Published in final edited form as:
Br J Dermatol. 2010 March ; 162(3): 587–593. doi:10.1111/j.1365-2133.2009.09586.x.

The 5-D itch scale: a new measure of pruritus

S. Elman, **L.S. Hynan**[*], **V. Gabriel**[†], and **M.J. Mayo**[‡]
University of Wisconsin School of Medicine, Madison, WI, U.S.A.

Summary

Background—Itching is a subjective and multidimensional experience which is difficult to quantify. Most methodologies to assess itching suffer from being unidimensional, for example only measuring intensity without impact on quality of life, or only measuring scratching activity. None has actually been demonstrated to be able to detect change over time, which is essential to using them as an outcome measure of response to an intervention. The 5-D itch scale was developed as a brief but multidimensional questionnaire designed to be useful as an outcome measure in clinical trials. The five dimensions are degree, duration, direction, disability and distribution.

Objectives—To study the 5-D with respect to validity, reliability and response to change.

Methods—The 5-D was administered to 234 individuals with chronic pruritus due to liver disease (n = 63), kidney disease (n = 36), dermatological disorders (n = 56), HIV/AIDS (n = 28) and burn injuries (n = 51). The 5-D was administered at baseline and after a 6-week follow-up period. A subset of 50 untreated patients was retested after 3 days to assess test-retest reliability.

Results—The 5-D score correlated strongly with a visual analogue score: r = 0.727 at baseline (P < 0.0001), r = 0.868 at the 3-day repeat (P < 0.0001), and r = 0.892 at the 6-week follow-up (P < 0.0001). There was no change in mean 5-D score between day 1 and day 3 in untreated individuals (intraclass correlation coefficient = 0.96, P < 0.0001). The 5-D did, however, detect significant changes in pruritus over the 6-week follow-up period (P < 0.0001). Subanalysis of the different patient groups revealed similar response patterns and scores, with the exception of lower total scores for the burn victims due to lower scores on the distribution domain because they itched only at the site of their burn.

Conclusions—The 5-D, therefore, is a reliable, multidimensional measure of itching that has been validated in patients with chronic pruritus to able to detect changes over time. The 5-D should be useful as an outcome measure in clinical trials.

Keywords

itch; measure; outcome; pruritus; questionnaire; validation

Pruritus is a primary symptom of many dermatological diseases, including atopic dermatitis, psoriasis, urticaria and postburn healing. It is also a common feature of several systemic diseases, including chronic kidney failure, hepatobiliary disease, human immunodeficiency virus (HIV) and haematopoietic disorders. More than just an annoyance, chronic pruritus

Correspondence Marlyn J. Mayo. Marlyn.mayo@utsouthwestern.edu.
[*]Department of Clinical Sciences, University of Texas Southwestern Medical Center, Dallas, TX 75390-9151, U.S.A.
[†]Department of Physical Medicine and Rehabilitation, University of Texas Southwestern Medical Center, Dallas, TX 75390-9151, U.S.A.
[‡]Department of Internal Medicine, University of Texas Southwestern Medical Center, Dallas, TX 75390-9151, U.S.A.

Conflicts of interest
None declared.

significantly reduces quality of life and can ultimately lead to severe disability. Its sequelae may include sleep disturbance, embarrassment, prolonged wound healing and secondary skin changes. Current treatments provide inconsistent and partial relief. Therefore, novel treatments are necessary. However, well-designed clinical trials require appropriate outcome measures to evaluate the response of pruritus to treatment.

Currently, only a few resources are available to measure pruritus. A visual analogue scale (VAS; Fig. 1) has been used most often to quantify pruritus. While the VAS is adequate in assessing the severity of the symptom, it does not take into account other aspects of pruritus, such as the relative impact of pruritus on quality of life. Some patients also have difficulty translating a subjective symptom, such as pruritus, into a point on a line. Despite its historical use, the ability of the VAS to detect changes over time has never been validated. In our experience, individuals often have similar responses on the VAS repeated measures even when they verbally report significant changes in their pruritus. Accordingly, the VAS may fail to detect some changes in pruritus severity. The subjective and multidimensional nature of pruritus requires an evaluation tool that is sensitive to these qualities. In an effort to address this deficit, Darsow *et al.* developed the Eppendorf Itch Questionnaire (EIQ) and Yosipovitch *et al.* developed the 'Questionnaire for the Assessment of Pruritus', modified from the McGill Pain Questionnaire, respectively.1–3 The EIQ collects information about a patient's subjective experience with pruritus using a detailed list of sensory and affective descriptors. The Questionnaire for the Assessment of Pruritus also collects information about the impact of pruritus on quality of life. While these questionnaires provide valuable information, better to understand the pruritus experience, they are time consuming and do not provide a quantifiable measure of pruritus. A shorter form of the Questionnaire for the Assessment of Pruritus, renamed the 'Itch Severity Scale', was recently developed and utilized to quantify and describe pruritus in subjects with psoriasis. None of these scales, however, has been demonstrated to be sensitive to change over time: a critical feature that determines whether they are useful as an outcome measure in clinical trials. Time sensitivity, as well as ease of administration and scoring, are all important qualities of a desirable outcome measure to be used in clinical trials. The 5-D itch questionnaire was specifically developed to be a measure of itch that is brief (one page), easy to complete, easy to score (either manually at the bedside or electronically as part of a large clinical trial), sensitive to the multidimensional nature of pruritus and its effect on quality of life, applicable to multiple diseases, and capable of detecting change over time.

Materials and methods

Instrument development

Preliminary items for the 5-D itch scale were derived from (i) modification of the Total Neuropathy Scale4 to be relevant to pruritus rather than neuropathy, (ii) clinical experience by the authors and expert consultants with chronic pruritus under conditions of patient care and clinical trials and (iii) review of the pruritus literature. The preliminary version included both open-ended questions and specific response questions regarding the patient's perception of pruritus. This preliminary version was administered to 21 patients participating in a trial of sertraline for a treatment of cholestatic pruritus.5 Ambiguous items or response choices were revised and response choices selected less than 5% of the time were removed.

The remaining items were grouped into five domains: duration, degree, direction, disability and distribution. Accordingly, the scale was titled the '5-D itch scale' (Fig. 2). The duration, degree and direction domains each included one item, while the disability domain had four items. All items of the first four domains were measured on a five-point Likert scale.

The distribution domain included 16 potential locations of itch, including 15 body part items and one point of contact with clothing or bandages. The preliminary version of the questionnaire also included an 'other' item which allowed subjects to write in a response. This led to further refinement of the body part list by the addition of 'groin', which was reported by nine subjects. Additional items written in for the free text 'other' item were determined by the authors to fit conceptually into items which were already present on the 5-D (e.g. 'breast' could be categorized as 'chest'). Therefore, the instructions were modified to instruct the participant to select the anatomically closest body part for areas that they might not find on the list.

Sample population and data collection

This study was approved by the Institutional Review Board of the University of Texas Southwestern Medical Center at Dallas. The conditions under which a new measure is studied should closely resemble the conditions of eventual use.6 Thus, five different patient groups representing the most common causes of itching were studied. Subjects were recruited from university-affiliated clinics for dermatology, burn, HIV, liver disease and emergent dialysis. Eligibility criteria for the study included: (i) pruritus secondary to one of the following conditions: primary dermatological disease, burn wounds, HIV, hepatobilary disease or chronic kidney disease; (ii) between the ages of 8 and 90 years; (iii) able to complete the questionnaires in English.

After providing written informed consent, subjects were asked about their medical diagnosis, stage of disease, comorbid medical conditions and current medication. All subjects then completed a questionnaire packet which included the 5-D, the VAS, and the itch domain of the PBC-40, a quality of life assessment in patients with the chronic itchy liver disease, primary biliary cirrhosis (PBC). Six weeks later, subjects were asked to repeat the questionnaires and report any changes in stage of disease, medication or skin care regimens. Follow-ups were completed (i) with patients in their regularly scheduled clinic visits whenever possible, and (ii) by contacting subjects by telephone and recording responses to the questionnaires at the time of telephone contact. A subset of patients ($n = 50$) not treated for their itching also completed the questionnaires 2–3 days after enrolment to assess test-retest reliability. These patients were either (i) approached in person during an inpatient stay or regularly scheduled clinic visit or (ii) contacted by telephone and asked to complete the questionnaires at that time.

Statistical methods

Test-retest reliability—In the subgroup of 50 individuals who repeated the questionnaire within 2–3 days, the intraclass correlation coefficient (ICC) was calculated to examine the agreement between repeated measures. Cronbach's alpha was determined to assess the internal consistency of the measure. A Bland–Altman plot was used to assess the association (reliability) between repeated measures.

Convergent validity—Convergent validity was assessed using Spearman rank order correlations separately for each time point to examine the association between the total score of the 5-D with the VAS and the PBC-40. Spearman rank order correlations were also used to assess the association between the individual domain scores on the 5-D and the VAS and PBC-40. Six-week change in each of the five domains, as well as the 5-D score, was correlated with the VAS using a Spearman rank order correlation. We hypothesized that the 5-D score, as well as each individual domain score, would correlate with the VAS. We hypothesized that that the degree domain would have the strongest correlation with VAS (both severity assessments) and that the disability domain would correlate best with the

PBC-40 (both quality of life assessments). All of the above analyses were performed for each subgroup of disease, and for the entire study population.

Results

Participants and follow-up

A total of 400 questionnaires was completed. Of these, 234 were completed at the time of enrolment. Fifty subjects repeated the questionnaire 2–3 days later to assess test-retest reliability. One hundred and sixteen questionnaires (50%) were completed 6 weeks later (range 4–8, median 6). Subjects had a mean ± SD age of 48 ± 13.8 years, were 66% female, and were ethnically diverse. The population was 40% Caucasian, 49% African-American, 10% Hispanic and 1% Asian. The study population comprised 63 patients with chronic liver disease, 56 patients with skin diseases, 51 burn patients, 36 patients with chronic kidney disease and 28 patients with HIV/AIDS. Thirty-seven different diseases were represented in the skin diseases population, with no single disease being represented more than twice. In 11 patients the aetiology of the pruritus was never determined by the physician.

Scoring and response frequencies of the 5-D itch scale

The scores of each of the five domains are achieved separately and then summed together to obtain a total 5-D score. 5-D scores can potentially range between 5 (no pruritus) and 25 (most severe pruritus). The mean ± SD 5-D score obtained in the study group was 16.5 ± 4.75 with scores ranging between 7 and 25 (Table 1). No score of 5 was obtained because presence of pruritus was one of the entry criteria.

Single-item domain scores (duration, degree and direction) are equal to the value indicated below the response choice (range 1–5).

The disability domain includes four items that assess the impact of itching on daily activities: sleep, leisure/social activities, housework/errands and work/school. The score for the disability domain is achieved by taking the highest score on any of the four items. Taking an average score across all four items was rejected as this method may underestimate the impact of itching on daily activities due to the lower impact of itching on other activity items compared with the impact on sleep. Seventy-five per cent of respondents endorsed at least some effect of itching on sleep. The other items in this category (leisure/social activities, housework/errands and work/school) appeared less relevant with only 35.9%, 31.2% and 14.5% of subjects, respectively, endorsing any impact of itching on these activities. Principal component analysis revealed two factors within this domain: sleep and other activities. The sleep item explained 52.9% of the total variance, while the ‘other activities’ explained an additional 21.3% of the variance. Both factors therefore contributed something different but potentially meaningful to the impact of itching on quality of life.

For the distribution domain, the number of affected body parts is tallied (potential sum 0–16) and the sum is sorted into five scoring bins: sum of 0–2 = score of 1, sum of 3–5 = score of 2, sum of 6–10 = score of 3, sum of 11–13 = score of 4, and sum of 14–16 = score of 5.

Similarities and differences between pruritus aetiology groups

The 5-D scores of each group assessed at both baseline and 6-week follow-up were statistically different from each other ($_{\text{ANOVA}}P < 0.0001$ at baseline and $P = 0.003$ at follow up). This was due to a lower score in the burn population because pruritus was limited to the site of the burn and thus scored lower on the distribution domain. The mean 5-D score in the burn population was 13.53, whereas it was between 16.75 and 18.22 in the other groups (Table 1). Nonparametric multiple comparisons demonstrated that 5-D scores in the burn

group were significantly lower than in each of the other groups, but that the 5-D scores of the other groups (HIV, liver disease, kidney disease, skin disease) did not differ from each other.

Convergent validity

The 5-D score correlated strongly with the VAS score each time the two measures were administered (Fig. 3). The Pearson's correlation coefficients were $r = 0.727$ at baseline ($P < 0.0001$), $r = 0.868$ at the 3-day repeat ($P < 0.0001$), and $r = 0.892$ at the 6-week follow-up ($P < 0.0001$). The individual 5-D domains that were expected to correlate best with other measures based on similarity of concept did correlate as expected: the degree domain at 6 weeks with change in VAS ($r = 0.55$, $P < 0.0001$), the direction domain at 6 weeks with change in VAS ($r = 0.70$, $P < 0.0001$), and the disability domain with the quality of life assessment of pruritus from the PBC-40 at baseline ($r = 0.69$, $P < 0.0001$) and at follow-up ($r = 0.87$, $P < 0.0001$).

Instrument reliability

There was no change in mean 5-D score between day 1 and day 3 in the 50 patients who repeated the questionnaire at days 1 and 3 for test-retest reliability (16.5 vs. 16.5, respectively). The ICC between the 5-D score obtained on day 1 and day 3 was 0.96 (95% confidence interval 0.92–0.98), which was a highly significant correlation ($P < 0.0001$). Although the total score did not change, the responses on some individual items did change over the 3-day interval (paired differences, $P < 0.0001$), indicating that subjects did not merely remember their previous answers. The Bland–Altman plot demonstrated an excellent association (reliability) between repeated measures (Fig. 4). The internal consistency (Cronbach's alpha) of the 5-D was 0.734. If one item of the 5-D were deleted, the average decrease in reliability was 0.067 (range 0.035–0.095).

Instrument response to change

The 5-D was able to detect significant changes in pruritus over the follow-up period. Of the 116 patients assessed at baseline and 6 weeks, 60 (52%) improved, 20 (17%) worsened and 36 (31%) remained unchanged (Wilcoxon $P < 0.0001$). Each of the five individual domains was sensitive to change over time (Table 2). The disability domain was the least responsive to change because many patients started without any disability from their itching and thus could experience no improvement. When broken down into pruritus aetiology groups, the highest percentage of improved 5-D total scores over the 6-week period was in patients with HIV/AIDS (78.6%, $P = 0.0118$), followed by burn (53.1%, $P = 0.0004$), liver disease (50%, $P = 0.0141$), skin disease (47.4%, $P = 0.2323$) and kidney disease (36.8%, $P = 0.5418$). The change in 5-D score correlated strongly with the change in VAS in all subjects (Fig. 5; $r = 0.862$, $P < 0.0001$). The direction domain, in which subjects record whether their itching is resolved, improving, unchanged or worsening, directly addresses the concept of change over time and was expected to correlate with change in VAS and change in 5-D (adjusted to remove the direction domain). The direction domain response at 6 weeks did, in fact, correlate well with the change in VAS ($r = 0.699$, $P < 0.0001$). The direction domain at 6 weeks correlated even more strongly with the change in combined score of the remaining domains (so-called 4-D score—the 5-D score with the direction domain removed) ($r = 0.784$, $P < 0.0001$).

Discussion

The 5-D has been developed as a brief, single page, instrument for the multidimensional quantification of pruritus that is sensitive to change over time. The most important feature of this study is the follow-up assessments, demonstrating the very high test-retest reliability as

well as good ability to detect changes over time. Although not all of the subjects completed the 6-week follow-up questionnaire, the 50% response rate observed for the follow-up questionnaire is considerably higher than reported in other studies using follow-up questionnaires (typically 25–30%). Importantly, the questionnaire was easy to understand and easily completed with very few errors. Most of the subjects were recruited from county health facilities, and many participants had low income and limited education, which did not pose a barrier to completing the 5-D in less than 5 min. The VAS, the historical standard for pruritus assessment, requires the participant to use abstract thought processes to convert their itch severity to a mark on a continuum, and the scoring requires manual measuring of the mark with a ruler (or sophisticated graphics analysis software), whereas the 5-D is either multiple choice or 'check all boxes that apply'. This is a format that lends itself well to simple computerized scoring,although manual scoring was used in this study. The 5-Ds were all administered by a single examiner (S.E.) who did not provide any additional instructions other than what was on the form, but was available for questions. Thus, although the 5-D was easy for subjects to self-administer with little to no guidance, this study can only validate its use under the same conditions.

The validity of the 5-D instrument was demonstrated by significant correlation ($P < 0.0001$) with the traditional VAS score at each time point. In addition, the individual 5-D domains that were expected to correlate with other measures based on similarity of concept did correlate as expected, e.g. the disability domain with the quality of life assessment of pruritus from the PBC-40, the degree domain at 6 weeks with change in VAS, and the direction domain at 6 weeks with change in VAS. Thus, these individual domains could actually be used as a stand-alone measure for investigators who are interested in only one aspect of itching. However, the total 5-D score has a higher reliability and better reflects the multidimensional character of itching. One caveat is that the reference quality of life measure used in this study (PBC-40) was developed specifically for one liver disease (PBC) and not the variety of diseases represented in this subject population. Nevertheless, the correlation of the PBC-40 itch domain with the 5-D disability domain was equally strong in all patient groups.

The test-retest reliability of the 5-D was extremely high (ICC = 0.96). Over a 3-day interval, scores on some domains worsened slightly while scores on other domains improved slightly, but the overall score was not affected. This slight variability in individual domain scores indicates that the very high test-retest agreement is not due to memorization of previous responses, but rather short-term stability of pruritus and its assessment using the 5-D. Although there was no change in 5-D score over a 3-day interval, there were significant changes in 5-D score over a 6-week interval, indicating that the 5-D is responsive to change. No other pruritus instrument, to our knowledge, has been formally demonstrated to detect changes over time—a critical feature of any instrument to be used as an outcome measure in a therapeutic trial. All of the subjects entered into this study had been identified and referred to the study by their physician. Thus, many received treatment for their condition during the 6-week follow-up interval. This was an observational study of clinical course, not an interventional treatment trial, so we expected that some patients would be treated for itching and others not treated; some patients would improve and others would not. Unfortunately, there is no gold standard to establish whose pruritus actually did improve in order to determine whether the 5-D was accurate in the magnitude and direction of change in pruritus that it detected. Data were extracted from the medical record regarding diagnoses, medications, treatments and physician assessments. However, the data (obtained from chart review) were not complete enough to make valid statistical correlations. In fact, over 40% of physicians who referred their patients for this study did not even document pruritus as one of the medical problems at the referral visit. The observed change in 5-D did correlate very well with the observed change in VAS, a historical but not gold standard.

Because the study group was large and contained five subgroups of patients, we were able to evaluate the behaviour of the instrument in several distinct subject groups with adequate statistical power. It was remarkable that responses to each of the domains and the total score were similar in all groups, with the exception of the burn patients. Burn patients score lower on the 5-D as a result of lower scores on the distribution domain because they itch only at the site of the burn. This finding underscores the dictum that an instrument should be validated in the same population and under the same conditions in which it will ultimately be used.

In summary, the 5-D is a new tool that can be used to measure pruritus. The 5-D has demonstrated ease of use, content validity, test-retest reliability, internal consistency and ability to detect change in itch over time in patients with skin disease, liver disease, kidney disease, HIV/AIDS and burns. The 5-D is the first written pruritus measure to be validated in postburn itch, HIV and liver disease. It offers improvement over current methodologies because of its ease of use, superior performance characteristics, and demonstrated efficacy in multiple patient groups.

Acknowledgments

S.E. was salary supported by a grant from the Doris Duke Foundation. Statistical support for this publication was provided by grant number UL1RR024982, titled ‘North and Central Texas Clinical and Translational Science Initiative’ (Milton Packer, M.D., PI) from the National Center for Research Resources, a component of the National Institutes of Health (NIH) and NIH Roadmap for Medical Research.

References

1. Darsow U, Scharein E, Siman D, et al. New aspects of itch pathophysiology: component analysis of atopic itch using the ‘Eppendorf Itch Questionnaire’. Int Arch Allergy Immunol. 2001; 124:326–31. [PubMed: 11307006]
2. Yosipovitch G, Zucker I, Boner G, et al. A questionnaire for the assessment of pruritus: validation in uremic patients. Acta Derm Venereol (Stockh). 2001; 81:108–11. [PubMed: 11501646]
3. Melzack R. The McGill Pain Questionnaire: major properties and scoring methods. Pain. 1975; 1:277–99. [PubMed: 1235985]
4. Cornblath DR, Chaudry V, Carter K, et al. Total neuropathy score: validation and reliability study. Neurology. 1999; 53:1660–4. [PubMed: 10563609]
5. Mayo MJ, Handem I, Saldana S, et al. Sertraline as a first-line treatment for cholestatic pruritus. Hepatology. 2007; 45:666–74. [PubMed: 17326161]
6. Nunnally, JC.; Bernstein, IH. Psychometric Theory. 3rd edn.. McGraw-Hill, Inc.; New York, NY: 1994. p. 301

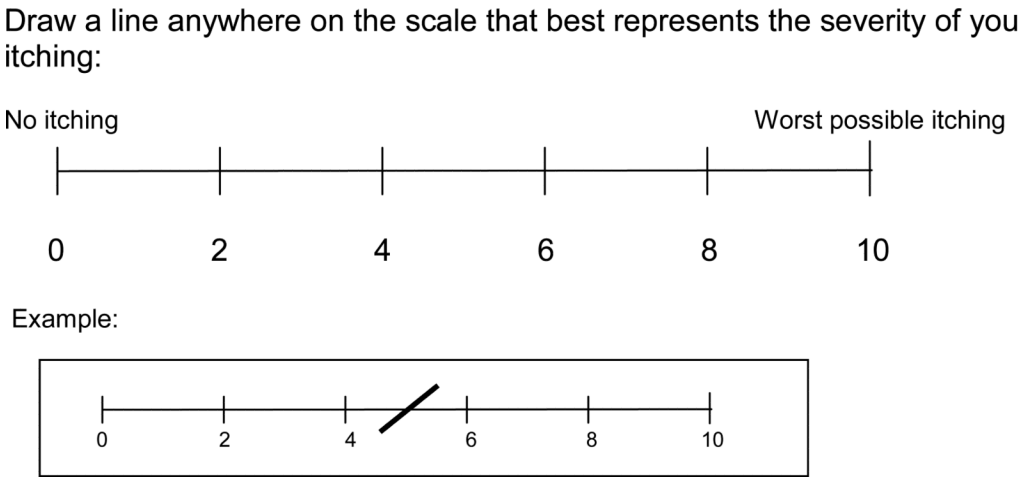


Fig 1.
Visual analogue scale.

5-D Pruritus Scale

1. **Duration:** During the last 2 weeks, how many hours a day have you been itching?

Less than 6hrs/day	6-12 hrs/day	12-18 hrs/day	18-23 hrs/day	All day
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

2. **Degree:** Please rate the intensity of your itching over the past 2 weeks

Not present	Mild	Moderate	Severe	Unbearable
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

3. **Direction:** Over the past 2 weeks has your itching gotten better or worse compared to the previous month?

Completely resolved	Much better, but still present	Little bit better, but still present	Unchanged	Getting worse
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

4. **Disability:** Rate the impact of your itching on the following activities over the last 2 weeks

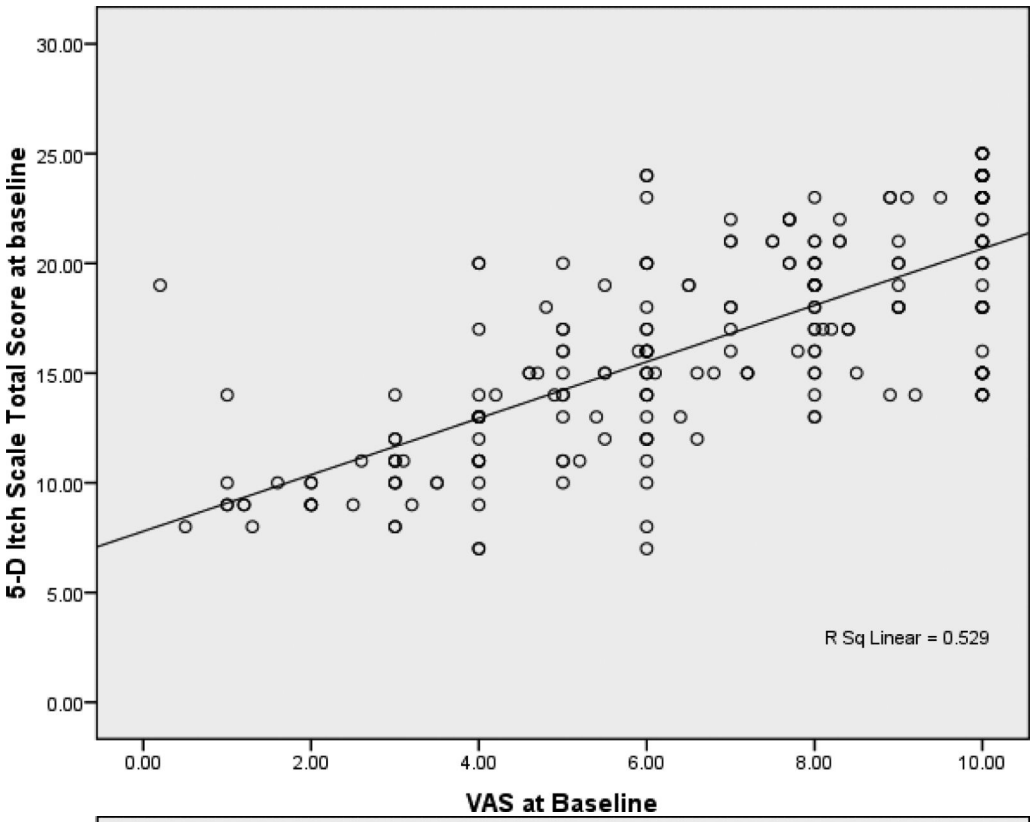
	Never affects sleep	Occasionally delays falling asleep	Frequently delays falling asleep	Delays falling asleep and occasionally wakes me up at night	Delays falling asleep and frequently wakes me up at night
Sleep	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

	N/A	Never affects this activity	Rarely affects this activity	Occasionally affects this activity	Frequently affects this activity	Always affects this activity
Leisure/Social	☐	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Housework/ Errands	☐	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Work/School	☐	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

5. **Distribution:** Mark whether itching has been present in the following parts of your body over the last 2 weeks. If a body part is not listed, choose the one that is closest anatomically.

	Present		Present
Head/Scalp	☐	Soles	☐
Face	☐	Palms	☐
Chest	☐	Tops of Hands/Fingers	☐
Abdomen	☐	Forearms	☐
Back	☐	Upper Arms	☐
Buttocks	☐	Points of Contact w/ Clothing	
Thighs	☐	(e.g waistband, undergarment)	☐
Lower legs	☐	Groin	☐
Tops of Feet/Toes	☐		

Fig 2.
5-D itch scale.



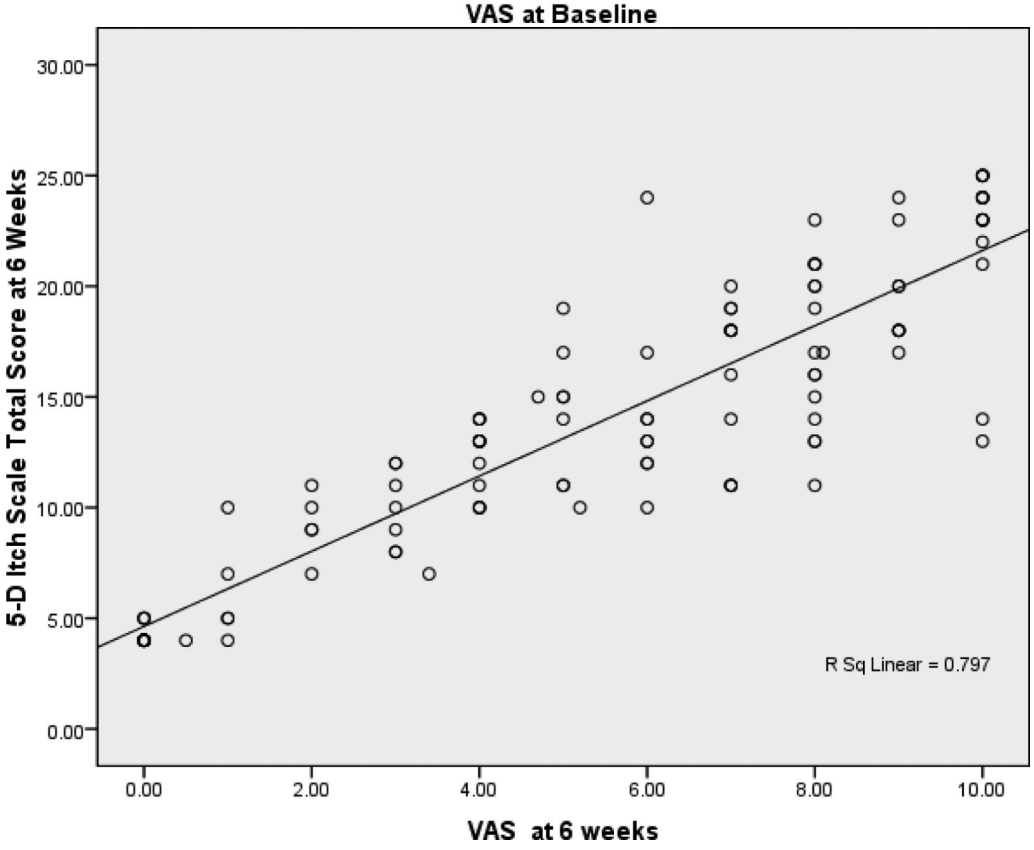


Fig 3.

5-D itch scale vs. visual analogue scale (VAS) at baseline and at 6 weeks.

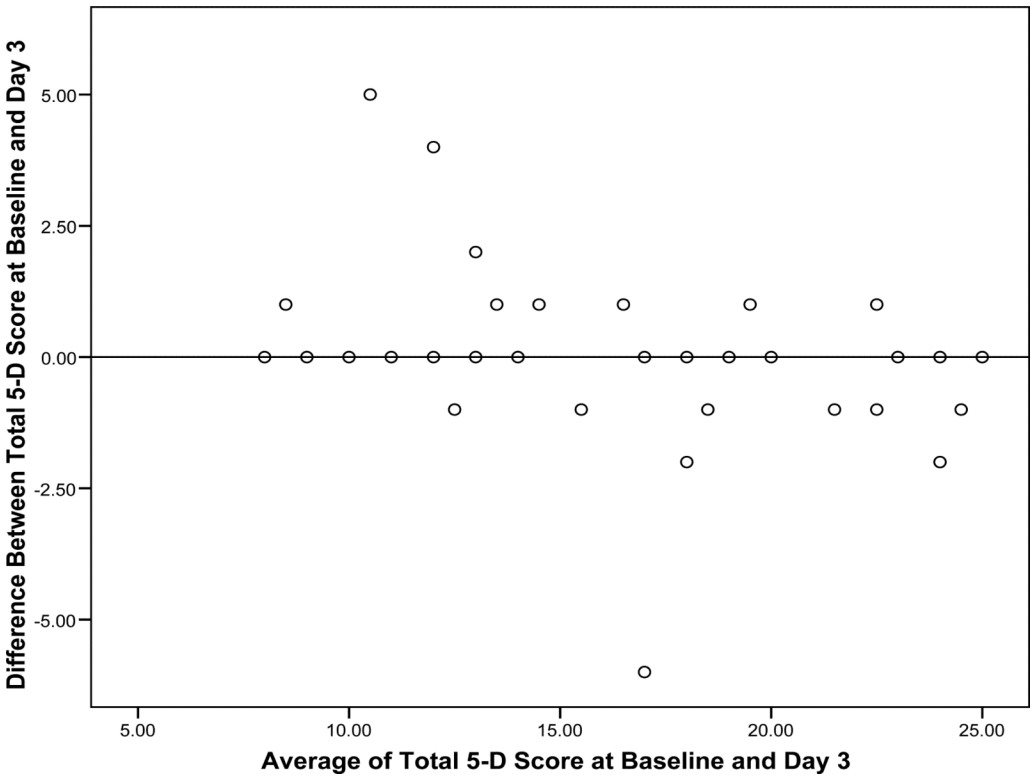


Fig 4.
Bland–Altman plot.

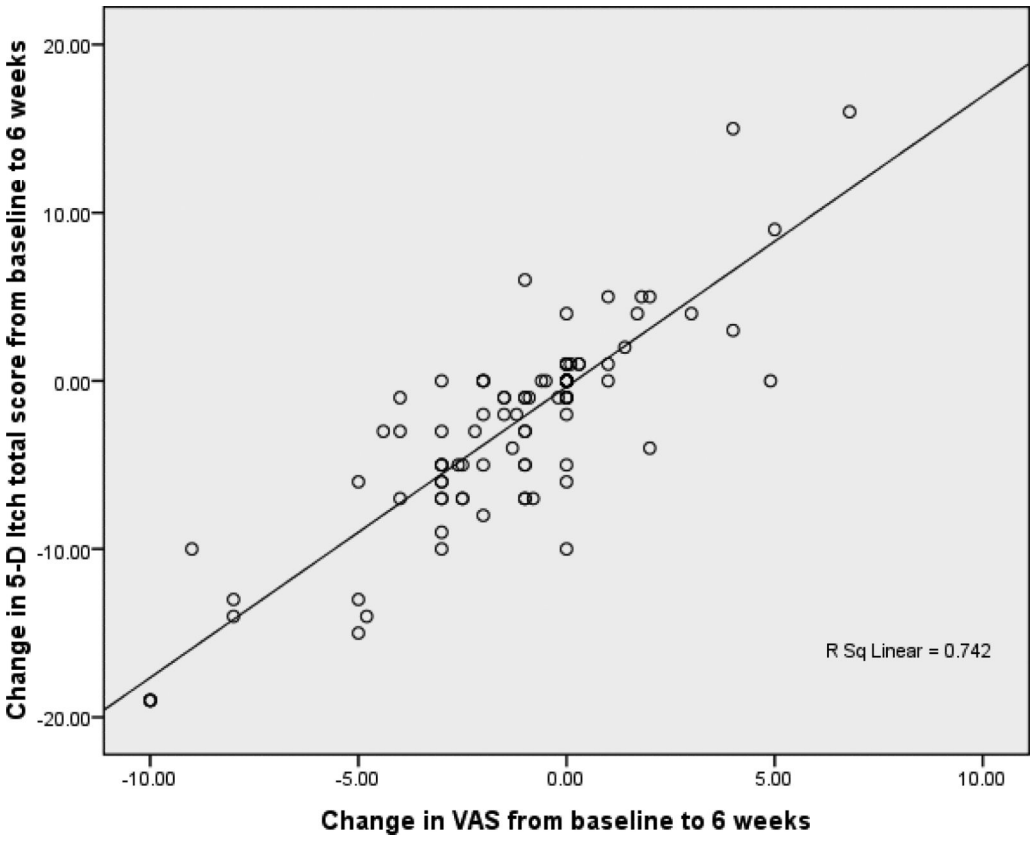


Fig 5.
Correlation of change in 5-D itch scale over time with change in visual analogue scale (VAS).

Table 1

5-D scores of each disease group

Group	*n*	Mean ± SD
Baseline		
Burn	51	13.53 ± 3.23
HIV/AIDS	28	16.75 ± 5.30
Kidney disease	36	18.22 ± 4.09
Liver disease	63	16.94 ± 4.67
Skin disease	56	17.45 ± 5.07
Total	234	16.49 ± 4.75
Follow-up		
Burn	32	11.31 ± 4.44
HIV/AIDS	14	11.86 ± 6.92
Kidney disease	19	18.42 ± 4.83
Liver disease	32	13.69 ± 6.03
Skin disease	19	16.21 ± 7.42
Total	116	14.00 ± 6.28

Table 2

Change over time in each domain and total score of the 5-D

Variable	Change	*n*	% of total	Mean rank	Sum of ranks	Wilcoxon *P*-value
Duration	Improved	28	24.1	22.80	638.50	0.0018
	Worsened	12	10.3	15.13	181.50	
	No change	76	65.5			
	Total	116				
Degree	Improved	41	35.3	24.74	1014.50	<0.0001
	Worsened	8	6.9	26.31	210.50	
	No change	67	57.8			
	Total	116				
Direction	Improved	50	43.1	32.85	1642.50	<0.0001
	Worsened	12	10.3	25.88	310.50	
	No change	54	46.6			
	Total	116				
Disability	Improved	28	24.1	22.57	632.00	0.0488
	Worsened	15	12.9	20.93	314.00	
	No change	73	62.9			
	Total	116				
Distribution	Improved	46	39.7	36.78	1692.00	<0.0001
	Worsened	19	16.4	23.84	453.00	
	No change	51	44.0			
	Total	116				
5-D total	Improved	60	51.7	43.13	2587.50	<0.0001
	Worsened	20	17.2	32.63	652.50	
	No change	36	31.0			
	Total	116				