



Clinical trial

Construct validity and test–retest reliability of the Swedish version of the Acceptance of Chronic Health Conditions Scale

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ARTICLE INFO

Keywords:

Multiple sclerosis
Validity
Reliability
Acceptance
Measurement

ABSTRACT

The Acceptance of Chronic Health Conditions Scale was developed to measure acceptance in chronic health conditions like multiple sclerosis (MS) and has been translated into Swedish (The Swedish Acceptance of Chronic Health Conditions Scale). The purpose of the present study was to evaluate construct validity and test–retest reliability of the Swedish Acceptance of Chronic Health Conditions Scale in a sample of 138 people with MS. Predefined hypotheses about relationships between the Swedish Acceptance of Chronic Health Conditions Scale and other measures, and the scale's ability to differentiate between groups were explored. Evaluations of reliability and measurement error were performed for both Swedish Acceptance of Chronic Health Conditions Scale sum scores and individual items. Most (78%) a priori formulated construct validity hypotheses were confirmed. Reliability was considered good (intraclass correlation coefficient = 0.80, and weighted kappa values ranging from 0.29 to 0.74). Measurement errors were acceptable (standard error of measurement 3.3 points, limits of agreement –7.5 and 10, and percentage agreement ranging from 42% to 58%). The findings give evidence of both satisfactory construct validity and test–retest reliability and indicate that the Swedish Acceptance of Chronic Health Conditions Scale can be considered for use in both research and clinical practice.

1. Introduction

Multiple sclerosis (MS) is a chronic neuroinflammatory disease of the central nervous system (Compston and Coles, 2008) and the most common cause of neurological disability in young adults (Kingwell et al., 2013). There is no cure, but immunomodulatory treatments are used to inhibit disease activity (Compston and Coles, 2008). MS has a vast negative impact on functioning, health and wellbeing. It may cause a wide range of impairments, including fatigue and depression, and activity limitations and participation restrictions (Einarsson et al., 2006a,b; Johansson et al., 2007). Thus, people with MS (PwMS) experience disability in many concurrent areas and will live

with an unpredictable disease over decades.

How life is experienced by an individual is often explored with questionnaires measuring quality of life (QoL) or health-related quality of life (HRQL). In general, QoL can be regarded as a subjective satisfaction with life, while HRQL can be described as the capacity to derive satisfaction from meaningful behavior despite one's disease (Meyers et al., 2000). It has been shown that PwMS have decreased HRQL compared to the general population and to people with other chronic conditions (Sprangers et al., 2000). Antonovsky (Antonovsky, 1987) has proposed that an individual's sense of coherence might explain why some individuals maintain good health despite being under considerable strain. Sense of coherence is defined

Abbreviations: ACHC, Acceptance of Chronic Health Conditions Scale; ADL, activities of daily living; AUC, area under the curve; BDI, Beck Depression Inventory; COSMIN, consensus-based standards for the selection of health measurement instruments; EDSS, Expanded Disability Status Scale; EQ-VAS, EuroQoL-Visual Analogue Scale; FSS, Fatigue Severity Scale; HRQL, health-related quality of life; ICC, intraclass correlation coefficient; LiSat-11, Life Satisfaction checklist; MS, multiple sclerosis; MSIS-29, Multiple Sclerosis Impact Scale; MSIS-29 Phys, Multiple Sclerosis Impact Scale Physical subscale; MSIS-29 Psych, Multiple Sclerosis Impact Scale Psychological subscale; PwMS, people with MS; ROC, receiver operating characteristic; Swe-ACHC, The Swedish version of the Acceptance of Chronic Health Conditions Scale; SEM, standard error of measurement; SOC, Sense of Coherence Scale; QoL, quality of life

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<https://doi.org/10.1016/j.msard.2019.07.033>

Received 14 February 2019; Received in revised form 24 June 2019; Accepted 30 July 2019

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as an individual's global view of life based on how comprehensible, manageable and meaningful it appears to that individual (Antonovsky, 1987), and a stronger sense of coherence may lead to a better health.

Coping is often defined as the efforts of an individual to prevent or diminish threat, harm, and loss, or to reduce associated distress (Carver and Connor-Smith, 2010). It was recently shown that PwMS with high levels of QoL endorse more use of problem-focused and adaptive coping such as active coping and acceptance, compared to those with low QoL (Strober, 2018). Other studies have shown that the use of acceptance as a coping strategy is associated with better QoL and positive psychological adjustment in PwMS (Chalk, 2007; Van Damme et al., 2016). Acceptance is an accommodative emotion-focused coping strategy that refers to adjustments within the self, which are made in response to constraints (Carver and Connor-Smith, 2010). From the experience of living with a chronic health condition, acceptance can be said to focus on adaptation to and acceptance of changes in a person's life. Thus, in this view, acceptance does not imply resigning or giving up, but rather to cease with unnecessary attempts to control the health condition and instead use one's power and energy to live a good life within the context of the condition (Stuifbergen et al., 2008). Acceptance does not improve a person's health, but it can make the person to feel better in the pursuit of valued living (Hayes et al., 2006). Higher level of acceptance is associated with a better adjustment to MS (Pakenham and Fleming, 2011). Thus, it is important to try to capture perspectives of acceptance in PwMS with measures that are valid and reliable.

According to the COSMIN (consensus-based standards for the selection of health measurement instruments) terminology, validity concerns “the degree to which an instrument truly measures the construct it purports to measure” (Mokkink et al., 2010). Assessment of construct validity is applicable in situations in which a gold standard for the construct to be measured is lacking (de Vet et al., 2011). Construct validity refers to the degree to which scores are consistent with hypotheses about the construct (de Vet et al., 2011). These a priori formulated hypotheses should be based on existing knowledge, i.e. previous research findings and/or clinical experience, and can be expressed as expected relationships with scores of other instruments or differences between relevant groups (de Vet et al., 2011). The domain reliability contains according to the COSMIN the three measurement properties internal consistency, reliability and measurement error (Mokkink et al., 2010). Reliability, as a measurement property, is defined as “the proportion of the total variance in the measurements which is because of ‘true’ differences among patients” and measurement error as “the systematic and random error of a patient's score that is not attributed to true changes in the construct to be measured” (Mokkink et al., 2010). Thus, reliability gives information on how well patients can be distinguished from each other and measurement error on how close the scores for repeated measurements are.

The Acceptance of Chronic Health Conditions Scale (ACHC) was developed to measure acceptance in chronic health conditions (Stuifbergen et al., 2008). The psychometric properties of the original scale were found to be satisfactory using classical test theory approach (Stuifbergen et al., 2008). The ACHC has been translated into Swedish and cross-culturally adapted (Forslin et al., 2016). The Swedish Acceptance of Chronic Health Conditions Scale (Swe-ACHC), see appendix, has undergone Rasch analysis and was found to have acceptable psychometric properties regarding internal scale validity, internal consistency and the ability to separate between groups (Forslin et al., 2016). There was, however, a need to further explore validity and reliability of the Swe-ACHC. Thus, the aims of the present study were to evaluate construct validity and test-retest reliability of the Swe-ACHC in PwMS.

2. Methods

2.1. Participants

Eligible participants in the present study were those PwMS who in 2012 participated in a 10-year follow-up study of a cohort of PwMS in Stockholm, Sweden. Recruitment procedures and data from baseline and follow-ups of this cohort have been published elsewhere (Johansson et al., 2007; Ytterberg et al., 2008; Conradsson et al., 2018). Briefly, at baseline in 2002 those scheduled for an outpatient appointment with a neurologist at a MS Centre in Stockholm, were considered for enrolment in the study; 219 PwMS agreed to participate. Of those, 155 PwMS participated in the 10-year follow-up. The study was approved by the ethical review board in Stockholm, registration numbers 449/01 and 2011/2068-31/5, and procedures were conducted in accordance with the Declaration of Helsinki.

2.2. Procedures

Data collection at the 10-year follow-up took place at the MS Centre or at a home visit, with a research physiotherapist present guiding the participant through the data collection. For reliability evaluation, all participants received the Swe-ACHC by mail one week after the data collection. They were asked to fill it out again, and then return it by using a pre-paid envelope.

2.3. Measures

Data on age, sex, work status, and living situation were collected using standardized questions administered as an interview. Information on type of MS (relapsing remitting or progressive), disease duration (years) were collected from medical records. The Expanded Disability Status Scale (EDSS) (Kurtzke, 1983) was used to classify disease severity into mild (EDSS score 0–3.5), moderate (EDSS score 4–5.5) or severe (EDSS score 6–9.5). Standardized self-reported questionnaires, as described below, were used for collection of all other data.

The Swe-ACHC was used for assessment of acceptance (Forslin et al., 2016). The scale consists of 10 items scored on a 5-category Likert rating scale. Six items are negatively worded, and 4 items are positively worded. The positively worded items are coded in reverse before the scores are summed together to a total sum score ranging from 10 to 50. Higher scores correspond to a higher level of acceptance (Stuifbergen et al., 2008). The Sense of Coherence Scale (SOC) was used for assessment of sense of coherence (Antonovsky, 1993). The scale consists of 13 items rated on a 7-category Likert rating scale. A total score is calculated, which can range from 13 to 91, and higher scores indicate a stronger sense of coherence. The Fatigue Severity Scale (FSS) was used for assessment of fatigue (Krupp et al., 1989). The scale consists of 9 items scored on a 7-category Likert rating scale. The mean of all item scores is calculated and the total score can range from 1 to 7. A higher score indicates a higher level of fatigue. The Beck Depression Inventory (BDI) was used for assessment of depressive symptoms (Beck et al., 1961). The scale consists of 20 items scored on a 4-category Likert rating scale (0–3) and one item scored on a 3-category Likert rating scale (0–2). A total score is calculated, which can range from 0 to 62, and higher scores indicate more severe degree of depressive symptoms. The Multiple Sclerosis Impact Scale (MSIS-29) was used for assessment of the physical and psychological impact of MS from the perspective of the PwMS (Hobart et al., 2001). The MSIS-29 consists of 20 items measuring physical impact and 9 items measuring psychological impact. Each item is scored on a 5-category Likert rating scale. Two subscale scores (MSIS-29 Phys and MSIS-29 Psych) are calculated and each is converted to a 0–100 number. A higher score indicates perceived worse physical or psychological impact, respectively, on health. The MSIS-29 was in the present study considered to be a disease-specific measure of physical and psychological dimensions of

HRQL. The EuroQoL-Visual Analogue Scale (EQ-VAS) was used for assessment of health status (Brooks, 1996). The scale consists of a 20-cm vertical line on which respondents mark their perceived overall health state ‘today’ which can range from 0 (worst imaginable) to 100 (best imaginable). The Life Satisfaction checklist (LiSat-11) was used for assessment of aspects of life satisfaction (Fugl-Meyer et al., 2002). The scale consists of 11 items scored on a 6-category Likert rating scale ranging from “very dissatisfied” to “very satisfied”. One item captures global satisfaction with life (life as a whole), and ten items capture satisfaction with life in the domains vocation, economy, leisure, contacts, sexual life, family life, partner relationship, activities of daily living (ADL), physical health and psychological health. The scale can be dichotomised into not satisfied (scores ≤ 4) or satisfied (scores ≥ 5) (Fugl-Meyer et al., 2002). Data from the three items “life as whole”, “physical health”, and “psychological health” were used in the present study.

2.4. Statistical methods

Descriptive statistics were used to present data. Construct validity was evaluated by testing a priori made hypotheses about: (1) the direction and strength of relationships between scores from the Swe-ACHC and scores from the other measures (SOC, FSS, BDI, MSIS-29 Phys, MSIS-29 Psych, EQ-VAS); and (2) the Swe-ACHC's ability to differentiate between groups (not satisfied versus satisfied in three LiSat-11 items). Spearman's rank correlation analyses, and receiver operating characteristic (ROC) curve analyses with calculations of the size of the area under the curve (AUC) were used for these construct validity evaluations. Correlation coefficients between 0.26 and 0.49 were considered low, and moderate to good if between 0.50 and 0.75 (Portney and Watkins, 2009). The AUC reflects how well the Swe-ACHC could distinguish between groups. An AUC between 0.5 to 0.7 was considered to indicate low accuracy and moderate if between 0.7 and 0.9 (Akobeng, 2007).

The research team considered FSS and BDI to measure slightly diverging constructs and that the correlations between these measures and the Swe-ACHC would be low ($r \leq -0.3$). The other measures were considered to capture more similar constructs and correlations would therefore be almost moderate with SOC ($r \geq 0.4$), around moderate with MSIS-29 Phys (r between -0.4 and -0.6), and at least a moderate with MSIS-29 Psych ($r \geq -0.6$) and EQ-VAS ($r \geq 0.6$). The a priori made hypotheses about the Swe-ACHC's ability to differentiate those PwMS categorized as satisfied in the three LiSat-11 items (“life as whole”, “physical health”, “psychological health”) were that the AUCs would be ≥ 0.6 . Hypotheses were based on clinical experience and published literature (Chalk, 2007; Stuijbergen et al., 2008; Pakenham and Fleming, 2011; Lim et al., 2017; Kratz et al., 2017).

Test–retest reliability of the Swe-ACHC was evaluated by analyses of the measurement properties reliability and measurement error. Reliability analyses consisted of intraclass correlation coefficient (ICC) analysis as described below for sum scores and quadratic weighted Cohen's kappa analysis for Swe-ACHC items (de Vet et al., 2011). Reliability was considered very good if $ICC_{\text{agreement}} \geq 0.80$, and fair to good if weighted kappa values were between 0.40 and 0.75 [17]. The standard error of measurement (SEM) and limits of agreement, as described below, were calculated as a parameters of measurement error for Swe-ACHC sum scores (de Vet et al., 2011). Percentage agreement was used as a parameter for measurement error for individual items (de Vet et al., 2011). To check for systematic bias, outliers or heteroscedasticity (i.e. whether the differences depend on the magnitude of the mean), Swe-ACHC sum score data were visualised in a Bland–Altman plot (Fig. 1).

$$ICC_{\text{agreement}} = \sigma_p^2 / (\sigma_p^2 + \sigma_o^2 + \sigma_{\text{residual}}^2)$$

σ_p^2 = variance due to systematic difference between ‘true’ scores of patients

σ_o^2 = variance due to systematic difference between occasions

$\sigma_{\text{residual}}^2$ = residual variance

$$SEM_{\text{agreement}} = \sqrt{(\sigma_o^2 + \sigma_{\text{residual}}^2)}$$

Limits of agreement were defined as $\bar{d} \pm 1.96 \times SD_{\text{diff}}$ where \bar{d} is mean difference between the test and retest occasion and SD_{diff} the standard deviation of the differences.

All analyses were performed using SPSS software (version 24).

3. Results

Of the 155 eligible PwMS, 145 filled out the Swe-ACHC at two occasions, i.e. test (T1) and retest (T2). There were, however, missing data in seven participant's questionnaires, thus, 138 PwMS were included in the present study (Table 1). Almost all participants answered the additional self-reported standardized questionnaires at the 10-year follow-up data collection. Descriptive data from test and retest of the Swe-ACHC and the other questionnaires are presented in Table 2. The distribution of the frequencies of the item scores of Swe-ACHC at T1 and T2 showed that all response options were used except for item 4 (Table 3). Furthermore, that most PwMS used the categories strongly agree and agree with the positively worded items 1, 4, 6 and 9 (Table 3).

Most (78%) a priori formulated construct validity hypotheses were confirmed (Tables 4 and 5). The correlation between Swe-ACHC and BDI sum scores was higher than anticipated whereas the correlation with MSIS-29 Psych was lower. Although all hypotheses concerning AUCs were confirmed, the Swe-ACHC's ability to differentiate those PwMS categorized as satisfied in the LiSat-11 items “life as whole” and “physical health” was better compared to the item “psychological health” (Table 5).

Reliability for the Swe-ACHC sum scores was considered very good, i.e. $ICC_{\text{agreement}} = 0.80$ with a 95% confidence interval of 0.73–0.86. Weighted kappa values ranged from 0.29 to 0.74, and the only value below the range fair to good was for item 6 (Table 6).

Measurement error the Swe-ACHC sum scores was 3.3. The mean difference (\bar{d}) and SD_{diff} were 1.3 and 4.5, respectively, and thus, the limits of agreements were -7.5 and 10.1 (Fig. 1). Percentage agreement for the individual Swe-ACHC items ranged from 42% to 58% (Table 6).

4. Discussion

This study aimed to evaluate psychometric properties of the Swe-ACHC in PwMS. Our findings give evidence of both satisfactory construct validity and test-retest reliability and indicate that the Swe-ACHC can be considered for use in both research and clinical practice.

The COSMIN standards state that assessment of construct validity should be based on testing of a priori specified hypothesis in groups of at least 50 people, and that at least 75% of the results should support the in advance specified hypotheses (de Vet et al., 2011; Terwee et al., 2007). As all these proposed quality criteria were fulfilled, it can be concluded that the construct validity of the Swe-ACHC was good. In addition, the correlations between the Swe-ACHC and self-reported standardized questionnaires were in accordance with previously reported correlations between the original ACHC and measures of HRQL ($r = 0.5$), health ($r = 0.4$) and depression ($r = -0.5$) (Stuijbergen et al., 2008). Construct validity of the Chinese ACHC in patients with stoma has also been explored and, in line with our result, a moderate to good correlation with EQ-VAS ($r = 0.7$) was reported (Lim et al., 2017).

Two of our a priori validity hypotheses were unsupported. The constructs of acceptance and depression seemed to be more related than anticipated. That depression is associated with coping in PwMS has previously been reported (Arnett et al., 2002; Lynch et al., 2001), especially to mal-adaptive emotion-focused coping such as avoidance

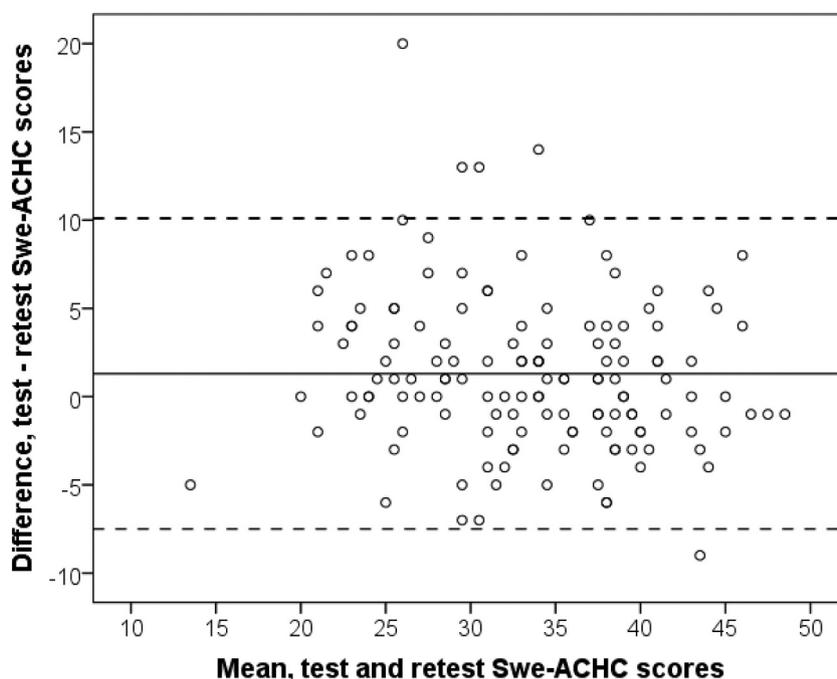


Fig. 1. A Bland–Altman plot for data from test and retest occasions ($n = 138$). The mean of the Swedish Acceptance of Chronic Health Conditions Scale (Swe-ACHC) sum scores from test and retest occasions plotted against the difference between scores from test and retest occasions for each participant. The mean difference (\bar{d}) is marked with a solid line and the limits of agreements are marked with dashed lines.

Table 1
Participant characteristics ($n = 138$).

Variable	Mean	SD	Min–Max
Age (years)	55.2	11.7	30–84
Time since diagnosis (years)	22.8	9.9	11–52
EDSS (score)	4.4	2.5	0–9
	<i>n</i>	(%)	
Women	92	(67)	
Living alone	46	(33)	
University education	57	(41)	
Working full- or part-time	59	(43)	
Type of MS			
relapsing remitting	60	(43)	
primary/secondary progressive	78	(57)	
Disease severity			
mild (EDSS 0–3.5)	61	(44)	
moderate (EDSS 4.5–5.5)	16	(12)	
severe (EDSS 6–9.5)	61	(44)	

SD: standard deviation, Min: minimum value, Max: maximum value, EDSS: Expanded Disability Status Scale.

and escape, but less to accommodative coping such as cognitive restructuring and acceptance. However, our clinically valuable finding that a higher level of acceptance is associated with less depressive symptoms corroborates the result from Chalk (Chalk, 2007). Another possible explanation, in light of findings presented in the original study of the ACHC (Stuifbergen et al., 2008), is that our hypothesis regarding the correlation between depression and acceptance in fact was set too low. We found that both MSIS-29 Phys and MSIS-29 Psych were moderately associated with acceptance. A result in contradiction to our hypothesis and previous studies, where psychological HRQL dimensions are reportedly more related to acceptance than physical dimensions (Van Damme et al., 2016; Grech et al., 2018). These discrepancies might be due to differences in used outcome measures. On the other hand, we found that the AUC was larger for the Lisat-11 item “physical health” than the “psychological health” item, indicating that the Swe-

Table 2
Descriptive results from the self-reported standardized questionnaires.

Questionnaire (possible score)	<i>n</i>	Mean	SD	Median	IQR	Min–Max
Swe-ACHC (10–50)						
T1 test	138	34.1	7.0	35.0	29–39	11–50
T2 retest	138	32.8	7.7	33.5	27–39	16–49
SOC (13–91)	136	68.2	11.9	70.0	62–76	9–90
FSS (1–7)	137	4.6	1.6	4.9	3–6	1–7
BDI (0–62)	135	8.6	6.6	7.0	4–12	0–32
MSIS-29 Phys (0–100)	137	37.0	26.4	33.0	13–57	0–95
MSIS-29 Psych (0–100)	137	30.3	23.9	27.0	10–44	0–91
EQ-VAS (0–100)	137	64.2	21.6	70.0	50–80	0–100

SD: standard deviation, IQR: interquartile range, Min: minimum value, Max: maximum value, Swe-ACHC: Swedish Acceptance of Chronic Health Conditions Scale, SOC: Sense of Coherence Scale, FSS: Fatigue Severity Scale, BDI: Beck Depression Inventory, MSIS-29 Phys: Multiple Sclerosis Impact Scale physical subscale, MSIS-29 Psych: MSIS-29 psychological subscale, EQ-VAS: EuroQoL-Visual Analogue Scale.

ACHC had better ability to differentiate PwMS categorized as satisfied concerning their physical health in comparison to psychological health.

Studies of test–retest reliability should, according to the COSMIN, be evaluated in samples of at least 50 people by calculation of reliability and measurement error parameters (de Vet et al., 2011; Terwee et al., 2007). These recommendations were followed, which gives credibility to our findings. Reliability of the Swe-ACHC sum scores was considered very good and the result was in line with reliability estimates of the original scale in a MS sample (Stuifbergen et al., 2008), but somewhat lower than found for the Chinese ACHC in patients with stoma. The latter study reported an ICC value of 0.997, however, only 20 patients took part in this test-retest assessment. The measurement errors, expressed as SEM and limits of agreement, indicate that for an individual PwMS a change of approximately ± 10 points of Swe-ACHC sum score can be interpreted as a “true” change. Reliability (weighted kappa values) and measurement error (percentage agreement) parameters for

Table 3

Distribution of the frequencies of item scores of the Swedish Acceptance of Chronic Health Conditions Scale (Swe-ACHC) on test (T1) and retest (T2) occasion ($n = 138$).

Swe-ACHC items	(1) Strongly agree T1/ T2	(2) Agree T1/T2	(3) Not sure T1/ T2	(4) Disagree T1/T2	(5) Strongly disagree T1/ T2
1 I feel I've come to terms with my MS	57/42	60/65	12/21	4/5	5/5
2 I'd give all the money I have to get rid of my MS	56/48	21/21	27/20	21/34	13/15
3 I think of my MS as a curse	33/23	35/54	16/18	37/32	17/11
4 I can't conquer MS, but I can adapt to it	60/40	54/73	14/19	10/0	0/6
5 My fondest dream is that I'll awaken some morning without my MS	54/66	36/22	12/15	23/21	13/14
6 Having a disease like MS is just part of life	42/38	56/67	23/12	9/8	8/13
7 My MS is a major focal point in my life.	13/15	21/34	20/20	48/45	36/24
8 I spend a lot of time wondering why I have MS	10/18	22/18	9/10	52/62	45/30
9 I think of my MS as just a part of who I am	33/24	55/69	19/19	24/19	7/7
10 I think a lot about what my life would be like without MS	19/20	17/26	11/23	47/47	44/22

Table 4

Construct validity results presenting Spearman's correlation coefficients (r) between the Swedish Acceptance of Chronic Health Conditions Scale (Swe-ACHC) and the other self-reported standardized questionnaires. Hypothesis supported is shown in bold.

	SOC	FSS	BDI	MSIS-29 Phys	MSIS-29 Psych	EQ-VAS
Swe-ACHC						
r	0.4	-0.3	-0.5	-0.5	-0.5	0.6
p -value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

SOC: Sense of Coherence Scale, FSS: Fatigue Severity Scale, BDI: Beck Depression Inventory, MSIS-29 Phys: Multiple Sclerosis Impact Scale physical subscale, MSIS-29 Psych: MSIS-29 psychological subscale, EQ-VAS: EuroQoL-Visual Analogue Scale.

Table 5

Construct validity results from receiver operating characteristic curve analyses of the Swedish Acceptance of Chronic Health Conditions Scale (Swe-ACHC) sum scores predicting participants categorized as satisfied in three items from the Life Satisfaction checklist. Hypothesis supported is shown in bold.

	Life satisfaction checklist					
	Life as whole		Physical health		Psychological health	
	AUC	95% CI	AUC	95% CI	AUC	95% CI
Swe-ACHC	0.7	0.6–0.8	0.7	0.6–0.8	0.6	0.5–0.7

AUC: area under the curve, CI: confidence interval.

the individual items were considered acceptable. The item 6 (“Having a disease like MS is just part of life”) had both the lowest weighted kappa (0.29) and percentage agreement (42%) value. As highlighted before,

Table 6

Quadratic weighted kappa values and percentage agreement for individual items of the Swedish Acceptance of Chronic Health Conditions Scale (Swe-ACHC).

Swe-ACHC items (in English)	Weighted kappa (95% CI)	Agreement
1 I feel I've come to terms with my MS	0.63 (0.49–0.77)	58%
2 I'd give all the money I have to get rid of my MS	0.74 (0.45–0.83)	56%
3 I think of my MS as a curse	0.61 (0.48–0.74)	49%
4 I can't conquer MS, but I can adapt to it	0.43 (0.24–0.61)	54%
5 My fondest dream is that I'll awaken some morning without my MS	0.61 (0.45–0.74)	49%
6 Having a disease like MS is just part of life	0.29 (0.10–0.48)	42%
7 My MS is a major focal point in my life.	0.67 (0.55–0.80)	55%
8 I spend a lot of time wondering why I have MS	0.59 (0.45–0.72)	55%
9 I think of my MS as just a part of who I am	0.56 (0.42–0.69)	49%
10 I think a lot about what my life would be like without MS	0.56 (0.42–0.70)	49%

CI: confidence interval.

this item can have a dual meaning (Forslin et al., 2016) which might partly explain the finding. Further, having fewer categories than the present 5-category Likert rating scale, e.g. excluding the middle alternative “not sure”, would likely increase both reliability and percentage agreement.

Although our study sample was considered large enough and showed diversity regarding sex, disease severity and other characteristics, it lacked newly diagnosed PwMS. Furthermore, the sample rated themselves at the positive end of the psychological scales used which might be due to that ten years had passed since diagnosis was set or due to that the sample was to some extent selected from a clinical setting. More research is needed to explore construct validity of the Swe-ACHC among PwMS newly diagnosed and in populations not selected from clinical settings. Furthermore, the scale's ability to detect clinically important changes over time and the degree to which a qualitative meaning can be assigned to these changes should also be studied.

5. Conclusions

In conclusion, the Swe-ACHC showed satisfactory construct validity, good reliability and acceptable measurement errors which indicate that the scale can be useful in both research and clinical practice.

Funding

This work was supported by the Neuro Sweden.

Declaration of Competing Interest

None.

Appendix. The Swedish Acceptance of Chronic Health Conditions Scale (Swe-ACHC) and the English ACHC for persons with multiple sclerosis (MS)

Item	Swe-ACHC	English ACHC
1	Jag känner att jag lärt mig leva med min MS	I feel I've come to terms with my MS
2	Jag skulle betala vad som helst för att slippa ha MS	I'd give all the money I have to get rid of my MS
3	MS är som en plåga som drabbat mig	I think of my MS as a curse
4	Jag kan inte vinna över min MS, men jag kan anpassa mig	I can't conquer MS, but I can adapt to it
5	Det jag önskar mest av allt är att en morgon vakna utan MS	My fondest dream is that I'll awaken some morning without my MS
6	Att få en sjukdom som MS är bara som livet kan vara	Having a disease like MS is just part of life
7	Mitt liv kretsar mycket kring MS	My MS is a major focal point in my life.
8	Jag tänker mycket på varför just jag fått MS	I spend a lot of time wondering why I have MS
9	MS har blivit som en del av mig	I think of my MS as just a part of who I am
10	Jag tankar mycket på hur mitt liv skulle vara utan MS	I think a lot about what my life would be like without MS
Likert rating scale		
1	Stämmer helt	Strongly agree
2	Stämmer	Agree
3	Osäker	Not sure
4	Stämmer inte	Disagree
5	Stämmer inte alls	Strongly disagree

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