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REVIEW ARTICLE

APPLICATIONS OF MCGILL PAIN QUESTIONNAIRE AS AN ASSESSMENT TOOL FOR PATIENTS WITH PAIN: LITERATURE REVIEW

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ABSTRACT

Pain is the most distressing consequence ever experienced by the patients during their life journey. Pain assessment is vital in supporting the diagnosis of the source of pain and for effective treatment. McGill Pain Questionnaire (MPQ) is a multidimensional tool widely used clinically to evaluate significant qualities of pain. It can be used to assess the pain over time and to determine the usefulness of any intervention. It was developed by Dr. Melzack at McGill University in Montreal Canada and updated for another two versions; the latest version being enabled to assess both neuropathic and non-neuropathic pain. It demonstrated good construct and concurrent validity. The objective of this paper was to review the published literature to describe the applications of MPQ in pain assessment. From the eligible studies, 23 different MPQ language versions and 5 adapted versions were identified. The MPQ has been adopted as a pain assessment tool in many countries and validated in different patient populations such as those with cancer pain, low back pain and post-operative pain. Validity and reliability of the MPQ as a qualitative and quantitative measure of pain for statistical analysis among cross cultures and languages were shown.

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INTRODUCTION

Pain is the most common and distressing symptom ever experienced by the patients with terminal illnesses like cancers. As defined by the International Association for the Study of Pain (IASP) (International_ Association_ for_ the_Study_of_Pain., 2017) pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Pain is a subjective, multidimensional experience that diverges significantly between individuals. Pain assessment is therefore a fundamental part of the appropriate treatment and control of pain. Pain should be regarded as an important vital sign and therefore should regularly assess using validated scales in improving outcomes in pain management. Among the variety of methods available for pain assessment however no single perfect system exists and there is no simple device that can objectively record how much pain an individual experience. Pain experience is influenced by age, character, gender, past experience, individual coping strategies, culture and current circumstances. Therefore, what one patient may describe as severe may be only mild to another patient as pain is a highly subjective experience. Similarly, the quality of pain, such as gnawing or stabbing, may interpret differently making the assessment and measurement of pain even more complex. Therefore, it is important to utilize an appropriate pain assessment tool in order to assess the pain adequately and accurately. An Expert Working Group was convened under the auspices of the Steering Committee of the Research Network of the European Association of Palliative Care to review the status of the use of pain measurement tools (PMTs) in palliative care research conducted in a multilingual multicenter setting (Caraceni, 2002). Based on a literature review and on the experts' opinion, the authors recommend that standardized methods should be applied for the use of PMTs in research and in patient care. Visual analogue scales, numerical rating scales, and verbal rating scales are considered valid to assess pain intensity in clinical trials and in other types of studies. Among the multidimensional questionnaires designed to assess pain, the McGill Pain Questionnaire and Brief Pain Inventory are valid in many multilingual versions (Caraceni, 2002). The objective of this review of the published literature was to provide an update of prevailing evidence on applications of MPQ in assessment of patients with pain which is of timely importance.

McGill Pain Questionnaire: The visual analogue scale (VAS) and the MPQ appear to be the most frequently used instruments for the measurement of pain in clinical and research settings. Melzack and Torgerson in 1975 first developed the long version of MPQ and found to be valid, reliable, and consistent and provides a relatively rapid way of measuring subjective pain experience. Since its introduction in 1975, the MPQ has been used in more than 500 studies of acute, chronic, and laboratory-produced pains. It has been translated into several languages and has also adapted to development of similar pain questionnaires in other languages (Katz, 1999). Thereafter, Short Form McGill Pain Questionnaire (SF-MPQ) was developed in 1984 with 15 descriptors consisting of 11 sensory and 4 affective which are rated from 0= none to 3= severe. Dworkin and colleagues (Dworkin, 2009), developed the SF-MPQ-2, an expanded and revised version of the SF-MPQ, designed to measure qualities of both neuropathic and non-neuropathic pain in research and clinical settings. This includes seven new descriptors relevant to neuropathic pain and 11-point Numerical Rating Scale (NRS) for each descriptor (Dworkin, 2009). This latest version was tested on patients with chronic pain syndromes and painful diabetic neuropathy. Excellent validity and reliability was found for this new version, namely SF-MPQ-2 (Dworkin, 2009). SF-MPQ-2 has been translated and validated in several countries such as Greece, Sweden, Thailand, Japan and Korea (Georgoudis, 2001 and Burckhardt, 2001). The MPQ can be used to evaluate the efficacy and effectiveness of pain interventions and to identify qualities of pain associated with distinct nociceptive disorders and neuropathic pain disorders, including arthritis (Hawker, 2011).

Applicability of a measurement tool: The applicability of a measurement tool depends on the properties of the tool as an outcome measure. They are known as psychometric properties or clinometric properties of the tool. Psychometric properties involve construction and validation of measurement instruments, whereas clinometric properties involve the clinical application into screening, diagnosis and prognosis (Kumar, 2011). The applicability is determined by two factors: (1) Validity: how accurately it measures what it was supposed to measure and (2) Reliability: how accurately the measure reflects differences due to time, repeated testing, situation, condition, intervention and testers. The measurement property of validity is the construct validity which is further subcategorized into translation validity (face validity or content validity) and criterion-related validity (four subtypes: predictive validity, concurrent validity, convergent validity, and discriminant validity) (Kumar, 2011). Reliability is referred to as the extent to which results are consistent over time and an accurate representation of the total population under study, and if the results of a study can be reproduced under a similar methodology (Golafshani, 2003). The subtypes of reliability include inter-rater reliability, test–retest reliability, parallel-forms reliability and internal consistency (Moss, 1994). Inter-rater or inter-observer reliability is used to assess the degree to which different raters/ observers give consistent estimates of the same phenomenon. Test–retest reliability is used to assess the consistency of a measure from one time to another. Parallel-forms reliability is used to assess the consistency of the results of two tests constructed in the same way from the same content domain. Internal consistency reliability is used to assess the consistency of results across items within a test consistency (Kumar, 2011). Often, a measurement tool which has a good validity need not be reliable; and a reliable tool need not necessarily be valid (Moss, 1994).

MATERIALS AND METHODS

A review of the published literature on 'application of MPQ as an assessment tool for pain' was performed using online databases such as MEDLINE, PUBMED, PsycInfo and Google Scholar during the period November 2017 to March 2018. The articles were selected based on titles and abstracts published between 1981 to 2017. The search terms used MPQ, McGill pain questionnaire cross cultural adaptations, validity and reliability. The results of the search were completed by tracing references from studies already published. The search was limited to original articles published in English and review research manuscripts.

RESULTS AND DISCUSSION

From the eligible studies, 23 different MPQ language versions, 5 adapted versions and different applications of MPQ versions were identified (Table 1). The 23 language versions represent 16 different languages/ cultures as there were multiple versions for the same language (2 Turkish, 2 Persian, 3 Japanese, 2 Thai, 3 Greek). The Spanish version was tested in 5 Spanish speaking countries Argentina, Costa Rica, Mexico, Panama, and Spain (Lázaro, 2001). Among the MPQ versions, 3 were long form MPQ, 14 were SF-MPQ and 6 were SF-MPQ-2 latest version. The different applications of MPQ included cancer pain, acute low back pain, chronic pain diagnoses, surgery related pain, orthodontic pain and pain due to burns and irritable bowel syndrome. Construct validity of MPQ: Factors are subcategories, or dimensions, of a more general topic (e.g., sensory pain is a dimension of total pain phenomena) (Mason, 2008). Melzack, proposed that the SF-MPQ consists of 2 independent factors. One was referred to as sensory, which described the nociceptive pain experience of the individual, and the other was referred to as affective, which described the emotional impact of the nociceptive pain experience. Confirmatory factor analysis is a structural equation modeling method used to test the viability of hypothesized models (Mason, 2008). A 2-factor solution was reported by Beattie *et al* (Beattie, 2004), from a sample of 187 patients undergoing lumbar magnetic resonance imaging (MRI) to diagnose chronic lower back pain. Confirmatory Factor Analysis of SF MPQ: Mason *et al* (Mason, 2008), conducted a study among 338 burn injury patients with a 14% mean total body surface area burnt who met the criteria for American Burn Association's for major burn injury. Confirmatory factor analysis produced fit index values representing viability of a 2-factor, oblique, solution composed of sensory and affective latent constructs. Those findings were consistent with previous work and the theoretic constructs (Mason, 2008). Cross cultural adaptation: With the increase in the number of multinational and multicultural research projects, the need to adapt health status measures for use in other than the source language has also grown rapidly. The cross-cultural adaptation of a health status self-administered questionnaire for use in a new country, culture, and/or language necessitates use of a unique method, to reach equivalence between the original source and target versions of the questionnaire. It is now recognized that if measures are to be used across cultures, the items must not only be translated well linguistically, but also must be adapted culturally to maintain

Table 1. Comparison of MPQ translation versions

Version of MPQ	Language	Authors (year of publication)	Sample size	Sample characteristics	Measurement properties reported	Reference measures	Study findings
SF MPQ 2	Persian [19]	Adelmanesh *et al*., (2012)	258	Sub-acute and chronic non-neuropathic pain and patients with painful diabetic peripheral neuropathy	V & R	PGIC, PPI, VAS	C-α=0.906, ICC =0.941 r = 0.926.
SF MPQ 2	Persian [20]	Kachooei *et al*., (2014)	100	Knee osteoarthritis.	V&R	SF-36, WOMAC	C-α=0.88, ICC=0.90 r=-0.47 to -0.61
SF MPQ	Turkish [21]	Biçici *et al*., (2012)	160	Leukemia	V & R	NRS	C-α=0.88 ICC=0.85 r = 0.78
SF MPQ	Turkish [22]	Yakut *et al*., (2006)	89	Rheumatoid arthritis	V & R	NRS	C-α=0.705, r=0.637
SF MPQ 2	Thai [7]	Buppa *et al*.,(2016)	220	Chronic pain including both nociceptive and neuropathic pain.	V&R	T. SF MPQ, VAS, PPI	C-α=0.771-0.993, ICC=0.985-0.996, r>0.4
SF MPQ	Swedish [6]	Burckhardt CS, Bjelle A. (1994)	100	Women with fibromyalgia(FS) or rheumatoid arthritis	V&R	AIMS, VAS	C-α=0.73 - 0.89 r=0.43
SF MPQ	Greek [23]	Georgoudis *et al*., (2000)	60	Spinal and osteoarthritis chronic musculoskeletal pain	V&R	VAS, PPI	C-α=0.71 r=0.33
SF MPQ	Greek [5]	Georgoudis *et al*., (2001)	80	spinal or knee pain	V& R	VAS, PPI	test re-test- ICC=0.87-0.98 (within day), ICC= 0.70–0.92 (for administrations between days)
SF MPQ	Thai [24]	Kitisomprayoonkul *et al*., (2006)	60	musculoskeletal or neuropathic pain	V&R	VAS, PPI	C-α=0.788 r > 0.8
SF MPQ 2	Japanes [25]	Maruo *et al*., (2014)	234	chronic pain	V&R	VAS, SF MPQ-J, LF MPQ-J	C-α = 0.907 ICC: 0.75 - 0.85.
SF MPQ	Japanes [26]	Arimura *et al*. (2012)	134	nonmalignant, chronic pain	V & R	LF MPQ-J	C-α =0.78 to 0.87. ICC=0.78 to 0.91
MPQ	Japanese [27]	Hasegawa *et al*., (2001)	199	chronic pain	V&R	VRS, NRS, VAS	C-α =0.58- 0.80, r=0.58 - 0.82,
MPQ	Greek [27]	Mystakidou *et al*., (2002)	114	advanced cancer	V & R	PRI, PPI, NWC	C-α =0.95–0.97,
SF MPQ	Arabic [28]	Terkawi *et al*., (2017)	142	chronic pain	V &R	BPI, SLANSS	C-α = 0.81 – 0.89 ICC=0.62–0.79 r = 0.39 to 0.49,
SF MPQ 2	Chinese [29]	Wang *et al*., (2017)	145	Chronic visceral pain	V&R	Diagnosis by pain physicians according to ICD 11	ICC=0.90 to 0.95, C-α =0.83
SF MPQ 2	Korean [9]	Choi *et al*., (2015)	150	Chronic pain	V &R	PPI, VAS	C-α total, sensory, and affective scale=0.93,0.90, 0.91,
SF MPQ	Brazilian[30]	Ferreira *et al*., (2013)	302	Chronic pain	V& R	LF- MPQ-Brazilian	KR-20= 0.52
SF MPQ	Brazilian-Portuguese [31]	da C. Menezes Costa *et al*.,(2011)	203	Musculoskeletal pains	V&R	LF MPQ-Brazilian Portuguese	C-α = 0.70–0.79 ICC=0.69–0.85 r = 0.49 to 0.68
MPQ	Dutch [32]	van der Kloot *et al*.,(1995)	92	Patients who had physiotherapy	V&R	VAS	C-α =0.61 to 0.85 ICC= 0.62 to 0.93
SF MPQ	Norwegian [33]	Strand *et al*., 2008)	69	musculoskeletal and rheumatic pain	V &R	PGIC, VAS, PPI	Rheumatic pain-ICC= 0.95- 0.79 Musculo-ske pain-ICC= 0.76- 0.63
SF MPQ	Hebrew [34]	(Sloman *et al*., 2005)	95	Patient with Post-operative pain & nurses caring for them	V & R	VAS	r=0.60- 0.71
SF MPQ	Danish [35]	(Perkins *et al*., 2004)	104	Post-herpetic neuralgia Phantom limb pain Rheumatoid arthritis Ankle fracture acute Appendicitis acute Labor pain (first stage)	V&R	VAS	Total r=0.55, rest pain r=0.43, activity associated pain r=0.30)
SF MPQ	Libyan [36]	(Tashani *et al*., 2016)	40	Patients with pain attending to physiotherapy clinic	Poor internal consistancy	VAS, PPI	C-α= 0.15 VAS-r=0.37, P=0.02 PPI- r=0.62. P<0.01

MPQ= McGill Pain Questionnaire, SF= Short Form, LF= Long Form, R: reliability; V: validity; C-α: Cronbach's alpha, ICC= Intra Class Correlation, r= person's correlation , PGIC=Patient Global Impression of Change, PPI=Present Pain Intensity, VAS=Visual Analogue Scale, NRS: Numerical Rating Scale, AIMS: Arthritis Impact Measurement Scales , WOMAC: Western Ontario and McMaster Universities Arthritis Index , MPI=Multidimensional Pain Inventory, PDI=Pain Disability Index , VRS= Visual Rating Scale, MHAQ= Modified Health Assessment Questionnaire, PRI=Present Rating Index ,SF 36=36-Item Short Form Survey, NWC= Number of Words Chosen, S-LANSS= Self-Completed Leeds Assessment of Neuropathic Symptoms and Signs, ICD 11= International Classification of Disease Eleventh version, KR-20=Kuder-Richardson 20 coefficient

the content validity of the instrument at a conceptual level across different cultures (Beaton, 2000). A study done by Lazaro *et al* (Lázaro, 2001), investigates the psychometric properties of a Spanish version of the MPQ in five Spanish-speaking countries. Study was performed in pain clinics and acute pain units of four Latin American countries (Argentina, Costa Rica, Mexico, and Panama) and Spain. This study included 205 patients (84 with acute pain, 121 with chronic pain) from Latin America. Their data were compared with those of 282 Spanish patients. Patients were evaluated once with a Spanish version of the MPQ, a visual analog scale, and a verbal rating scale. It was found that the Spanish version of the MPQ maintained a high internal validity when tested in different countries. Ordinal consistency, inter category, inter parameter, and qualitative-to-quantitative parameter correlations were similar in all countries. However, a few descriptors were considered as inappropriate or difficult to understand (Lázaro, 2001).

MPQ versions have been translated in to several languages, comparison is shown in the Table 1.

Use of MPQ in different patient populations: Patients with cancer: A systematic search of research was conducted by Ngamkham *et al* (2012) to evaluate the MPQ as a multidimensional measure of pain in adults with cancer and published in English from1975 to 2009. 30 studies have met their inclusion criteria and among them four groups of investigators reported the construct validity, five studies supported the strength of the content validity while five investigative groups reported criterion validity. The reliability of the MPQ was reported as a test-retest reliability of 0.70 (Lázaro, 1975). Findings were supportive of MPQ as an effective multidimensional measure with good stability, content, construct, and criterion validity and showed sensitivity to treatment or known-group effects. The MPQ is a valid, reliable, and sensitive multidimensional measure of cancer pain. Another study was done by Mystakidou *et al* (Perkins, 2004), to assess the applicability, reliability, and validity of the MPQ on a sample of Greek patients with cancer receiving palliative treatment. MPQ was administered to 114 cancer patients before the initiation of palliative treatment, and then to 80 cancer patients during the treatment and 7 days later. The study reported a very favorable scale reliability (0.95–0.97). During the pretreatment period, correlations between Present Rating Index (PRI), Present Pain Intensity (PPI), and Number of Words Chosen (NWC) ranged between 0.42 and 0.92. During the post-treatment time, the correlations ranged between 0.28 and 0.91. Patients presented a desirable level of convergent construct validity ($P<0.05$) concerning their performance status. Results revealed Greek-MPQ as a reliable and valid measure for evaluating the qualities of cancer pain. Another study evaluated age differences in the validity, reliability and use of the SF-MPQ-2 in 244 people with advanced cancer pain in home palliative care in Toronto, Canada (Gauthier, 2014). It was confirmed the previously reported four-factor solution (Affective, Continuous, Intermittent and Neuropathic pain) in older (≥60 years) and younger (<60 years) patients. Convergent validity for total and subscales of the SF-MPQ-2 were correlated with BPI (Brief Pain Inventory) with average pain (total younger 0.67, older 0. 55). Cronbach's alpha for younger and older patients ranged (0.89-0.93) from acceptable to excellent in each age group. Internal consistency reliability and convergent validity were similar across age groups. Therefore, this study demonstrated SF MPQ-2 as a valid tool in older and younger people with advanced cancer pain. Chronic pain diagnoses: Lovejoy *et al* (Lovejoy, 2012), evaluated the psychometric properties of SF-MPQ-2 in a sample of 186 U.S. veteran patients with a range of chronic pain diagnoses. Internal consistency reliability was in the excellent range for total pain score (Cronbach's alpha = 0.96) and in the good to excellent range for each of the pain scale scores (Cronbach's alpha between 0.84 and 0.92). Convergent validity was tested with Multidimensional Pain Inventory (MPI) Severity and Interference scales, The Pain Disability Index (PDI), Beck Depression Inventory, second edition (BDI-II) and the Generalized Anxiety Disorder 7-Item (GAD-7) scale. Moderate to high correlations were found between SF-MPQ-2 pain scale scores and other pain measures, ranging from 0.50 to 0.74. Four factor model confirmed and coefficients for continuous pain = 0.98, intermittent pain = 0.88, neuropathic pain = 0.94, and affective descriptors = 0.86.

Acute Low Back Pain: A study done by Dworkin *et al* (2015), among 666 patients with acute low back and associated radicular leg pain assessed the psychometric properties of SF-MPQ-2. It was shown that Cronbach's alpha coefficients for the total score and each subscale ranged from 0.77 to 0.93, suggestive of excellent internal consistency reliability. The SF-MPQ-2 total and subscale scores were also significantly correlated with BPI-SF pain interference scale, the BPI-SF sleep interference item, the Roland and Morris Disability Questionnaire (RMDQ), and the (Hospital Anxiety and Depression Scale) HADS total score and anxiety and depression subscales. These correlations were all moderate in magnitude, ranging from .21 to .52 (all $p < .001$). High responsiveness was shown when baseline and endpoint data were analyzed. The results suggested that the SF-MPQ-2 has generally excellent reliability, validity, and responsiveness in a large sample of patients with acute low back and associated radicular leg pain. Surgery related pain and symptoms: The study done by Ortner *et al* (2014) used SF-MPQ- 2 to evaluate persistent pain in a healthy obstetric population undergoing planned Cesarean Delivery (CD) and to provide a comprehensive description of pain quality. Three hundred eighty-one women with no pain history, undergoing CD were included in this prospective, observational cohort study. Spinal anesthesia was standardized, and postoperative pain was recorded at 24 hours. In each woman, pain was assessed at 8 weeks, and 6 and 12 months using questionnaires of pain intensity and interference. Pain quality was assessed using the SF-MPQ-2. Post-caesarean pain has been shown to be predominantly of neuropathic nature; therefore, the SF-MPQ-2, which particularly evaluates symptoms relevant to neuropathic and musculoskeletal pain, was well suited. The most frequently reported descriptors 12 months after delivery were peri-incisional "numbness," followed by "itching" and "tenderness." Patients with irritable bowel syndrome (IBS): Tanhaee *et al.* (2012), have done a study with a total of 107 (40 males, 67 females) IBS patients diagnosed according to Rome III criteria who referred to the Gastroenterology Clinic at Baqiyatallah Hospital, Iran. Patients completed the short-form SF-MPQ-2 which had been translated into Farsi. The findings showed acceptable reliability and validity for the short-form SF-MPQ-2 in confirming the presence of IBS.

Modified MPQ for orthodontic patients: University of Missouri at Kansas City conducted a study aiming to modify and validate the SF-MPQ among 61 orthodontic patients (2013). Internal and external expert panels developed a Modified MPQ-SF with 15 descriptors and 4-point Likert severity scales (MMPQ-SF15). Sixty-one subjects completed the MMPQ-SF15, a visual analogue scale (VAS), and the present pain index (PPI) 24 hours after an orthodontic visit. According to the preliminary findings, MMPQ-SF15 and VAS ($r = 0.78$, r2s = 0.61, P, .0001), MMPQ-SF15 and PPI ($r = 0.84$, r2s =0.71, P, .0001), and VAS and PPI ($r = 0.70$, r2s = 0.48, P, .0001) were correlated positively and significantly. Internal consistency estimates of reliability (Cronbach's alpha) for the general/emotional and localized pain subscales were 0.883 and 0.857, respectively. It was found that out of 15 descriptors 11 were discriminating pain, other 4 did not contribute meaningfully to the total score ($P > 0.05$) were eliminated from the MMPQ-SF15, and MMPQ-SF11 scores were computed. The investigated MMPQ-SF, particularly MMPQ-SF11, demonstrated efficiency and utility in the assessment of pain in adolescent orthodontic patients and correlated well with VAS and PPI ratings.

Adapted versions of the MPQ: In view of differences in pain reports between languages and cultures made researchers start the elaborate work of developing adapted versions of the MPQ (Strand, 1997). Adapted versions of MPQ found in the literature include Finnish pain questionnaire (Ketovuori, 1981), Italian pain (De Benedittis, 1988), Arabic pain questionnaire (Harrison, 1988) Norwegian Pain Questionnaire (Strand, 1997) and French (Boureau, 1992).

Conclusion

This review of the literature describes the development of the MPQ and its different uses in pain assessment to which the MPQ is well-matched. The MPQ can be used as both a quantitative and a qualitative measure of pain for statistical analysis in research. The MPQ is a powerful tool and, having demonstrated both reliability and validity across cultures and languages, is being adopted in many countries for clinical pain assessment, epidemiological studies, and in studies of the effectiveness of pain treatment in patients with many diagnoses. It is proposed to develop more language versions of validated MPQs enabling their application across the world for better outcomes in health care.

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