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Article · January 2002

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The Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0): An overview and recent progress

Louise Demers*, Rhoda Weiss-Lambrou and Bernadette Ska

Research Center of the Institut universitaire de gériatrie de Montréal, 4565 Queen Mary Road, Montreal (Quebec), H3W 1W5, Canada

Abstract. The Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0) is a 12-item outcome measure that assesses user satisfaction with two components, Device and Services. Psychometric properties have been tested with respect to test-retest stability, alternate-form equivalence, internal consistency, factorial composition and nomological validity. Examples of results obtained with the first version of the tool in outcome studies in Europe and North America support the importance and relevance of the satisfaction measure.

1. Purpose

The Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0) was designed as an outcome measurement instrument to evaluate a person's satisfaction with a wide range of assistive technology (AT). It was intended as a clinical and research instrument. As a clinical tool, the rating scale provides practitioners with a means of collecting satisfaction data to document the real-life benefits of AT 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 settings and in different countries. Until now, the QUEST 2.0 has been used mainly with adults but it may also be administered to adolescents and elderly users of AT.

2. Conceptual basis

Due to a vacuum in theoretical knowledge, satisfaction determinants are vague in the field of assistive technology. Similar conceptual limitations exist in other health domains [1–3]. Despite lack of standards, the rationale behind the QUEST was drawn from the state of the art in satisfaction assessment. The relations between the variables involved in the experience of satisfaction with AT are represented within a linear general framework, inspired by Simon and Patrick [4]. In Fig. 1, expressed satisfaction is conceived as a reaction to assistive technology provision. It may also trigger a subsequent action or behaviour, for instance, the use or the abandonment of the AT. Satisfaction is defined as a person's critical evaluation of several aspects of a device. This evaluation is believed to be influenced by one's expectations, perceptions, attitudes and personal values. Accordingly, satisfaction is considered as a multidimensional concept with two underlying dimensions respectively related to assistive technology, Device and Services. As shown in Fig. 2, the Device dimension embraces 8 items related to salient characteristics of the assistive technology whereas the Services dimension encompasses 4 intercorrelated items.

*Corresponding author: Tel.: +1 514 340 3540; Fax: +1 514 340 3548; E-mail: Louise.Demers@umontreal.ca.

Assistive Technology Experience

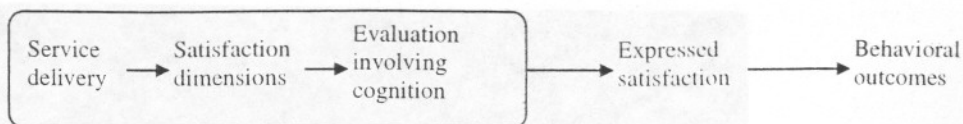


Fig. 1. Satisfaction with assistive technology model (inspired by Simon and Patrick [4]).

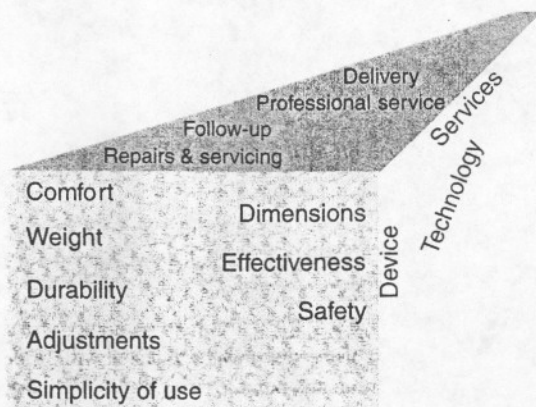


Fig. 2. QUEST 2.0 Bidimensional satisfaction structure.

3. Description

The first version of the QUEST consisted of 24 items although the user could also add any other items considered important [5]. They were drawn and adapted from current literature on assistive technology assessment and the Matching Person and Technology model [6]. Responses were coded on a 5-point importance scale ('of no importance' to 'very important') and on a 5-point satisfaction scale ('not satisfied at all' to 'very satisfied'). Field testing of this original version were conducted [7,8]. Based on these data, an item analysis was performed [9] and those items that ranked best in terms of demonstrating optimal measurement performance were included in QUEST 2.0. The importance scale was removed because it did not prove to be reliable for discriminating between and among users of AT [8].

Accordingly, the current version of the scale includes 12 items rated on a 5-point satisfaction scale graded as previously (see examples in Fig. 3). The items were considered applicable for a wide variety of devices [9]. For the purpose of identifying the sources of user satisfaction or dissatisfaction, space for comments is provided next to each item. The QUEST 2.0 yields three scores: Device, Services, and total QUEST, calculated by averaging valid responses to assigned items (range 1.00 to 5.00). Finally, the three most important

items for the device being assessed are identified from a checklist of the 12 satisfaction items. With respect to evaluation procedures, two administration formats may be used. In its self-administered format, the QUEST 2.0 demands minimal skills to circle or mark the responses on the rating scale and to write one's comments. If however the pencil and paper format is not appropriate for an individual user, the assessment tool can be administered by an interviewer. For this purpose, some interactive optional material is provided, including a list of 12 satisfaction items printed in large font and an enlarged rating scale displaying the 5-point degree of satisfaction. In either case, for each device being evaluated, approximately 10–15 minutes are required to complete the evaluation. The instrument was developed in Canadian English and French.¹ It was subsequently translated into Dutch, Swedish, Norwegian, Danish, and Japanese.

4. Reliability

Reliability, which is concerned with error in measurement, was assessed through test-retest stability, alternate-form equivalence between self and interviewer administration forms, and internal consistency. At the test level, some studies were carried out on 4 community-based adults with Multiple Sclerosis using mobility devices (walkers, wheelchairs, and scooters) [10]. These subjects were assigned to four groups and a second QUEST 2.0 was administered one week later. Groups differed with respect to the format and the order in which alternate forms were presented. The measures of association for test-retest stability, the intraclass correlation coefficient (ICC), were .82, .82 and .91, for the Device, Services, and total QUEST, respectively. For alternate-form equivalence, the ICC were .89, .76, and .91, suggesting somewhat lower results for the Services subscale. At the item level, indices

¹ Publisher of QUEST 2.0: Marcia J. Scherer Ph.D. Institute Matching Person and Technology, 486 Lake Road, Webster, NY, USA 14580. E-mail: IMPT97@aol.com.

1	2	3	4	5
not satisfied at all	not very satisfied	more or less satisfied	quite satisfied	very satisfied

ASSISTIVE DEVICE				
<i>How satisfied are you with,</i>				
1. the dimensions (size, height, length, width) of your assistive device? <i>Comments:</i>			1	2 3 4 5
2. the weight of your assistive device? <i>Comments:</i>			1	2 3 4 5
3. the ease in adjusting (fixing, fastening) the parts of your assistive device? <i>Comments:</i>			1	2 3 4 5
4. how safe and secure your assistive device is? <i>Comments:</i>			1	2 3 4 5

SERVICES				
<i>How satisfied are you with,</i>				
9. the service delivery program (procedures, length of time) in which you obtained your assistive device? <i>Comments:</i>			1	2 3 4 5
10. the repairs and servicing (maintenance) provided for your assistive device? <i>Comments:</i>			1	2 3 4 5

Fig. 3. Examples from the QUEST 2.0.

agreement for the 12 items were obtained from a study of the original 24-item instrument [8]. In this study, 85 users of wheelchairs and lower limb prosthesis were administered the test twice, with a 7 to 10-day interval between measures. Weighted kappa ranged from .51 to .74 and averaged around .61. Internal consistency estimates were calculated from the same sample of subjects and Alpha values of .80, .76 and .82 were found [9].

5. Validity

During the early development of the QUEST, content validity was tested by asking a panel of stakehold-

ers and consumers to review and critique the preliminary versions of the instrument [5]. This led to the development of an experimental 24-item version, ready for field trials. A number of researchers and clinicians ($n = 12$) from the United States, The Netherlands, and Canada volunteered to test the newly developed outcome measure and completed a questionnaire on its content, administration procedures, and usefulness [7]. At the test level, the findings revealed that the QUEST was sampled adequately in terms of embracing all important facets of satisfaction with AT. At the item level, however, it was shown that changes needed to be made to item wording and to the administration procedures to ensure optimal content validity. These results, combined with those of a reliability study, were used in

an item analysis [9] and led to the development of the shorter single rating scale QUEST2.0 [11].

Factorial analyses of the QUEST 2.0 were performed in two studies using the Principal Axis Factoring method. The first study [9] involved 150 Canadian subjects using mobility devices. Results suggested a bidimensional structure of satisfaction with AT, Device and Services, accounting for 40% of the common variance. A cross-validation study [12] was conducted with 243 Dutch subjects using a wide range of home technologies. The findings broadly supported the division into Device and Service components, in spite of contrasting assistive technology and services delivery systems.

In a recent study [10], the expected relationship between the QUEST 2.0 and another outcome measure of assistive technology was empirically tested. Participants ($n = 81$) who were administered the instrument also completed the Psychosocial Impact of Assistive Devices Scale (PIADS) [13]. This measure captures the concepts of Competence, Adaptability, and Self-Esteem, all subsumed as fundamental dimensions under quality of life. Both measures rely on the individuals' subjective experiences but have different standpoints for evaluation. Positive correlations were found between the QUEST 2.0 and the three PIADS dimensions. They were fair to moderate for Device and total QUEST (Pearson correlation coefficient [r_p] .34 to .45) and fair with Services (r_p .27 to .30). This argues that satisfaction with a device is associated, to a certain extent, with lifestyle, behavior, and experiential factors.

6. Results of application in outcome studies

The following are examples of studies in Europe that used the first version of the QUEST as an outcome measure of satisfaction with AT. In the Netherlands, Wessels et al. [14] implemented a 3-month follow-up study with 375 users of toilet adaptations, shower seats and chairs, wheelchairs, adapted beds, stairlifts, home adaptations and adapted beds. Although the majority of the respondents reported they were very satisfied with their devices, a substantial proportion (19%) expressed specific concerns and overall dissatisfaction. The items that clients were least satisfied with were related to services issues, such as Service Delivery, Follow-up Services, or Professional Services, whereas the items that clients were most satisfied with included Durability, Effectiveness, Comfort and Dimensions. Brandt

and Iwarsson [15] used the Danish version of the original QUEST as part of their outcome study on powered wheelchair used by the elderly. Data from 111 subjects showed that the vast majority considered the AT to be important and that they were satisfied with it as a whole. However, a substantial proportion of users were not satisfied with some of the technical characteristics, such as power and speed.

In North America, Benedict et al. [16] used the tool to examine whether use of AT by young children was related to caregiver satisfaction ($n = 37$). They found that high ranked satisfaction scores were more likely for children using the device as intended than for those underutilizing the device. Weiss-Lambrou et al. [17] assessed user satisfaction with modular-type seating device integrated in a powered wheelchair ($n = 23$). The results revealed that the item comfort was the most important consumer criterion yet it was evaluated as the least satisfying. The QUEST was one of four measures chosen by Bursick et al. [18] to assess wheelchair seating and positioning outcomes in the elderly nursing home population. This randomized controlled study included an intervention group ($n = 12$) receiving a new wheelchair, cushions and a custom seat back and a comparison group ($n = 12$). Overall, the subjects in the custom fitted wheelchairs and seating systems were more satisfied (3.72 compared with 3.14) with their AT. Use of and satisfaction of upper limb myoelectric prostheses were studied by Routhier et al. [19] with a sample of 10 subjects. Although general satisfaction was high (80%), specific concerns were raised with respect to heat, weight, service delivery procedures, durability of mechanisms and battery, follow-up services, professional services, dimensions and loss of tactile sensation. Stickel et al. [20] conducted interviews with 40 users and nonusers of electronic aids to daily living. Simplicity of use and safety were rated as the most satisfactory items whereas cost, follow-up services and device compatibility were commonly reported to be low.

Results from the application of the QUEST 2.0 are beginning to be published. Vincent and Demers [21] administered the test to 43 community-dwelling subjects using twin or double electrical beds. The majority of users are very satisfied with their bed, with item scores averaging close to 4.00. Comfort and ease of use were considered the most important items. Interestingly, users of double beds were more satisfied with the item dimension than were users of twin beds. Several concerns were raised about the noise of the engine, the maximal and minimal heights, the tilting angles and

the overall resistance of the beds. The QUEST 2.0 has been released recently and more outcome studies are expected to be published in the coming years.

7. Discussion

The QUEST 2.0 is a pioneer scale for satisfaction measurement. It was developed in response to the last decade's wake-up call for outcome measurements in the field of rehabilitation assistive technology. As a generic assessment, it covers both Device and Services components of AT. Thus, the items may be applied to a wide range of devices. On the other hand, some potential items, relevant to a specific pieces of technology or delivery systems may be absent. Speed, for instance, is subsumed within the item effectiveness although it may be considered an important aspect of a powered wheelchair's performance. Users of the tool are invited to add a few items of their own, using the 5-point satisfaction rating scale and a similar format. However, such data cannot be included in the Device, Service and total QUEST scores; they should be added at the end of the questionnaire and analysed separately.

Most studies about the psychometric properties of the tool have been conducted by the team of developers themselves. Nevertheless, the scales and subscales appear to be adequate with respect to test-retest stability, alternate-form equivalence, and internal consistency. More reliability tests for the 4-item Services subscale however need to be conducted. Construct validity has been studied through factorial composition and nomological relatedness (expected correlation between measures of related concepts). Although not extensive, validity results are convergent and support the adequacy of the satisfaction measure. Several outcome studies were conducted using the first version of the tool. The QUEST 2.0 has better measurement properties and is an important improvement to the previous version. It allows both item and test levels results and should become a valuable tool to enhance most studies concerned with consumer satisfaction.

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