and threatens to limit their recovery following stroke [1], [2]. It is a disorder of diminished motivation, associated with a marked reduction of initiative, social interactions, activities, cognitive processes and emotional responsivity [3]–[5]. It is prevalent after stroke, affecting 22 – 41% of stroke survivors [6]–[8]. Post-stroke apathy (PSAp) has a negative impact on recovery [9], [10]. It is associated with greater physical disability and impaired cognitive functioning and often associated with greater long-term impairment [11]–[13].

PSAp has important clinical implications, but is relatively under-researched [14]. There are currently no recommendations or mention of PSAp in NICE guidance in the UK [15]. Despite this, however, it is important to detect, and address PSAp given its association with stroke rehabilitation outcomes [12], [13].

Apathy, as a motivational deficit, can be present with emotional indifference, abulia and athymormia, or one or two of these symptoms, or as a pure apathy. Moreover, there are reported to be distinct subtypes of apathy affecting initiation, executive functioning and emotional neutrality [16], [17]. Several apathy scales, such as the Apathy Scale [18] and the Apathy Evaluation Scale [4] are in common, however, that they provide only a unidimensional score of apathy severity, on the assumption that apathy is a unidimensional phenomenon.

Based on the model of Levy and Dubois [19], the Dimensional Apathy Scale (DAS [20]) assesses three subtypes of apathy. The DAS consists of three subscales: ‘Executive Apathy’, which assesses lack of motivation for planning, organisation or attention; ‘Emotional Apathy’, which assesses emotional indifference and neutrality; and ‘Initiation Apathy’, which assesses lack of motivation for self-generation of thoughts or actions [20]. The DAS has been validated in Motor Neurone Disease [21], Parkinson’s disease [22] and dementia [20]. These

validation studies have found positive intra-correlations between DAS subtypes. It is not yet, however, validated for acquired brain injuries, such as stroke.

Given the high prevalence and clinical importance of PSAp [8], [9], [23], the aim was to investigate the psychometric properties and validity of the DAS against a ‘gold-standard’ unidimensional measure of apathy and to assess its associations with depression and anxiety in stroke survivors.

Method

Design

The study was a cross-sectional observational online survey with a 2x3 mixed factorial design, to investigate the impact of group (stroke survivors and people without stroke) on DAS subscale scores (Executive, Emotional, and Initiation Apathy). The chosen design is in line with the design used in previous studies validating the DAS in other neurological disorders, allowing validation and comparison of profiles [21], [24]–[26].

Participants

The inclusion criteria for our stroke survivor group were: age 18 years or older and having experienced a stroke that required hospital attendance at age 18 or above. The inclusion criterion for the non-stroke survivor group were: age 18 years or older. The exclusion criteria for the stroke group were major medical, neurological, or psychiatric co-morbidities unrelated to stroke (e.g., neither a potential risk factor nor consequence of stroke). The exclusion criteria for the non-stroke group were major medical, neurological, or psychiatric conditions. These exclusion criteria were applied to allow the study to focus on apathy associated with stroke, rather than other conditions.

Participants with anxiety and depression were included, as these are frequent consequences of stroke, improving the representativeness of the stroke survivors recruited. Depression and anxiety were screened using the GAD-7 and PHQ-9 in the questionnaires to enable us to characterise the divergent validity of the DAS in relation to other disorders.

Procedure

Stroke survivors and non-stroke participants were recruited to an online survey via Twitter and Facebook. Stroke charities (e.g., Headway, Stroke Association UK, Stroke Association NI) were contacted to increase visibility of the study. Disc Online Surveys was used to collect data. All participants were given an option to enter a prize draw of five £25 Amazon vouchers. This study was granted ethical approval from the University of East Anglia Faculty of Medicine and Health Sciences Research Ethics Committee and followed the General Data Protection Regulation (GDPR) guidelines [27]. Participants gave informed consent in line with the Declaration of Helsinki [28].

The research team, consisting of people with expertise in stroke psychology and apathy research, independently reviewed whether participants met inclusion or exclusion criteria, based on the information provided about their health in the survey and reached consensus via discussion. Participants were excluded on the basis of declaring a health condition unrelated to stroke and or with a known association with apathy, to ensure that the current study measured apathy due to stroke, rather than other conditions. A few examples of medical conditions forming the basis of exclusion from both groups were: idiopathic intracranial hypertension, traumatic brain injury, congenital cervical stenosis, epilepsy, spina bifida, ongoing cancer, bipolar 1 disorder, and ongoing substance abuse.

Measures

Demographic and clinical data on age, gender, years of education, occupation, marital status, age when admitted to hospital for stroke and other mental or physical health conditions were collected at the beginning of the survey.

Apathy

The Dimensional Apathy Scale (DAS, [20]) is a 24-item, three-dimensional scale for assessment of apathy subtypes. It has three subscales, each with 8 items. All items are rated on a 4-point Likert-scale, ranging from 0 (Almost always) to 3 (Hardly ever). Overall scores range from 0-72; higher scores indicate greater severity. Clinical cut-off scores are: Total \geq 39, Executive subtype \geq 14, Emotional subtype \geq 15 and Irritation subtype \geq 16 [20]. The measure was found to have acceptable internal consistency for Parkinson's disease (Cronbach's $\alpha=.84$, [22]), Alzheimer's disease ($\alpha=.85$, [24]) and Amyotrophic lateral sclerosis ($\alpha=.86$, [26]). Informant/carer-rated and self-versions are available. The self-rated version was used.

The Apathy Evaluation Scale (AES, [4]) comprises of 18 items measuring general apathy. Each item is rated on a 4-point Likert-scale, ranging from 1 (Not at all) to 4 (A lot). The scale has good internal consistency ($\alpha=.86-94$), and test-retest reliability ($\alpha=.76-94$ [4]). There are three versions of this scale, for clinicians, informants and self-rated versions. The version used in this study was the self-rated version. Scores range from 18 to 72, higher scores indicate abnormal levels of apathy.

Depression

The Patient Health Questionnaire (PHQ-9, [29]) is a screening tool for depression, based on the DSM-IV criteria, validated for post-stroke depression [30]. Each item is rated on a 4-point Likert-scale, ranging from 0 (Not at all) to 3 (Nearly every day). Distribution of scores in terms of depression severity is as follows: minimal =0-4, mild =5-9, moderate =10-14, moderately severe =15-19 and severe =20-27 [29]. PHQ-9 has excellent internal validity

($\alpha=.89$) and test-retest reliability ($r = 0.84$) [29]. Individuals scoring 10 or higher on the scale have a 88% chance of meeting diagnostic criteria for depression [29].

Anxiety

The Generalised Anxiety Disorder (GAD-7, [31]) is a 7-item screening tool for anxiety, based on the DSM-IV criteria, validated for stroke. GAD-7 has excellent internal validity ($\alpha=.92$), with good test-retest reliability (intraclass correlation coefficient =.82) [31]. Each item is rated on a 4-point Likert-scale, ranging from 0 (Not at all) to 3 (Nearly every day). The distribution of GAD-7 scores in terms of level of anxiety severity is as follows: minimal =0-4, mild =5-9, moderate =10-14 and severe =15-21 [31].

Statistical Analysis

G*Power 3.1.9.4 [32], was used to calculate the required sample size for the mixed design ANOVA. A medium effect size, used as a conventional estimate, yielded an estimated sample size of 44 participants.

IBM SPSS v.25 was used for data analysis. Data preparation included checking and replacing missing data using median imputation, and assessment of distributions across variables. Tests of internal consistency and associations between measures in the stroke group were planned to test the reliability and validity of the DAS in stroke. Analysis of variance was used to test for effects of group, subscale or interaction, to characterise apathy in the two groups.

Results

One-hundred-and-forty people completed the online questionnaire. Altogether 53 stroke survivors and 71 people who had not experienced stroke were included in the analysis. Seven stroke survivors and nine people who had not experienced stroke were excluded from further analysis on medical, psychiatric and neurological grounds. Data preparation indicated

that 43% of stroke survivors and 81% of the participants without stroke completed the questionnaire. Participants who did not complete the survey were excluded from further analysis. As seen in Table 1, the two groups were matched on gender, living arrangements, and years of education, but differed significantly on age and occupational status.

TABLE 1 ABOUT HERE

Ischemic strokes were the most common stroke type. People with strokes in the left and right hemispheres were almost equally represented (N = 14 left-hemisphere strokes, N = 15 right-hemisphere strokes), but 43% of stroke survivors did not specify stroke-location. Relatively few stroke survivors had experienced repeated strokes (10%).

In our stroke group there were no significant correlations (Spearman's Rho) between age and apathy on the DAS (DAS total score, $r_s(51) = .138, p = .328$; DAS Executive Apathy, $r_s(51) = -.222, p = .110$; DAS Initiation Apathy, $r_s(51) = -.212, p = .127$); and DAS Emotional Apathy, $r_s(51) = .156, p = .263$). The correlation between age and the DAS total score control group was non-significant $r_s(69) = -.166, p = .127$.

Data Preparation

Missing data (< 1%) were handled using median imputation [33], [34]. Where possible non-parametric tests were used. A 2x3 mixed ANOVA with a Greenhouse Geiser correction testing differences between groups and subscales on the DAS and the interaction between these factors.

Psychometric Properties of the DAS in Stroke

Internal Consistency of the DAS

Overall, the DAS showed good internal consistency in stroke ($\alpha=.84$) and acceptable internal consistency for people who had not experienced stroke ($\alpha=.76$). Internal consistency was acceptable for the initiation apathy ($\alpha=0.79$) and executive apathy subscales ($\alpha=0.74$), but questionable for the emotional subscale ($\alpha=0.64$) for the stroke group.

Convergent Validity of the DAS

DAS total scores showed a strong, positive correlation with the AES. The Initiation and Executive Apathy subscales were also strongly positively correlated with the AES and the emotional subscale showed a moderate positive correlation with the AES. These findings support the convergent validity of the DAS in stroke.

For the stroke group the DAS total score correlated significantly with all subscales: Emotional Apathy $r_s(51)=.71, p<.001$, Executive Apathy $r_s(51)=.85, p<.001$, and Initiation Apathy $r(51)=.86, p<.001$. Significant positive intercorrelations were also found between all DAS subscales: Emotional Apathy vs Initiation Apathy $r_s(51)=.39, p<.01$, Emotional Apathy vs. Executive Apathy $r_s(51)=.38, p<.01$, and Executive Apathy vs initiation Apathy $r_s(51)=.67, p<.001$.

Divergent Validity of the DAS

Correlations between the DAS, AES, PHQ-9 and GAD-7 for the stroke survivor group are presented in Table 2. The DAS Executive and Initiation subscales correlate positively with not only the AES but also the PHQ-9 and GAD-7. These relationships are as expected, as depression and anxiety are likely to be associated with reduced initiative and executive apathy. In contrast, the DAS Emotional Apathy subscale showed a moderate positive correlation with AES, but small correlations with PHQ-9 and GAD-7 which were non-significant. As emotional apathy (e.g. lack of emotion) is a different construct to depression or anxiety this lack of relationship was expected. However, since the internal consistency of this subscale was lower than the others, we cannot exclude the possibility of null effects.

TABLE 2 ABOUT HERE

Group Comparisons across Measures

Groups differed on all apathy scales, but not on the PHQ-9 or GAD-7, with stroke survivors showing greater levels of apathy.

TABLE 3 ABOUT HERE

Group Comparison on the DAS

Scores on the DAS showed a significant main effect of group ($F(1,22)=33.17$, $p<.001$). As seen in Figure 1, the DAS scores of stroke survivors were higher than those of the non-stroke comparison group. There was also a significant main effect of DAS subscale ($F(2,228)=14.82$, $p<.001$). The interaction between group and subscale was not significant ($F(2,228)=.25$, $p=0.764$), indicating that there was no significant difference in the profile of subscales between the two groups. Figure 1 shows the means for each group across subscales.

FIGURE 1 ABOUT HERE

Non-parametric tests confirmed the significant main effects of groups and subscale. The results of Mann-Whitney U group comparisons per scale and subscale are presented in Table 3. A non-parametric Friedman's test found significant effect of subscale ($\chi^2(3)=103.06$,

$p < .001$, $W = .65$), as well as significant pairwise comparison between the subscales for the non-stroke group ($\chi^2(3) = 141.80$, $p < .001$, $W = .67$). There was a difference on all subscales (Executive, Emotional and Initiation), and presented in Table 3.

Group Comparison of Caseness

As seen in Figure 1, the DAS profiles of both groups followed similar patterns, although stroke survivors had higher levels of apathy across all apathy subtypes. Table 4 presents cut-off scores for the DAS in stroke, calculated as two standard deviations above our non-stroke group means.

As seen in Table 4, there were significant differences of caseness between groups on the DAS total apathy scale and all subscales using published cut-off scores. The median scores for depression (PHQ-9) and anxiety (GAD-7) fell in the mild clinical range for stroke survivors and the normal range for controls, but neither this difference (Table 3) or the difference in numbers reaching caseiers for depression or anxiety across the two groups (Table 4) reach significance once the Bonferroni correction is applied.

TABLE 4 ABOUT HERE

Forty-three percent of stroke survivors scored above cut-off on multiple apathy subtypes on the DAS. As seen in Table 5, these stroke survivors had significantly higher scores for depression (PHQ-9) than stroke survivors who did not score above apathy cut-offs; their scores for anxiety (GAD-7) were also higher, although this did not reach significance after Bonferroni correction.

The median number of apathy subtypes was two. Eight stroke survivors (15.1%) scored above cut-off for one subscale, eight (15.1%) scored above cut-off on two different subscales and six (11.3%) had elevated scores on all three subscales.

TABLE 5 ABOUT HERE

Discussion

The aim was to investigate if the DAS is a valid and reliable screening tool for apathy in stroke survivors. The DAS has been validated for degenerative diseases, but not for stroke [21], [24]–[26]. The DAS showed good internal consistency and was strongly correlated with the AES, indicating good convergent validity. The relationships between DAS subscales and a measure of depression replicated previous findings for other conditions [21], [22] with self-rated Executive and Initiative Apathy, but not Emotional Apathy, showing significant positive correlations with severity of depressive symptoms. In the current study, the internal consistency of the Emotional Apathy subscale was lower than that of the other subscales, so we cannot exclude the possibility that this might account for the lack of significant relationship with depression.

Stroke survivors showed higher levels of apathy on the DAS, than did the non-stroke comparison group, for each of the three apathy subtypes in terms of symptom-rating and caseness. Forty-three percent of stroke survivors displayed one or more apathy subtype, with the most common subtypes being Initiation Apathy and Executive Apathy. This is a striking finding given that the use of online recruitment is likely to mean that participants were more motivated than other samples of stroke survivors. The Emotional Apathy subtype was less

common and reliable, and findings should be interpreted with caution. Low reporting on emotional apathy has been considered a possible indication of dysfunction in social cognition, and self-awareness [22], [24].

The DAS apathy profiles for stroke survivors and people who have not experienced stroke followed similar patterns. Our stroke sample showed a similar profile of apathy subtypes to profiles reported for people with Parkinson's [22] and Alzheimer's disease [24]. In Alzheimer's disease, no associations between the Emotional apathy subscale and depression were found, and it was suggested that people with Alzheimer's disease have an awareness deficit in terms of Emotional apathy and depression [24].

Our findings show the importance of screening for both apathy and depression in clinical settings. Stroke survivors with more than one apathy subtype have significantly higher depression scores. This might indicate that it is useful to take apathy into account when treating depression and vice versa. The prevalence of depression was relatively low in both groups. This might be associated with the relatively high level of motivation needed to complete the survey, as severe depression or severe apathy would make completion of the survey more challenging. Seventeen percent of our stroke survivors scored in the moderately severe to severe range for depression, which is lower than the estimated 30 % prevalence of post-stroke depression [35], [36].

Apathy research has found associations between older age and more severe apathy scores [37]. For example, a longitudinal study found that apathy was more pronounced in healthy participants after the age of 65 years [37]. It was therefore potentially problematic that our groups were not matched for age. However, both the stroke sample and the control group were younger than participants in studies reporting an association between apathy and age (with a median age of 54 for stroke survivors and 45 years for controls) and showed no association between age and apathy.

Strengths, Limitations and Recommendations

This is the first validation of a multidimensional apathy scale in stroke. Despite current understanding of apathy as a multidimensional construct, research has frequently used unidimensional apathy scales, such as the AES [4] and AS [38]. Therefore, the validation of the self-reported DAS in community stroke survivors is a valuable contribution to PSAP research, as this scale reflects the current multidimensional conceptualisation of apathy and enables characterisation of the specific nature of apathy after stroke.

This study has a number of limitations. Online recruitment enabled stroke survivors in the community to participate even if they were no longer receiving stroke rehabilitation, but the sample size is relatively small and restricted to those able and willing to participate online. A challenge faced in all apathy research is sampling the full range of apathy, as research is often based on self-selected samples. Nevertheless, levels of apathy in our stroke sample were higher compared to our non-stroke group. It is possible however, that PSAP is even more prevalent than found in this study, given the levels of motivation required to access and complete an online survey. The dropout rate was nearly twice as high in the stroke survivor group, where over half of the participants discontinued the survey before completion. It is possible that some of these participants dropped out due to lack of motivation and this might indicate even higher prevalence of apathy for stroke than captured by our survey. The high prevalence of PSAP and implications for functional activity and recovery highlights the importance of this area of research [9], [13]. Future research could usefully test associations between clinical variables (including type of stroke, stroke location and premorbid functioning) and apathy profiles by recruiting from clinical services.

Multidimensional apathy research in stroke is still in its infancy and there is a need for more investigation of the assessment and treatment of apathy after stroke. It would be useful

for future research to validate the carer-version of the DAS, as well as the Brief DAS, for rapid detection of apathy in the clinic [39].

Conclusions

Given the high prevalence of PSaP and its implications for rehabilitation, the present study aimed to validate a multidimensional screening tool for apathy. This is important as no multidimensional measures of apathy have been validated for stroke. The DAS was found to be a psychometrically robust method of assessing apathy and apathy subtypes in stroke and recommend using published DAS cut-off scores. Stroke survivors scored significantly higher on the Executive, Initiation and Emotional Apathy subscales of the DAS compared with the non-stroke group. Forty-three percent of stroke survivors scored above the cut-off for apathy on one of the subscales, and 63.6% of these scored above cut-off for multiple subscales. These findings suggest there is a need of modification in current practice in terms of assessment and interventions for PSaP.

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In text tables and figures

Table 1*Demographic Characteristics for Stroke Survivors (N=53) and the Non-Stroke Group (N=71)*

Factor	Stroke survivors	Non-stroke group	U	χ^2	df	p
Age, Median (IQR)	54 (14)	45 (27)	1327.5			.005
Gender male (N %)	24 (45.3)	19 (26.8)		5.13	2	.077
In employment or studies N (%)	23 (43.4)	63 (88.7)		35.67	1	.001
Living arrangement, N (%)				2.06	6	.915
Single	12 (22.6)	18 (25.4)		122	1	.727
Married/ partnership	37 (68.7)	36 (50.7)		136	1	.712
Divorced/ separated	3 (5.7)	4 (5.6)		123	1	.726
Other	1 (1.9)	2 (2.8)		.04	1	.834
Years of education, Median (IQR)	13 (3)	13 (2)	2077.0			.230
University degree, N (%)	31 (58.5)	52 (73.2)		3.51	1	0.61

*IQR = Interquartile range, p-values in bold show significant differences***Table 2***Correlations between DAS, AES, PHQ-9 and GAD-7 for Stroke Survivors (N=53).*

Stroke survivors (N=53)	AES	PHQ-9	GAD-7
DAS Executive subscale	.775**	.620**	.427**
DAS Emotional subscale	.523**	.030	-.031
DAS Initiation subscale	.756**	.510**	.288*

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

AES (Apathy Evaluation Scale), PHQ-9 (Patient health Questionnaire), GAD-7 (Generalised Anxiety Disorder-7)

Table 3*Mann-Whitney U tests of Group Differences in DAS, AES, PHQ-9 and GAD-7 scores, with Bonferroni correction.*

Scale	Stroke median (IQR)	Non-Stroke median (IQR)	Mann-Whitney U	p
DAS Total	34 (18)	24 (29)	934.00	<.001
DAS Executive Apathy	12 (8)	8 (6)	1152.00	<.001
DAS Emotional Apathy	12 (8)	9 (4)	1165.00	<.001
DAS Initiation Apathy	10 (6)	6 (5)	995.00	<.001
AES	34 (17)	28 (8)	1197.50	<.001
PHQ-9	8 (9) mild depression	3 (4) normal	1641.50	.018
GAD-7	5 (6) mild anxiety	3 (6) normal	1801.00	.409

IQR = Interquartile range, p-values in bold show significant differences with Bonferroni correction for multiple comparisons applied; p values < .007 are considered significant).

Table 4

Frequencies of participants meeting the diagnostic cut-offs for the assessment tools. P values are corrected for multiple comparisons using Bonferroni correction.

Scale	Stroke N (%)	Non-stroke N (%)	χ^2	<i>p</i>
DAS Total	17 (32.1)	3 (4.2)	17.40	<.001
DAS Executive apathy	18 (34.0)	7 (9.9)	10.95	.002
DAS Emotional subscale	9 (17.0)	0 (0)	13.00	.001
DAS Initiation subscale	14 (26.4)	3 (4.2)	12.63	.001
AES	23 (43.4)	5 (7.0)	22.24	<.001
PHQ-9	9 (17.0)	3 (4.2)	5.55	.038
GAD-7	6 (11.3)	5 (7.0)	.69	.610

DAS= The Dimensional Apathy Scale [21], DAS total cut-off score ≥ 39 , DAS Executive apathy cut-off score ≥ 14 , DAS Emotional subscale cut-off score ≥ 1 , DAS Initiation subscale cut-off score ≥ 16 . AES= The Apathy Evaluation Scale [4], cut-off score ≥ 3 . PHQ-9= The Patient Health Questionnaire (PHQ-9 [29]), cut-off score ≥ 15 . GAD-7 = The Generalised Anxiety Disorder (GAD-7 [31]), cut-off score ≥ 10 . p-values in bold show significant differences with Bonferroni correction for multiple comparisons applied; p values < .007 are considered significant).

Table 5

Comparison of Stroke Survivors According to Number of Apathy Subtypes with Bonferroni correction.

Above Published Cut-offs for ≥ 1 Apathy Subtype (N = 23)	Below Published Cut-offs for Apathy Subtypes (N = 30)	<i>p</i>
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Age, median (IQR)	54.0 (17)	54.0 (11)	.98 6
Years of education, median (IQR)	12.0 (2)	13.0 (2)	.16 7
Multiple strokes median (IQR)	0.0 (0)	0.0 (0)	.76 7
Age at first stroke, median (IQR)	46.5 (13)	49.0 (10)	.78 5
PHQ-9, median (IQR)	11.5 (10)	5.0 (8)	<.0 01
GAD-7, median (IQR)	7.0 (13)	4.0 (5)	.01 5

IQR= interquartile range, p-values in bold show significant differences. *P-values in bold show significant differences with Bonferroni correction for multiple comparisons applied; p-values < .008 are considered significant).*

Appendix

As seen in Table I, these calculated cut-off scores are similar to published cut-offs [21]. The published cut-off scores could therefore be applied to our stroke sample and used these to determine caseness.

Table I

Calculation of DAS cut-off scores, based on our non-stroke group, and published cut-off scores.

DAS	Mean (SD)	Cut-off	Radakovic et al., (2016)	Cut-off
Executive subscale	7.94 (3.49)	15		14
Initiation subscale	8.96 (3.66)	16		16
Emotional subscale	7.08 (3.28)	14		15
Total score	23.98 (7.40)	39		39

Figure 1

DAS Apathy profiles for the Stroke and Non-stroke Groups: Means and Standard Errors

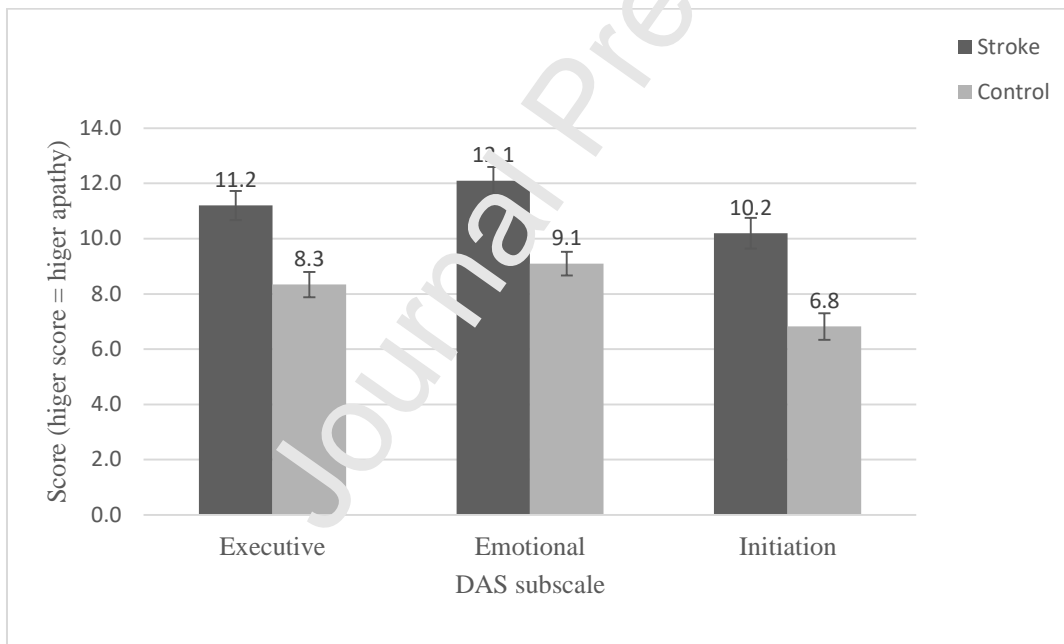
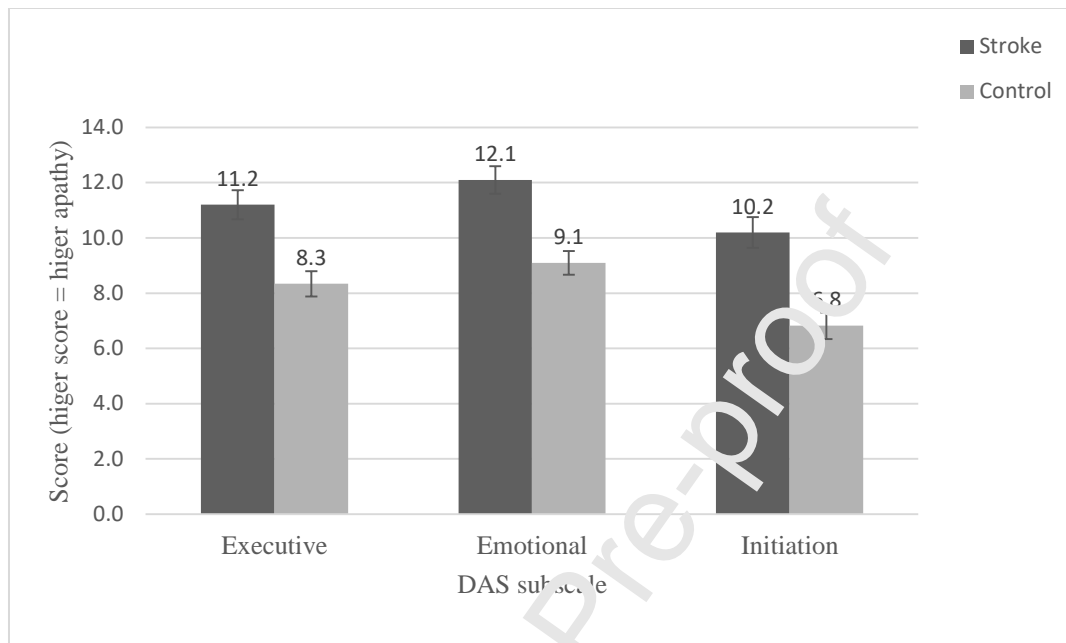


Figure source files

In text figures

Figure 1

DAS Apathy profiles for the Stroke and Non-stroke Groups: Means and Standard Errors



Highlights document

- The Self-Rated Dimensional Apathy Scale is valid and reliable for apathy profiling in stroke.
- 43% of stroke survivors displayed more than one apathy subtype.
- Stroke survivors had higher apathy over all subtypes compared to controls.
- Initiation and Executive Apathy were the most common apathy subtypes found in community-based stroke survivors (based on cutoffs).

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