

ORIGINAL ARTICLE

A Comparison of Control Populations in Quebec Using the Short Musculoskeletal Function Assessment

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ABSTRACT The Short Musculoskeletal Function Assessment (SMFA) questionnaire is a health status instrument validated in the United States for use with patients with musculoskeletal impairments. It allows patients to self-rate their level of disability and impairment. This questionnaire has never been validated for Canada's English and French speaking populations. The first objective of this study was to determine the baseline responses of a healthy (i.e., without orthopaedic pathology) population representative of English and French speaking Canadians. The second objective was to compare the results of the Short Musculoskeletal Function Assessment to see if language or gender had any significant effect on the responses. A sample population (n=144) of Quebec Francophone and Anglophone subjects was interviewed using the Short Musculoskeletal Function Assessment questionnaire over the course of five weeks. All subjects were obtained from the orthopaedic clinic of the Montreal General Hospital in Montreal, Quebec. All subjects were self-reported as not being orthopaedic patients themselves in the past or present, and were merely accompanying patients of the clinic. Results were analyzed for differences between four groups using the ANOVA statistical test: Francophone females, Francophone males, Anglophone females, and Anglophone males. No statistically significant differences were detected between the four groups. Results were also analyzed for any differences between three age groups using the ANOVA statistical test, (15-35 years, 36-55 years, and 56 and greater years), with no significant differences detected. The overall Short Musculoskeletal Function Assessment values obtained for the four patient populations were: Francophone males = 5.41; Francophone females = 5.40; Anglophone males = 6.41; and Anglophone females = 5.33. For the three age groups, the results were: 15 - 35 years = 6.87; 36 - 55 years = 5.22; 56 years and greater = 5.18. These results provide an initial baseline to which future orthopaedic patients can be compared, and suggest that analysis of the Short Musculoskeletal Function Assessment results may be compared across gender and language lines within Canada..

INTRODUCTION

Musculoskeletal disease is very common in North America and imposes a large direct and indirect economic cost. Arthritis alone accounted for 42.7 million patients and cost \$US 65 billion in the United

States in 1992, with the number of patients in 2020 being projected at 60 million. (1) In comparing the direct and indirect costs of various illnesses on the Canadian economy, musculoskeletal disease ranks third, behind only cardiovascular disease and cancer. (2) While no such projection data was available for Quebec or Canada at the time of publication, it can be inferred that musculoskeletal disease will also become more common in Canada.

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The use of functional status instruments plays an important role in the assessment of patients. These instruments are typically a series of graded questions answered by patients with regard to their levels of ability and impairment. They allow a rapid, cost-effective, and objective means of measuring the health level of patients. (3, 4) Such instruments are often designed for specific medical impairments of patient populations, and a variety of such instruments have been developed for patients with musculoskeletal impairments, such as the Arthritis Impact Measurement Scales (AIMS) (5), the Short Form-36 (SF-36) (6), and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) (7). The Musculoskeletal Function Assessment questionnaire is a tool with which patients can self-rate their current levels of disability and impairment. It is intended for use with adult patients presenting with general musculoskeletal disease. Previously, it has been evaluated for use in the United States, and its validity and reliability have been studied, proving it to be consistent across gender and age categories. (8) The Short Musculoskeletal Function Assessment (SMFA) is a modified version (46 questions) of the 101-question Musculoskeletal Function Assessment, whose validity, reliability and consistency have also been established. (9, 10) To date, no studies have been done to validate a translation of the Short Musculoskeletal Function Assessment in a language other than English.

A validated version of the Short Musculoskeletal Function Assessment for use with Quebec's population would be useful in managing this group of patients. Such a tool would allow a means of comparing the efficacy and cost-effectiveness of various treatments for musculoskeletal disease, allowing for a more efficient allocation of health-care resources. It would also enable health-care workers to see if certain patient population subsets respond to treatments in a different fashion. However, any possible differences due to language or culture between the U.S. and Quebec populations must be taken into account. (11) Validating the pre-existing Short Musculoskeletal Function Assessment for the Quebec population would be more economical than developing a similar instrument de novo. In addition to validating the current Short Musculoskeletal Function Assessment for Quebec's Anglophone population, this would entail translating the Short Musculoskeletal Function Assessment into French for use with Quebec's Francophone population and validating this instrument as well. This has been performed with previous functional status instruments with favorable results. (12) For these purposes, a French translation of the Short Musculoskeletal Function Assessment was

Table 1. Demographic characteristics of the healthy subjects administered the Short Musculoskeletal Function Assessment

Characteristics	Francophone		Anglophone	
	Women (n=40)	Men (n=30)	Women (n=34)	Men (n=40)
Age in Years, n (%)				
15-35	10 (25)	6 (15)	13 (32.5)	7 (17.5)
36-55	22 (55)	12 (30)	14 (35)	19 (47.5)
56+	8 (20)	12 (30)	7 (7)	14 (35)
Education, n (%)				
< high school	9 (22.5)	5 (12.5)	4 (10)	3 (7.5)
High school	16 (40)	14 (35)	16 (40)	20 (50)
University	11 (27.5)	10 (25)	7 (17.5)	7 (17.5)
> University	4 (10)	1 (2.5)	7 (17.5)	10 (25)
Race, n (%)				
White	38 (95)	27 (90)	32 (94.12)	27 (67.5)
Hispanic	1 (2.5)	0 (0)	0 (0)	1 (2.5)
African-American	0 (0)	2 (6.67)	0 (0)	1 (2.5)
Asian/Pacific Isl.	0 (0)	0 (0)	1 (2.94)	5 (12.5)
Other	1 (2.5)	1 (3.33)	1 (2.94)	6 (15)
Marital Status, n (%)				
Married or living together	26 (65)	19 (63.33)	22 (64.71)	27 (67.5)
Widowed	2 (5)	0 (0)	2 (5.88)	1 (2.5)
Divorced or Separated	6 (15)	5 (16.66)	2 (5.88)	6 (15)
Never married	5 (12.5)	5 (16.67)	8 (23.53)	6 (15)
Missing	1 (2.5)	1 (3.3)	0 (0)	0 (0)
Employment, n (%)				
Full-time	17 (42.5)	17 (56.67)	15 (44.12)	17 (42.5)
Part-time	3 (7.5)	0 (0)	4 (11.76)	3 (7.5)
Retired or unemployed	14 (35)	10 (33.33)	11 (32.36)	16 (40)
Other / Missing	6 (15)	3 (10)	4 (11.76)	4 (10)
Income, n (%)				
<\$20,000	9 (22.5)	5 (16.67)	1 (8.82)	5 (12.5)
\$20,001 - \$70,000	18 (45)	20 (66.67)	16 (47.06)	18 (45)
> \$70,001	8 (20)	4 (13.33)	8 (23.53)	12 (30)
Missing	5 (12.5)	0 (0)	7 (20.59)	5 (12.5)

developed by the Department of Orthopaedic Surgery of the McGill University health Center (see Methods).

The purpose of this study is twofold. Firstly, the study attempts to establish base-line values for subjects without musculoskeletal problems within the overall Canadian population. These values are necessary to provide comparison with the results obtained from patients with musculoskeletal conditions in the future. Secondly, this study should help to determine whether or not the Short Musculoskeletal Function Assessment scores may be compared between Canada's Francophone and Anglophone men and women, and between patients of different age groups. This would also allow future investigators to determine to what extent reported

Table 2. Language and gender demographic comparison with the Short Musculoskeletal Function Assessment

	DIS	BIS	Short MFAIS
Francophone Women (n=40)	5.37±5.55	5.52±7.33	5.41±5.71
Francophone Men (n=30)	5.12±4.35	6.18±7.29	5.40±4.93
Anglophone Women (n=40)	6.40±5.33	6.43±9.75	6.41±6.32
Anglophone Men (n=40)	5.42±5.86	5.05±7.44	5.33±5.97
Inter-group difference	<i>p</i> =0.77	<i>p</i> =0.88	<i>p</i> =0.86

Table 3. Age demographic comparison with the Short Musculoskeletal Function Assessment

	DIS	BIS	Short MFAIS
Age 15-35 (n=36)	6.88±6.13	6.83±10.12	6.87±7.02
Age 36-55 (n=67)	5.32±5.47	5.66±7.65	5.22±5.64
Age 56+ (n=41)	5.27±4.31	4.93±5.94	5.18±4.49
Inter-group difference	<i>p</i> =0.31	<i>p</i> =0.58	<i>p</i> =0.32

DIS: Dysfunction Index score; BIS: Bother Index score; Short MFAIS: Short Musculoskeletal Function Assessment Index score. All scores are between 0 and 100, and are expressed here as mean ± SD.

scores are dependant on actual musculoskeletal disease, and to what extent they are dependant on language and/or gender among the Quebec population. It would also allow data regarding Anglophone and Francophone patients and male and female patients to be combined and compared without the fear of confounding variables. It would also help to determine the effectiveness of the translation of the Short Musculoskeletal Functional Assessment being used. By using non-musculoskeletal patients, any inter-group differences detected due to disease can be minimized.

METHODS

Translation of Short Musculoskeletal Function Assessment

The French translation of the Short Musculoskeletal Functional Assessment was produced using a translation/back translation technique. (13,14) This technique involved three translators who working as a group, translated the Short Musculoskeletal Function Assessment from English into French. Though not expressly trained in translation, the translators were all researchers in the Department of Orthopaedic Surgery at McGill University Health Center who were

fluent in French and English. The newly produced French Short Musculoskeletal Function Assessment was then provided to a second similar group of three translators who had no knowledge of the wording of the original English Short Musculoskeletal Function Assessment. This second group translated the French Short Musculoskeletal Function Assessment back into English. The two groups then met to compare the original English Short Musculoskeletal Function Assessment and the reproduced English Short Musculoskeletal Function Assessment. Using the differences between the original and reproduced versions, the two groups then made adjustments upon the final wording of the French Short Musculoskeletal Function Assessment, in order to provide an accurate translation. Final changes to the French translation were made by consensus decision between the translators. This technique has been used previously to translate functional outcome tools with satisfactory results. (13, 14)

Subject selection

144 subjects were selected over the course of five weeks in the Montreal General Hospital's orthopaedic clinic. Subjects were chosen consecutively from persons that had come to the clinic accompanying patients, but who were not present as patients themselves. The writer, a third-year medical student, briefly interviewed subjects in French or English regarding their past musculoskeletal and general health history. Criteria for exclusion were: subjects currently receiving treatment for musculoskeletal problems; subjects having received treatment for musculoskeletal problems in the past with ongoing symptoms; non-residents of Canada; questionnaires in which greater than 50% of questions in any section were left unanswered; and inability to speak and read either English or French. Musculoskeletal problems were defined as arthritis (including but not limited to osteoarthritis), fractures, ligament injuries, musculoskeletal neoplasia, infections of the musculoskeletal system, congenital defects of the musculoskeletal system, and osteoporosis. Subjects were given either a French or an English Short Musculoskeletal Functional Assessment depending on which language they indicated a preference for, or which of the two that they used during a majority of their daily routine.

Scoring of the Short Musculoskeletal Functional Assessment

The Short Musculoskeletal Functional Assessment is composed of two parts: a 34-question Dysfunction Index and a 12-question Bother Index. The Dysfunction Index inquires into the amount of

difficulty the subject has performing tasks, as well as the frequency with which the patient experiences difficulty. The Bother Index inquires into the magnitude of intrusion imposed by the symptoms on various aspects of the patient's life. Each question allows the subject to respond on a 5 point scale, with a response of 1 indicating excellent function/no impairment and a response of 5 indicating poor function/maximal impairment. (8) The scores for each index are calculated by summing the point values of the total responses (raw score) and subtracting from this value the minimum possible score for the Index (one point for each question, i.e. 12 points being the minimum possible score for the 12-question Bother Index), then dividing the total by the range of possible raw scores and multiplying by 100.

$$\frac{(\text{raw score} - \text{minimum score possible}) \times 100}{\text{range of possible scores}}$$

This formula allows both the dysfunction index and the bother index to be expressed on a 100-point scale, with a score of 0 indicating minimal disability and score of 100 indicating maximal disability. The overall Short Musculoskeletal Function Assessment Index score is similarly calculated from a raw score that is the sum of the dysfunction index and bother index raw scores. Questions left unanswered for each index were answered with the mean of the patient's answered questions. Questionnaires with more than 50% of the questions unanswered were discarded.

Score Analysis

The mean Dysfunction Index score, Bother Index score, and total Short Musculoskeletal Function Assessment Index score for each gender and language group (Francophones and Anglophones) were compared using an ANOVA statistical test. Similarly, the three Index scores were compared between three age groups (15-35 years, 36-55 years, and 56 years and over) using the ANOVA statistical test. The test was used to analyze the differences between the mean Index scores (dependent variable) of the various groups divided by the dependent variables of language and gender (Francophone men, Francophone women, Anglophone men, Anglophone women) or by age.

RESULTS

Demographic Characteristics of Subjects

The description of the subject population, grouped by language and gender, is presented in Table 1. The average age of the total subject population was 46.62 + 14.96 years, with a range of 15-81 years. 74 (51%) of the subjects were female, and 70 (49%) were Francophone. 20 subjects (14%) were non-Caucasian,

65 subjects (45%) were working full-time (more than 35 hours per week), and 94 subjects (65%) were married. The mother tongue of subjects was not recorded. The relationship between subjects interviewed and the patient(s) that they were accompanying to the orthopaedic clinic was also not recorded.

Comparison by gender and language

The comparison between the four subject subpopulations (Francophone women, Francophone men, Anglophone women, and Anglophone men) is presented in Table 2. Comparisons were made between total Dysfunction, Bother, and Short Musculoskeletal Function Assessment Index scores, but not by individual question. The null hypothesis for each comparison was that there was no significant difference between the four groups. The P-value for the dysfunction index is 0.77. The P-value for the bother index was 0.88. The P-value for the overall Short Musculoskeletal Function Assessment index was 0.86.

Comparison by age

The subject population was divided into three age groups, which were based upon previous studies using the Short Musculoskeletal Function Assessment. (6) The dysfunction, bother, and Short Musculoskeletal Function Assessment index scores for each group were compared with each other. Again, comparisons were made between total Dysfunction, Bother, and Short Musculoskeletal Function Assessment Index scores, but not by individual question. The results are presented in Table 3, with the null hypothesis again being that there was no significant difference between the age groups. The P-value for the dysfunction index is 0.31. The P-value for the bother index was 0.58. The P-value for the overall Short Musculoskeletal Function Assessment index was 0.32.

DISCUSSION

The findings of this paper support the hypothesis that the Short Musculoskeletal Functional Assessment is equally applicable for both men and women of Quebec's French and English speaking populations. No statistically significant differences were detected between control (non-patient) sample groups of Francophone women, Francophone men, Anglophone women, and Anglophone men for Short Musculoskeletal Function Assessment's dysfunction index, bother index, or total Short Musculoskeletal Function Assessment index scores. This indicated that the Short Musculoskeletal Function Assessment might be useful in making comparisons between

patients from among these groups in the future, and that any inter-patient difference is due to factors other than language or gender. It is possible that a difference in Short Musculoskeletal Function Assessment scoring between these groups might emerge among patients with musculoskeletal disease. This may be due to differences in patient perception of illness due to gender, language or culture. One way of testing this hypothesis may be to have patients rated in terms of disability by physicians and comparing physician-generated scores with patient-generated Short Musculoskeletal Function Assessment scores.

The Short Musculoskeletal Function Assessment also showed no significant differences among the three age groups examined. This indicates that Short Musculoskeletal Function Assessment scores may be compared between patients of these age groups without age having an effect on the score. However, there was more inter-group difference than expected, with age showing a statistically insignificant but potentially clinically significant inverse relationship to the dysfunction, bother, and Short Musculoskeletal Function Assessment index scores. This differs with the expected increase in Short Musculoskeletal Function Assessment score with age as predicted by the longer Musculoskeletal Function Assessment. (14) This may be an artifact due to small sample size, or may be due to increased frequency of sub-acute musculoskeletal injury in younger populations due to a more active lifestyle. Future studies of the Short Musculoskeletal Function Assessment in Quebec may be useful in clarifying this issue.

Other Short Musculoskeletal Function Assessment studies may wish to focus their attention on subsets of the Quebec population underrepresented in this study. For example, the subject population was derived from a single urban environment. A sample population from across Quebec would be of use in verifying the results of this study. In addition, the large majority of the subjects involved in this study were self-identified as Caucasian; future studies including a higher percentage of other ethnic groups would be useful. Related to this problem is the large immigrant population in Montreal whose mother tongue is a language other than French or English. This study did not differentiate between native French speakers and French-speaking immigrants whose first language was not French, or native English speakers and English-speaking immigrants whose first language was not English. While the results of this study seem to suggest that this should not be a confounding variable, larger studies evaluating the usage of the Short Musculoskeletal Function Assessment may

address this issue. Finally, a comparison of Short Musculoskeletal Function Assessment scores by income was problematic due to a large number of subjects interviewed refusing to indicate their annual income. It would be of great interest to determine if there is a relationship between income and Short Musculoskeletal Function Assessment results.

In conclusion, the use of the Short Musculoskeletal Function Assessment in Quebec appears to be a useful tool for the self-evaluation of musculoskeletal patients in the future. Because of Quebec's unique linguistic populations, and due to the fact that the Short Musculoskeletal Function Assessment was developed in the United States, further testing of it will be required. However, it appears that the Short Musculoskeletal Function Assessment will be able to be used in Quebec in place of having to develop a separate functional assessment instrument for musculoskeletal disease.

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REFERENCES

- 1 Center for Disease Control. Prevalence and Impact of Chronic Joint Symptoms -Seven States, 1996. *Morbidity & Mortality Weekly Report*, 47(17): 345-51, 1998
- 2 Wigle, Donald T. Canada's Health Status: A Public Health Perspective. *Risk Analysis*, 15 (6): 693-698, 1995
- 3 Swiontkowski MF, Chapman JR. Cost and effectiveness issues in care of injured patients. *Clinical Orthopaedics and Related Research*, 318: 17-24, 1995
- 4 Keller, RB. Measuring outcomes. *Journal of Bone and Joint Surgery*, 14: 171-172, 1996
- 5 Meenan RF, Gertman PM, Mason JH. Measuring health status in arthritis: the Arthritis Impact Measurement Scales. *Arthritis and Rheumatism*, 23: 146-152, 1980.
- 6 Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care*, 30:473-83, 1992.
- 7 Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW. Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. *Journal of Rheumatology*, 15:1833-1840, 1988.
- 8 Swiontkowski MF, Engelberg R, Martin DP, Agel J. Short Musculoskeletal Function Assessment questionnaire: validity, reliability, and responsiveness. *Journal of Bone and Joint Surgery*, 81: 1245-1260, 1999
- 9 Martin, DP, Engelberg R, Agel J, Snapp D, Swiontkowski MF. Development of a musculoskeletal extremity health-

- status instrument: the Musculoskeletal Function Assessment instrument. *Journal of Bone and Joint Surgery*, 14: 173-181, 1996
- 10 Engelberg R, Martin DP, Agel J, Obremsky W, Coronado G, Swiontkowski MF. Musculoskeletal Function Assessment instrument: criterion and construct validity. *Journal of Bone and Joint Surgery*, 14: 182-192, 1996
 - 11 Dauphinee SW, Gauthier L, Gandek B, Magnan L, Pierre U. Readyng a US measure of health status, the SF-36, for use in Canada. *Clinical and Investigative Medicine*, 20: 224-238, 1997
 - 12 Sampalis JS, Pouchot J, Beaudet F, Carette S, Gutkowski A., Harth M., Myhal D, Senecal J, Yeadon C, Williams JI, Esdaile JM. Arthritis impact measurement scales: reliability of a French version and validity in adult Still's disease. *Journal of Rheumatology*, 17: 1657-1661
 - 13 Fullerton JT, Wallace HM, Concha-Garcia S. Development and translation of an English-Spanish dual-language instrument addressing access to prenatal care for the border-dwelling Hispanic women of San Diego County. *Journal of nurse-Midwifery*, 38: 45-50, 1993
 - 14 Hendricson WD, Russell IJ, Prihoda TJ, Jacobson JM, Rogan A, Bishop GD, Castillo R. Development and initial validation of a dual-language English-Spanish format for the arthritis impact measurement scales. *Arthritis and Rheumatism*, 32: 1153-9, 1989
 - 15 Engelberg R, Martin DP, Agel J, Swiontkowski MF. Musculoskeletal Function Assessment: reference values for patient and non-patient samples. *Journal of Orthopaedic research*, 17: 101-109, 1999

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