Validation of simplified scoring systems for assessing cutaneous disease activity in dermatomyositis

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Abstract

Objective

The Cutaneous Dermatomyositis Disease Area and Severity Index (CDASI) is a standard clinician-scored outcome measure for dermatomyositis (DM), but requires expertise and training. We aimed to validate simplified versions of the CDASI activity score.

Methods

Adult DM patients were prospectively enrolled with two clinic visits ≥2 months apart. Two rheumatologists independently assessed patients using the CDASI activity score (range 0–100) and the cutaneous visual analogue scale of the Myositis Disease Activity Assessment Tool (MDAAT cutaneous VAS). Additionally, patients completed the Skindex questionnaire. Four simplifications (sCDASI) were derived: (1) sCDASI-1 (range 0–66), simplified erythema to absent/present (0–1); (2) sCDASI-2 (range 0–36), simplified erythema and exclusion of scale scoring; (3) sCDASI-3 (range 0–20), simplified erythema, exclusion of scale and ulcer scoring; (4) sCDASI-4, (range 0–50), simplification of all parameters to absent/present.

Results

Twenty-seven DM patients (81.5% female, 96.3% White, median age 50.0) were included. Median CDASI activity was 4.5 (IQR 1.0–12.0). All sCDASI scores correlated strongly with the full CDASI (Spearman ϱ=0.97–0.98), MDAAT cutaneous VAS (Spearman ϱ=0.94), and Skindex (Spearman ϱ=0.82–0.83), indicating good convergent validity. Inter-rater reliability for all simplifications was high, as indicated by strong correlations between assessors. The changes from baseline in simplified CDASI scores correlated strongly with the changes in full CDASI scores and MDAAT cutaneous VAS, demonstrating good responsiveness.

Conclusion

Simplified CDASI scorings demonstrated preliminary evidence of favourable validity, reliability, and responsiveness in the longitudinal evaluation of rashes in DM patients.

Key words
dermatomyositis, CDASI score, simplification, skin diseases, outcome assessment

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Introduction

Dermatomyositis (DM), the most common subtype of idiopathic inflammatory myopathy (IIM), is an autoimmune disease with distinct skin lesions, muscle weakness, and other systemic manifestations (1). The cutaneous manifestations of DM are diverse and do not always correlate with muscle disease activity (1). They include photosensitivity and pruritus, with significant impacts on the patient's quality of life (2-4).

Cutaneous Dermatomyositis Disease Area and Severity Index (CDASI) is a clinician-scored instrument that measures activity (erythema, scale, erosion/ulceration) and damage (poikiloderma, calcinosis) caused by cutaneous DM in 15 body areas. Scores range from 0-100 for activity and from 0-32 for damage, with higher scores indicating greater skin involvement (5). CDASI activity scores of 14 or less characterise mild disease, and a 4-5-point change reflects a minimal clinically significant change (6). The CDASI has been validated across multiple studies and has demonstrated strong intra- and inter-rater reliability, validity, and responsiveness to clinical changes. It has been used in clinical trials and longitudinal studies to monitor skin disease progression and evaluate therapeutic efficacy (7, 8). The CDASI also correlates significantly with patient-reported outcome measures (PROMs) and DM-related biomarkers (9, 10).

Despite these favourable metrics, application of the CDASI requires substantial expertise and training, which may limit its use among clinicians who are less experienced in dermatologic assessments (11). Notably, scoring erythema across patients with different skin pigmentation introduces significant inter-rater variability, particularly in individuals with darker skin tones (12, 13). Furthermore, the clinical relevance of distinguishing between degrees of erythema in the scoring has not been fully defined. Additionally, assessment of scaling superimposed on background skin xerosis can be difficult. This variability highlights the need for a more accessible and user-friendly version of the CDASI that maintains the tool's robust psychometric properties while reducing the potential for subjective bias when used by non-experts.

Simplifying outcome measures reduces clinician burden, promotes consistent documentation, and supports decision-making by focusing on clinically meaningful indicators. In dermatology, the Simplified Psoriasis Index (SPI) (14) and Simplified Psoriasis Area and Severity Index (SPASI) (15) were developed to improve clinical applicability without compromising psychometric integrity. Collectively, these tools streamline complex assessments and facilitate disease monitoring in both research settings and clinical practice.

In response to the challenges associated with the use of the full CDASI, our study aimed to validate simplified versions of the CDASI activity score, with the goal of making this important assessment tool more applicable to a broader range of healthcare providers. We hypothesised that these simplified versions would retain the validity, reliability, and responsiveness of the full CDASI while being easier to implement in diverse clinical settings. Given its focus on reversible, treatment-responsive disease components, CDASI-activity was used for analysis in this study rather than CDASI-damage or total score.

Materials and methods

Study design

This prospective observational study enrolled DM patients from the University of Pittsburgh Myositis Center to evaluate the performance of the simplified CDASI scores. The study adhered to the Institutional Review Board (IRB) approved protocol 3.01 (MOD21090106-006), the principles of the Declaration of Helsinki, and the Harmonized Tripartite Guideline for Good Clinical Practice from the International Conference on Harmonization. All patients provided written informed consent prior to study participation.

Study participants

Adult DM patients (≥18 years) with varying degrees of active skin disease or no skin involvement fulfilling the 2017 European League Against Rheu-

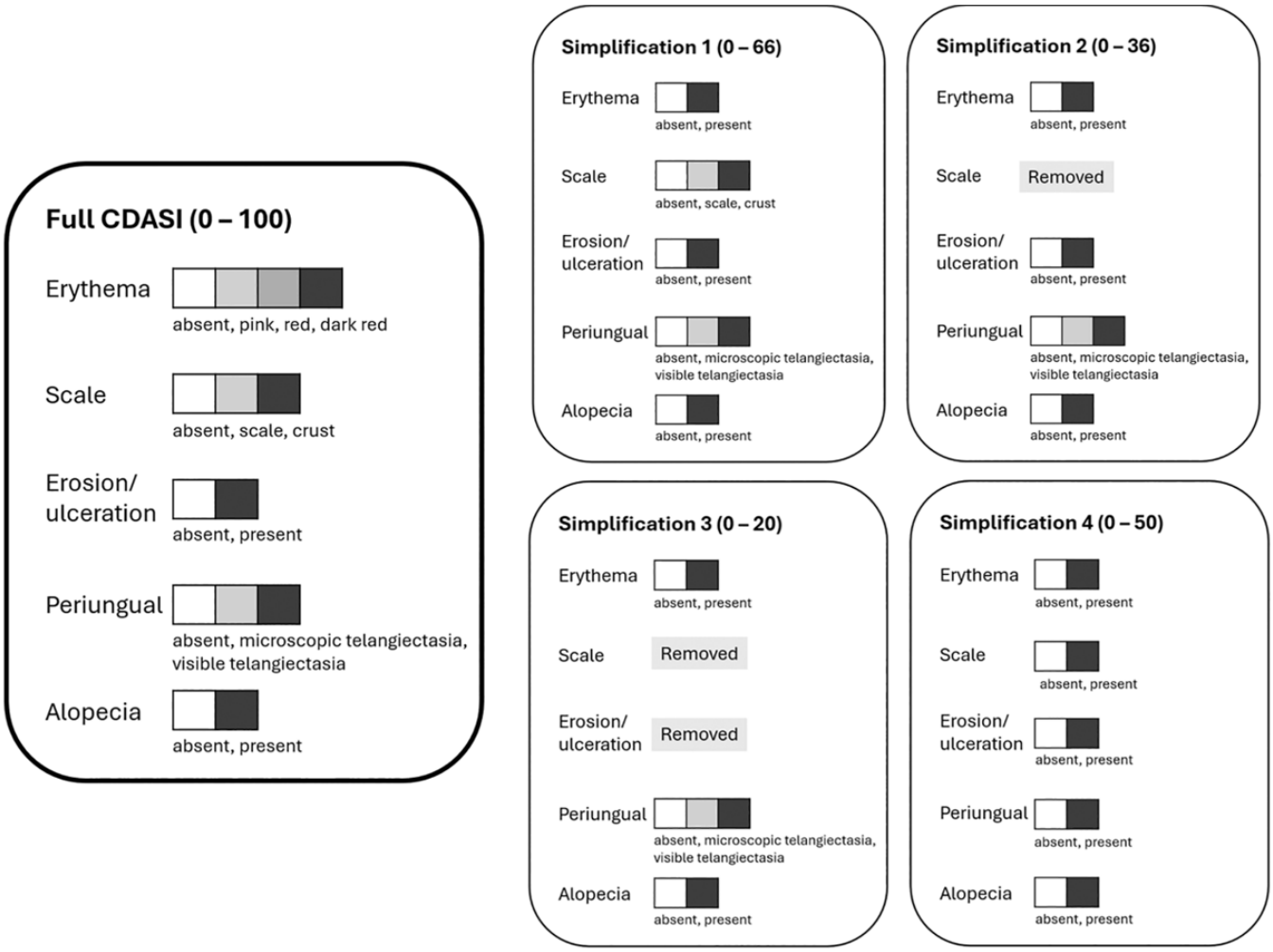

Fig. 1. Structure of the full Cutaneous Dermatomyositis Disease Area and Severity Index (CDASI) activity score and the four CDASI simplifications.
Left panel: full CDASI activity score (0-100), showing item structure and ordinal categories for erythema, scale, erosion/ulceration, periungual change, and alopecia.
Right panels: Simplification 1 (0-66) dichotomises erythema to absent/present while retaining full scoring for scale, erosion/ulceration, periungual change, and alopecia. Simplification 2 (0-36) further removes scale scoring; Simplification 3 (0-20) removes both scale and erosion/ulceration; Simplification 4 (0-50) dichotomises all parameters (erythema, scale, erosion/ulceration, periungual change, alopecia) to absent/present.

matism/American College of Rheumatology classification criteria of DM (16) were identified for enrolment. Individuals with significant cutaneous conditions other than DM that could interfere with skin assessment were excluded.

Study procedures

Each participant completed two clinic visits, one baseline visit and the second visit 2 to 12 months later. Demographic features, disease characteristics, and all outcome evaluations were collected at both visits. At both visits, two experienced University of Pittsburgh Myositis Center rheumatologists with expertise in IIM independently completed the standard CDASI score and cutaneous visual analogue scale of the Myositis Disease Activity Assessment Tool (MDAAT cutaneous VAS) (17). Both rheumatologists had prior training and clinical experience in CDASI and MDAAT evaluation. The simplified CDASI scores were subsequently derived from the standard CDASI assessments using predefined item subsets (see below).

Participants completed the PROMs, including the Skindex-16 questionnaire, patient global activity (PtGA), itch scale or peak pruritus numerical rating scale (PP-NRS), and Health Assessment Questionnaire-Disability Index (HAQ-DI). The Skindex-16 is a validated PROM of the impact of skin diseases on patients' quality of life (18). It consists of questions in key areas of symptoms, emotions, and functioning, with higher scores reflecting a greater negative impact on quality of life. PtGA is a 10 cm visual analogue scale (VAS) that provides an overall rating of DM-related disease activity. PP-NRS evaluates the patient-reported intensity of the worst itch on a scale of 0-10 in the previous 24 hours (19). HAQ-DI is a self-reported questionnaire that evaluates physical function with a higher score indicating worse disability (20).

During visits, the study staff conducted standardised in-clinic 3D photography using the Vectra H1 camera (Canfield Scientific, NJ, USA) on the four most commonly affected areas in DM (face, upper chest, neck/upper back, and

hands), regardless of rash presence, with additional areas photographed if affected. Using Vectra Analysis Module (VAM) software, total rash areas (cm^2) and the percentage of total body surface area (%BSA) affected by rashes were calculated.

Participants also completed two novel patient self-assessments of DM disease activity tools developed by the University of Pittsburgh Myositis Center: Patient Dermatomyositis **Ra**sh **S**everity (RAS) and Patient Dermatomyositis **Ra**sh **M**apping (RAM). These tools were designed to promote patient self-awareness, support personalised care, and facilitate shared decision-making, thereby enriching both clinical management and research efforts. RAS is a simplified DM cutaneous severity score that involves self-identification of rashes, such as heliotrope rash and periorbital oedema. Scores range from 0 to 99, with higher values indicating greater disease severity. RAM enables patients to document DM rash location and redness on body diagrams with severity scores calculated by summing the individual products of the %BSA affected by the rashes multiplied by the redness level (pink=1, red=2, dark red=3). Higher scores indicate greater disease severity.

The CDASI score simplifications (sCDASI)

From the parameters that measure cutaneous disease activity in the full CDASI score (erythema, scale, erosion/ulceration, periungual change, alopecia), four simplifications were made, 1) sCDASI-1: simplified erythema score from absent, pink, red, dark red (0–3) to erythema absent/present (0–1) with no change in other parameters; 2) sCDASI-2, simplified erythema score and exclusion of scale scoring; 3) sCDASI-3, simplified erythema score, exclusion of scale and ulcer scoring; 4) sCDASI-4, simplification of all CDASI parameters (erythema, scale, erosion/ulceration, periungual change, alopecia) to absent/present (0–1). The score ranges for the aforementioned 4 CDASI simplifications were 0–66 (sCDASI-1), 0–36 (sCDASI-2), 0–20 (sCDASI-3), and 0–50 (sCDASI-4) (Fig. 1).

Table I. Characteristics of Dermatomyositis Patients (n=27).

Variables	n (%) or median (IQR)
Demographics	
Age at enrollment	50.0 (38.0 – 61.0)
Disease duration (months)	38.0 (11.0 – 89.0)
Female	22 (81.5)
Race	
White	26 (96.3)
Black	1 (3.7)
Laboratory	
Myositis-specific antibodies	19 (70.4)
TIF1-γ	13
NXP2	1
MDA5	3
SAE	1
Jo-1	1
PL-12	1
Myositis-associated antibodies	5 (18.5)
Ro	4
PM-Scl	1
Creatine kinase (IU/L)	71.0 (48.0 – 111.0)
DM cutaneous features*	
Scale	16 (59.3)
Erosion/ulceration	4 (14.8)
Myositis outcome measures at baseline (visit 1)	
Physician assessment (54 assessments)	
CDASI activity (0 – 100)	6.0 (1.8 – 13.3)
CDASI activity 0 to ≤ 6	28 (51.9)
CDASI activity > 6 to ≤ 14	13 (24.1)
CDASI activity > 14 (moderate-severe activity)	13.0 (24.1)
CDASI damage (0 – 32)	0.0 (0.0 – 0.0)
Patient assessment	
Skindex-16 (0 – 96)	28.0 (4.0 – 45.0)
Myositis outcome measures at all visits (visit 1 and visit 2)	
Physician assessment (100 assessments)	
CDASI activity (0 – 100)	4.5 (1.0 – 12.0)
CDASI activity 0 to ≤ 6	58.0 (58.0)
CDASI activity > 6 to ≤ 14	20.0 (20.0)
CDASI activity > 14 (moderate-severe activity)	22.0 (22.0)
CDASI damage (0 – 32)	0.0 (0.0 – 0.0)
Patient assessment	
Skindex-16 (0 – 96)	9.0 1.0 – 40.0)

Abbreviations: CDASI, Cutaneous Dermatomyositis Disease Area and Severity Index; DM, dermatomyositis; IQR, interquartile range.
Higher CDASI and Skindex-16 indicate worse outcomes.
*Presented at least in one out of the two visits.

Statistical analysis

Baseline characteristics were presented using descriptive statistics, including n (%) for categorical variables and median with interquartile range (IQR) for continuous variables. Ceiling and floor effects were calculated as the percentage of patients having the best and worst score possible at the scale level. Greater than 15% was considered as the presence of significant ceiling or floor effect (21). Bland-Altman plots were drawn to evaluate the agreement between the log 10 transformation of the full CDASI and its four simplifications by plotting the mean of the two scores against their difference. The plots visualise the average bias (mean difference) and the 95% limits of agreement. A narrow range of limits indicates stronger agreement, while wider limits suggest greater variability between the two methods.

The construct validity, inter-rater reliability, and responsiveness of the CDASI simplifications were evaluated using the Spearman correlation coefficient (r_{sp}), comparing it to the standard CDASI, MDAAT cutaneous VAS, PROMs, and patient self-assessments of DM disease activity. The magnitude of r_{sp} was defined as follows: strong, r_{sp} >0.50, moderate between 0.30 and 0.49, and poor <0.30[22]. Divergent va-

lidity was also examined, with anticipated weak correlations among CDASI simplifications and HAQ-DI (r_{sp} <0.30) due to differences in the constructs measured. A linear regression analysis was also performed to assess the relationship between the full CDASI and its four simplifications.

Moreover, an intraclass correlation coefficient (ICC) with a 95% confidence interval (95% CI) based on a single measurement, absolute agreement, and two-way mixed effects model was used to evaluate inter-rater reliability. To meet the normality assumption for ICC analysis, a log 10 transformation was applied to the CDASI score simplifications. This was a proof-of-concept study of 30 subjects. Statistical analyses were performed using SPSS version 22 (IBM, Armonk, NY, USA).

Results

Participants

Between August 2022 and April 2024, 27 DM patients (81.5% female, 96.3% White) were enrolled (21 patients with varying degrees of active rash and 6 patients without rash). The median age at enrolment was 50.0 (38.0–61.0) years, and the DM disease duration was 38.0 (11.0–89.0) months.

The median CDASI activity score at baseline was 6.0 (1.8–13.3). Most of the participants had mild cutaneous disease activity, while 24.1% had moderate-severe disease activity at baseline, defined as a CDASI activity score of more than 14. The median CDASI activity score for all visits was 4.5 (1.0–12.0). Regarding specific cutaneous features, 59.3% of patients had a scale score ≥1, while 14.8% exhibited at least one erosion or ulceration with an erosion/ulceration score ≥1 across the two visits (Table I).

CDASI score simplifications

After addressing missing data, 100 full CDASI scores from 27 participants were analysed. The results of the four simplified CDASI scores are summarised in Table II and Supplementary Figure S1. The full CDASI provided the widest score range and most variability. All four simplifications reduced the range and the potential complexity of scoring. sCDASI-2 and sCDASI-3 offered a more condensed and simplified scoring system. sCDASI-1 and sCDASI-4 had more balance between simplification and maintaining a broader score range compared with sCDASI-2 and sCDASI-3. Notably, the distributions of all scores, including the full CDASI, exhibited a right-skewed pattern, reflecting the predominance of mild cutaneous disease activity among the participants.

Table II. Summary statistics of Cutaneous Dermatomyositis Disease Area and Severity Index (CDASI) score simplifications (all visits).

CDASI simplification	Median (IQR) in the patient cohort	Range in the patient cohort	Minimum score – maximum score	Ceiling effect*	Floor effect*
Full CDASI	4.5 (1.0 – 12.0)	0 - 48	0 - 100	0%	5.2%
sCDASI-1[1]	4.0 (0.3 – 10.0)	0 - 30	0 - 66	0%	5.2%
sCDASI-2[2]	4.0 (0.3 – 9.0)	0 - 19	0 - 36	0%	5.2%
sCDASI-3[3]	4.0 (0.3 – 9.0)	0 - 18	0 - 20	0%	5.2%
sCDASI-4[4]	4.0 (0.3 – 9.8)	0 - 27	0 - 50	0%	5.2%

CDASI: Cutaneous Dermatomyositis Disease Area and Severity Index; IQR: interquartile range; sCDASI: simplified CDASI score.
*Excluding 6 patients without an active rash.
[1]**Simplification 1:** simplified erythema score to 0 or 1, with other parameters remaining the same.
[2]**Simplification 2:** simplified erythema score to 0 or 1, exclusion of scale scoring.
[3]**Simplification 3:** simplified erythema score to 0 or 1, exclusion of both scale, and ulcer scoring.
[4]**Simplification 4:** simplification of all parameters (erythema, scale, erosion/ulceration, periungual change, alopecia) to 0 or 1.

Floor and ceiling effects of CDASI score simplifications

After excluding 6 patients without an active rash, the full CDASI score and its simplifications demonstrated no significant floor and ceiling effects (<15%) at the scale level (Table II).

Agreement between the full CDASI and simplifications

Bland-Altman plots revealed levels of agreement between the full CDASI and its four simplifications (Fig. 2). While all simplifications exhibited a slight positive bias, indicating a tendency to underestimate skin activity compared to the full CDASI, the degree of agreement differed. sCDASI-1 and sCDASI-4 demonstrated the narrowest limits of agreement, suggesting robust concordance with the full CDASI, while sCDASI-2 showed the widest limits, indicating poorer agreement. These findings suggest that, in terms of agreement, sCDASI-1 and sCDASI-4 may be suitable alternatives to the full CDASI.

Validity of CDASI score simplifications

All CDASI score simplifications maintained a strong correlation with the full CDASI, with r_{sp} ranging from 0.97 to 0.98 (Table III). Linear regression analysis yielded similarly robust results (Fig. 3). Simplified scores also correlated well with MDAAT cutaneous VAS (r_{sp}=0.94 for all), comparable to the full CDASI's correlation with MDAAT cutaneous VAS (r_{sp}=0.93), indicating good convergent validity. The simplified scores retained substantial correlations with patient-reported outcomes, including the Skindex-16, Itch Scale, PtGA, RAS, RAM, and %BSA involvement of rashes from 3D camera images, although the strength of these associations was slightly lower. Thus, despite simplification, the indices still captured the relevant and clinically meaningful aspects of skin disease as perceived by patients. Objective 3D imaging further enhanced the validity of the different simplified scoring systems. Divergent validity was confirmed by the absence of a statistically significant correlation between CDASI score simplifications and HAQ-DI.

For known groups validity, the patients with moderate-severe skin disease activity (full CDASI activity >14) had significantly higher sCDASI scores compared to those with mild skin disease activity. Median scores for each simplification in the moderate-severe vs. mild groups were as follows: sCDASI-1 (16.0 *vs*. 3.0), sCDASI-2 (13.0 *vs*. 3.0), sCDASI-3 (13.0 *vs*. 3.0), and sCDASI-4 (16.0 *vs*. 2.5); all comparisons were statistically significant (p<0.001).

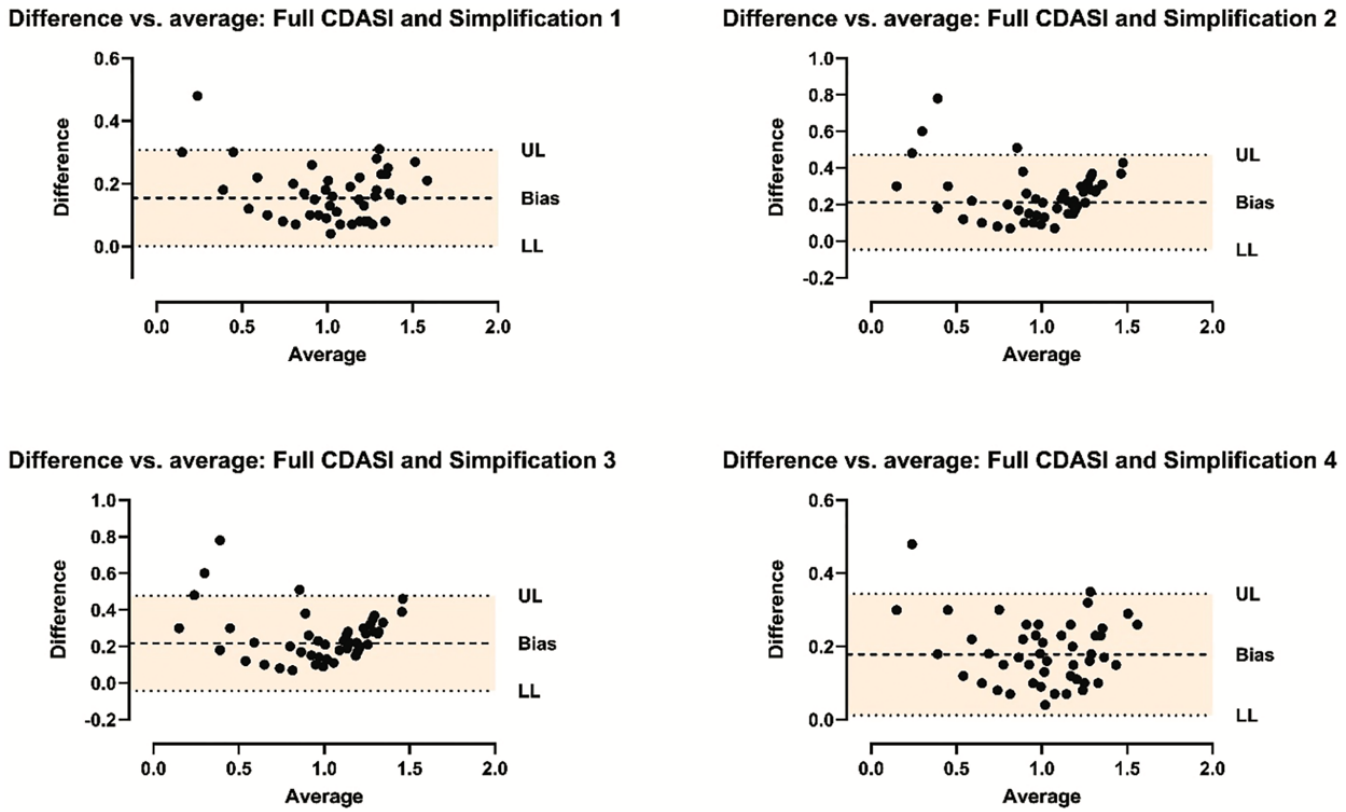

Fig. 2. Bland-Altman plots between the log 10 transformation of the full Cutaneous Dermatomyositis Disease Area and Severity Index (CDASI) and its four simplifications.
Bland-Altman plots showing the agreement between log 10 transformation of the full CDASI and Simplifications 1-4. The plots display the difference between the full CDASI and each simplification against the average of the two measurements. The bias line (mean difference) and the upper (UL) and lower (LL) limits of agreement (± 1.96 standard deviations) are indicated.
Simplification 1: simplified erythema score to 0 or 1, with other parameters remaining the same.
Simplification 2: simplified erythema score to 0 or 1, exclusion of scale scoring.
Simplification 3: simplified erythema score to 0 or 1, exclusion of both scale, and ulcer scoring.
Simplification 4: simplification of all parameters (erythema, scale, erosion/ulceration, periungual change, alopecia) to 0 or 1.

Inter-rater reliability of CDASI score simplifications

Inter-rater reliability for all simplifications was high, as indicated by strong correlations between assessors and high ICCs. The simplifications generally showed improved inter-rater reliability over the full CDASI, with Spearman correlation coefficients between 0.95 and 0.96 and ICCs ranging from 0.92 to 0.94. These results suggested that the simplified CDASI indices not only correlate well with the full scores but also enhance consistency between different assessors (Supplementary Table S1).

Responsiveness of CDASI score simplifications

Regarding absolute changes in scores between two visits, the correlation with the full CDASI remained high across all simplifications (r_{sp} 0.81-0.87). Linear regression analysis yielded similarly robust results (Supplementary Fig. S2). Additionally, changes in sCDASI scores showed moderate to strong correlations with changes in MDAAT cutaneous VAS, Skindex-16, PtGA, RAS, RAM, and %BSA by 3D camera imaging. These findings support that the CDASI simplifications track disease changes comparably to the full CDASI. Notably, their correlations with changes in PROMs and patient self-assessments were similar or superior to those of the full CDASI, indicating good responsiveness to clinical change across all simplifications (Supplementary Table S2).

Discussion

This prospective study validated simplified versions of the CDASI activity score, demonstrating that reducing the complexity of this clinical tool did not compromise its validity, reliability, or responsiveness in assessing DM cutaneous disease activity. Since the evaluation of skin erythema is subject to significant inter-rater variability, even amongst dermatologists (12, 13), and the clinical significance of varying degrees of erythema, particularly in relation to overall disease severity in DM remains unclear, we simplified the erythema score to a binary measure (0 or 1) across all four simplified versions. This adjustment prioritises clarity and consistency over sensitivity to subtle changes in redness, where precise clinical implications are yet to be clearly established.

The full CDASI, developed in 2008 and refined in 2010 from having four main activity measures (erythema, scale, excoriation, ulceration) to three main activity measures (erythema, scale, erosion/ulceration), has been a cornerstone in cutaneous DM disease

Table III. Correlation of Cutaneous Dermatomyositis Disease Area and Severity Index (CDASI) simplifications with full CDASI and other parameters (all visits).

CDASI simplification	Spearman correlation coefficient								
	MDAAT Cutaneous VAS	**Full CDASI**	**Skindex-16**	**Itch Scale**	**PtGA**	**HAQ-DI**	**RAS**	**RAM**	**3D camera %BSA**
Full CDASI	0.929* n = 93	N/A	0.811* n = 98	0.476* n = 98	0.709* n = 94	0.090 n = 98	0.770* n = 94	0.877* n = 80	0.833* n = 94
sCDASI-1[1]	0.944* n = 93	0.982* n = 100	0.834* n = 98	0.502* n = 98	0.721* n = 94	0.085 n = 98	0.784* n = 94	0.891* n = 80	0.820* n = 94
sCDASI-2[2]	0.940* n = 93	0.972* n = 100	0.824* n = 98	0.502* n = 98	0.712* n = 94	0.056 n = 98	0.763* n = 94	0.887* n = 80	0.839* n = 94
sCDASI-3[3]	0.939* n = 93	0.972* n = 100	0.823* n = 98	0.501* n = 98	0.710* n = 94	0.052 n = 98	0.761* n = 94	0.886* n = 80	0.838* n = 94
sCDASI-4[4]	0.939* n = 93	0.979* n = 100	0.832* n = 98	0.513* n = 98	0.717* n = 94	0.078 n = 98	0.781* n = 94	0.886* n = 80	0.817* n = 94

CDASI: Cutaneous Dermatomyositis Disease Area and Severity Index; HAQ-DI: Health Assessment Questionnaire Disability Index; MDAAT Cutaneous VAS: cutaneous visual analogue scale of the Myositis Disease Activity Assessment Tool; PtGA: patient global activity; RAS: Patient Dermatomyositis Rash Severity; RAM: Patient Dermatomyositis Rash Mapping; sCDASI: simplified CDASI score; 3D camera %BSA: percentage of body surface area involvement of rashes calculated from 3D camera images.
Higher CDASI, Skindex-16, Itch Scale, PtGA, HAQ-DI, RAS and RAM indicate worse outcomes.
*p-value <0.001.
[1]**Simplification 1:** simplified erythema score to 0 or 1, with other parameters remaining the same.
[2]**Simplification 2:** simplified erythema score to 0 or 1, exclusion of scale scoring.
[3]**Simplification 3:** simplified erythema score to 0 or 1, exclusion of both scale, and ulcer scoring.
[4]**Simplification 4:** simplification of all parameters (erythema, scale, erosion/ulceration, periungual change, alopecia) to 0 or 1.

assessment (10). In a prior study, the 2010 CDASI showed a nearly perfect correlation with the 2008 version (r_{sp} =0.99)[5], confirming the robustness of the simplified scale.

We observed consistently high Spearman correlation coefficients (0.97–0.98) between the simplified CDASI scores and the full CDASI. The simplified scores also correlated well with physician-assessed MDAAT cutaneous VAS, comparable to the full CDASI score, demonstrating that the simplified versions retain strong convergent validity. These findings suggest that, despite the reduced scoring complexity, the simplified versions continue to accurately capture cutaneous disease activity in DM patients as assessed by rheumatologists. Similarly, our findings align with prior studies in psoriasis that reported a high correlation between the professionally reported Simplified Psoriasis Index for severity (proSPI-s), and Psoriasis Area and Severity Index (PASI) (r_{sp}=0.91), suggesting that simplified versions of skin disease severity scores can preserve performance metrics (14).

Slightly lower Spearman correlation coefficients were found between the CDASI simplifications and the Skindex-16 (0.81–0.82). However, these correlations were still higher than those observed between the full CDASI and the Skindex-16, indicating that the simplifications may offer some improvement in capturing patient-reported outcomes. This trend was similar to other PROMs and patient self-assessments of DM disease activity. Comparatively, Goreshi *et al*. have reported moderate correlations between full CDASI scores and Skindex-29 subscores, with the Pearson's correlation coefficient of 0.33 for Skindex-Symptoms, 0.46 for Skindex-Emotion, and 0.44 for Skindex-Function (2).

The inter-rater reliability of the four CDASI simplifications was high. This improvement in reliability over the full CDASI suggests that the simplified versions may reduce variability in scoring between different assessors. This enhanced reliability could facilitate broader adoption of the CDASI simplifications in diverse assessors, particularly those with varying levels of experience in dermatological assessments.

The responsiveness of the simplified CDASI score, evidenced by strong correlations in absolute changes from baseline with the full CDASI and moderate to strong correlations with MDAAT cutaneous VAS, PROMs, and patient self-assessments of DM disease activity, underscores the potential utility of simplified CDASI scores for longitudinal monitoring of patients.

Among the simplifications, sCDASI-1 and sCDASI-4, which balance simplification with a broad scoring range, appear to offer the most practical alternatives for routine clinical use. These versions reduce the scoring burden while preserving the tool's psychometric properties, potentially increasing its applicability by a wider range of healthcare providers. It is important to acknowledge potential trade-offs, particularly in sCDASI-2 and sCDASI-3, where the ability to detect subtle changes in higher disease activity might be compromised by the condensed scoring system.

Despite promising results, several limitations should be acknowledged. The

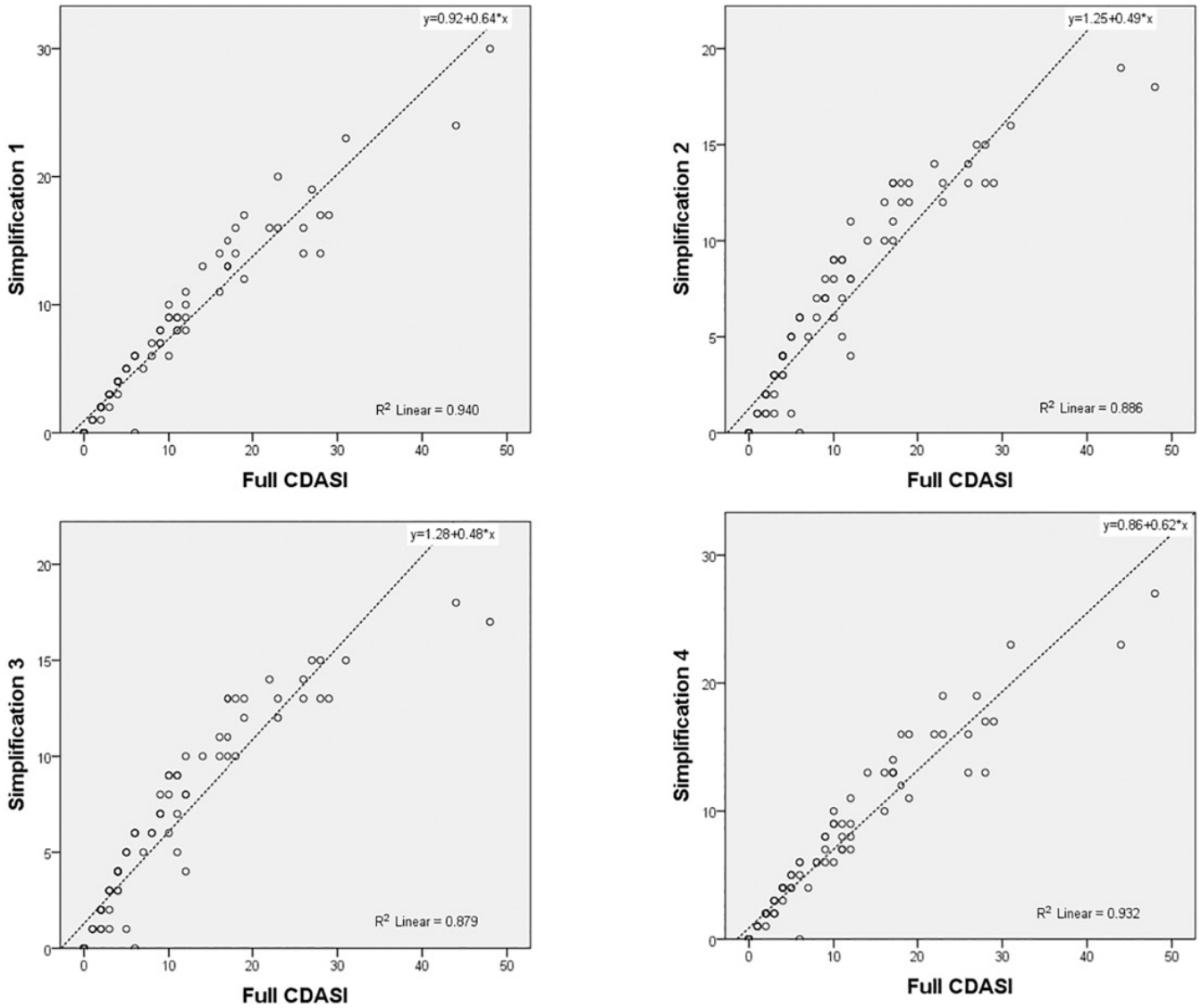

Fig. 3. Linear regression analyses comparing each Cutaneous Dermatomyositis Disease Area and Severity Index (CDASI) simplification (Simplifications 1-4) to the full CDASI score.

Each panel displays the regression line, equation, and coefficient of determination (R^2) for the respective simplification. All simplifications demonstrated strong linear correlation with the full CDASI, with R^2 values ranging from 0.879 to 0.940. Despite varying slopes and intercepts, all simplifications captured a substantial proportion of the variance in full CDASI scores, supporting their potential as alternatives for disease activity assessment.

Simplification 1: simplified erythema score to 0 or 1, with other parameters remaining the same.

Simplification 2: simplified erythema score to 0 or 1, exclusion of scale scoring.

Simplification 3: simplified erythema score to 0 or 1, exclusion of both scale, and ulcer scoring.

Simplification 4: simplification of all parameters (erythema, scale, erosion/ulceration, periungual change, alopecia) to 0 or 1.

relatively small, single centre, and homogenous cohort, comprised primarily of White patients with generally low cutaneous disease activity and infrequent erosions or ulcerations (14.8%), may limit the generalizability of these findings to the broader DM population, particularly those with more extensive or severe skin involvement. Although this homogeneity can be viewed as a methodological strength in the context of a pilot proof-of-concept study, as it allows clearer evaluation of structural changes by reducing confounding factors related to ethnicity, disease variability, and clinical practice settings, our results should be interpreted as preliminary. Future studies in larger and more ethnically diverse populations spanning the full spectrum of disease activity are needed to confirm these findings and further establish the feasibility and applicability of simplified CDASI scoring in clinical practice. In conclusion, the simplified CDASI scores demonstrated strong validity, high inter-rater reliability, and good responsiveness, suggesting that these simplifications could facilitate the broader adoption of the CDASI in clinical practice. However, further research is necessary to validate their utility across diverse clinical settings.

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References

1. DEWANE ME, WALDMAN R, LU J: Dermatomyositis: Clinical features and pathogenesis. *J Am Acad Dermatol* 2020; 82(2): 267-81. https://doi.org/10.1016/j.jaad.2019.06.1309
2. GORESHI R, CHOCK M, FOERING K, FENG R, OKAWA J, ROSE M *et al*.: Quality of life in dermatomyositis. *J Am Acad Dermatol* 2011; 65(6): 1107-16. https://doi.org/10.1016/j.jaad.2010.10.016
3. HUNDLEY JL, CARROLL CL, LANG W *et al*.: Cutaneous symptoms of dermatomyositis significantly impact patients' quality of life. *J Am Acad Dermatol* 2006; 54(2): 217-20. https://doi.org/10.1016/j.jaad.2004.12.015
4. KLEITSCH J, WEINER JD, PANDYA R, CONCHA JS, LIM D, WERTH VP: The physical and emotional impact of cutaneous dermatomyositis: a qualitative study. *Arch Dermatol Res* 2023; 315(8): 2431-5. https://doi.org/10.1007/s00403-023-02625-2
5. YASSAEE M, FIORENTINO D, OKAWA J *et al*.: Modification of the cutaneous dermatomyositis disease area and severity index, an outcome instrument. *Br J Dermatol* 2010; 162(3): 669-73. https://doi.org/10.1111/j.1365-2133.2009.09521.x
6. ANYANWU CO, FIORENTINO DF, CHUNG L *et al*.: Validation of the Cutaneous Dermatomyositis Disease Area and Severity Index: characterizing disease severity and assessing responsiveness to clinical change. *Br J Dermatol* 2015; 173(4): 969-74. https://doi.org/10.1111/bjd.13915
7. AGGARWAL R, CHARLES-SCHOEMAN C, SCHESSL J *et al*.: Trial of Intravenous Immune Globulin in Dermatomyositis. *N Engl J Med* 2022; 387(14): 1264-78. https://doi.org/10.1056/NEJMoa2117912
8. WERTH VP, HEJAZI E, PENA SM *et al*.: Safety and Efficacy of Lenabasum, a Cannabinoid Receptor Type 2 Agonist, in Patients with Dermatomyositis with Refractory Skin Disease: A Randomized Clinical Trial. *J Invest Dermatol* 2022; 142(10): 2651-9e1. https://doi.org/10.1016/j.jid.2022.03.029
9. RIDER LG, WERTH VP, HUBER AM *et al*.: Measures of adult and juvenile dermatomyositis, polymyositis, and inclusion body myositis: Physician and Patient/Parent Global Activity, Manual Muscle Testing (MMT), Health Assessment Questionnaire (HAQ)/ Childhood Health Assessment Questionnaire (C-HAQ), Childhood Myositis Assessment Scale (CMAS), Myositis Disease Activity Assessment Tool (MDAAT), Disease Activity Score (DAS), Short Form 36 (SF-36), Child Health Questionnaire (CHQ), physician global damage, Myositis Damage Index (MDI), Quantitative Muscle Testing (QMT), Myositis Functional Index-2 (FI-2), Myositis Activities Profile (MAP), Inclusion Body Myositis Functional Rating Scale (IBM-FRS), Cutaneous Dermatomyositis Disease Area and Severity Index (CDASI), Cutaneous Assessment Tool (CAT), Dermatomyositis Skin Severity Index (DSSI), Skindex, and Dermatology Life Quality Index (DLQI). *Arthritis Care Res* (Hoboken) 2011; 63 Suppl 11(011): S118-57. https://doi.org/10.1002/acr.20532
10. AHMED S, CHEN KL, WERTH VP: The validity and utility of the Cutaneous Disease Area and Severity Index (CDASI) as a clinical outcome instrument in dermatomyositis: A comprehensive review. *Semin Arthritis Rheum* 2020; 50(3): 458-62. https://doi.org/10.1016/j.semarthrit.2020.01.002
11. TIAO J, FENG R, BIRD S *et al*.: The reliability of the Cutaneous Dermatomyositis Disease Area and Severity Index (CDASI) among dermatologists, rheumatologists and neurologists. *Br J Dermatol* 2017; 176(2): 423-30. https://doi.org/10.1111/bjd.15140
12. ZHAO CY, WIJAYANTI A, DORIA MC *et al*.: The reliability and validity of outcome measures for atopic dermatitis in patients with pigmented skin: A grey area. *Int J Womens Dermatol* 2015; 1(3): 150-4. https://doi.org/10.1016/j.ijwd.2015.05.002
13. FINLAY AY, GRIFFITHS TW, BELMO S, CHOWDHURY MMU: Why we should abandon the misused descriptor 'erythema'. *Br J Dermatol* 2021; 185(6): 1240-1. https://doi.org/10.1111/bjd.20660
14. CHULAROJANAMONTRI L, GRIFFITHS CE, CHALMERS RJ: The Simplified Psoriasis Index (SPI): a practical tool for assessing psoriasis. *J Invest Dermatol* 2013; 133(8): 1956-62. https://doi.org/10.1038/jid.2013.138
15. LOUDEN BA, PEARCE DJ, LANG W, FELDMAN SR: A Simplified Psoriasis Area Severity Index (SPASI) for rating psoriasis severity in clinic patients. *Dermatol Online J* 2004; 10(2): 7. https://doi.org/10.5070/D318w9j736
16. LUNDBERG IE, TJARNLUND A, BOTTAI M *et al*.: 2017 European League Against Rheumatism/American College of Rheumatology Classification Criteria for Adult and Juvenile Idiopathic Inflammatory Myopathies and Their Major Subgroups. *Arthritis Rheumatol* 2017; 69(12): 2271-82. https://doi.org/10.1002/art.40320
17. ISENBERG DA, ALLEN E, FAREWELL V *et al*.: International consensus outcome measures for patients with idiopathic inflammatory myopathies. Development and initial validation of myositis activity and damage indices in patients with adult-onset disease. *Rheumatology* (Oxford) 2004; 43(1): 49-54. https://doi.org/10.1093/rheumatology/keg427
18. CHREN MM, LASEK RJ, SAHAY AP, SANDS LP: Measurement properties of Skindex-16: a brief quality-of-life measure for patients with skin diseases. *J Cutan Med Surg* 2001; 5(2): 105-10. https://doi.org/10.1007/BF02737863
19. YOSIPOVITCH G, REANEY M, MASTEY V *et al*.: Peak Pruritus Numerical Rating Scale: psychometric validation and responder definition for assessing itch in moderate-to-severe atopic dermatitis. *Br J Dermatol* 2019; 181(4): 761-9. https://doi.org/10.1111/bjd.17744
20. BRUCE B, FRIES JF: The Stanford Health Assessment Questionnaire: a review of its history, issues, progress, and documentation. *J Rheumatol* 2003; 30(1): 167-78.
21. MCHORNEY CA, TARLOV AR: Individual-patient monitoring in clinical practice: are available health status surveys adequate? *Qual Life Res* 1995; 4(4): 293-307. https://doi.org/10.1007/BF01593882
22. COHEN J: A power primer. *Psychol Bull* 1992; 112(1): 155-9. https://doi.org/10.1037//0033-2909.112.1.155