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Development of the Seating and Mobility Script Concordance Test for Spinal Cord Injury: Obtaining Content Validity Evidence

*†Laura J. Cohen, PT, PhD, ATP, *†Shirley G. Fitzgerald, PhD, ‡Suzanne Lane, PhD, and §Michael L. Boninger, MD

*Human Engineering Research Laboratories / VA Center of Excellence in Wheelchairs and Related Technology, VA Pittsburgh Healthcare System, Pittsburgh, Pennsylvania;
†Department of Rehabilitation Science and Technology, School of Health and Rehabilitation Sciences, University of Pittsburgh, Pittsburgh, Pennsylvania;
‡Department of Psychology in Education, School of Education, University of Pittsburgh, Pennsylvania; and
§Department of Physical Medicine & Rehabilitation, School of Medicine and Department of Bioengineering, School of Engineering, University of Pittsburgh, Pittsburgh, Pennsylvania

The appropriateness of a consumer's seating and mobility system varies considerably depending on the competence, proficiency, and experience of the professionals assisting the user. At present, there is a scarcity of skilled and knowledgeable therapists to evaluate and recommend seating and mobility devices. There is also a lack of measurement tests available to evaluate the impact of educational experiences or clinical practice on the ability to make specialized clinical decisions about seating and mobility needs. The Seating and Mobility Script Concordance Test (SMSCT) is a new assessment tool, grounded in the hypothetico-deductive and schema theories of clinical reasoning. The test is designed to assess therapists by examining the organization of their knowledge, associations between items of their knowledge, and the adequacy of their clinical decisions as compared to expert consensus. This article describes the interview, test development, and content/item review processes used for the collection of content validity evidence. The iterative process employed and the appraisal of the content validity evidence that resulted in the final version of the SMSCT are presented. The SMSCT appears to be a promising assessment tool representing content within the domain of seating and mobility for individuals with spinal cord injuries. The process utilized to develop the SMSCT in spinal cord injury can be replicated for other diagnoses and domains.

Key Words: Professional practice—Clinical competence—Rehabilitation—Seating and mobility—Educational measurement—Validity evidence.

As a result of inadequate professional training, there is a scarcity of physical therapists (PTs) and occupational therapists (OTs) experienced in or specially trained to provide seating and mobility (SM) recommendations (Fifield & Fifield, 1997; Herman & Lange, 1999). With the aging of the U.S. population and the increasing prevalence of persons with mobility impairments (Jones & Sanford, 1996), the demand for assistive technology (AT) devices and services is anticipated to continue to rise. The availability of skilled service providers will not meet this demand unless training opportunities are developed to increase the supply of skilled AT practitioners (Fifield & Fifield, 1997).

Although the need to train additional skilled practitioners is clear, the most effective means of training and the tools to evaluate the effectiveness of training programs have yet to be identified. A review of the literature reveals a dearth of research related to effective means of increasing the competence and expertise of professionals working in the field of SM (Fifield & Fifield, 1997; Hinojosa

Dr. Cohen is now with the Crawford Research Institute, Shepherd Center, Atlanta, Georgia.

Address correspondence and reprint requests to Dr. Shirley G. Fitzgerald, Human Engineering Research Laboratories (151R-1), VA Pittsburgh Healthcare System, 7180 Highland Drive, Pittsburgh, PA 15206.

et al., 2000; Lenker, 1998). With ever-changing and emerging technologies available in the area of SM, it is imperative that clinicians continually update their knowledge, skills, and clinical competencies in order to provide quality care. New measurement tools that can evaluate the impact of educational experiences or clinical practice on the ability to make clinical decisions are needed. The authors embarked on developing such a measurement tool, entitled the Seating and Mobility Script Concordance Test (SMSCT).

Purpose of the SMSCT

The SMSCT is designed to be a performance-based measurement tool rooted in the hypothetico-deductive and the schema theories of clinical reasoning. Authors have hypothesized that differences between experts and novices lie primarily in experts' recall of meaningful relationships and patterns, that is, the structure of knowledge, versus the problem-solving strategy applied to the problem (Charlin, Roy, Brailovsky, Goulet, & van der Vleuten, 2000; Schmidt, Norman, & Boshuizen, 1990). The acquisition of expertise in an area can be characterized by the development of distinctive memory structures, called *scripts*, which are meaningful sets of connections among abstract concepts or specific experiences (Charlin, Roy, et al., 2000; Charlin, Tardif, & Boshuizen, 2000; Schmidt et al., 1990). Research in this area is attempting to portray how a script as a memory structure might be organized for specific diagnostic, investigative, or treatment tasks.

Founded in the theoretical framework of cognitive psychology, the Script Concordance test, a relatively new assessment tool developed for the field of medicine by Charlin and colleagues (Charlin, Roy, et al., 2000), was created to evaluate the reflective clinician. Based on this work, the SMSCT is designed to assess clinicians by examining their knowledge, associations between items of their knowledge, and adequacy of their clinical decisions compared to expert consensus. SMSCT test items are designed to probe memory organization, knowledge use, problem representation, and how these change with experience (Charlin, Tardif, et al., 2000). In accordance with the work of Charlin and colleagues (Charlin, Desaulniers, Gagnon, Blouin, & van der Vleuten, 2002; Charlin, Roy, et al., 2000; Charlin, Tardif, et al., 2000), test items are intended to require therapists to make a clinical judgment based on information provided in a clinical vignette (Charlin et al., 1998). The item format used is as follows: If you are thinking of A and you discover B, what is the effect on your hypothesis? (Charlin, Roy, et al., 2000). Figure 1 provides an example of the item formats created by Charlin and colleagues.

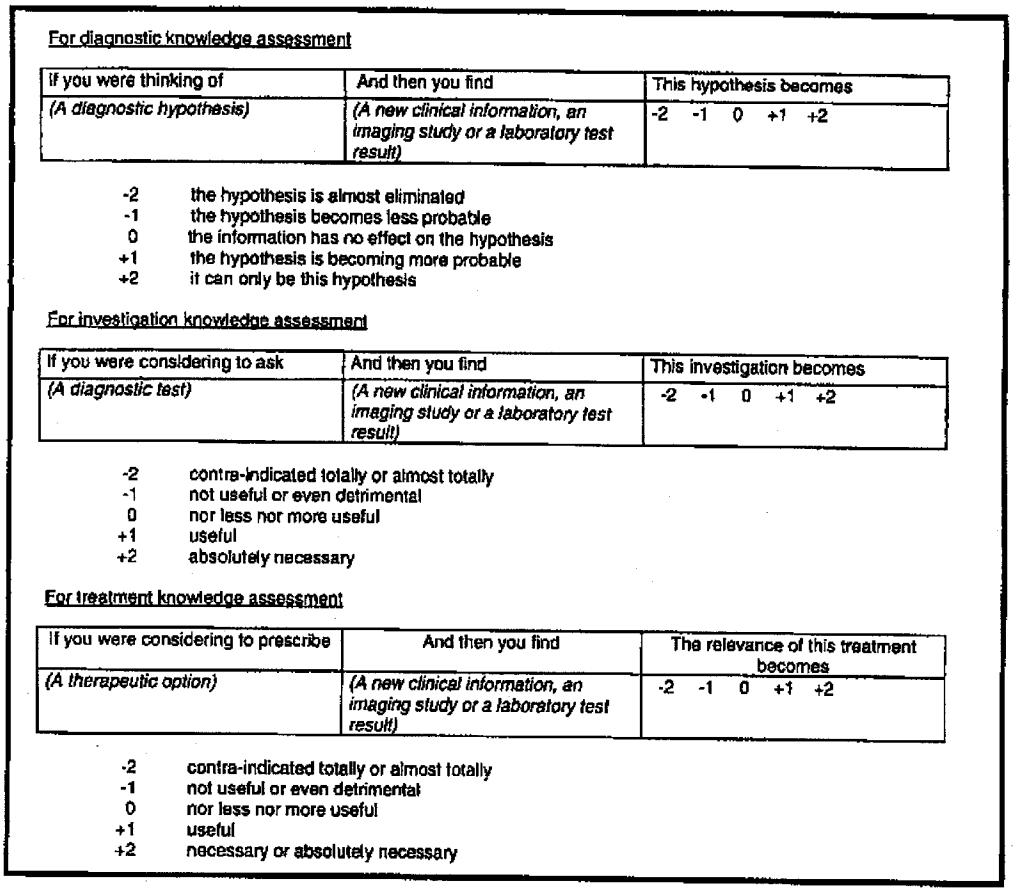
Specifically, the SMSCT is designed to evaluate the meaningfulness of the links within an item and to examine whether the organization and associations between items of knowledge allow the making of adequate clinical decisions. The SMSCT is developed to assess whether OTs and PTs with differing amounts of experience possess the elements of knowledge that "expert" clinicians use in specific clinical situations. The scoring system of the test is designed to measure the difference, or the disparity, that exists between examinees' scripts (networks of knowledge) and those of a panel of experts.

Content Domain: SCI

In order to focus the scope and content of a new measurement tool, the content domain selected was narrowed to include only individuals with traumatic spinal cord injuries (SCIs) who use manual wheelchairs. This decision was based on several factors: Individuals with SCI customarily require SM technologies and portray similar clinical and functional findings based on level of injury. In addition, the researchers had access to a number of individuals who met the criteria of expert SM clinicians who have a high rate of exposure to individuals with SCI. The process used to develop the SMSCT in SCI will eventually be replicated for other diagnoses. Our overall aim was to characterize clinicians' skill level as well as to measure changes in the level of expertise prescribing SM systems for individuals with SCI.

Content Representativeness and Relevance

Content validity evidence describes the extent to which test items are representative and relevant to an instrument's domain of important content (American Education Research Association, American Psychological Association, & National Council on Measurement in Education, 1999; Nitko, 2001). Ideally, content validity evidence will be obtained while an instrument is in the development phase, because the appraisal helps to identify items that should be eliminated, revised, or added to the instrument before it is finalized (Beck & Gable, 2001; Crocker, 1977; Nitko, 2001). The purpose of this article is to present the conceptual foundation, item generation process, and content validity evidence leading to the final version of the SMSCT.



For diagnostic knowledge assessment

If you were thinking of	And then you find	This hypothesis becomes
(A diagnostic hypothesis)	*(A new clinical information, an imaging study or a laboratory test result)*	-2 -1 0 +1 +2

-2 the hypothesis is almost eliminated
-1 the hypothesis becomes less probable
0 the information has no effect on the hypothesis
+1 the hypothesis is becoming more probable
+2 it can only be this hypothesis

For investigation knowledge assessment

If you were considering to ask	And then you find	This investigation becomes
(A diagnostic test)	*(A new clinical information, an imaging study or a laboratory test result)*	-2 -1 0 +1 +2

-2 contra-indicated totally or almost totally
-1 not useful or even detrimental
0 nor less nor more useful
+1 useful
+2 absolutely necessary

For treatment knowledge assessment

If you were considering to prescribe	And then you find	The relevance of this treatment becomes
(A therapeutic option)	*(A new clinical information, an imaging study or a laboratory test result)*	-2 -1 0 +1 +2

-2 contra-indicated totally or almost totally
-1 not useful or even detrimental
0 nor less nor more useful
+1 useful
+2 necessary or absolutely necessary

FIG. 1. The item format as developed by Charlin, Roy, et al. (2000) varies with the object of the assessment (e.g., diagnosis, investigative, treatment). Reprinted with permission from Charlin, Roy, et al. (2000).

METHODS

Several phases were completed to develop and validate the SMSCT. This article describes the qualitative results of the collection and appraisal of the content validity evidence, a process comprised of three components: interviews, test development, and content/item review. This work guided the test development process and resulted in the final version of the SMSCT. In this overview section, the participants and methods for the three components that comprise this work are initially described (Fig. 2). Subsequently, the methods of analysis employed for each component are specified.

Participants

Participants were composed of expert clinicians unless indicated otherwise. For the purpose of this work, we defined *expert clinician* as a person

- with a physical or occupational therapy license,
- with a combination of SM service provision that equates to full-time work for at least 5 years (full-time work is defined as approximately 40 hr/week), and
- who has completed professional development (i.e., continuing education courses, manufacturer in-services, graduate course work, etc.) to include a minimum of 10 contact hr/year for a minimum of 5 years in the area of SM as verified by self-report.

The number of participants varied for the different components of the study. The sample size was based on the expertise of one author, who has completed qualitative research previously.

Interviews

Interview Participants

Six expert PTs and OTs who work at different Model Centers on SCI and who regularly prescribe SM equipment to individuals with SCI were re-

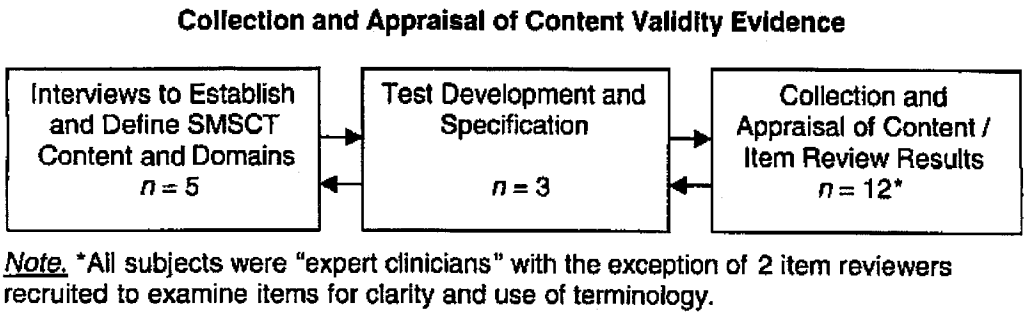


FIG. 2. Process and sample size used for collecting and appraising Seating and Mobility Script Concordance Test (SMSCT) content validity evidence.

cruited and interviewed. A request for volunteers who met the eligibility requirements was distributed through e-mail.

Initially, four experts were recruited and participated in the first round of interviews during the 18th International Seating Symposium in Vancouver, British Columbia, Canada, in March 2002. Two additional experts were recruited by e-mail, and subsequent interviews were conducted via telephone for the second round of interviews. Informed consent was obtained from each participant per Institutional Review Board (IRB) protocol. Upon completion of one participant's interview, it was discovered that study eligibility requirements had not been met; therefore, that participant's data were not included in analysis. Table 1 provides the demographic information of the remaining five experts.

Interview Methodology

Two rounds of interviews were completed using the same protocol. One researcher conducted, audiotaped, and then transcribed all interviews with the five experts. Interviews typically lasted 60–75 min, resulting in transcripts that were, on average, 20 pages in length.

The primary purpose of the first round of interviews was to identify similarities and themes describing standards of practice for professionals prescribing seating and mobility technologies to individuals with SCIs. The second-round interview questions focused on identifying (a) unique skills of SCI SM experts, (b) knowledge and skills that differentiate SCI experts from other SM clinicians and novice therapists, and (c) common misconceptions in clinical practice. The purpose of these interviews was to obtain information that would allow further refinement of the SMSCT vignettes and items progressing toward the final version of the test.

Two other documents, in addition to the interview transcripts, were used to verify the data as representative of the scope of clinical situations encountered in SM service provision. These documents were developed by RESNA: (a) *RESNA Guidelines for Knowledge and Skills for Provision of Assistive Technology Products and Services: Assistive Technology Practitioner* (RESNA, 1996), and (b) *RESNA Guidelines for Knowledge and Skills for Provision of the Specialty Technology: Seating and Mobility* (RESNA, 1997). These documents were developed by work groups made up of

TABLE 1. Therapist profiles of expert spinal cord injury clinicians

Therapist	Age (years)	Gender	Profession	Entry-level degree	Year of graduation	Years of clinical practice	Years of seating and mobility experience	Region of the United States
1	48	M	PT	BS	1984	18	10	SE
2	47	F	PT	BS	1978	23	23	W
3	31	F	PT	MS	1996 MS	5	5	NW
4	44	F	OT	Advanced MS	1982 BS, 1992 MS	19	14	NW
5	46	F	OT	MS	1979 BS, 1984 MS	24	24	SW

Note: M = male; F = female; PT = physical therapist; OT = occupational therapist; BS = bachelor of science degree; MS = master of science degree; SE = southeast; SW = southwest; NW = northwest; W = west.

TABLE 2. Sample vignettes

Vignette	Example
1	A first-time manual wheelchair user with a new traumatic low-level tetraplegia (i.e., C5, C6, or C7 injury), ready for discharge from acute rehabilitation
2	An experienced manual wheelchair user with a diagnosis of spinal cord injury, presenting to the clinic, with poor sitting posture (i.e., kyphotic posture, posterior pelvic tilt, cervical hyperextension, etc.), complaints of pain (i.e., neck, low back, and shoulder pain), or need for a replacement wheelchair or seating system
3	An individual with either a short (i.e., <8 months) or long (i.e., >10 years) history of spinal cord injury and a recent diagnosis of skin breakdown on the buttocks with etiology of unknown origin
4	An active manual wheelchair user who has funding for only one wheelchair and uses a manual wheelchair in multiple settings (i.e., indoor level surfaces such as carpet, tile, and linoleum; outdoor surfaces such as hills, gravel, dirt, grass, and pavement; inclement weather such as snow, rain, and heat) for multiple purposes (i.e., attending soccer games, basketball, outdoor trails, city obstacles, etc.)
5	A person with midlevel paraplegia (i.e., T5, T6, T7, or T8 injury) who uses a manual wheelchair and has new onset of upper extremity motor or sensory deficits

stakeholders (physical therapists, occupational therapists, rehabilitation engineers, educators, and others) in the service delivery process to reflect content-specific knowledge. Qualitative triangulation techniques were used between the interview data and the two RESNA documents to validate the thoroughness of our findings to ensure that no important aspects of SM clinical practice were overlooked. Details of this analysis are provided in the Interview Results section.

Test Development

Test Developers

Two physical therapists, each with more than 13 years of SM experience, fulfilled the role of SMSCT test developers. Another SM clinician, recognized by both RESNA and expert peers as an authority in the field, edited the preliminary test items and provided input to the test developers throughout the test development process.

Test Development Methodology

As the first step in the test writing process, the test developers were asked to describe problematic clinical situations common to individuals with SCI who use manual wheelchairs. Multiple clinical vignettes were then written to illustrate common, problematic clinical situations. Table 2 shows sample vignettes.

Following the preestablished test development process developed by Charlin et al. for physicians, the initial form of the SMSCT was created with the dimensions of diagnosis, investigation, and treatment (Fig. 1). Consequently, test performance targets for all three dimensions of the test were established. After the initial set of test items ($n = 74$) was written, a combination of 25 diagnostic (33%), 21 investigative (28%), and 28 treatment (37%) items were developed using the preestablished item format (Charlin, Roy, et al., 2000). The test developers were asked to specify for each clinical vignette: (a) the relevant hypotheses, investigation strategies, or treatment options; (b) the questions they would ask, physical examinations they would perform, and tests they would review in order to solve the problem; and (c) the clinical information, positive or negative, they would look for in these inquiries (Charlin, Roy, et al., 2000).

Based on the D-studies (which provide justification as to the number of test items necessary in test administration to achieve a specific alpha) from Charlin, Roy, et al., 2000, the number of items that are necessary in each script concordance test administration to achieve a coefficient alpha of .8 is between 50 and 60 items. We elected to write a pool of items larger than required in order to allow for attrition of potentially poorly performing items.

Actual test items were built by presenting the clinical vignette followed by a series of related items (based on the model illustrated in Fig. 1) and item format differing with the dimension of the test (diagnostic, investigative, or treatment) (Charlin, Roy, et al., 2000). Answers are placed on a 5-point Likert scale. The test taker is required to decide whether components of clinical information are relevant or not to the given clinical situation (Charlin et al., 1998; Charlin, Roy, et al., 2000; Charlin, Tardif, et al., 2000). The 74 test items for the initial SMSCT were built from the information obtained during this stage.

TABLE 3. Sample content review questions

No.	Question
1	Does this question set represent the scope of practice with patients with SCI? What other content is needed?
2	Describe some other scenarios that are needed to embody the scope of practice with patients with SCI.
3	Describe some real-life situation you encounter in practice.
4	Indicate any hypotheses you think should be added, changed, or omitted.
5	Do you think the words for this scale should remain the same, or do you have alternative wording?
6	Do you think the order of the information presented is according to the way clinicians' think? Do you think the order of the columns should remain the same, or be reversed? Please explain your reasoning.

Note: SCI = spinal cord injury.

TABLE 4. Sample item review questions

Type	Question
Wording	Do you find this item clearly stated?
	Is the item as succinct as possible?
	Could the wording of the item mean different things to examinees from various settings, locations, or regions?
Subject content	Do you find this item relevant to your practice?
	Do you typically pose this type of question to yourself in your practice?
Context	Is the item context likely to mean different things to professionals with different backgrounds?

Content/Item Review

Content/Item Reviewers

Twelve reviewers with varying levels of experience and SCI expertise were recruited to serve as content and item reviewers. Reviewers were verbally invited by the investigators to participate. Informed consent was obtained from each participant per IRB protocol.

Content/Item Review Methodology

Draft SMSCT test items were reviewed for content on two separate occasions to determine if the items were reflective of genuine diagnostic, treatment, and intervention situations as well as to ensure item clarity, terminology, and brevity. Reviewers were mailed content or item review packets consisting of SMSCT performance targets, test items, and either content or item review questions. Sample review questions are provided in Tables 3 and 4.

Methods of Analysis

Because this work focuses on the development of test questions, traditional statistics, such as coefficient alphas, were not used. Instead, qualitative methods (as described below) were employed.

Interview Analysis

The computer software program NUD*IST N4 (Nonnumerical Unstructured Data: Indexing Searching Theorizing) was used for data analysis (Scolari Sage Publications, Inc., 1997). Two types of data were imported to N4 for analysis: (a) five interview transcripts, and (b) two RESNA guideline documents (RESNA, 1996, 1997).

Interview transcripts were then analyzed to determine how experienced PTs and OTs practice and what unique knowledge they employ in evaluation and equipment specification. The goal of the analysis was to understand the major evaluation processes employed by PTs and OTs to ensure that the SMSCT vignettes and items would be reflective of standard practice. Because we wanted to clarify common practices shared by PTs and OTs and variations of practices in each evaluation stage, we began the analysis with descriptive coding. First, the transcripts were coded using an iterative process beginning with reading the transcripts line by line and identifying open codes. As patterns and themes evolved, open codes were categorized, revised, and reorganized into axial codes and core codes. The N4 software package was instrumental in exploring, interacting, and querying the data (Gahan & Hannibal, 1998; Miles & Huberman, 1994; Scolari Sage Publications, Inc., 1997).

Next, the two RESNA knowledge and skill documents (basic and advanced guidelines for SM skills and knowledge) (RESNA, 1996, 1997) were cross-referenced with the coding of the transcripts, comparing the process of evaluation indicated by the expert therapists and the processes presented in the RESNA documents. We expected that this comparison would suggest to what extent expert therapists display the identified skills, tasks, and knowledge outlined in the established guidelines. In addition, we envisioned that this comparison would provide us with aspects that may otherwise

have been missed in the analysis of the transcripts. We expected that this comparison of documents would identify perspectives and questions to explore in greater depth during future interviews.

Test Specification and Revisions

Based on an iterative process of test development and specification, numerous modifications and improvements were made to the preliminary version of the SMSCT prior to initiating successive content and item reviews and test finalization. Founded in comments and recommendations from the content and item review, changes were made to the subtest categories, item formats, and item response scales.

First, the original subtest dimensions were changed from diagnostic, investigative, and treatment to final subtest dimensions of assessment and intervention. This change was completed based on feedback from both the test developers and content experts in order to better represent clinical practice in the domain of SM, as opposed to medical practice. Assessment subtest items were designed to reflect the dynamic process in which the practitioner makes clinical judgments based on data gathered during the three components of the examination: patient/client history, analysis of function, and tests and measures (i.e., supine mat assessment, range of motion). Intervention subtest items were designed to reflect the process of selecting an intervention solution based on the clinical findings identified during the assessment process. The intervention process encompasses three components: problem solving, equipment trial/simulation, and patient education/training.

Within each dimension (assessment and intervention), the following content categories were identified as key to representing the population of individuals served by SCI SM practitioners: level of injury, duration since injury, activity level, and complication. The test blueprint was written to include a representative sample of clinical vignettes for these four categories:

1. Level of injury (low tetraplegia [C5–C8], high paraplegia [T1–T7], low paraplegia [below T8]);
2. Duration since injury (acute injury, 5–10 years postinjury, >15 years postinjury);
3. Activity level (low activity, high activity);
4. Complications
   a. skin (redness, ulcer, moisture),
   b. orthopedic (postural instability, scoliosis, kyphosis, obliquity),
   c. pain (low back, neck, headaches, shoulder), and
   d. diagnosed repetitive stress injury (impingement at shoulder, carpal tunnel).

Next, the item format was revised by reordering and renaming the columns of the test items to better reflect the clinical information-gathering sequence and clinical reasoning specific to the field of SM.

Finally, the wording for the Likert scales for the two subtests were modified to provide softer end points to encourage the full use of the 5-point scale (Schaeffer, 1991). Because it is necessary to have an assortment of item responses (1–5), it was also necessary to revise several items in order to get a representative range of possible responses. The test developers determined which items required revision based on the results of a trial test administration and feedback from the content experts.

Content/Item Review Analysis

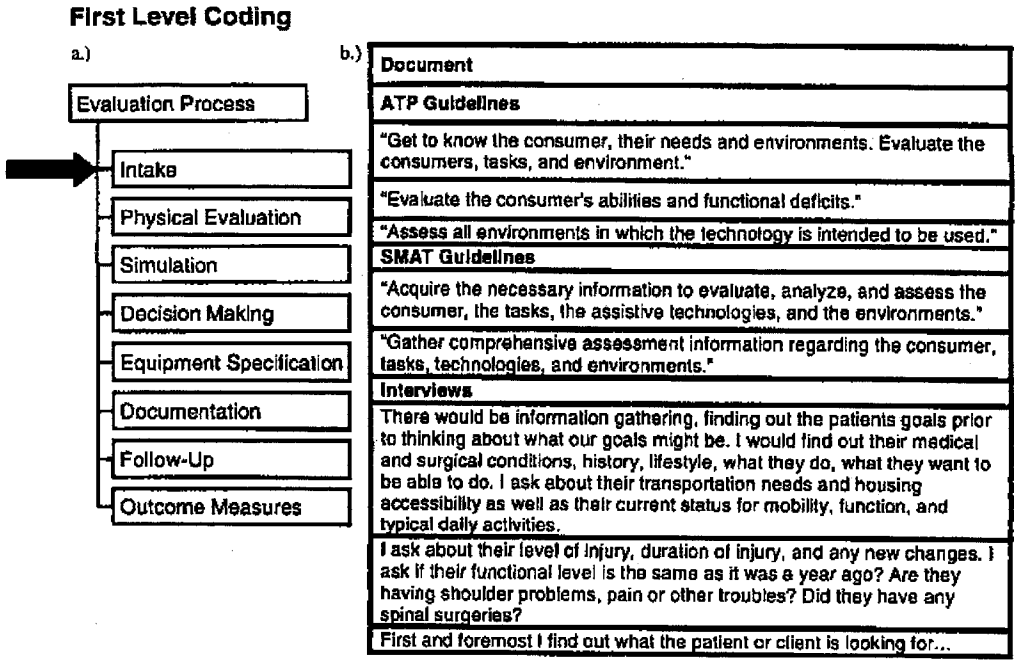
Content and item review forms were administered and analyzed on two separate occasions. Comments were reviewed, and careful examination of each item was undertaken. Based on the responses from the content and item analyses, the SMSCT items were either discarded, revised, or rewritten, as previously described. The revised version of the SMSCT was then reviewed for a second time and compared to the original test blueprint. Modifications were then completed for the test blueprint in order to accurately reflect the final SMSCT.

RESULTS

Interviews

Round 1

Using the software program N4, the investigators developed a coding tree. First-level coding of the evaluation process revealed the coding tree shown in Figure 3a. We were primarily interested in the data pertaining to the evaluation process to provide evidence that the content for the SMSCT was comprehensive and representative of standard practice. Next, N4 was used to generate a document report for the Evaluation Process nodes for all interview and guideline documents. Using this report, we could review all text units coded under each node of the coding tree. Quotes were found to compare what the guidelines and the participants said about each node identified as part of the evaluation process. Figure 3b provides a sample of the



Note. Interview data have been paraphrased for conciseness. ATP Guidelines = *RESNA guidelines for knowledge and skills for provision of assistive technology products and services: Assistive Technology Practitioner;* SMAT Guidelines = *RESNA Guidelines for Knowledge and Skills for Provision of the Specialty Technology: Seating and Mobility.*

FIG. 3a–b. First-level coding tree (Fig. 3a). Subset of data from "intake" code report comparing information from the interviews and RESNA guideline documents (Fig. 3b).

data substance identified in the code report for the intake node. This method was repeated for each node on the coding tree to explore the data and to verify that we had captured the most important concepts of the evaluation process. Results of the cross-referencing of interview data and the RESNA documents revealed no major discrepancies in the key aspects of SM clinical practice identified. The descriptions identified through this process were used to guide the test developers in creating representative clinical vignettes during test development.

Round 2

Transcripts from the second-round interviews were referred to during the SMSCT test revision process. Items were revised based on specific examples, situations, and common misconceptions identified during these interviews. Item hypotheses and findings were fine-tuned based on this input.

Final Test Specification

The resulting version of the SMSCT included 67 items. There were 33 items (49%) in the assessment dimension and 34 items (51%) in the intervention dimension, each with five clinical vignettes. This version of the SMSCT was used for preliminary test administration and psychometric testing. Sample vignettes and test items from the SMSCT-67 are provided in Appendixes A and B.

DISCUSSION

Participants

One major constraint we faced in designing eligibility criteria for this study is that there are no established and recognized criteria for identifying expert SM clinicians. In general, research involving expertise has employed a range of criteria to identify or select experts, including extent of experience, educational qualifications, professional qualifications, personal qualities, professional activities, and status (Chi, Glaser, & Farr, 1988; Ericsson & Smith, 1991; Manley & Garbett, 2000; Patel & Groen, 1991). However, overall, there seems to be little consistency between studies in terms of criteria used to identify experts or expertise. In their work in script concordance test development within the field of medicine, Charlin et al. defined expertise by choosing certified specialists in the

domain of interest (gynecology, radiology, surgery) (Charlin et al., 1998; Charlin, Roy, et al., 2000; Charlin, Tardif, et al., 2000). Still, within the field of SM for individuals with SCI, there is no certification for specialists, so therefore we used a combination of criteria.

Interviews

Our first-round interview participants were a homogeneous group by design. We selected clinicians employed at Model Centers on SCI regularly recommending SM equipment to individuals with SCI. We would expect a different scope of responses to be found in a more heterogeneous sample of participants, that is, clinicians with a range of experience recommending SM equipment to individuals with a variety of diagnoses. In hindsight, it may have been more beneficial to include a more heterogeneous sample in order to better represent the range of clinical practice. A sample of clinicians with a range of experience recommending SM equipment to a variety of populations may have helped us in identifying differences in practice, knowledge/expertise, and common misconceptions specific to SCI SM service provision, therefore minimizing the need for second-round interviews.

Test Representativeness

The validity of an instrument such as the SMSCT depends greatly on how well the test samples preestablished learning targets (Nitko, 2001). The authors of some instruments have argued that the content of an instrument should be defined based on interviews with experts in the field (American Education Research Association et al., 1999; Nitko, 2001). We relied not only on the opinions of those with expertise in the area of SM with SCI, but also on the review of existing documents for the triangulation of data. This methodology has been used by others to develop similar script concordance tests (Charlin et al., 1998; Charlin, Roy, et al., 2000). Although it is possible that this method may have resulted in a test that fails to capture important aspects of the construct it is designed to measure, we believe that the current instrument reflects an adequate representation of the SM for SCI dimensions of assessment and intervention.

The SMSCT is anticipated to measure some, but not all, attributes of clinical competence. Results in other content domains (e.g., medicine) have shown that script concordance test scores would predict part of the performance on the measures of clinical reasoning but predicted less well the performance on the measures that examined both clinical reasoning and clinical skills (Brailovsky, Charlin, Beausoleil, Cote, & van der Vleuten, 2001). Because this test is not performance based, we would expect the same sort of limitations from the SMSCT. Unfortunately, because there currently is no "gold standard" measure of competence or expertise in this content area, we are unable to fully validate this finding.

Item Format

Feedback from the content and item reviewers resulted in several changes to the SMSCT item format. Comments indicated that it took some time to "warm up" to the response formats for the SMSCT. In order to minimize errors due to the response formats, instruction sheets with sample items have been provided in the final version of the SMSCT for each subtest dimension in order to allow test takers an opportunity to try out, ask questions, and reflect on the item format prior to beginning the scored portion of the test. Another outcome of the content review resulted in revisions to the response option scales for each subtest, to provide softer end points in order to maximize the use of the entire range of the scale.

Future Work

Additional validity evidence is being obtained for the SMSCT. The development of the scoring system and preliminary psychometric analyses (internal structure evidence, external structure evidence, and generalization evidence) are in progress. A related educational intervention study has been conducted using a pretest/posttest design to collect additional validity evidence. Results of the intervention study will describe the degree to which SMSCT test scores change for all clinicians following an educational intervention. These activities are in progress and will be presented in future publications.

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APPENDIX A

For assessment knowledge

A 45-year-old male with a diagnosis of T10 spinal cord injury arrives in your clinic, sitting in his manual wheelchair, in a slumped kyphotic posture with complaints of sliding forward.

	If you were thinking of (a hypothesis)	*And then you find*	*This hypothesis*
1.	Impaired sitting balance	Upon request to lift upper extremities off mat, you observe a weight shift to the left and increased thoracic kyphosis	1 2 3 4 5
2.	Impaired sitting balance	Upon lifting arms, you observe an elongation of thoracic spine with symmetrical weightbearing on both ischial tuberosities	1 2 3 4 5
3.	Tight hamstrings	When supine on mat with hips flexed to 85, you measure 110 degree popliteal angle	1 2 3 4 5
4.	Bilateral hip flexion less than 90 degrees	Patient sitting with a posterior pelvic tilt but is able to passively achieve a neutral pelvic position when allowing the shoulders to move slightly posterior to hips	1 2 3 4 5

(Corresponds to SMSCT-67 item numbers 5, 7, 8, 11)

1 becomes almost eliminated
2 becomes less probable
3 is not affected by the new information
4 becomes more probable
5 becomes most likely probable

APPENDIX B

For intervention knowledge

A 45- year old man 20 years status post C6-7 spinal cord injury is referred to your clinic for a replacement wheelchair. He is an experienced manual wheelchair user and is currently using a 10 year old, folding frame, depot manual wheelchair with a fixed seat to back angle and no rear wheel axle adjustability. This chair presents with vinyl upholstery that is overstretched and results in his body being positioned between the back posts. He has removed the armrests for easier wheel access. He sits with a slumped posture with rounded shoulders and forward head position. His main complaint is neck and shoulder pain of recent slow onset (less than 4 months). He reports an active lifestyle including driving a car, independently loading/unloading his folding wheelchair, and employment as an architect. He lives in an accessible home environment with his wife and two children 5 and 7 years old. He states he is interested in trying new things that may alleviate his current problems or improve his pain.

	If you find	*And then the supplier recommends the following*	*To what degree of confidence could you justify this recommendation?*
5.	He reports that his neck and shoulder pain is less severe when propelling his wheelchair	Duplicating features of current wheelchair with a lightweight wheelchair	1 2 3 4 5
6.	When sitting on the mat he falls forward and he puts his hands on the mat in order to stop himself	Adjustable tension back upholstery	1 2 3 4 5
7.	Complaints of pain with shoulder extension, abduction and internal rotation	Ultralight manual wheelchair with rear axle adjustability positioned in a mid to forward position	1 2 3 4 5
8.	When repositioned in his current wheelchair so that his hips are beneath his shoulders he is unable to lift his arms without falling forward	Solid back insert to replace the sling upholstery	1 2 3 4 5

(Corresponds to SMSCT-67 item numbers 34, 35, 37, 38)

1 with very little confidence
2 with little confidence
3 neither favor nor oppose the recommendation
4 with partial confidence
5 with a high degree of confidence