

# Telehealth Usability Questionnaire (TUQ)

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## Topical Focus

- Satisfaction and Usability Outcomes: Spotlight on the TUQ.
- The success of telerehabilitation as a tool for clinical service delivery depends on the extent to which it is embraced by stakeholders, and the degree to which its use is able to be mainstreamed into usual clinical practice.



## Topical Focus (cont'd)

- Telerehabilitation has two groups of key user stakeholders:
  - (a) Customers (service recipients)
  - (b) Clinicians (service providers)



## Topical Focus (cont'd)

- In order for TR to be successful, the service delivery mechanisms must be usable and users must be satisfied that such mechanisms accomplish the job effectively.



## Goals of TUQ Development

- A comprehensive questionnaire that covers all usability factors:
  - Ease of use
  - Reliability
  - Effectiveness
  - Satisfaction
  - Usefulness
- Covers both clinicians and patients
- Covers various types of telehealth systems



## Usability Factors in Telehealth

Telehealth Usability Factors	Example of Questions	Usefulness	Ease of use	Effectiveness	Reliability	Satisfaction
<b>Usefulness</b>	Telehealth improves my access to healthcare services	X				
<b>Ease of Use &amp; Learnability</b>	It was easy to learn to use the telehealth system		X			
<b>Interface Quality</b>	The way I interact with this telehealth system is pleasant		X			
	This system is able to do everything I would want it to be able to do			X		
<b>Interaction Quality</b>	I can easily talk to the clinician using the telehealth system			X		
	I can hear the clinician clearly using the telehealth system			X		
<b>Reliability</b>	I think the visits provided over the telehealth system are the same as in-person visits				X	
<b>Satisfaction and Future Use</b>	I would use telehealth services again					X



## Sources from Existing Questionnaire

- TSQ: Telemedicine Satisfaction Questionnaire (TSQ) [Yip et al., 2003]
- Technology Acceptance Model (TAM): PU-PEOU [Davis 1989]
- PSSUQ/CSUQ: Post-Study System Usability Questionnaire/Computer System Usability Questionnaire [Lewis, 1992]



## Comparison

	TAM	TSQ	PSSUQ	TUQ
Usefulness	Y	Y		Y
Ease of Use and Learnability	Y	P	Y	Y
Interface Quality	P		Y	Y
Interaction Quality		Y		Y
Reliability	P	P	P	Y
Satisfaction and Future Use	P	Y	Y	Y



## Usefulness in Telehealth

The system is useful when it works and has positive effects to clinical outcomes or reduce clinical cost (Anne, et al., 2010)

1.	Telehealth improves my access to healthcare services.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
2.	Telehealth saves me time traveling to a hospital or specialist clinic.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
3.	Telehealth provides for my healthcare need.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE



## Ease of Use in Telehealth

Simplicity of tasks and technology increases the chances of success of a technology adoption.

Example: easy installation, easy to operate, task simplicity

4.	It was simple to use this system.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
5.	It was easy to learn to use the system.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
6.	I believe I could become productive quickly using this system	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE



## Effectiveness in Telehealth

Completeness and integration telehealth functionality is very important in a telehealth system (Brennan DM., et al., 2009; Parmanto B., et al., 2012).

10.	This system is able to do everything I would want it to be able to do.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
11.	I can easily talk to the clinician using the telehealth system.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
12.	I can hear the clinician clearly using the telehealth system.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
13.	I felt I was able to express myself effectively.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
14.	Using the telehealth system, I can see the clinician as well as if we met in person.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE



## Reliability in Telehealth

Low error rate, easily recover from mistakes(Nielsen, 1993). Reliability and validity of data transmission is essential to the safety of patients (Schlachta-Fairchild et al., 2008).

15.	I think the visits provided over the telehealth system are the same as in-person visits.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
16.	Whenever I made a mistake using the system, I could recover easily and quickly.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
17.	The system gave error messages that clearly told me how to fix problems.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE



## Satisfaction in Telehealth

Satisfaction reflects patients' values and expectations regarding various aspects of a health service. When there is a match between the care expected and that received, then the patients are satisfied (Greeneich DS., et al., 1992)

18.	I feel comfortable communicating with the clinician using the telehealth system.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
19.	Telehealth is an acceptable way to receive healthcare services.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
20.	I would use telehealth services again.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE
21.	Overall, I am satisfied with this telehealth system.	<input type="checkbox"/>	DISAGREE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	AGREE



## TUQ: Test of Reliability

- Since the TUQ language is standardized, we developed a protocol to train proctors to vary the language orally when administering to a targeted respondent group to ensure that the instrument is tailored to and optimally understood by its audience in a given situation.



## TUQ: Test of Reliability (cont'd)

- We also performed a “systems check” by administering the TUQ across varied telecommunication systems.



## TUQ: Test of Reliability (cont'd)

- We administered the TUQ to a sample of 50 undergraduate and graduate students as well as faculty members.
- Individuals in the sample who had not used TR technology previously performed a simulated clinical activity using our VISYTER technology, and then completed the TUQ.





## TUQ: Test of Reliability (cont'd)

- Other participants who had prior experience (moderate to advanced levels) with TR technology also completed the TUQ.
- The computation of the TUQ's reliability involved calculating Cronbach's Alpha coefficients.



## TUQ: Test of Reliability (cont'd)

- Cronbach's Alpha is a coefficient of internal consistency.
- It is commonly used as an estimate of reliability.
- The theoretical value of alpha varies from zero (0) to one (1).



## TUQ: Test of Reliability (cont'd)

- Higher values of alpha are more desirable (0.70) or higher is typically used as a rule of thumb for determining acceptable reliability of an instrument.



## TUQ: Test of Reliability (cont'd)

- See evaluative guidelines below:

$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable



## TUQ: Test of Reliability (cont'd)

- Cronbach's Alpha results for 'Usefulness' construct (3 items):

Cronbach Coefficient Alpha	
Variable	Alpha
Standardized	0.849707



## TUQ: Test of Reliability (cont'd)

- Cronbach Alpha results for 'Ease of Use' construct (6 items):

Cronbach Coefficient Alpha	
Variable	Alpha
Standardized	0.927096



## TUQ: Test of Reliability (cont'd)

- Cronbach's Alpha results for 'Effectiveness' construct (5 items):

Cronbach Coefficient Alpha	
Variable	Alpha
Standardized	0.873959



## TUQ: Test of Reliability (cont'd)

- Cronbach's Alpha results for 'Reliability' construct (3 items):

Cronbach Coefficient Alpha	
Variable	Alpha
Standardized	0.806124



## TUQ: Test of Reliability (cont'd)

- Cronbach's Alpha results for 'Satisfaction' construct (4 items):

Cronbach Coefficient Alpha	
Variable	Alpha
Standardized	0.921560



## TUQ: Factor Structure

- 'Usefulness' construct – 3 items;
  - The eigenvalue of the first factor was 2.5, the eigenvalues for factors 2-3 were all  $< 0.4$ .
  - All loadings were on the first factor, showing uni-dimensionality.
  - The % of variation explained by that factor was 82%.



## TUQ: Factor Structure (cont'd)

- 'Ease of Use' construct – 6 items:
  - The eigenvalue of the first factor was 4.4, the eigenvalues of factors 5-9 were all  $< 0.75$ .
  - All loadings were on the first factor, showing uni-dimensionality.
  - The % variability explained by that factor was 73%.



## TUQ: Factor Structure (cont'd)

- 'Effectiveness' construct - 5 items:
  - The first factor had an eigenvalue of 3.33, the others (11-14) had eigenvalues  $< 0.66$ .
  - All loadings were on the first factor, showing uni-dimensionality.
  - The % variability explained by that factor was 66%.



## TUQ: Factor Structure (cont'd)

- 'Reliability' construct – 3 items:
  - The eigenvalue of the first factor was 2.09, the eigen values of the others (16-17) were  $< 0.60$ .
  - All loadings were on the first factor, showing uni-dimensionality.
  - The % variability explained by that factor was 70%.



## TUQ: Factor Structure (cont'd)

- 'Satisfaction' construct – 4 items:
  - The eigenvalue of the first factor was 3.2, whereas the factors 19-21 all had eigenvalues of  $< 0.3$ .
  - All loadings were on the first factor, showing uni-dimensionality.
  - The % variability explained by that factor was 81%.

