

**Quebec User Evaluation of Satisfaction with
assistive Technology**

QUEST version 2.0

An outcome measure for assistive technology devices

by

**Louise Demers, Rhoda Weiss-Lambrou &
Bernadette Ska**

Table of contents

Authors' Profiles

Introduction

Chapter 1 Development of the QUEST assessment tool

Theoretical background

Construction of the original version

Psychometric testing of the original version

Construction of the QUEST (version 2.0)

Chapter 2 QUEST (version 2.0)

Distinct features of the assessment tool

Materials

Administration

Scoring

Interpretation of the results

Chapter 3 Psychometric properties of the QUEST (version 2.0)

Conclusion

Publications on QUEST

References

Authors' profiles

Louise Demers is an occupational therapist who in 1995 obtained her Master's degree in Clinical Sciences & Rehabilitation at the Université de Montréal. The subject of her master's thesis was the construction and development of the original QUEST. The reliability and validity studies of the QUEST tool were the focus of her doctoral thesis that was completed in 1999. Throughout her graduate work, she was awarded graduate study scholarships from the Quebec Health Research Fund (*Fonds de la recherche en santé du Québec*) and research grants from the Canadian Occupational Therapy Foundation. Louise Demers is a member of the Publications Committee of the Canadian Association of Occupational Therapists and she is an external reviewer for three health professional journals. She has presented QUEST at several international conferences and is the author of several publications. She is currently a postdoctoral fellow at the Center for Clinical Epidemiology and Community Studies at the Lady Davis Institute for Medical Research, Montreal.

Rhoda Weiss-Lambrou is Full Professor of occupational therapy at the École de réadaptation/School of Rehabilitation, Université de Montréal. Her teaching and research activities focus on the use and satisfaction of assistive technology for persons' with a disability. She is a researcher at the Research Centre of the Institut universitaire

de gériatrie de Montréal and is President of the Committee for Integration of Disabled Students at the Université de Montréal. Professor Weiss-Lambrou is a published author of numerous articles, two books and several Web sites. In January 2000, she was appointed Director of faculty development services for *Support in Using the Internet and Technology in Education (SUITE)* at the Université de Montréal.

Bernadette Ska is Full Professor of neurological language impairments at the École d'orthophonie et d'audiologie/School of Speech and Audiology, Université de Montréal. Her teaching and research activities focus on the neuropsychological effects of normal and pathological ageing. She is one of the active research members at the Research Centre of the Institut universitaire de gériatrie de Montréal. Her current research is funded by the Medical Research Council of Canada (MRC). She is also Director of the Graduate Programs at the École d'orthophonie et d'audiologie/School of Speech and Audiology, Université de Montréal. Bernadette Ska is a published author and co-author of numerous articles as well as chapters of books.

Acknowledgements

This publication of QUEST was made possible through the financial support of the *Fonds pour la recherche en santé du Québec*, the Canadian Occupational Therapy Foundation and the *Université de Montréal*. Special thanks are extended to Dr. Luc de Witte, Roelof Wessels, and the personnel of the Institute for Rehabilitation Research (iRv) and TNO-PG in the Netherlands for their collaboration. The authors also express their thanks to the international group of assistive technology experts from the United States, The Netherlands and Canada who participated in the content validation study of QUEST. They are also appreciative of the participation of the assistive technology users and the personnel from the *Centre de réadaptation Lucie-Bruneau*, *Institut de réadaptation de Montréal* et *Centre de réadaptation Constance Lethbridge* in Montreal. Finally, the authors acknowledge all persons with disabilities who seek, demand and deserve satisfaction with assistive technology.

Introduction

The Quebec User Evaluation of Satisfaction with assistive Technology (QUEST) is a new outcome measurement instrument designed to evaluate a person's satisfaction with his or her assistive technology device. It can be used with adolescents, adults and elderly persons who as a result of a physical or sensory impairment have acquired an assistive technology device. The assistive devices targeted include seating and mobility aids environmental control units, hearing and visual aids as well as aids to assist in the performance of daily living activities. The concept of satisfaction as defined in QUEST refers to a person's positive or negative evaluation of those distinct dimensions of the assistive device that are influenced by one's expectations, perceptions, attitudes and personal values. It is important to note that QUEST does not assess the user's performance with the aid. Rather, its focus is on how satisfied the person is with specific features of the assistive technology device as well as certain characteristics of the services related to the technology.

The QUEST 2.0 is the result of the doctoral research conducted by Louise Demers and her research directors, Professors Rhoda Weiss-Lambrou and Bernadette Ska. It is a product of more than four years of research and development. Although there are some general satisfaction questionnaires and checklists that have been developed

(Rehabilitation Engineering and Assistive Technology Society of North America, 1998), QUEST is the first and only standardized satisfaction assessment tool that was designed specifically for assistive technology devices. In developing the instrument, data from several sources contributed to item generation including Batavia and Hammer's evaluation criteria (1990). Scherer's *Matching a Person with Technology* (MPT) model (1996) served as the theoretical foundation for the instrument.

The QUEST 2.0 was created for assistive technology practitioners and researchers (i.e. occupational and physical therapists, speech pathologists, psychologists, and rehabilitation engineers). Designers, manufacturers and vendors of assistive technology devices can also use it. This new version of the assessment tool is in a paper and pencil format that can be either self-administered or completed with the help of the evaluator. As a clinical tool, the QUEST 2.0 provides practitioners with a means of collecting satisfaction data that can be used to document the real-life benefits of assistive technology and to justify the need for these devices. As a research tool, it can be used to compare satisfaction data with other outcome measures such as clinical results, quality of life, functional status, cost factors and comfort. It can also serve to compare satisfaction results obtained with different user groups, in different service settings and in different countries. Finally, because the QUEST 2.0 is easier and shorter to complete than its original version, it can be

used in research studies (e.g., postal surveys) that require rapid acquisition of satisfaction data.

The QUEST manual is organised as follows. Chapter 1 presents an overview of the development and psychometric testing of the original QUEST and the steps undertaken to construct the second version. Chapter 2 provides a complete description of the QUEST version 2.0 assessment tool and explains the QUEST form. Guidelines on how to administer, score and interpret the results are also provided. Chapter 3 highlights some of the psychometric properties of the QUEST 2.0 and invites the reader to consult the authors' recent publications on these findings. A list of publications on QUEST and the assessment materials are also included in this publication.

It is important to note how the terms "user" and "evaluator" are used throughout this manual. For reasons of clarity and consistency, the word "user" refers to the person who is being assessed; it refers to the consumer, the client, the patient or the respondent. The word "evaluator" refers to the professional who is either administering the QUEST or who is scoring and interpreting the results; it refers to the practitioner, the researcher, as well as the designer, manufacturer or vendor of assistive technology.

Chapter 1

Development of the QUEST Assessment Tool

Theoretical background

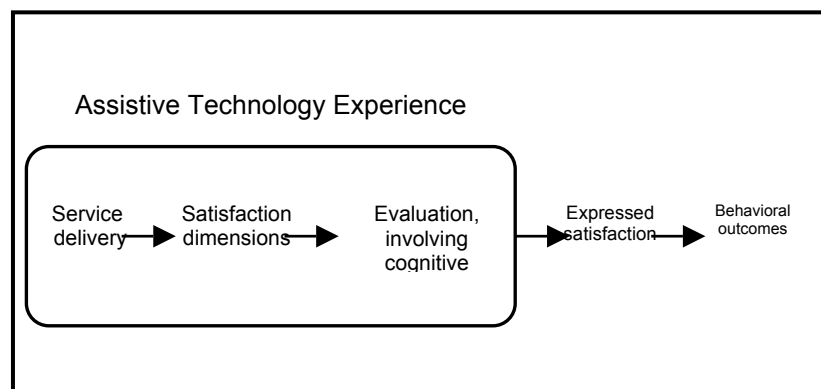
Etymologically, the word "satisfy" means, "make enough". Satisfaction is a complicated multi-dimensional concept and to date there is little agreement about the factor structure of satisfaction measures. Although satisfaction can mean different things to different people, there is general agreement that satisfaction is an attitude about a service, a product, a service provider or an individual's health status.

From a psychological perspective, satisfaction is a subjective reaction, that is, a state of pleasantness, well being or gratification (Chaplin, 1985). According to Linder-Pelz (1982), satisfaction is a positive attitude; it is an affect that is the result of social psychological determinants including perceptions, evaluations and comparisons. Based on the theory and the research conducted in rehabilitation, Simon and Patrick (1997) define consumer satisfaction as a level of pleasantness, well being or gratification felt in reaction to a

total specified experience or its components. In his comprehensive review article on patient satisfaction with rehabilitation services, Keith (1998) explains that satisfaction is comprised of affective components that reflect positive or negative feelings as well as cognitive components that are concerned with what is important and how it is evaluated. He maintains that if the factors that influence a patient's opinion cannot be identified then the satisfaction measures have little value. Furthermore, Keith (1998) argues that unless there is some uniformity in satisfaction questionnaires and instruments, it will not be possible to compare levels of satisfaction across settings and programs.

As shown in Figure 1, the relations between variables involved in the experience of assistive technology can be considered and represented linearly. The satisfaction is conceived as a reaction to the service delivery (dependent variable) and as a trigger to a subsequent action or behaviour (independent variable). In the case of assistive technology, as with other phenomenon, the construct is broken down into several dimensions that correspond to specific aspects of user satisfaction. The evaluation of these dimensions involves a cognitive process in which there is some degree of subjectivity involved. In this context, satisfaction as defined in the QUEST is based on a person's critical evaluation of specific characteristics of the technology. The person's expectations, perceptions, attitudes and personal values affect this assessment.

Figure 1: Satisfaction with assistive technology model



* Model of satisfaction inspired from Simon & Patrick (1997)

Construction of the original version

The methodology used to develop the original QUEST was described in detail in two recent publications (Demers, Weiss-Lambrou & Ska, 1996, 1997). This first version was divided into three parts. Part one consisted of 18 close-ended questions aimed at describing the context in which user assistive device satisfaction or dissatisfaction developed. In Part two, the user was asked to rate the degree of importance he or she attributes to 24 items associated with specific personal characteristics as well as features of the device and the environment. Using a 5-point scale, the degree of

importance was rated with a score ranging from 1 denoting *of no importance*, to a score of 5 indicating *very important*.

Inasmuch as the QUEST was designed to assess a wide range of assistive technology devices, not all items were applicable to every user and every situation; the user was consequently allowed to score an item as *non-applicable*. In Part three of the QUEST, the user was asked to rate his or her satisfaction with the variables using a 5-point satisfaction scale, in which case a score of 1 signified *not satisfied at all* and 5 indicated *very satisfied*. For each item that was scored 3 (*more or less satisfied*), 2 (*not very satisfied*) or 1 (*not satisfied at all*), the user was asked to comment or explain the source(s) of dissatisfaction. Finally, the user was asked to rate his or her overall satisfaction with the device. It required approximately 45 minutes for the evaluator to administer the assessment in a face-to-face interview context.

The original QUEST was created in a "card-playing" format version only and the assessment materials were presented as a kit. These materials consisted of 24 playing cards (with each card representing a satisfaction item); an interactive assessment box for rating the variables and classifying the cards; a 5-point importance scale on one side of the box and a 5-point satisfaction scale on the reverse side; an instruction manual and a scoring sheet. QUEST was developed simultaneously in French and English, and a Dutch version translation was later constructed (Wessels, De Witte, Weiss-Lambrou, Demers, & Wijnhuizen, 1998).

Psychometric testing of the original version

Two studies were recently conducted concurrently to establish the psychometric properties of the original QUEST. The purpose of the first study was to perform *an international content validation study* of QUEST (Demers, Wessels, Weiss-Lambrou, Ska & De Witte, 1999). For this purpose, a specific questionnaire was developed to assess the value of the QUEST items and to critically analyse the administration and scoring procedures. This questionnaire was completed by an international group of 12 content experts from the United States, the Netherlands and Canada. These experts were provided with a QUEST kit and were given several months to apply and test the instrument in a clinical or research context. At the test level, the findings revealed that QUEST had been adequately sampled in terms of embracing all the important facets of satisfaction with assistive technology. At the item level however, it was disclosed that changes needed to be made to the procedures used in administering QUEST and to the formulation of the satisfaction variables in order to ensure optimal content validity.

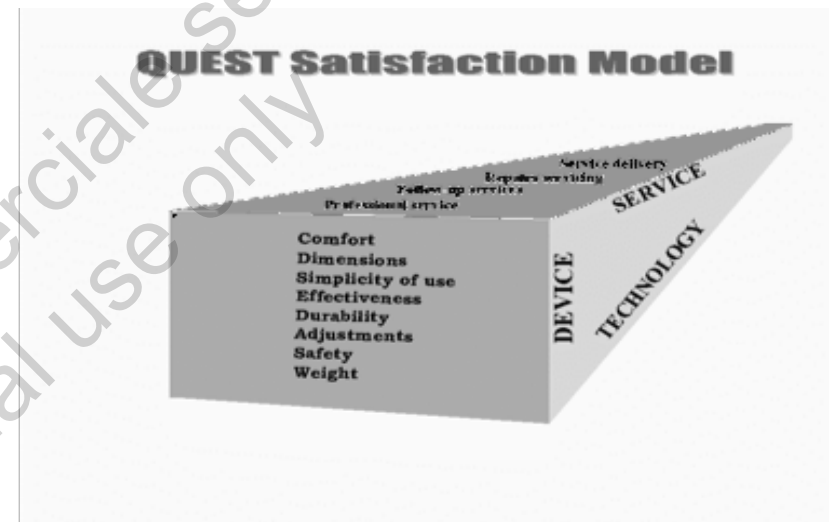
The aim of the second study was to determine at the item level, *the test-retest stability and the interrater reproducibility of QUEST* (Demers, Ska, Giroux & Weiss-Lambrou, 1999). A total of 139 subjects were administered the original QUEST on two occasions, 7 to 11 days apart. For a first cohort of subjects (n=85), the same rater

administered both evaluations and for a second cohort (n=54), a different rater was involved. Reliability coefficients of the satisfaction ratings were found to be moderate to substantial for all the items with reference to stability and for 75% of the items with respect to reproducibility. The estimate coefficients were perceptibly weaker for the importance ratings whereas little variance in scores was observed. Based on the results of this study, the satisfaction scale was found to be reliable in terms of stability and reproducibility however the importance scale did not prove to be reliable for discriminating between and among users of assistive technology. From a validity perspective, these results confirmed that QUEST had adequate content coverage because it embraced those aspects of satisfaction that were considered important to the users. However in terms of reliability, the obtained coefficients did not support the usefulness of rating the importance of each of the QUEST items. More than half the items did not generate a moderate or higher level of agreement. The significance of this finding was that the task of scoring the importance of the items would not be included in the subsequent version of QUEST.

Creation of the QUEST 2.0

One of the goals in test construction is to develop a test of minimal length that will yield scores with the desired degree of reliability and validity for the intended uses. Based on the findings of the previous two studies (Demers, Ska et al., 1999; Demers, Wessels et al., 1999), an item analysis of 24 items comprising the original QUEST was conducted. These results are reported in an article that will soon be published in the journal *Assistive Technology* (Demers, Weiss-Lambrou & Ska, in press). In order to select a subset of items that would demonstrate optimal measurement properties, several criteria were used: general acceptability, content validity, criterion validity, contribution to internal consistency, test-retest stability and instrument sensitivity. The items that ranked best in terms of these measurement properties were then submitted to factorial analysis. The results of this factor analysis revealed that the underlying structure of satisfaction with assistive technology consists of two dimensions: one related to the assistive technology **Device** (eight items) and one associated with the assistive technology **Services** (four items). This finding was cross validated in a Dutch sample of 253 device user subjects and an identical structure was obtained thereby strongly supporting the stability of the QUEST satisfaction model (Figure 2).

Figure 2:



Chapter 2

QUEST Version 2.0

Distinct features of the assessment tool

The purpose of the QUEST (version 2.0) is to evaluate user satisfaction and to provide assistive technology professionals with an outcome measure of this dimension. This new version of the assessment tool is in a paper and pencil format and it can be either self-administered or completed with the help of the evaluator. For each device being evaluated, approximately 10 -15 minutes are required to complete the QUEST form.

The specific objectives of the assessment are:

- to assess the degree of satisfaction the user attributes to the eight items related to the assistive technology **Device** and the four items associated with the assistive technology **Services** ;
- to identify the sources of user satisfaction and dissatisfaction;

- to determine which three satisfaction items are considered by the user to be the most important for the device being assessed.

The QUEST form displays the scoring of the 12 satisfaction items in two parts: **Device** (eight items) and **Services** (four items). The satisfaction items related to the characteristics of the device are: *dimensions, weight, adjustments, safety, durability, simplicity of use, comfort and effectiveness*. Each item is scored using a 5-point satisfaction scale, with a score of 1 denoting "not satisfied at all" and 5 indicating that the person is "very satisfied". For the purpose of identifying the sources of user satisfaction or dissatisfaction, space for comments is provided next to each item. The satisfaction items associated with the related services are *service delivery, repairs and servicing, professional services and follow-up*. Once again, the same 5-point satisfaction scale is used to rate the items and space for comments is provided. A checklist with the 12 satisfaction items is subsequently presented on the QUEST form and the user is asked to select the three most important items. On the last part of the QUEST form, the scoring sheet that is completed by the evaluator is presented.

The assessment tool was developed simultaneously in French and English and both versions of the QUEST form are included in this manual. In French, the assessment is entitled *ÉSAT* for *Évaluation de la Satisfaction envers une Aide Technique*. In addition, a Dutch translation (*D-QUEST*) was

produced for the purpose of testing the reliability and validity of the tool and a Danish version of the QUEST is currently in progress. These later versions are yet to be published and are therefore not available.

Materials

The QUEST form is required for completing the assessment. As a self-administered questionnaire, it demands minimal writing skills to circle or mark the responses on the rating scale and to write one's comments. If the paper and pencil format is however not appropriate for an individual user, the assessment tool can be administered within the context of an interview. For this purpose, some interactive optional material retained from the original version is provided:

- a satisfaction sheet with the 12 items printed in such a way that they can be cut into a set of 12 satisfaction cards;
- an enlarged rating scale displaying the 5-point of degree of satisfaction.

Administration

Depending on the context, the user or the evaluator can complete the QUEST form. In either case, it is recommended that whenever possible, the evaluator is present in order to assure that the user understand the questions. In the face-to-

face interview context, the evaluator can provide additional explanation if required. For example, it might be necessary to emphasise that the evaluation focuses on the user's satisfaction and dissatisfaction with a particular device as opposed to similar devices that were used in the past or other devices currently being used.

The assessment begins by identifying the type of device (category, model or any other specifications) being evaluated, the name of the user and the date of the assessment. The purpose of the QUEST questionnaire and instructions on how to answer the questions are then explained as follows:

The purpose of the QUEST questionnaire is to evaluate how satisfied you are with your assistive device and the related services you experienced. The questionnaire consists of 12 satisfaction items.

- *For each of the 12 items, rate your satisfaction with your assistive device and the related services you experienced by using the following scale of 1 to 5.*

1	2	3	4	5
Not satisfied at all	Not very satisfied	More or less satisfied	Quite satisfied	Very satisfied

- *Please circle or mark the one number that best describes your degree of satisfaction with each of the 12 items.*
- *Do not leave any question unanswered.*
- *For any item that you were not "very satisfied", please comment in the section comments.*

The user who can independently complete the form, then goes on to score each of the 12 satisfaction items using the 5 point scale and selects the three items that he or she considers to be the most important. If the user however does not have the motor, sensory or cognitive skills required to complete the QUEST form, the evaluator administers the questionnaire, records the person's answers on the form and uses the optional material provided. The evaluator asks the user to rate each of the satisfaction items by responding either verbally or by pointing to the selected number on the enlarged rating scale. The evaluator then places the satisfaction sheet or the 12 satisfaction cards in front of the user and asks the person to select the three most important satisfaction items. The user is invited to respond either verbally or by pointing to the three satisfaction cards of choice.

Scoring

The evaluator records the results on the scoring sheet. The QUEST 2.0 yields three scores: **Device** subscale score, **Services** subscale score and a **Total** score. Data analyses suggest that the grouping of the items into Device and Services subscales is meaningful and that users can discriminate between these two aspects of their satisfaction. A total score is also thought to be useful when examining the relationship of overall satisfaction with other outcomes measures.

A valid response item has a value ranging from 1 to 5. The evaluator must first enter the number of non-valid responds. The score for the Device subscale is obtained by adding the ratings of the valid responses for items 1 to 8 and dividing this sum by the number of valid items in the subscale. Similarly, the score for the Services subscale is derived by computing the average score for items 9 to 12. The total QUEST score is obtained by adding the ratings of the valid responses for items 1 to 12 and dividing the sum by the number of valid items. Accordingly, a score can range from 1.00 to 5.00, with two decimal places for scores between these minimal and maximal values.

Missing data is often a problem when QUEST is self-administered and the evaluator is not present. Missing data

can occur if the item is omitted, erroneously marked or marked as non-applicable. The following set of scoring procedures adapted from King, Rosenbaum and King (1995) can be applied to deal with missing data. The QUEST assessment is considered invalid if scores for more than six satisfaction items (out of a total of 12 items) are missing. If there is a sufficient number of completed and valid responses on the QUEST 2.0, the next step is to calculate each subscale score. A subscale score is computed only if there are at least six valid scores on the Device subscale and three valid scores on the Services subscale.

Interpretation of the results

The scoring method described above allows for comparability across subscales and scales and also eliminates any confusion when interpreting scores based on a different number of items. The meaning and significance of the results however depends upon who is doing the interpretation and to whom the results are being presented. In other words, the meaning of the results may differ among practitioners and researchers of different disciplines. The various assistive technology stakeholders do not always interpret the meaning of the QUEST results in the same way. With this in mind, a few examples of how to interpret the QUEST results are provided here.

Descriptive statistics - Means, standard deviations and range of scale scores

The means for the subscale scores provide useful summary statistics about the relative satisfaction or dissatisfaction of the Device and Services dimensions of assistive technology devices. A mean score of,

- 1 (or very close to 1) indicates that the users are "not satisfied at all" with their device on that subscale;
- 2 (or very close to 2) can be interpreted as the users being "not very satisfied" with their Device on that subscale;
- 3 (or very close to 3) indicates that the users are "more or less satisfied" with their Device on that subscale;
- 4 (or very close to 4) denotes that the users are "quite satisfied" with their Device on that subscale and
- 5 (or very close to 5) indicates that they are "very satisfied" with their Device on that subscale.

In addition to these qualitative descriptions, the mean plus or minus the standard deviation and the range of scores provide useful information about how much variability or dispersion there is in the data set. The data in Table 1 was taken from

one of the QUEST Montreal studies (Demers, Weiss-Lambrou & Ska, in press) and illustrates some of the statistics that can be used to interpret the users' satisfaction with lower limb prostheses.

Table 1: Descriptive statistics for the QUEST 2.0 scales from a Montreal sample of users with lower limb prostheses (n=25)

SUBSCALE	M	SD	SCORES WITHIN M ±1 SD	MIN	MAX	RANGE
DEVICE	4.06	0.50	3.56 to 4.56	2.86	4.88	2.02
SERVICES	4.16	.90	3.26 to 5.00	1.50	5.00	3.50
TOTAL	4.10	.61	3.49 to 4.71	2.50	4.88	2.38

For example in Table 1, the lowest mean in this data set is 4.06 (SD = 0.50) for the *Device* and the highest mean is 4.16 (SD = 0.90) for *Services*. To understand where and how much variation is represented, it may however be more useful to examine the mean value for each scale plus or minus one standard deviation. In a normal distribution, approximately 68% of the scores fall within the range of the mean plus or minus one standard deviation. For the *Services* subscale one can note that the scores within one standard deviation of the mean have a relatively wide range (3.26 to 5.00) and that the scores nearly covered the full range of possible values from 1.00 to 5.00 (with a minimal score of 1.50 and a maximum of 5.00). The range of scores within

one standard deviation of the mean for *Device* subscale is much more narrow (3.56 to 4.56) and there is a much higher minimum score of 2.86.

Item by item analysis

Another method for interpreting the results is to perform an item by item analysis. If the evaluator seeks to identify those areas where improvements should be made to the device or to the related services, then it would be helpful to examine the scores for each of the satisfaction items. Table 2 presents an item by item analysis for the *Device* subscale, based on data collected from 71 users of electrical wheelchairs and 51 users of manual wheelchairs. The percentage of subjects who reported that they were "somewhat satisfied" or less (scores 1, 2 and 3 combined) and the percentage of those who were "satisfied" to "very satisfied" (scores 4 and 5 combined) are displayed.

Table 2: Item by item analysis for the Device subscale for electrical (n=71) and manual (n=50) wheelchair users

ITEMS	ELECTRICAL WHEELCHAIRS		MANAL WHEELCHAIRS	
	% subjects "More or less satisfied" or less (scores 1,2, 3)	% subjects "Quite satisfied" or "Very satisfied" (scores 4 & 5)	% subjects "More or less satisfied" or less (scores 1,2, 3)	% subjects "Quite satisfied" or "Very satisfied" (scores 4, 5)
1. DIMENSIONS	23.9	76.1	25.5	74.5
2. WEIGHT	42.1	57.9	35.5	64.5
3. ADJUSTMENT	30.0	70.0	32.7	67.3
4. SAFETY	23.9	76.1	15.7	84.3
5. DURABILITY	13.2	86.8	22.9	77.1
6. EASE OF USE	18.3	81.7	29.4	70.6
7. COMFORT	29.6	70.4	29.4	70.6
8. EFFECTIVENESS	15.5	84.5	21.6	78.4

In determining where improvements can be made, the satisfaction data on a specific device can be used to indicate how a group of users rate their satisfaction with the same type of device. The data in this table also allows for a comparison of satisfaction between two different types of mobility aids. For example, satisfaction with *weight* and *safety* is perceptibly weaker among users of electrical wheelchairs than for users of manual wheelchairs. Finally, when interpreting the QUEST results, it is important to focus on items where an appreciable percentage of users (at least 25% to 33%) report that they are only "somewhat satisfied", "dissatisfied", or "very dissatisfied" as shown in those cells that are highlighted in Table 2. For example, if a large percentage of users report that they are dissatisfied with the *ease in adjusting* their device, then the sources for this dissatisfaction must be addressed.

Chapter 3

Psychometric properties of the QUEST 2.0

Reliability

There are three major approaches to the estimation of reliability, depending upon the sources of errors that are considered (Contandriopoulos, Champagne, Potvin, Denis & Boyle, 1990). The first approach is referred to as test-retest and is concerned with the stability of the measure at two different points in time. The second approach known as interrater reliability assesses the reproducibility of the measure when two or more raters at a given point of time measure the phenomenon under study. In the case of interview format measures, interrater and intertime reliability are interconnected - what is estimated is a person's score on the QUEST when administered by two different raters at two points in time (Feinstein, 1987). The third approach is referred to as internal consistency. Its focus is on the extent to which items of a composite score essentially measure the same concept. It is a measurement property that characterises the scales and the subscales in their entirety.

Test-retest stability of the individual items that comprise the QUEST 2.0 was established in a study conducted on a

Montreal sample of 139 users of mobility assistive technology (Demers, Ska, Giroux & Weiss-Lambrou, 1999). The reliability estimates were weighted Kappas (Cohen, 1968) which is an appropriate statistic for categorical data. This statistic was preferred over the simpler measure of percentage of agreement because it discounts the proportion of agreement that is expected by chance alone (Maclure & Willett, 1987) and it takes into account partial agreement. According to Landis and Koch's (1977) benchmarks, the coefficients values may be interpreted according to the following categories: poor (<0.00), slight ($0.00-0.20$), fair ($0.2-0.40$), moderate ($0.41-0.60$), substantial ($0.61-0.80$), and almost perfect ($0.81-1.00$).

Table 3: Coefficients of stability and reproducibility of 12 QUEST items based on a Montreal sample of 139 mobility device users

ITEMS	STABILITY		REPRODUCIBILITY	
	Weighted Kappa	Judgement	Weighted Kappa	Judgement
1. DIMENSIONS	0.74*	Substantial	0.66*	Substantial
2. WEIGHT	0.63*	Substantial	0.69*	Substantial
3. ADJUSTMENT	0.52*	Moderate	0.43*	Moderate
4. SAFETY	0.58*	Moderate	0.43*	Moderate
5. DURABILITY	0.69*	Substantial	0.40*	Fair
6. EASE OF USE	0.52*	Moderate	0.35*	Fair
7. COMFORT	0.51*	Moderate	0.72*	Substantial
8. EFFECTIVENESS	0.62*	Substantial	0.55*	Moderate
9. SERVICE DELIVERY	0.61*	Substantial	0.51*	Moderate
10. REPAIRS & SERVICING	0.68*	Substantial	0.65*	Substantial
11. PROF. SERVICES	0.61*	Substantial	0.48*	Moderate
12. FOLLOW-UP	0.56*	Moderate	0.63*	Substantial

Table 3 incorporates the stability and the reproducibility of the satisfaction ratings for the 12 items that comprise the

QUEST 2.0. Inspection of the statistics listed under "Stability" indicates that the entire set of stability coefficients reached the moderate and substantial levels. At the scale and subscales level, the QUEST 2.0 test-retest reliability has not yet been empirically tested.

Interrater reproducibility of the QUEST 2.0 is relevant and important to consider if the assessment tool is administered in a face-to-face interview. Although this is not the standard procedure, it is important to note that most of the items either maintain the same level of agreement as in test-retest ($n=5$), or dropped to the next category ($n=4$). Only one item (*durability*) dropped two categories below. Such results are not surprising since an additional source of error was imposed on the research design, one that is attributed to differences between evaluators. Quite unexpectedly however, two items increased their reliability level from moderate to substantial, specifically the items *comfort* and *follow-up*. Once again, it is important to note that the estimates are not available at the scale and subscales level.

The Cronbach alpha coefficient of internal consistency reached 0.82 for the total scale, 0.80 for the Device subscale and 0.76 for the Service subscale. According to the acceptability levels proposed by DeVellis (1991), the first two coefficients are considered very good while the third estimator can be judged as being respectable. The mean item intercorrelation was 0.28.

Validity

Appraisal of an instrument's validity consists of evaluating its capacity to measure the concept under study (Contandriopoulos et al., 1990). It refers to the adequacy between the theoretical concept and its operationalisation at the variable level. Classically, test developers are concerned with three types of validity: content, criterion-related and construct validity. Although criterion-related validity of the QUEST 2.0 has yet to be addressed, there is evidence for the instrument's content and construct validity.

Content validity refers to the extent to which the instrument covers the scope of the construct of satisfaction. It includes the relevance of selected items and their capacity to represent every facet of the measured concept (Messick, 1980). Based on a study involving 12 international experts, the items comprising the QUEST 2.0 can be considered as being very important and relevant (Demers, Wessels, et al., 1999). As shown in Table 4, the percentage of agreement on the relative importance of all the items ranged from 50% to 92%. According to the study on item analysis (Demers, Weiss-Lambrou & Ska, in press), a majority vote on the primary importance (50%) was required to retain a particular item.

Table 4: Percentage of agreement on the relative importance of the 12 QUEST items based on an international sample of 12 experts

ITEMS	PRIMARY IMPORTANCE (%)	SECONDARY IMPORTANCE (%)	NEITHER (%)
1. DIMENSIONS	67	33	0
2. WEIGHT	62	5	0
3. ADJUSTMENT	54	38	8
4. SAFETY	92	8	0
5. DURABILITY	85	15	0
6. EASE OF USE	92	8	0
7. COMFORT	85	15	0
8. EFFECTIVENESS	92	8	0
9. SERVICE DELIVERY	50	42	8
10. REPAIRS & SERVICING	85	15	0
11. PROF. SERVICES	67	33	0
12. FOLLOW-UP	50	42	8

With respect to construct validity, a factorial analysis was conducted on a Montreal sample of 150 users of mobility

aids (Demers, Weiss-Lambrou & Ska, in press). Factor analysis is an analytical technique that permits the reduction of a certain number of interrelated variables to a smaller number of latent or hidden dimensions (Pedhazur & Schmelkin, 1991). The results of the factor analysis are shown in Table 5. This factor structure matrix represents the loadings of the 12 items that comprise the QUEST 2.0 with factors. The communalities, that are the proportion of variance accounted for by this solution, are reported in the right-hand column. Small portions of the items *comfort* (#1), *safety* (#10), and *service delivery* (#11) variances were explained (respectively 0.193, 0.224 and 0.180). For this analysis, a conservative threshold for meaningful loadings at 0.30 was employed (Pedhazur & Schmelkin, 1991). Results reveal that most items are high on one factor and low on the other, thus contributing positively to a simple resulting structure. Two items however performed slightly differently. Item *effectiveness* (#6) loaded on both factors but more substantially on Factor one. Item *durability* (#8) loaded moderately on the two factors, somewhat more with Factor two. Because it is conceptually more closely related to the first cluster of items, *durability* was nevertheless assigned to Factor one.

Table 5: Results of factor analysis of the 12 QUEST items

NO	ITEM	DEVICE	SERVICES	COMMUNALITIES
1.	COMFORT	0.420		0.193
2.	DIMENSIONS	0.608		0.381
5.	SIMPLICITY OF USE	0.661		0.485
6.	EFFECTIVENESS	0.589	0.346	0.466
8.	DURABILITY	0.361	0.419	0.306
9.	ADJUSTMENTS	0.658		0.449
10.	SAFETY	0.396		0.224
12.	WEIGHT	0.577		0.338
3.	PROFESSIONAL SERVICE		0.689	0.509
4.	FOLLOW-UP SERVICES		0.823	0.696
7.	REPAIRS/SERVICING		0.689	0.487
11.	SERVICE DELIVERY		0.394	0.180

Based on the content of each scale, the factors were respectively named assistive technology **Device** (8 items) and assistive technology **Services** (4 items). The Device

factor accounted for 20.6% of the explained common item variance and the Services factor accounted for 18.7% for an explained common item variance totalling 39.3%. Based on the Principal Component Analysis (PCA), the total item variance explained by this solution attained 48.4%. These findings were cross-validated in a Dutch sample of 253 users subjects and an identical structure was obtained thereby strongly supporting the stability of the QUEST 2.0 satisfaction model (Demers, Weiss-Lambrou & Ska, in press).

Conclusion

The QUEST (version 2.0) is a client-centred and consumer-based satisfaction tool that is comprehensive, useful and simple to administer. It is a product of more than four years of research and development and recent psychometric studies have confirmed its reliability and validity as an outcome measure of user satisfaction with assistive technology. With this publication of the QUEST, assistive technology practitioners and researchers around the world will discover the many advantages and applications of this new outcome instrument:

- It can be used for clinical, research and marketing purposes;
- It can be used with adults of different ages and disabilities ;
- It can be applied to a wide range of assistive technology products;
- It is an easy to use tool for obtaining outcomes data for the purpose of documenting the real-life benefits of assistive technology and justifying the value and impact of the devices;
- It is grounded on a theoretical model of satisfaction with assistive technology;
- It can be given repeatedly to measure changes in satisfaction over time;

- It can be used alongside other measures of health and functional outcomes and service costs when conducting economic evaluations of rehabilitation services and products;
- It can be used for international comparisons of user satisfaction with assistive technology devices.
- It provides information that can be used to improve the design of assistive devices to better meet the needs of the consumers;
- It is simple to administer, easy to score and requires only 10 to 15 minutes to complete;
- There are no specific qualifications or training required to administer the assessment;
- It can be adapted to meet the physical needs of those persons who cannot manipulate the assessment materials;
- The assessment materials and manual are easy-to-understand;
- It is the ideal mail survey tool for collecting satisfaction data with large samples;
- Persons who have been evaluated with the QUEST are highly motivated to express their (dis)satisfaction and value the opportunity of expressing their opinion and reporting on their experience with assistive technology.

Publications on QUEST

(In chronological order)

Demers, L., Weiss-Lambrou, R., Ska, B. (1996). The Quebec User Evaluation of Satisfaction with assistive Technology: QUEST, *Assistive Technology*, 8 (1), 3-13.

Demers, L., Weiss-Lambrou, R., & Ska, B. (1997). Quebec User Evaluation of Satisfaction with assistive Technology (QUEST): A new outcome measure. *Proceedings of the RESNA 97 Annual Conference - Let's Tango Partnering people and technologies* (pp. 94-96). David L. Lawrence Convention Center, Pittsburgh, Pennsylvania.

Weiss-Lambrou, R., Demers, L., Tremblay, C., Ska, B., Lacoste, M., Dansereau, J. (1997). In QUEST of user satisfaction with assistive technology devices. In G. Anogianakis, C. Buhler & M. Soede (1997), *Advancement of Assistive Technology, Assistive Technology Research Series*, Volume 3, (pp.428-431), Washington, DC: IOS Press.

Weiss-Lambrou, R., Tremblay, C., Lacoste, M., LeBlanc, R., Dansereau, J. (1998). Consumer criteria for evaluating satisfaction with wheelchair seating aids: QUEST results. *Proceedings of the RESNA 98 Annual Conference - The State of the Arts and Science* (pp. 152-154). Hyatt Regency Hotel, Minneapolis, MN.

Wessels, R.D., de Witte, L.P., Weiss-Lambrou, R., Demers, L., Ska, B., Dansereau, J. (1998). Cross-cultural adaptation of QUEST and its application as a routine follow-up within the service delivery process. *Abstracts of the 1998 International conference of the World Federation of Occupational therapists*, Montreal, Canada.

Wessels, R.D., de Witte, L.P., Weiss-Lambrou, R., Demers, L., Wijihuisen, G. (1998). A Dutch version of QUEST (D-QUEST) applied as a routine follow-up within the service delivery process. In I. Placencia Porrero & E. Ballabio (1998), *Improving the Quality of Life for the European Citizen*, (pp.420-424), Washington, DC: IOS Press.

Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) (1998). *RESNA Resource Guide for Assistive Technology Outcomes: Assessment Instruments, Tools, & Checklists from the Field*, Volume II, pp.291-299. Arlington, VA: RESNA.

Vachon, B., Weiss-Lambrou, R., Lacoste, M., Dansereau, J. (1999). Elderly nursing home residents' satisfaction with manual and powered wheelchairs. In *Proceedings of the RESNA '99 Annual Conference* (pp. 221-223). Long Beach, CA: RESNA.

Demers, L., Wessels, R., Weiss-Lambrou, R., Ska, B., & de Witte, L. (1999). An international content validation of the Quebec User Evaluation of Satisfaction with assistive

Technology (QUEST). *Occupational Therapy International*, 6 (3) 159-175.

Weiss-Lambrou, R., Tremblay, C., LeBlanc, R., Lacoste, M., Dansereau, J. (in press). Wheelchair seating aids: How satisfied are consumers? *Assistive Technology*.

Demers, L., Ska, B., Giroux, F., & Weiss-Lambrou, R. (1999). Stability and reproducibility of the Quebec User Evaluation of Satisfaction with assistive Technology (QUEST). *Journal of Rehabilitation Outcomes Measurement*, 3 (4).

Demers, L., Weiss-Lambrou, R., & Ska, B. (in press). Item analysis of the Quebec User Evaluation of Satisfaction with assistive Technology (QUEST). *Assistive Technology*.

References

Batavia, A. I., & Hammer, G. S. (1990). Toward the development of consumer-based criteria for the evaluation of assistive devices. *Journal of Rehabilitation Research and Development*, 7, 425-436.

Chaplin, J. P. (1985). *Dictionary of Psychology*. New York: Dell.

Cohen, J. (1968). Weighted kappa: Nominal scale agreement with provision for scaled disagreement of partial credit. *Psychological Bulletin*, 70, 213-220.

Contandriopoulos, A. P., Champagne, F., Potvin, L., Denis, J. L., & Boyle, P. (1990). *Savoir préparer une recherche, la définir, la structurer, la financer*. Montréal, QC: Les presses de l'Université de Montréal.

Demers, L., Ska, B., Giroux, F., & Weiss-Lambrou, R. (1999). Stability and reproducibility of the Quebec User Evaluation of Satisfaction with assistive Technology (QUEST). *Journal of Rehabilitation Outcomes Measurement*, 3(4).

Demers, L., Weiss-Lambrou, R., & Ska, B. (1996). Development of the Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST). *Assistive Technology*, 8, 3-13.

Demers, L., Weiss-Lambrou, R., & Ska, R. (1997). Quebec User Evaluation of Satisfaction with assistive Technology (QUEST): A new outcome measure. In S. Sprigle (Ed.), *Proceedings of the RESNA 97 Annual Conference Let's Tango - Partnering People and Technology* (pp. 94-96). Arlington (VA): RESNA Press.

Demers, L., Weiss-Lambrou, R., & Ska, B. (in press). Item analysis of the Quebec User Evaluation of Satisfaction with assistive Technology (QUEST). *Assistive Technology*.

Demers, L., Wessels, R., Weiss-Lambrou, R., Ska, R., & De Witte, L. (1999). An international content validation of the Quebec User Evaluation of Satisfaction with assistive Technology (QUEST). *Occupational Therapy International*, 6(3), 159-175.

DeVellis, R. F. (1991). *Scale development - Theory and applications*. Newbury Park, Ca: Sage.

Feinstein, A. R. (1987). *Clinimetrics*. New Haven, CT: Yale University Press.

Keith, R. A. (1998). Patient satisfaction and rehabilitation services. *Archives of Physical Medicine and Rehabilitation*, 79, 1122-1128.

King, S., Rosenbaum, P. L., & King, G. (1995). The measure of processes of care (MPOC): A means to assess family-

centered behaviours of health care providers. Unpublished manuscript. McMaster University, Neurodevelopmental Clinic Research Unit, Hamilton.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33, 159-174.

Linder-Pelz, S. (1982). Toward a theory of patient satisfaction. *Social Science and Medicine*, 16, 577-582.

Messick, S. (1980). Test validity and the ethics of assessment. *American Psychologist*, 35, 1012-1027.

MacLure, M., & Willett, W. (1987). Misinterpretation and misuse of the kappa statistic. *American Journal of Epidemiology*, 126, 161-169.

Pedhazur, E. J., & Schmelkin, L. P. (1991). *Measurement, design, and analysis: An integrated approach*. Hillsdale, NJ: Lawrence Erlbaum Associates.

RESNA (Rehabilitation Engineering and Assistive Technology Society of North America). (1998). *RESNA resource guide for assistive technology outcomes: Assessment instruments, tools, & checklists from the field (Vol. 2)*. Arlington, VA: RESNA.

Scherer, M. J. (1996). *Living in the state of stuck - How technologies affect the lives of people with disabilities (2d ed.)*. Cambridge, MA: Brookline Books.

Simon, S. E., & Patrick, A. (1997). Understanding and assessing consumer satisfaction in rehabilitation. *Journal of Rehabilitation Outcomes Measurement*, 1(5), 1-14.

Wessels, R.D., De Witte, L.P., Weiss-Lambrou, R., Demers, L., & Wijnhuizen, G. (1998). A Dutch version of QUEST (D-QUEST) applied as a routine follow-up within the service delivery process. In E. Placencia, E. Ballabio (Eds.), *Improving the Quality of Life for the European Citizen* (pp. 420-424). Washington, DC: IOS Press.

NOTES

Pour utilisation non commerciale seulement
Non-commercial use only