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Construction and validation of a quality of life questionnaire in Chronic Lower Limb Venous Insufficiency (CIVIQ)

R. Launois,* J. Reboul-Marty and B. Henry

Département de Santé Publique, Faculté de Médecine Léonard De Vinci, Université de Paris (R. Launois, J. Reboul-Marty); Analyses et Recherches sur en Economie de la Santé (ARCOS), 31 rue Ernest Renan, 92130 Issy les Moulineaux, France (B. Henry)

Quality of life may be considerably reduced in patients who are suffering from chronic lower limb venous insufficiency, although existing generic quality of life instruments (NHP, SF-36 or SIP) cannot completely identify their specific complaints. The Chronic Venous Insufficiency Questionnaire (CIVIQ) has been developed by iterative process. First, a pilot group of 20 patients was used to identify a number of important features of quality of life affected by venous insufficiency, other than physical symptoms of discomfort. A second study involving 2,001 subjects was used to reduce the number of items. Subjects were asked to score both the severity of their problems and the importance they attributed to each problem on a 5-point Likert scale. The importance items found in patients with venous insufficiency were subjected to factorial analyses (PCA, PAF). The final version is a 20-item self-administered questionnaire which explores four dimensions: psychological, physical and social functioning and pain. Internal consistency of the questionnaire was validated for each dimension (Cronbach's alpha > 0.820 for three out of four factors). Reproducibility was confirmed in a 60 patient test–retest study. Pearson's correlation coefficients for both the four dimension subscales and for the global score at 2-week intervals were greater than 0.940. Finally, the questionnaire was tested in a randomized clinical trial of 934 patients in order to assess responsiveness and the convergent validity of the instrument, together with the patient's own quality of life. This study demonstrated that convergence was valid: Pearson's correlation coefficients between clinical score differences and quality of life score differences were small (from 0.199–0.564) but were statistically different from 0 ($p < 0.001$). Standardized response mean (SRM) and effect size (ES) were calculated to assess sensitivity to change. SRM and ES both demonstrated considerable responsiveness to change (> 0.80). Reliability, face, content, construct validity and responsiveness were also determined for this specific quality of life questionnaire relating to venous insufficiency. Results suggest that this questionnaire may be used with confidence to assess quality of life in clinical trials on chronic venous insufficiency.

Key words: Lower limb venous insufficiency; quality of life, questionnaire.

Introduction

A quality of life assessment must fulfil the objectives of the different groups involved. For the physician, the aim of a quality of life assessment is to go beyond the purely biomedical approach used in an acute clinical assessment, which is only of secondary importance once the patient has been removed from immediate danger. Apart from organic problems, it is also important to assess both the functional and psychological effects of the disorder whilst not compromising the scientific approach to the assessment by introducing subjective value judgements which cannot be confirmed. Although only the patient can describe his or her complaints, the physician must be able to classify the patient's problems and to provide an appropriate treatment solution.

Patients do not need to describe their complaints or disabilities totally; what is essential is that they can express their different expectations depending on the respective weight which they attribute to different aspects of their lives. Specific significance can be allocated to the patient's complaints by assessing each criterion and then by classifying it according to its importance.

The community as a whole needs a coherent classification mechanism which reflects the society's

* To whom correspondence should be addressed at Département de Santé Publique, Faculté de Médecine Léonard de Vinci, Université de Paris XIII, 74 rue Marcel Cachin, 93012 Bobigny cedex, France.

priorities and assists it in its decision-making. These three approaches to quality of life, assessed from the health professional's point of view, the patient's own experience and from society's preferences are based on fundamentally different conceptual frameworks: psychometrics,[1] decision theory,[2] and quality adjusted life years (QALY,[3] HYE[4]). In practice these correspond to very different interests: quantification of the outcomes, reintroduction of the patient's preferences into the choices of treatment available and management of society's resources.

This study is based on the first of these approaches and is primarily a clinical assessment: quantification of outcomes. This approach is particularly important in the context of venous insufficiency, as the consequences of this disorder are not infrequently understated by the medical profession. This is due to a number of reasons: first, the very high prevalence of the disorder in the population and the often very indolent clinical course it follows which leads to paradoxical underestimation of its severity; second, because the symptoms of venous insufficiency are not always associated with objective signs such as varicosities, dilated veins, ulcers or other lesions and thirdly because subjective symptoms are not exclusively due to venous insufficiency. Therefore, in order to define a precise instrument to assess the efficacy of treatments used in the management of venous insufficiency, it was essential to develop a specific tool which could rigorously and reproducibly quantify the patient's complaints.

None of the currently available generic indicators combine all of the areas affected by venous insufficiency. The SIP[5] for example provides an accurate assessment of the consequences of the disorder on mobility, sleep and restriction in leisure activities, in contrast to Ware's SF-36.[6] Unlike the SF-36 however, the SIP does not assess positive aspects of health, particularly vitality and the patient's perception of their state of health. None of these three indicators (SIP, NHP[7] or SF-36) assesses the specific symptoms and signs of venous disorders.

Furthermore, in those dimensions which are assessed effectively by the indicators which are currently available, the choice of items and their scoring poorly reflects specific problems due to venous insufficiency. The issue of 'standing for a long time' which is extremely unpleasant for the patient, and sitting for long periods of time are not assessed. These questions are very often answered in terms of 'presence or absence of the symptom', although this yes or no approach makes no account of the severity of the disorder or its clinical course. This demonstrates the need for a specific indicator.

Methods

Identification of the dimensions of impairment

In order to ensure that the text of the questionnaire accurately reflects the impact of venous sufficiency on the patient's everyday life, 20 semi-structured interviews, each lasting one to one and a half hours, were conducted in seven men and 13 women suffering from venous insufficiency in three regions with very different climatic and socio-economic characteristics: Paris, Strasbourg and Nice. This approach was designed to encourage the patient to speak openly and to express his or her ideas. The interviewer was therefore given some degree of freedom in obtaining responses to questions.

An interview guide was drawn up from preliminary information collected from a review of published literature and from interviews with four medical specialists (angiologists, dermatologists and phlebologists) and three general practitioners. This was designed to facilitate reconstruction of the history of the disease (family history, presenting symptoms, clinical course, *etc.*) and to collect a complete and detailed description of patients' complaints (symptoms and physical, psychological and social repercussions). The interview guide was designed to ensure that all aspects of the venous insufficiency problem were thoroughly assessed.

The patients' complaints in these in-depth interviews were assessed by thematic analysis. One hundred and eighty-eight verbatim descriptions were collected and were classified initially into five dimensions:[8] signs and symptoms, functional repercussions, psychological impact, social consequences and perception of general health. Redundant or ambiguous complaints were excluded and the initial questionnaire (Voo) used in the subsequent quantitative survey consisted of a total of 45 questions.

Selection of items

The initial questionnaire (Voo) was given to 150 patients purely for methodological purposes. This exercise was not designed to assess the consequences of venous insufficiency on the quality of life in the population assessed, but rather to refine measurements by removing redundant items and integrating patients' value judgements by allowing them to express their complaints in order of importance.

The check-list was a 45-item self-administered questionnaire. For each item, questions were based

on two criteria: severity of the complaint (no disability, slight disability, moderate disability, severe disability or completely incapacitated) and the importance assigned to each complaint by the patient (unimportant, slightly important, moderately important, very important or extremely important). The first criterion reflects the extent to which symptoms are experienced and is particularly useful for the clinician. The second is based on the importance attached to each complaint by the patient and reflects the actual impact of the disorder on the patient's everyday life. Replies were graded on a 5-point scale.

Relevant items may be selected using one of two methods. The Volkswagen method[9] involves choosing those items with the highest value calculated as the product of their frequency and mean importance. The other more sophisticated method excludes redundant items by Principal Component Analysis (PCA).[10] We used both methods to select our variables. First, we selected items with the highest value of the 'product complaint frequency in the population assessed' multiplied by 'the importance attributed to the complaint'. This way, patient's preferences were incorporated into the measurement instrument as they formed the basis of the items themselves. A principal component analysis was then performed to identify redundant variables and select those items which were to be retained in the questionnaire.[11–12] The PCA was then refined by Principal Axis Factoring (PAF) to identify the dimensions of the indicator more accurately. PAF[10] differs from PCA by the method in which factors are extracted. The PAF technique represents repeated PCA in which values on the diagonal of the original correlation matrix are replaced by estimated communalities. Analyses are only performed on factors with an Eigenvalue (determined by PCA), of ≥ 1 (Kaiser index).

Variables with low communality (variance explained by all of the factors included) and those with a high residue (> 0.05) are eliminated. Analyses are then repeated on a limited number of items until an acceptable number of variables is obtained. A varimax rotation was conducted in order to achieve a simple structure.

These processes produced the first version of a chronic venous insufficiency quality of life questionnaire which consisted of 18 items; 17 general items and one work item. Two changes were made on subsequent analysis. The wording of the question which referred to interference with work was changed to include any disturbance of normal everyday activities. This allowed this item to be used for both unemployed and working patients. Two new questions were then added to reinforce certain aspects which appeared to be absent or underrepresented: pain and the desire to go out. This questionnaire was called CIVIQ 1 — 'CIVIQ' for 'ChronIc Venous Insufficiency Questionnaire' and '1' as this is inevitably only the first draft of a quality of life scale.

Development of the quality of life scale

The first version of the CIVIQ was tested in a cross-sectional observational study on a sample of 2,001 patients who were recruited by general practitioners and were divided into two groups: one group of 1,001 patients with venous insufficiency and a control group of 1,000 patients who had sought consultation for other reasons.[13–14] Patients were required to fulfil two conditions in order to be classified as suffering from venous insufficiency: (1) the diagnosis was to have been made by the general practitioner, regardless of the symptoms of the disorder: organic or functional venous insufficiency; (2) patients were required to have suffered from one or more objective signs or subjective symptoms characteristic of venous insufficiency within a period of 4 weeks prior to inclusion. The only exclusion criteria were age over 75 years and absence of symptoms within 4 weeks. Coexistent disorders did not represent an exclusion criterion.

In order to demonstrate the specific nature of functional complaints, the patient group must be compared to a control group. Each investigator was therefore asked to include five patients with and five patients without venous insufficiency who were matched for age and sex with the five venous insufficiency patients. Patients with coexistent disorders were also not excluded in the control group. The only patients excluded were those over 75 years of age.

A second principal component analysis was performed on the 1,001 cases of chronic venous insufficiency based on importance criteria. Four dimensions were identified: physical (four questions), psychological (nine questions), social (three questions) and finally, pain (four questions). To simplify the analysis and facilitate the use of the questionnaire in a clinical trial, complaints were not scored for importance; as once patient's preferences had been included in defining the components in the indicator, these are no longer necessary in the questionnaire. Only the severity variables were included in the second version of the questionnaire.

The CIVIQ 2 consists of a total of 20 equally-weighted items. The recall period is the previous 4 weeks. The score for each dimension is obtained by

adding scores for each constituent item and the total score is obtained by summating the 20 items.

Absolute scores are converted into an index which is analogous to the index used to score the SF-36. Three scores can be calculated: a score per item (value 1–5), a score per dimension (value 0–100) and a global score (value 0–100). The value of the score is directly proportional to the degree of deterioration of quality of life: 0 representing the highest quality of life and 100 the lowest. This instrument was then used in this form in a double-blind, randomized trial on 934 patients to compare two formulations of micronized flavonoid preparation (1000 mg vs. 500 mg × 2) per day. The trial was designed to measure the clinical equivalence of the two presentations. Patients included in the trial had chronic symptomatic venous insufficiency with symptoms of heavy legs, cramping or pain or moderate functional incapacity, *i.e.* severity greater than 40 mm on a visual analogue scale. We included the CIVIQ in this trial for two reasons: (1) to confirm the stability of the factorial structure on day 0 and (2) to confirm intra-individual sensitivity of the indicator after treatment for two months.

Validation

Five conditions have to be satisfied for a quality of life measurement to be valid: relevance, acceptability, reliability, construct validity and sensitivity.

Content validity. Two conditions must be satisfied: the entire range of patient's complaints must be included and the items chosen must be shown to be representative. The content validity of the CIVIQ is supported by the fact that the process used to select items was based on input from specialists in angiology, from published data and from direct definitions of complaints obtained from patients suffering from venous insufficiency, whilst the use of factorial analysis enabled redundant items to be identified and excluded.

Face validity. The acceptability of a questionnaire depends on the quality of its construction. Sentences were phrased based directly on patient's descriptions. Patient's own vocabulary was therefore used to compile the questionnaire, ensuring a simple construction suitable for the target population, without which it would be impossible for the patients to participate actively in the survey. The acceptability of the CIVIQ 2 questionnaire evaluated from the response rates to each of the questions asked and by the number of questionnaires completed was confirmed both in a randomized trial (934 patients) and in a large scale pharmaco-epidemiological survey (26,681 patients).

Reliability

- *Internal consistency*
  The different items in a dimension must be homogeneous as they relate to the same concept even if they are worded differently. This 'internal consistency' is tested by Cronbach's α,[15] values of which range from 0–1. Coefficients above 0.70 are generally regarded to be acceptable for psychometric measurements. Cronbach's α was calculated for the four dimensions in the observational study of 1,001 patients suffering from venous insufficiency (CIVIQ 1) and in the clinical trial on 934 patients (CIVIQ 2).

- *Reproducibility*
  A specific test–retest study was performed in order to confirm that the indicator was reproducible, *i.e.* to ensure that the answers to the same questionnaire remained unchanged in stable patients. This study included 60 subjects in which the patients' physicians recorded clinical signs on the day of the first visit and also asked patients to complete the self-administered quality of life questionnaires (CIVIQ 1). Two weeks later, the physicians asked patients to complete the quality of life questionnaire after confirming that the patient's clinical states had remained unchanged. Pearson's correlation coefficients were calculated for each item, each dimension and the global indicator score between the scores on day 0 and day 15 in order to assess reproducibility of the items on the quality of life indicator. Calculations were performed both for the severity and for the importance scores.

Construct validity. In order for an instrument to be accurate, there must be a degree of congruence between the measuring operations and the theoretical items which these operations are designed to measure. In the absence of an accepted gold standard, the basis of the concepts used to design the measuring tool can be validated first by confirming that its factorial structure is stable on different population samples (factorial validity). The measuring tool is then analyzed to confirm whether the nature or strength of correlations with independent external criteria (other quality of life indicators, clinical indices) fits the expected relationship both at a given point of time and longitudinally in time.

- *Factorial validity*
  Variables describing the importance of the disability

in the observational study ($n = 1001$) were subjected to factor analysis (PCA and PAF). According to psychometric theory, 'construct validity' is assumed when factor analysis performed on different population samples produces the same dimensions. It must therefore be stable in the different analyses. We attempted to confirm this condition by comparing the factor structure of the indicator in the observational study on 1,001 patients suffering from venous insufficiency and in the clinical trial on 934 patients.

- *Cross-sectional validity*
  In order to validate the scale as a discriminatory instrument,[16–17] we calculated correlation coefficients between clinical severity scores for the manifestations of venous insufficiency and quality of life scores obtained from 1,001 venous insufficiency (VI) patients, in the observational study. We took the correlation coefficient of ≥ 0.5, as confirmation that these parameters were convergent.

  The definition of venous insufficiency used to include the 1,001 subjects in the observational study was based on the presence of one or more subjective symptoms or objective signs over the previous 4 weeks. Subjective symptoms consisted of heavy legs, leg pain, nocturnal cramps, paraesthesiae or burning sensations. Objective signs consisted of evening oedema, erythema/cyanosis, abnormal local skin temperature, or induration.

  Each symptom and sign was allocated a severity score from 0–3 (0 = absent, 1 = moderate, 2 = severe and 3 = very severe). The functional score was calculated from the sum of the scores allocated to the five subjective symptoms and the objective score from the sum of the four scores for objective signs. The symptoms may of course be caused by other disorders. Five hundred and eighty-six of the 1,000 control cases were suffering from a disorder other than venous insufficiency such as orthopaedic, neurologic or metabolic disorders, which could cause lower limb problems.

  The non-specific nature of the subjective symptoms or objective signs associated with venous insufficiency is frequently quoted as an objection to assessing treatment value, in the absence of visible venous signs. Two-way analysis of variance (ANOVA) was performed to adjust for the effects of concomitant disorders and lower limb venous insufficiency, and therefore to determine the specific contribution of each problem — venous insufficiency and other problems (obesity, hypertension *etc.*) — in producing the same symptoms. This analysis tests the effect of each factor adjusted for the presence of the other factor. It confirms, for example, whether quality of life is more severely disturbed when venous insufficiency occurs in a patient who is already suffering from arterial disease.

- *Longitudinal validity*
  The validity of an evaluation indicator designed to measure changes in response to treatment may be confirmed by demonstrating correlations between differences in clinical measurements and differences in quality of life measurements. The end point (efficacy criterion) in the clinical trial on 934 patients was functional incapacity, rated on a visual analogue scale from 0 (no functional incapacity) to 100 (unbearable functional capacity). This was the principal criterion although three other minor criteria which were scored on a 4-point scale were also used: heavy legs, cramps and leg pain. Pearson's correlation coefficients were calculated between differences in clinical scores and quality of life measurements on day 0 and on day 60.

Sensitivity. A sensitive indicator is one which detects minor changes in a patient's quality of life. Changes in scores must be able to be registered in patients whose state of health is deteriorating (or improving). This characteristic is particularly important for indicators used in clinical trials. An inadequately sensitive indicator might miss differences between two treatments, as it may be unable to detect subtle changes in the patients corresponding clinical states. Means and standard deviations of differences in the quality of life scale were calculated for descriptive purposes in the 835 patients out of the 934 included in the clinical trial, whose clinical state improved significantly as defined by the functional incapacity measurement assessed from a visual analogue scale after treatment for 2 months.

Different statistical methods have been described to assess sensitivity in detecting change. The least contentious appears to be the standardized response mean (SRM)[18] and the effect size (ES)[19] as described by Liang. SRM is the ratio of the mean change to the standard deviation of the change. The ES is identical to the SRM but uses the standard deviation of the scores on D0 as the denominator.

In order to demonstrate the sensitivity of our indicator to change, we calculated the SRM and the ES for scores in each dimension, and the overall score in the CIVIQ 2. We then tested whether the scores improved significantly (statistically) after treatment for 2 months, using the Wilcoxon paired test.

Results

Face validity

The acceptability of the questionnaire was confirmed both in a randomized trial and in an epidemiologic survey. The following results were obtained:

Ninety-nine per cent of the 934 patients in the trial which compared two doses (1000 mg vs. 500 mg × 2 per day) of micronized flavonoid preparation, completed the quality of life questionnaire. Seventy-five point six per cent of patients answered all questions. The non-response rate for each item ranged from 1–3.9%, except for one item in the social dimension (sporting activities) which had a non-response rate of 19.3%. The content of this item has been changed to take into account discomfort due to strenuous physical activity. Sixteen thousand eight hundred and forty-five of the 26,681 patients in the pharmaco-epidemological survey[20] completed the questionnaire (63.1%) with response rates from 66–79%. The item (sporting activities) had not been changed when patients completed this questionnaire. It is obviously more difficult to control epidemiologic surveys than clinical trials and some information has therefore been lost between the two studies. This is more a problem of difficulty of control rather than lack of acceptability as the task consigned to the physicians was considerably more difficult than had been expected. We feel these results are satisfactory in view of the populations recruited.

Table 1. Pearson's correlation coefficients for items scores on day 0 and day 15. Test–retest study ($n = 60$ patients)

Abbreviated content of items in CIVIQ scales	Correlation coefficients	
	Intensity items	Importance items
Pain in legs	0.8963	0.8781
Interferes with work	0.9140	0.8504
Sleeps badly	0.9238	0.8669
Standing for a long time	0.8981	0.8699
Climb several flights of stairs	0.9626	0.8751
Squatting/kneeling	0.9274	0.8983
Walk quickly	0.9388	0.8947
Travelling in a car	0.9182	0.8684
Do the housework	0.8913	0.8874
Going out in the evening	0.9425	0.8099
Sporting activities	0.9020	0.8591
Feels anxious	0.8183	0.9021
Tires easily	0.9075	0.9076
Feels like a dead weight	0.9633	0.9632
Has to take specific precautions	0.9414	0.8578
Embarrassed to show one's legs	0.9567	0.8892
Easily irritable	0.8462	0.8721
Feels disabled	0.9298	0.8939
Difficulty in getting going	0.8807	0.8924
Does not feel like going out	0.8975	0.9233

Reliability

Internal consistency. The Cronbach's coefficients are high for CIVIQ 1: 0.90 for the psychological dimension, 0.830 for the physical dimension, 0.832 for the paint dimension and 0.673 for the social dimension. Coefficients are slightly lower for the CIVIQ 2: 0.853 for the psychological dimension, 0.711 for the physical dimension, 0.779 for the pain dimension and 0.654 for the social dimension. These findings confirm that internal consistency is satisfactory.

Reproducibility. Correlation coefficients for severity and importance items between day 0 and day 15 are shown in Table 1. Coefficients for severity were higher than those for importance, apart from the following items: 'feels anxious', 'easily irritable' and 'difficulty in getting going'.

Despite the minor differences between severity and importance items, all items correlated closely between day 0 and day 15. Coefficients for the severity items ranged from 0.8133 ('feels anxious') to 0.9633 ('feels like a dead weight'). For the importance items, these ranged from 0.8504 ('interferes with work') to 0.9632 ('feels like a dead weight').

The dimension scores (Table 2) also correlated closely with each other. Here again, the coefficients for the importance items were slightly lower than those for the severity items. Coefficients for the importance items ranged from 0.8529 (social repercussions) to 0.9550 (psychological repercussions). For the severity items, coefficients ranged from 0.9447 (social repercussions) to 0.9774 (physical repercussions). Correlation coefficients for the overall score were also high: 0.9803 for the severity score and 0.9512 for the importance score.

These results confirm that the CIVIQ was both reliable and reproducible.

Construct validity

Factorial validity. Factor loadings and the proportions of variance explained by each factor are shown in Table 3. These results are obtained from the analysis of the population of subjects suffering from chronic venous insufficiency ($n = 1{,}001$). Eigenvalues for the four dimensions are 8.30, 1.08, 0.86 and 0.69 respectively. The proportions of variance explained by each of these dimensions are 41.50%, 5.40%, 4.30% and 3.50% respectively.

Table 4 shows results of the factor analysis performed on the 934 patients in the clinical trial. Eighteen items in the second questionnaire remained stable and two shifted compared to the first factorial structure.

The item 'doing the housework' was located in the pain dimension rather than in the physical dimension. This item correlated more closely with the pain dimension ($r = 0.48837$) than with the physical dimension ($r = 0.3121$), although the correlation with the physical dimension was the second highest observed.

Table 2. Pearson's correlation coefficients for dimension scores on day 0 and day 15. Test–retest study ($n = 60$ patients)

Quality of life scales	Correlation coefficients	
	Severity items	Importance items
Psychological repercussions	0.9630	0.9550
Physical repercussions	0.9774	0.9308
Pain repercussions	0.9493	0.9352
Social repercussions	0.9447	0.8529
Overall quality of life score	0.9803	0.9512

Table 3. Factor analysis. Observational study ($n = 1{,}001$ patients)

	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalue	8.30	1.08	0.86	0.69
% of variance explained	41.50%	5.40%	4.30%	3.50%
Psychological repercussions	Factor loadings			
Easily irritable	**0.7100**	0.0771	0.1921	0.1966
Does not feel like going out	**0.6795**	0.2875	0.1258	0.2436
Difficulty in getting going	**0.6525**	0.2807	0.1385	0.1339
Feels anxious	**0.6433**	0.1324	0.3338	0.1125
Feels disabled	**0.6325**	0.3548	0.2020	0.1470
Feels like a dead weight	**0.6192**	0.3313	0.2007	0.1413
Has to take specific precautions	**0.5488**	0.3701	0.2687	0.1957
Tires easily	**0.5071**	0.3407	0.3627	0.1149
Embarrassed to show one's legs	**0.4243**	0.0698	0.1378	0.3437
Pain repercussions				
Pain in legs	0.2187	0.1805	**0.7629**	0.0989
Interferes with work	0.2279	0.2392	**0.7596**	0.1355
Standing for a long time	0.2001	0.3278	**0.6288**	0.2151
Sleeps badly	0.3066	0.2484	**0.4376**	0.1396
Physical repercussions				
Climb several flights of stairs	0.2459	**0.6892**	0.3057	0.1394
Squatting/kneeling	0.2674	**0.6754**	0.2314	0.1253
Walk quickly	0.2686	**0.6605**	0.2287	0.1603
Do the housework	0.2955	**0.4270**	0.3548	0.2744
Social repercussions				
Going out in the evening	0.1648	0.1238	0.1493	**0.8325**
Sporting activities	0.1733	0.1329	0.0895	**0.5397**
Travelling in a car	0.2325	0.3492	0.2159	**0.3728**

Table 4. Factor analysis. Randomized clinical trial ($n = 934$ patients)

	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalue	6.59	1.25	0.81	0.69
% of variance explained	33.00%	6.30%	4.10%	3.50%
Psychological repercussions		Factor loadings		
Easily irritable	**0.7058**	0.1669	−0.0406	0.1161
Does not feel like going out	**0.5926**	0.0665	0.2360	0.1377
Difficulty in getting going	**0.5967**	0.1961	0.1819	0.0771
Feels anxious	**0.6451**	0.2703	−0.0294	0.1348
Feels disabled	**0.5129**	0.1754	0.3723	0.1214
Feels like a dead weight	**0.6050**	0.2566	0.2473	0.0614
Has to take specific precautions	**0.4963**	0.1502	0.3759	0.2106
Tires easily	**0.6078**	0.2886	0.2608	0.1295
Embarrassed to show one's legs	**0.3995**	0.0139	0.1064	0.0771
Pain repercussions				
Pain in legs	0.1289	***0.6416***	0.1426	0.0114
Interferes with work	0.1608	**0.6421**	0.2104	0.1214
Standing for a long time	0.1918	**0.5040**	0.2875	0.2370
Sleeps badly	0.1972	**0.5023**	0.1584	0.0913
Physical repercussions				
Climb several flights of stairs	0.1531	0.3238	**0.6680**	0.0853
Squatting/kneeling	0.1841	0.3395	**0.5386**	0.1182
Walk quickly	0.2148	0.2473	**0.6683**	0.1348
Do the housework	0.2671	**0.4884**	0.2669	0.3121
Social repercussions				
Going out in the evening	0.2127	0.1399	0.1458	**0.8570**
Sporting activities	0.1915	0.0871	**0.4591**	***0.4488***
Travelling in a car	0.1476	0.3024	0.0895	**0.3720**

The item 'sporting activities' was located in the physical dimension ($r = 0.45908$) rather than in the social dimension ($r = 0.44883$), although both correlation coefficients were very close.

This 'minor' instability of the factorial structure may be explained by the fact that the factorial structure of version 1 of the indicator was based on importance rather than severity variables. The second version of the indicator included only severity variables. Minor differences in the analysis of the factorial structure were therefore expected.

Cross-sectional validity. The correlations between the quality of life indicator (CIVIQ 1) with functional and objective scores at baseline were satisfactory. As expected, correlation coefficients between clinical scores and overall quality of life score were close to 0.5 (Table 5) confirming that these parameters were convergent.

The authors of the Basel study[21] compared symptom prevalence in subjects with visible venous problems (varicosities, trophic disorders, dilated veins) and in subjects suffering from other conditions (orthopaedic disorders, obesity, *etc.*) and concluded that 'functional disorders are not a sensitive or specific indicator of varicose disease or chronic venous insufficiency', although they tended to be 'concentrated' in subjects with visible signs of venous insufficiency.

Table 5. Pearson's correlation coefficients* between quality of life scores and clinical scores. Observational study ($n = 1{,}001$ patients)

Quality of life scales	Functional score	Objective score
Psychological dimension	0.4632	0.3788
Physical dimension	0.4571	0.4423
Pain dimension	0.6044	0.4005
Social dimension	0.3164	0.3321
Quality of life score	**0.5243**	**0.4499**

* all $p < 0.001$

These authors also demonstrated correlations between functional symptoms and orthopaedic problems or peripheral arterial disease in men, and obesity in women. It should be noted however, that the Basel study restricted its analysis to the presence or absence of symptoms and did not attempt to assess symptom severity or more specifically, their importance to the patient.

We therefore evaluated the frequency and severity of clinical symptoms in addition to their repercussions on the patient's quality of life measured by CIVIQ 1, as a function not only of the presence of a diagnosis of venous insufficiency, but also in the presence of other diseases, either alone or in association, which 'could induce functional disorders of the lower limbs'.

Two-way analysis of variance demonstrated that the dimensional and overall quality of life scores were significantly worsened ($p < 0.0001$) by the presence of venous insufficiency, whether or not another disorder such as arteritis (Table 6) — which could cause functional lower limb problems — were also present. The same relation between the quality of life scores was observed for lymphoedema, metabolic, orthopaedic or neurological disorders.

Longitudinal validity. All the Pearson's correlation coefficients (Table 7) for differences in clinical scores between day 0 and day 60 and differences in quality of life measurements were significantly different from 0 ($p < 0.001$). The score for the pain dimension was more closely related to the functional incapacity score, and particularly to the pain score (clinical symptom) rather than to heaviness or cramp scores. This clearly demonstrates that the 'pain' dimension of the quality of life indicator correlates more closely with the pain item of the objective indicator, confirming convergent validity of the instrument.

Sensitivity

Quality of life scores were also higher in the 835 patients whose clinical condition had improved after treatment for 2 months. Scores per item (Table 8) and per dimension (Table 9) were higher. These improvements were statistically significant. We also calculated the 'standardized response mean' (SRM) and 'effect size' (ES) to demonstrate the sensitivity of the CIVIQ 2 indicator to change.

Table 6. Results of the two-way analysis of variance

	No venous insufficiency of lower limb					Venous insufficiency of lower limb				
	Arteritis					Arteritis				
	No		Yes		p^*	No		Yes		p^*
	Mean	SD†	Mean	SD†		Mean	SD†	Mean	SD†	
Psychological dimension	17.17	7.40	19.03	6.61	ns	22.70	8.45	23.19	6.98	< 0.0001
Physical dimension	8.81	4.09	9.72	2.91	< 0.01	11.39	3.79	12.78	3.99	< 0.0001
Pain dimension	9.16	3.58	11.00	3.05	< 0.05	12.29	3.09	12.14	3.00	< 0.0001
Social dimension	5.79	2.97	6.37	3.17	ns	7.58	3.32	8.11	3.45	< 0.0001
Quality of life score	38.42	15.54	42.90	13.41	ns	50.36	15.60	53.08	14.90	< 0.0001

p^* arteritis influence; p^{**} venous insufficiency of lower limb influence; † SD = standard deviation

Table 7. Pearson's correlation coefficients for differences in quality of life and clinical scores at day 0 and day 60. Randomized clinical trial ($n = 934$ patients)

Quality of life scales	Functional symptoms			
	Functional discomfort	Heavy legs	Pain	Cramps
Psychological dimension	0.3624	0.3105	0.3036	0.2489
Physical dimension	0.3948	0.3869	0.3926	0.2210
Pain dimension	0.5430	0.4917	0.5643	0.3115
Social dimension	0.2752	0.3109	0.2922	0.1986
Quality of life score	0.4876	0.4678	0.4872	0.3165

All coefficients were different from 0, $p < 0.001$

Table 8. Changes in scores for items in the quality of life indicator in patients whose state of health had improved clinically after treatment for 2 months. Randomized clinical trial ($n = 934$ patients)

Abbreviated content of items in CIVIQ scales	Difference in result			p
	Number	Mean	SD*	
Pain in legs	804	−1.12	1.02	< 0.0001
Interferes with work	806	−1.05	1.00	< 0.0001
Sleeps badly	806	−0.88	1.48	< 0.0001
Standing for a long time	807	−0.92	1.03	< 0.0001
Climbing several flights of stairs	793	−0.79	1.04	< 0.0001
Squatting/kneeling	801	−0.71	1.09	< 0.0001
Walking quickly	792	−0.65	1.02	< 0.0001
Travelling in a car	782	−0.71	1.01	< 0.0001
Doing the housework	803	−0.86	1.06	< 0.0001
Going out in the evening	715	−0.85	1.09	< 0.0001
Sporting activities	614	−0.68	1.25	< 0.0001
Feels anxious	801	−0.70	1.07	< 0.0001
Tires easily	801	−0.94	1.13	< 0.0001
Feels like a dead weight	783	−0.77	1.18	< 0.0001
Has to take specific precautions	779	−0.55	1.06	< 0.0001
Embarrassed to show one's legs	795	−0.57	1.14	< 0.0001
Easily irritable	795	−0.59	1.12	< 0.0001
Feels disabled	792	−0.45	0.94	< 0.0001
Difficulty in getting going	801	−0.63	1.07	< 0.0001
Does not feel like going out	794	−0.58	1.12	< 0.0001

* SD = Standard deviation

Table 9. Changes in score per dimension and in overall quality of life score in patients whose state of health had improved clinically after treatment for 2 months. Randomized clinical trial ($n = 934$ patients)

Quality of life scales	Difference in result			p
	Number	Mean	SD*	
Psychological repercussions	747	−15.96	17.52	< 0.0001
Physical repercussions	771	−19.07	19.60	< 0.0001
Pain repercussions	793	−25.34	19.79	< 0.0001
Social repercussions	594	−19.00	20.47	< 0.0001
Overall quality of life score	552	−19.37	14.76	< 0.0001

* SD = Standard deviation

Table 10 demonstrates that SRM and ES values are very close to 1, and even exceed 1 for the global score and for the physical dimension score.

Table 10. Standardized response rate and effect size of quality of life scales. Randomized clinical trial ($n = 934$ patients)

Quality of life scales	SRM	ES
Psychological repercussions	0.91	0.80
Physical repercussions	1.28	1.20
Pain repercussions	0.93	1.13
Social repercussions	0.97	0.82
Overall quality of life score	1.31	1.17

Summary and conclusion

The content of the specific quality of life questionnaire for chronic lower limb venous insufficiency is appropriate. Completeness and representatives of the items

used have been ensured by allowing patients with venous insufficiency to self-report a wide variety of problems the disorder causes in their daily life, together with information collected in expert interviews. The acceptability of the questionnaire was then tested on large samples.

A representative sample of items was selected and the various components of the instrument were identified using factor analysis. The structure of the indicator was determined by factor analysis. The factor structure revealed three key quality of life dimensions: physical, psychological and social repercussions. A further dimension specific to chronic lower limb venous insufficiency was also found: pain and its repercussions on every day activities and/or work.

The reliability of the tool was assessed by testing internal coherence; Cronbach's α coefficient was calculated for each dimension: the α coefficient was greater than 0.80 for three of the four factors. Reproducibility, or response stability over time, was demonstrated clearly by correlation coefficients calculated for the items, dimensions and overall scores, which were all greater than 0.81. The quality of life indicator were also shown to be sensitive: quality of life scores are significantly higher when the clinical score improved.

The indicator was also found to be specific, as quality of life scores in patients with venous insufficiency and other disorder(s) were systematically worsened compared with control group patients suffering from the same 'other disorder(s)' but without venous insufficiency.

To check the construct validity of the tool we used both factorial analysis and clinical end points. The internal validity analysis would have to be completed. It would be worthwhile to verify in more depth the metric properties of the four scales used (Thurstone method) and to make sure that the equally-weighted items assumption is well founded (Likert criteria). To check the external validity of the instruments, we should compare it with the sub-scales of the Nottingham Health Profile or of the MOS-Short Form 36. Such a connection might show the convergence or divergence between those different tools and reveal the specific advantage of the CIVIQ questionnaire on the sensitivity aspect. Even though we know that the comparison between specific and generic scales is always recommended, we were unable to adopt such a protocol. None of the major quality of life instruments which are presently available in France (NHP, SIP, MOS-SF 36) have been the object of published work sufficient to establish their psychometric properties in terms of reliability, validity and sensitivity.

It is true that in the quality of life domain, we could never claim that any scale had been validated, we could only suggest that a body of convergent evidence has been put together in different environments and studies. Such a situation characterizes the present status of the CIVIQ questionnaire whose future development will require additional work.

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Appendix 1: French version of the CIVIQ 2

Auto-questionnaire < patients >

Beaucoup de Français se plaignent d'avoir mal aux jambes. Nous cherchons à savoir quelle est la fréquence de ces problèmes de jambes, et en quoi ceux-ci peuvent affecter la vie quotidienne de ceux qui en souffrent.

Vous trouverez ci-après un certain nombre de symptômes, de sensations ou de gênes que vous pouvez ou non éprouver, et qui peuvent rendre la vie quotidienne plus ou moins pénible. **Pour chaque symptôme, sensation ou gêne énoncés, nous vous demandons de répondre à la question posé:**

Vous indiquerez si vous avez vraiment éprouvé ce que décrit la phrase, et si oui, avec quelle **intensité**. Cinq réponses sont prévues, vous devez entourer celle qui correspond le mieux à votre situation:

1 si vous ne vous sentez pas concerné(e) par le symptôme, ou la sensation ou la gêne décrite,

2, 3, 4 ou 5 si vous l'avez ressenti avec plus ou moins d'intensité.

---

1 Dans les quatre dernières semaines, avez-vous eu des **douleurs** dans les **chevilles** ou dans les **jambes**, et quelle a été l'intensité de ces douleurs?
(entourer le chiffre correspondant à la bonne réponse) +

Aucune douleur	Douleurs légères	Douleurs modérées	Douleurs importantes	Douleurs intenses
1	2	3	4	5

2 Au cours des quatre dernières semaines, dans quelle mesure vous êtes-vous senti gêné(e) dans votre travail ou dans vos **autre activités habituelles quotidiennes à cause de vos problèmes de jambes**?
(entourer le chiffre correspondant à la bonne réponse) +

Aucune gêne	Un peu gêné	Modérément gêné	Très gêné	Extrêmement gêné
1	2	3	4	5

3 Dans les quatre dernières semaines, vous est-il arrivé de **mal dormir** à cause de votre problème de jambe, et quelle fréquence?
(entourer le chiffre correspondant à la bonne réponse) +

Jamais	Rarement	Assez souvent	Très souvent	Toutes les nuits
1	2	3	4	5

Dans les quatre dernières semaines, dans quelle mesure vos **problèmes de jambes** vous ont-ils **gêné(e) pour effectuer les gestes ou les activités** indiquées ci-après?
(Pour chaque énoncé figurant dans la colonne de gauche du tableau ci-dessous, indiquez dans quelle mesure vous êtes gêné(e) en entourant le chiffre choisi) +

		Aucune gêne	Un peu gêné(e)	Modérément gêné(e)	Très gêné(e)	Impossible à faire
4	Rester longtemps debout	1	2	3	4	5
5	Monter plusieurs étages	1	2	3	4	5
6	S'accroupir/s'agenouiller	1	2	3	4	5

		Aucune gêne	Un peu gêné(e)	Modérément gêné(e)	Très gêné(e)	Impossible à faire
7	Marcher d'un bon pas	1	2	3	4	5
8	Voyager en voiture	1	2	3	4	5
9	Effectuer certaines tâches domestiques (piétiner dans la cuisine, porter un enfant dans les bras, repasser, nettoyer sols ou meubles, bricoler...)	1	2	3	4	5
10	Aller à des soirées, des mariages, des fêtes, des cocktails...	1	2	3	4	5
11	Pratiquer un sport, faire des efforts physiques importants	1	2	3	4	5

Les problèmes de jambes peuvent avoir également des effets sur le moral. Dans quelle mesure les phases suivantes correspondent-elles à ce que vous avez ressenti au cours de ces quatre dernières semaines?
(Pour chaque énoncé figurant dans la colonne de gauche du tableau ci-dessous, entourez le chiffre correspondant à la bonne réponse).

		Pas du tout	Un peu	Modérément	Beaucoup	Tout à fait
12	Je me sens nerveux(se), tendu(e)	1	2	3	4	5
13	Je me fatigue vite	1	2	3	4	5
14	J'ai l'impression d'être un boulet	1	2	3	4	5
15	Je dois tout le temps prendre des précautions	1	2	3	4	5
16	Je sui s gêné(e) de monter mes jambes	1	2	3	4	5
17	Je suis facilement irritable	1	2	3	4	5
16	J'ai l'impression d'être handicapé(e)	1	2	3	4	5
19	J'ai des difficultés à me mettre en train le matin	1	2	3	4	5
20	Je n'ai pas l'envie de sortir	1	2	3	4	5

Appendix 2: English version of the CIVIQ 2

Auto-questionnaire (patients)

Many people in the country complain of heavy or aching legs. We are trying to find the frequency of these leg problems, and how they can affect the everyday life of the people suffering from them.

The following questions relate to a certain number of symptoms, sensations or discomforts (that you may or may not feel) that can make everyday life more or less difficult. **For each symptom, sensation or discomfort listed, we ask you to answer the corresponding question in the following manner:**

Please indicate whether you have experienced what is described in the sentence, and if so, to what intensity. On a scale of 1–5, please circle the intensity most suited to your situation.

1 if you do not feel concerned by the symptom, or sensation of discomfort described,

2, 3, 4 or 5 if you have experienced the symptom or discomfort described (5 = greatest intensity).

---

1 In the past four weeks, if you have felt **pain** in the **ankles** or **legs**, what was *the intensity* of this pain?
(circle the number corresponding to the right answer)

No pain	Light pain	Moderate pain	Strong pain	Intense pain
1	2	3	4	5

2 During the past four weeks, to what extent did you feel bothered/limited in your **work** or your other **daily activities because of your leg problem**?
(circle the number corresponding to the right answer) +

Not bothered/ limited	A little bothered/ limited	Moderately bothered/limited	Very bothered/ limited	Extremely bothered/limited
1	2	3	4	5

3 During the past four weeks, did you **sleep badly** because of your legs problems, and how often?
(circle the number corresponding to the right answer) +

Never	Seldom	Fairly often	Very often	Every night
1	2	3	4	5

During the past four weeks, to what extent did your **leg problems** bother/limit you **while doing the movements or activities** listed below?
(For each of the sentences listed in the left hand column of the table below, indicate to what extent you are bothered/limited by circling the corresponding number). +

	Not bothered/ limited at all	A little bothered/ limited	Moderately bothered/ limited	Very bothered/ limited	Impossible to do
4 Standing for a long time	1	2	3	4	5

5	Climbing stairs	1	2	3	4	5
6	Crouching, kneeling	1	2	3	4	5
		Not bothered/ limited at all	A little bothered/ limited	Moderately bothered/ limited	Very bothered/ limited	Impossible to do
7	Walking briskly	1	2	3	4	5
8	Travel by car, bus, plane	1	2	3	4	5
9	Housework such as working in the kitchen, carrying a child, ironing, cleaning floors or furniture, doing handy work	1	2	3	4	5
10	Going to discos, weddings, parties, cocktails	1	2	3	4	5
11	Sporting activities, making physically strenuous efforts	1	2	3	4	5

Leg problems can also have an effect on one's morale. To what extent do the following sentences correspond to the way you have felt during the past four weeks?

(For each of the sentences listed in the left hand column of the table below, circle the number that best corresponds to the right answer).

						+
		Not at all	A little	Moderately	A lot	Absolutely
12	I feel on edge					
13	I become tired quickly	1	2	3	4	5
14	I feel I am a burden to people	1	2	3	4	5
15	I must always take precautions (such as to stretch my legs, to avoid standing for a long time...)	1	2	3	4	5
16	I am embarrassed to show my legs	1	2	3	4	5
17	I get irritated easily	1	2	3	4	5
18	I feel handicapped	1	2	3	4	5
19	I have difficulty getint going in the morning	1	2	3	4	5
20	I do not feel like going out	1	2	3	4	5