DEVELOPMENT OF THE PRESSURE MAPPING KNOWLEDGE ASSESSMENT TOOL (PKAT)

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INTRODUCTION

Pressure mapping technology (PMT) is commonly used by clinicians who prescribe wheelchair and seating interventions in the field of medical rehabilitation. PMT permits objective measurement of pressure at the interface between body and the seating/sleeping surface (1). Clinicians use this technology to identify patterns of pressure distribution and areas of potential risk; to evaluate the impact of assistive technology products and positioning interventions on pressure intensity and distribution; to educate their clients; and to inform the clinical decision-making process (2). A variety of PMT products are commercially available and typically include a pressure sensing mat, an interface module and a computer with interpretive software. Research studies have reported on the validity and reliability of this technology with respect to obtaining precise measurement of interface pressure [IP] (3-5) and have used PMT as an outcome measure for clinical research. There is consensus in the literature that PMT can serve as a valuable tool to enhance the assessment process, but only to the extent that the clinician is able to effectively collect and interpret the data provided. A limited amount of research has been undertaken to examine the effectiveness of PMT to inform clinical reasoning and contribute to desirable clinical outcomes (5). Various issues may contribute to sub-optimal use, including lack of technical proficiency in setting up equipment and collecting data; selecting inappropriate output values and statistical measures for consideration; naivety regarding procedures to ensure accurate data is collected (e.g., settling time; calibration); and inappropriate or simplistic interpretation of the data provided. Furthermore, because of the complexity of PMT (whether real or perceived), some clinicians choose to use it infrequently or not at all in their practice with seating and pressure management issues. Consequently, PMT is not always used to its full potential, in part because of the variability in knowledge, skills and abilities among clinicians who use it as well as a lack of consensus around clinical guidelines and protocols for administering and interpreting this technology (6,7).

As part of an initiative to increase proficiency with PMT by clinicians in their facility, two senior occupational therapists at a large tertiary care hospital in western Canada began development of a continuing educational program. To be comprehensive, they were also interested in evaluating the effectiveness of this program; however, no tool was available to measure change in knowledge and skill with PMT. To address this gap, a research project was undertaken in collaboration with the University of Manitoba to develop a tool to measure this knowledge base. Two Master of Occupational Therapy students conducted the project under the supervision of an advisory group that included a faculty member and the two seating specialist clinicians. The objectives of the project were to develop a pressure mapping knowledge assessment tool (PKAT) that comprehensively captured knowledge and application of PMT; establish face and content validity of the PKAT; and evaluate criterion validity, specifically concurrent validity, of the PKAT. Because the intent of the larger project was proficiency with the PMT used at this facility (i.e., Force Sensitive Application [FSA] by Vista Medical Limited), the content of the PKAT was intentionally device-specific.

TOOL DEVELOPMENT

Tool development should involve planning, constructing, evaluating and validating phases (8). During the planning phase, the

investigators met with their advisory group to ensure the study sequence and goals of the project were aligned. The construction phase involved multiple meetings with their advisory group, as well as reviewing the literature on PMT and competency assessment for healthcare professionals. To gather information about relevant technical and application skills for the technology, they met with experts from the product manufacturer. Numerous iterations of the tool were reviewed and revised before a draft version was proposed for the subsequent project stages. As suggested by King et al. (9), a blue-print of competency was outlined to establish criteria and five pillars of knowledge were identified: technical knowledge about device configuration; purposes for PMT use; comprehension of data; interpretation of data; and clinical application. Three levels of proficiency were proposed: basic knowledge, intermediate knowledge, and advanced knowledge. The intent was to develop a tool that addressed each knowledge pillar at multiple levels of proficiency, providing a comprehensive assessment that would be sensitive to changes in knowledge. The PKAT used in this study consisted of 51 questions. Literature on assessing clinical competence recommends use of multiple methods of assessment to capture a comprehensive evaluation of knowledge, skill and abilities (10). Therefore, questions were presented in a variety of formats including matching, multiple choice, and true/false configurations. Some of the application and interpretation questions presented mock pressure mapping images and data. Other considerations pertaining to the structure and format of the PKAT were respondent burden and accessibility for administration of the tool. It was anticipated that the test could be completed in less than one hour if each question was allotted one minute. An electronic version of the tool was constructed in Microsoft Word to enable distribution and response via email or print.

TOOL EVALUATION

The evaluation and validation phase of tool development was conducted using expert- and clinician-participants to establish basic psychometric properties of the assessment tool. Phase one focused on establishing face and content validity while phase two measured criterion validity. One method of establishing face and content validity of a new assessment tool is through review from an expert panel (11). Three acknowledged experts in the PMT field were purposively sampled and agreed to participate in the study. A questionnaire was developed to ensure that expert-participants provided feedback in a consistent format. The questionnaire included five 'yes or no' questions. Opportunity was also given to provide qualitative feedback using a 'comments' section. The purpose of phase two was to establish criterion validity by comparing performance on the PKAT to another measure of clinical competence or expertise in this area of PMT. Since no other measure of PMT knowledge was identified in the literature, a self-assessment measure was developed for respondents to rate their proficiency. Based on Dreyfus' model (12), the spectrum of competency was categorized as novice, advanced beginner, intermediate, proficient, and expert. Initial versions of the self-assessment measure resulted in a restricted range of ratings, with clinicians typically under-rating their proficiency. After several iterations were pilot-tested and revised, a final format of the questionnaire provided a wider and more accurate response dispersion. The self-assessment scale consisted of ten questions related to technical knowledge, interpretation of data, application skills, and confidence with PMT, culminating in a ranking in one of the five categories. A total of 13 occupational therapists were recruited for phase two. All met the inclusion criteria of currently practicing as an occupational therapist in the metropolitan area, working a minimum of .5 EFT, and having used PMT at least once (independently or in conjunction with another clinician) in their practice. The participants had one week to complete and return the PKAT. To ensure confidentiality, participants were assigned a study number. Participants were from a variety of practice areas and populations, with a broad range in IMPT proficiency.

RESULTS

In phase one, the PMT experts unanimously agreed with three questions: does the tool reflect accurate content; is the structure and

format appropriate; and could the tool distinguish between levels of proficiency. Two of three experts affirmed the question "does the tool adequately cover the essential elements"; the third participant identified some limitation in the data interpretation component. The remaining question asked whether the tool "measured clinical knowledge and skill with PMT". Two participants responded "no"; however, both indicated this was because the tool focused solely on one PMT system and, while the tool would capture this construct related to the FSA device, users of another product might not be accurately evaluated because of device-specific questions. The third expert did not respond to this question.

Of the 13 clinicians who participated in the second phase, two rated themselves as novice, two as advanced beginner, five as intermediate, and four as proficient-users. No participants identified themselves as an expert-user. The overall mean score was 76.9% (SD 7.5) and ranged from 64.4 to 91.5%. The mean scores (SD, range) for each category were: novice 68.6% (6.0, 64.4 – 72.9); advanced beginner 70.9% (2.8, 69.0 – 72.9); intermediate 79.0% (7.3, 72.9 – 91.5); and proficient 81.4% (5.9, 72.9 – 86.4). Initial linear regression analysis identified r = .655 (p = .015); however, one score was identified as an outlier value. With the outlier removed, this value increased to r = .776 (p = .003). The dispersion of scores is illustrated in Figure 1.

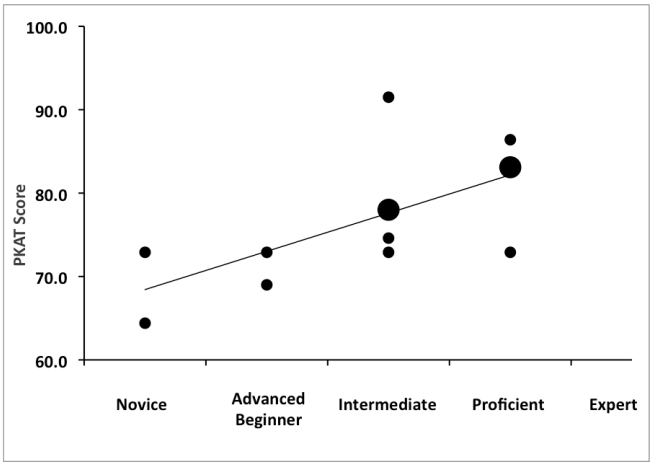

Figure 1. Scatterplot of PKAT scores versus Participant self rating of proficiency.

DISCUSSION

The PKAT shows promising potential as an evaluation measure for clinical competence. The phase one results suggest the tool is comprehensive and discriminating, although further enhancement in assessing data interpretation may be warranted. Within the context of the larger education initiative, the PKAT appears to be a viable outcome measure; however, the content is strongly linked to the FSA device and there is justifiable concern about its validity in assessing knowledge with other PMT products. With respect to criterion validity, there was a good to excellent correlation between the self-assessment rating and the scores obtained on the PKAT (13), with novice clinicians scoring lowest and each progressively advanced ranking scoring higher. A scatterplot of PKAT scores provides a clear indication of this relationship. Both the regression analysis and scatterplot indicated one score as an outlier – the highest PKAT score was obtained by a clinician rating themselves as intermediate. Removing the outlier further enhanced the correlation between PKAT score and self-rating of proficiency.

These results are encouraging for the development of a tool to measure PMT knowledge and proficiency. The PKAT is sufficiently robust to serve its intended purpose of evaluating knowledge acquisition in a facility-specific educational program with a device-specific focus. However, further development of the PKAT is warranted. The scope and depth of content could be increased, specifically with respect to data interpretation. Further revision and adaptation could potentially reduce the device-specific focus and questions might be reframed to explore knowledge in a device-generic format. Further research should be conducted into the intra-rater and test-retest reliability of the tool. It would be beneficial to know whether the PKAT can be administered to clinicians more than once or if different versions are required for pre- and post-intervention.

There are a variety of potential applications for the PKAT. Our study focused on using the tool to evaluate the effectiveness of a continuing education program provided within a rehabilitation hospital. However, a tool such as this might also be used for other education

programs, such as workshops or on-line learning programs. A knowledge assessment tool might also prove valuable for establishing competence where credentials are required to prescribe seating equipment. There is great potential for the current tool to be developed into a more comprehensive and robust product that could address these applications.

CONCLUSIONS

The PKAT demonstrated sufficient content and criterion validity to be used as an outcome measure in evaluating effectiveness of a device-specific PMT continuing education program in knowledge acquisition. The tool has considerable potential for further development as a device-generic measure of PMT proficiency with a variety of applications.

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