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Psychological Treatment Needs for Chronic Pain in Singapore and the Relevance of
the Psychological Flexibility Model

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to this study.

Abstract

Objective: The goals of the present study were (a) to assess the psychological treatment needs and treatment delivery preferences in people attending services or contacting a hospital website for chronic pain in Singapore, and (b) to explore potential relevance of the psychological flexibility (PF) model for this group by investigating associations between PF and pain-related outcomes.

Design and Setting: This was a cross-sectional questionnaire study of people with chronic pain in Singapore.

Subjects: Current users of treatment services at a tertiary pain management clinic (PMC), users of pain treatment services elsewhere, and non-treatment users.

Methods: Participants were either recruited face-to-face at a pain clinic or via an online portal. All participants completed a questionnaire, including a survey of treatment barriers and needs, treatment delivery preferences for chronic pain, and standardized measures of PF, pain interference, emotional functioning and healthcare use.

Results: A total of 200 participants completed the study. Cost of treatment was identified as a main deterrent, while proof of treatment success was identified as a main facilitator for treatment uptake. A majority of participants (88.5%) indicated a preference for face-to-face treatment. In multiple regression analyses, after controlling for relevant demographic variables and pain intensity, PF explained 14% of the variance for pain interference and impact of depressive symptoms and 22% of the variance for depressive symptoms.

Conclusion: A focus on meeting patients' needs at low cost, and providing proof of treatment success may increase psychological treatment uptake. Increasing PF for pain in people from Singapore may also contribute to better patient functioning.

Keywords: Chronic pain; treatment needs; treatment delivery preferences; psychological flexibility; cross-sectional study; Singapore

Introduction

Chronic pain, is a condition that creates many significant problems in the lives of people who suffer with it [1-2]. Modest benefits provided by conventional medical treatments alone have led to a shift towards considering the relevance of psychosocial factors in the treatment of chronic pain and related disability.

Behavioral and cognitive-behavioral methods that address these factors have had a significant impact on the management of chronic pain, and contributed greatly to our ability to more effectively treat this condition [3-4]. These methods are not uniformly available all around the world and it can be unclear how to best design and deliver these in distinctive national and cultural contexts where they have not yet been fully developed.

Acceptance and Commitment Therapy and Chronic Pain

Psychological treatment models for chronic pain continue to develop. In recent years this has included contextual cognitive behavioral approaches [5-7], such as Acceptance and Commitment Therapy (ACT) and mindfulness-based therapies. At the core of ACT is the concept of psychological flexibility (PF). The PF model combines cognitive and behavioral principles and applies these principles specifically to one's ability to persist or change behavior in ways that are goal-directed [8]. PF is enhanced through a focus on six core processes organized in three clusters and referred to as 'open' (cognitive defusion-acceptance), 'aware' (present moment

awareness-self as context) and 'engaged' (values-committed action) [9]. Simply defined, cognitive defusion is a process of reducing the impact of thoughts on behavior by raising awareness of the distinction between thoughts and the people or objects to which they relate. Acceptance involves the patient's willingness to have pain while still engaging in meaningful activities. Contact with the present moment is the process of flexible present-focused awareness. Self-as-context is a sense of self that is not defined by or entangled in thoughts and feelings, a sense of self that is above or bigger than the content of experience. Values are considered to be guiding principles in one's life or qualities of action one regards as personally important, and committed action includes persistent behavior patterns that are guided by goals and values [10]. The PF model provides a focus on treatment processes that link treatment methods with outcomes [7]. Through this focus, methods are able to be developed and improved through a process of testing and improving the mediation of treatment effects, a more direct means for understanding and tracking treatment impact than could be done with such process variables.

A recent systematic review on ACT treatment trials for chronic pain suggested that ACT is effective for enhancing general functioning and reducing emotional distress in comparison to inactive comparison conditions [11]. Five meta-analyses have been conducted on ACT-based intervention studies [12-16] but only two specific to chronic pain [15-16]. These two meta-analyses conducted by Veehof and colleagues [15-16] and including studies of ACT and mindfulness- based treatments for chronic pain, concluded that these treatments may not be more effective than conventional Cognitive Behavioral Therapy (CBT) but could be good alternatives to this approach.

Psychological Treatment for Chronic Pain in Asia

Similar models of healthcare service delivery appear to exist for the treatment of chronic pain in many parts of East and Southeast Asia, and these models do not typically include psychological treatments [17-19]. The literature that addresses the efficacy of psychological treatments for chronic pain in these parts of Asia are also limited, mostly preliminary, with only seventeen studies published since 2002, including only four randomized controlled trials (RCTs), and none of the studies addressing ACT [20].

A recent qualitative study of people with chronic pain in Singapore reported that barriers such as cost, time, access to appointments and resources, and a lack of knowledge of the relevance of psychological treatment for chronic pain may impede uptake of psychological treatment [21]. Verifying the potential role of these factors in a larger sample of people from the same population could be a constructive next step.

Evidence for ACT in Asia

The basic foundations of ACT and related therapies appear consistent with longstanding Asian philosophies and reflect East Asian cultural values and norms [22]. Even so ACT has been applied and studied mostly in Western settings, and evidence for processes of PF and ACT remains limited in Asia.

Correlation studies assessing the role of processes related to ACT in Asian populations have examined the association of PF with job performance [23], the impact of ACT on drug refractory epilepsy in India, [24] and on the psychological health of Japanese students based outside of Japan [25]. Each of these studies provides support for the potential benefits of ACT. The first experimental study of ACT methods for pain in an Asian context was a laboratory based study of pain tolerance with Japanese students studying in America [26]. Results demonstrated that participants in the acceptance intervention condition had greater pain tolerance relative to those in the comparison condition.

There are currently only about three studies of ACT including people with chronic pain from East Asia, and none of these were treatment studies [27-29]. Two of the studies focused on validation of translated versions of the Chronic Pain Acceptance Questionnaire (CPAQ) in Chinese (Cantonese) in Hong Kong [27] and in Korean [28]. Both studies found good test-retest reliability internal consistency, and good construct validity of the CPAQ as a measure of pain acceptance. Additional results supported the applicability and validity of the process of acceptance within these samples. The third study was a diary study conducted in a sample of Korean patients with Complex Regional Pain Syndrome (CRPS-1) [29]. Results from this study showed that pain acceptance based coping was associated with reduced pain and negative mood, and increased activity. None of these studies were conducted in Southeast Asia.

Study Rationale and Aims

Treatments for chronic pain, particularly those including a psychological component, are not well developed in Southeast Asia, including Singapore. In order to develop and deliver such treatments, both practical methods of delivery and appropriately fitting psychological models must be chosen. Different national, healthcare, and cultural context likely entail different needs and potential barriers for services users. Understanding these is important to be sure that services are appropriate in focus, accessible, and likely to be used. Likewise, there is an assumption that the PF model may have particular relevance and applicability in the culturally and linguistically diverse cultures of Asia [22, 30]. However, further studies would need to be done to test this. With English spoken as the first language, an established healthcare system and a mix of four communities, Chinese, Malay, Indian and Eurasians, conducting this study in Singapore appeared appropriate and potentially fruitful.

The specific aims of the present study were two-fold. The first was to examine with quantitative methods, psychological treatment barriers and needs derived from a previous qualitative study [21], including treatment delivery preferences in current users and non-users of conventional healthcare treatment for chronic pain in Singapore. It is possible that the psychological treatment needs between these groups of participants may differ. Results will contribute to a broader understanding of psychological treatment needs and better inform treatment design and delivery for people with chronic pain. The second was to examine if “in principle” PF therapy process that appear useful within the functioning of mostly western populations with pain also appear useful within the functioning of people in Singapore with chronic pain. Validated measures of PF in chronic pain studies have predominantly included

measures of pain acceptance, general acceptance and committed action. These measures were also selected for this study. Together, these aims are intended to guide the design of methods for delivering psychological treatment and the treatment components included in that delivery. Results can then be applied to guide health care service policy and development. Based on results from previous studies, [23, 31, 33, 34, 35] we predicted that our results would show that the three facets of PF assessed here would each significantly predict levels of participant functioning, including pain-related interference, depressive symptoms and impact of depressive symptoms, including in analyses where levels of pain severity are statistically controlled.

Methods

Design

This was a cross-sectional questionnaire study including participants with chronic pain recruited from pain services and via an online portal.

Participants

Participants were recruited face-to-face at the Pain Management Clinic (PMC) at Tan Tock Seng Hospital (TTSH), in Singapore, as well as through an online invitation open to the public and posted on the PMC website, with printed copies of the study

invitation also made available at the PMC. There are only two tertiary public hospitals in Singapore that offer interdisciplinary pain treatment services for people with chronic pain. Treatment services offered at PMC include pharmacotherapy, minimally invasive treatments, pain nursing education, psychological interventions, physiotherapy and occupational therapy. Such services are delivered via individual face-to-face sessions and via structured group program formats. Psychological intervention is cognitive behavioural therapy-based, with a mix of CBT and ACT interventions used in treatment, matching the individual training of the psychologists.

The clinic website for TTSH was regarded as an appropriate recruitment site as it was designed as a general publically available resource and likely to be widely visited. It includes educational articles, practical tips, and other information about pain management that people with chronic pain are likely to seek and access. Participants were asked to complete a two-part survey related to treatment for chronic pain as well as a set of measures of pain, daily functioning, and selected processes of PF, including pain acceptance, general acceptance and committed action. All participants were allocated a participant number that allowed data collected to remain anonymous.

Participants were included if they were (a) above the age of 21 years old (b) diagnosed with chronic nonmalignant pain (non-cancer pain) for more than three months (c) citizens or permanent residents in Singapore and (d) able to complete the full set of questionnaires without assistance. On the online survey, this was determined by participants' initial survey responses. The survey was designed such

that questions meant to elicit responses relating to the inclusion criteria were arranged on the first page of the survey. Participants who met the inclusion criteria were directed to complete the full survey. Those who did not meet criteria were directed to an information page. Here, participants were informed that further completion of the survey was not required as study criteria were not met.

Participants were excluded from the face-to-face recruitment if they (a) were diagnosed with a significant, relevant, cognitive impairment as documented in neurological or neuropsychological assessment findings, (b) were diagnosed with a current mental illness or health problems expected to significantly interfere with study participation or (c) did not have the capacity to give informed consent. The exclusion criteria were only applied to participants recruited at the PMC. As the online survey was anonymous, and participants' medical records were not available, participation on the online survey was primarily determined by the inclusion criteria.

Study Recruitment

A total of 227 participants were initially recruited for this study. Of the total number of participants recruited, 77 participants were recruited face-to-face and 150 participants began the survey online. The dual method of recruitment served the purpose of sampling a wider group of people with chronic pain in the community. Data on the total number of participants who declined participation via online recruitment are not provided as limited resources prevented tracking of the total number of people that accessed the PMC website. Among the 77 invited face-to-

face, 12 declined, four did not meet criteria, and four dropped out, leaving 57 participants who completed the pen and paper version of the survey. Of those who initiated the survey online, five did not meet study criteria and two dropped out, leaving 143 participants who completed the online version. Hence, a total of 200 participants (112 women, 88 men) completed the study.

To assess possible differences in survey opinions between participants currently seeking conventional medical treatment at PMC, those seeking other treatments not within PMC, and those not seeking any form of treatment, the labels 'PMC users', 'non-PMC' and 'non-users' were applied respectively. PMC users were currently undergoing some form of regular conventional healthcare treatment from a professional provider for their pain at PMC. Both single disciplinary treatment services and structured, interdisciplinary pain programs were offered at PMC. Patients who received single disciplinary treatment were seen by one or more of the interdisciplinary team of medical and allied health professionals such as a pain specialist, psychologist, physiotherapist, or occupational therapist. Patients who received treatment within a structured, interdisciplinary program offered at PMC received treatment by a team, comprising of a pain specialist, pain nurse, psychologist and physiotherapist over 2-weeks or 3-weeks. Patients assessed to have higher pain impact in their lives were usually referred for the 3-weeks program. Non-PMC users reported using similar treatments but only within single disciplinary settings. These included treatment by a General Practitioner (GP), private specialist treatment, or treatment by a private allied health professional such as a psychologist, physiotherapist, or occupational therapist. Non-users included individuals who self-medicated, sought treatment from a traditional Chinese medicine practitioner or

alternative treatment providers (i.e. chiropractors and osteopaths). These participants may have previously sought some form of conventional treatment but are not currently seeking such treatment. Our final sample included a total of 69 PMC users, 68 Non-PMC users and 63 non-users.

Ethics

Ethical approval for the study was received from the relevant institutional ethics committee, Domain Specific Review Board (DSRB; 2012/00717). Informed consent was obtained from all individual participants included in the study.

Measures

Participants completed a series of assessment instruments at only one time point. Background characteristics were assessed, including pain duration, location, days of medical leave, and healthcare usage, including pain-related doctor and emergency care visits over the past three months.

Survey on Treatment Barriers and Treatment Needs

A survey including a list of independent items assessing potential barriers and needs for psychological treatment related to chronic pain was developed for the purpose of this study. This was not meant as a psychometric measure that yields a summary

scale score. The first eight items assessed factors that might discourage uptake of psychological treatment and the other eight items assessed factors that might encourage uptake of psychological treatment. These items were derived from a previous qualitative study [21]. Participants rated these items on a scale of 0 (not important at all) to 10 (very important). The two sets contained precisely parallel content, with the difference being that they were examined as either barriers or facilitators. Additional survey questions on participants' preferences in the delivery formats of psychological treatment followed those used in a previous mixed methods study [36] (see Appendix for details of the survey).

Pain Intensity

Present and average pain intensity over the past week was assessed using a 0 (no pain) to 10 (worst possible pain) numerical rating scale. To obtain an overall pain intensity score, pain intensity was calculated by averaging the two ratings into one pain intensity component [37-38].

Measures of Functioning

Brief Pain Inventory (BPI) – interference scale.

The BPI [39] interference scale measures the level of pain interference in daily activities with participants rating each item on a scale from 0 (never interferes) to 10 (completely interferes). The BPI interference scale has demonstrated adequate internal consistency ($\alpha > 0.70$) and reliability with Cronbach's alpha ranging between 0.93-0.95 [40]. The IMMPACT panel on assessment methods for clinical trials has also

specifically identified the interference items of the BPI as one of their recommended measures of assessment of pain-related functional impairment in clinical trials [41].

Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 is a 10-item measure of depression [42]. The sum of the first nine items scored from 0 (not at all) to 3 (nearly every day) is used as an index of the severity of depression. The tenth item is a single item used here as a measure of the interference of depressive symptoms in one's life. It is intended and used as a separate index of the impact of depressive symptoms, particularly for use in screening for depressive symptoms that meet the diagnostic criteria as a disorder. The internal reliability of the PHQ-9 has a Cronbach's alpha of 0.89 with good test-retest reliability [42].

Process Measures of PF

Chronic Pain Acceptance Questionnaire-8 (CPAQ-8)

The CPAQ-8 [43] is a short version of the original 20-item inventory (CPAQ) measuring acceptance of pain [44]. Participants rate the eight items on a scale from 0 (never true) to 6 (always true). Good internal consistency reliability ($\alpha = 0.77$ to 0.89) and validity has been demonstrated for this scale [43].

Acceptance and Action Questionnaire-II (AAQ-II)

The AAQ-II [45] is a seven-item scale developed to assess general/ psychological acceptance. The AAQ-II appears to measure the same concept as the AAQ [46] but with better psychometric properties. Patients are asked to rate each statement on a scale from 1 (never true) to 7 (always true). The AAQ-II has adequate psychometric

characteristics, including internal consistency ($\alpha = 0.78$ to 0.88) and good test-retest reliability ($r = 0.79$ to 0.81).

Committed Action Questionnaire (CAQ)

The CAQ is an 18-item measure of committed action as defined within the PF model [34]. Committed action includes flexible and persistent goals-based action.

Participants are asked to rate how well each statement applies to them. Each of the items is rated on a scale from 0 (never true) to 6 (always true). The psychometric characteristics of the CAQ have been adequately demonstrated, including internal consistency ($\alpha = 0.87$).

Statistical Methods

To account for the highly skewed data obtained for duration of pain, these data were transformed with a log transformation. These transformed data were used in subsequent analyses.

For the barriers and needs survey, the primary questions concerned the rated importance of barriers and facilitators overall. However, comparisons were also made between PMC users, non-PMC users and non-users with regard to their reported treatment opinions and preferences. Descriptive statistics, chi-square, one way ANOVAs and post-hoc Tukey's HSD test were conducted. One way ANOVAs were also used initially to test potential differences among PMC users, non-PMC users and non-users on pain intensity, dependent variables (DVs) of pain

interference and emotional functioning and PF. As the focus of the study was to test the general utility of PF in our target sample, and not potential differences of PF between PMC users, non-PMC users and non-users, subsequent analyses included analyzing data as a whole. Correlation analyses assessing the relationship between demographic variables, pain intensity, DVs, and the three measures of PF were then conducted. Next, hierarchical multiple regression was used to assess the role of PF in accounting for the variance in pain intensity and the DVs. These analyses were also designed to statistically control the role of relevant participant demographic variables as well as pain intensity. Demographic variables including age, gender, education, and pain duration were tested as possible correlates with the DVs and entered together in step one where significant. Pain intensity was entered on the next step and the three PF variables on the final step. To test whether the order in which variables were entered made a difference to the predictor value of pain intensity, in the final set of analyses, pain intensity was entered in as a predictor after the PF variables.

Results

Participants had a mean age of 45.27 years ($SD = 12.88$), mean pain duration of 43.61 months ($SD = 65.31$), and a mean of 13.27 ($SD = 3.11$) years of education. A majority of participants were Chinese (83%), married (64%) and in full-time employ (68.5%). Table 1 provides a summary of participants' demographics.

[Insert Table 1 about here]

Preliminary Analyses

There was a significant difference in duration of pain between the participant groups, $F(2, 199) = 15.74, p = .000$. Post-hoc comparisons indicated that the mean pain duration for PMC users significantly differed from non-PMC users and non-users, with PMC users suffering a longer duration of pain. There were also differences in gender [$X^2 (2, N = 200) = 8.83, p = 0.01$], and pain site [$X^2 (18, N = 200) = 40.90, p = 0.002$] between participants. PMC users were more likely than non-users to be women 69.6% vs 44.4%, and more likely to have low back pain, 52.2% vs 30.2%. Non-users were more likely to have leg or foot pain 36.5% vs 4.3%.

Further group differences emerged with regard to pain intensity, pain interference, impact of depressive symptoms, and pain acceptance. Post-hoc comparisons indicated significant mean differences in level of pain intensity between PMC users and both non-PMC users and non-users. The mean levels of pain interference, impact of depressive symptoms and pain acceptance significantly differed between PMC users and non-users but not with non-PMC users (see Table 2).

[Insert Table 2 about here]

Work Absence and Healthcare Usage

Overall, participants reported a low rate of medical leave. Almost half of PMC users (47.8%) and non-PMC users (45.6%), and more than half of non-users (74.6%) reported zero medical leave days. Reports of medical visits in the past three months such as doctor visits, Accident and Emergency (A and E) visits and hospitalization days were also low. Due to low usage of such healthcare services for all participant

groups, and low overall variability, data regarding healthcare usage were not further analyzed. Table 3 shows the percentage use of health related visits.

[Insert Table 3 about here]

Barriers and Needs Survey

Results from the barriers and needs survey demonstrated that ratings of barriers and facilitators to psychological treatment were similar across all three participant groups. In particular, participants rated cost of treatment (Mean = 7.65, SD = 2.65) as the main barrier to psychological treatment uptake, and rated proof of treatment success (Mean = 8.86, SD = 1.61) as the main facilitator to treatment uptake.

PMC users, non-PMC users and non-users did not differ significantly in their opinions on many of the “barriers and needs” survey items that were assessed. To address the possibility of Type I error, a conservative significance level of $p < .01$ was applied. Results showed that the opinions of PMC users, non-PMC users and non-users differed on proof of treatment success $F(2, 199) = 4.97, p = 0.008$, and access to treatment, $F(2, 199) = 11.77, p = 0.00$. Post-hoc comparisons indicated that compared to PMC users, only non-users felt a stronger need for proof of treatment success to take up treatment. Compared to PMC users, both non-PMC users and non-users supported improved treatment access to facilitate treatment uptake. There were no significant differences in opinions between non-PMC users and non-users.

Participants differed in their opinion on the lack of information about psychological treatment as a barrier to psychological treatment uptake (see Table 4). Post-hoc

comparisons indicated that compared to PMC users both non-PMC users and non-users more strongly endorsed a lack of information about psychological treatment as a main treatment barrier. There were no significant differences in opinions between non-PMC users and non-users.

As the item sets related to the barriers and needs survey were designed in parallel, and few differences emerged between the two sets, only a single summary set of the mean ratings, those for potential treatment barriers, are presented in Table 4 (complete data for both sets of items are available from the first author).

[Insert Table 4 about here]

Preliminary analyses indicated that, there were no significant difference in type of treatment delivery preferences between PMC users, non-PMC users and non-users. As a whole, participants preferred face- to-face treatment (88.5%) followed by online treatment delivery (28%) and a combination of treatment methods (26.5%). The largest group of participants, who preferred a combination of treatment methods, expressed a preference for face-to-face treatment in combination with online treatment (43.4%). Participants (74%) also felt that a distribution of leaflets and brochures on psychological treatment for chronic pain could best promote treatment uptake.

Overall, participants preferred a schedule of once per week treatment sessions lasting an average of 45 minutes for a median of four to five sessions. Participants were willing to pay an average of S\$37.46 (SD = 19.45) per treatment session.

Descriptive Statistics

The means and standard deviations from the measures of pain intensity, participant functioning, and PF are summarized in Table 2. As for impact of depressive symptoms, 40% of all participants indicated some degree of impact of depressive symptoms while 60% indicated no impact of depressive symptoms on their daily functioning. A comparison between participant groups showed that 58% of PMC users, 33.8% of non-PMC users and 27% of non-users indicated that depressive symptoms created an impact on their lives.

Correlation Analyses

Correlation analyses were conducted to examine the relationships between participant demographic variables, pain intensity, pain interference, depressive symptoms, impact of depressive symptoms and the total scores on the CPAQ, AAQ-II and CAQ.

Among the demographic variables, years of education showed small relationships ($r = -0.20$ to $r = 0.30$) with age, pain intensity pain interference, depressive symptoms and pain acceptance. Pain duration showed small relationships ($r = 0.15$ to 0.26) with pain intensity, pain interference and impact of depressive symptoms, and age also had a small relationship with impact of depressive symptoms ($r = -0.15$). All

other relationships between demographic variables, pain intensity, measures of participant daily functioning, and measures of PF were not significant.

Small to moderate correlations were found between pain acceptance, general acceptance, committed action and measures of pain intensity, pain interference, depressive symptoms and impact of depressive symptoms. Mainly moderate inter-correlations were found between primary variables of interest. Table 5 provides the correlation matrix of these primary variables of interest.

[Insert Table 5 about here]

Regression Analyses

Hierarchical multiple regression analyses were carried out to investigate the combined contribution of the three measures of PF in accounting for variance in the DVs. Variance estimates (ΔR^2) and standardized regression coefficients (β) for these analyses are displayed in Table 6.

[Insert Table 6 about here]

As shown in Table 6 the background variables did not account for a significant amount of variance in the DVs. Pain intensity accounted for 35% of the variance in pain interference, 14% for depressive symptoms and 12% for impact of depressive symptoms. After controlling for pain intensity, the addition of the three primary process variables resulted in an increment of 14% of variance for pain interference, 22% for depressive symptoms, and 14% for the impact of depressive symptoms.

Pain intensity made the strongest contribution to pain interference while PF made the strongest contribution to depressive symptoms.

Among the three process variables of PF, pain acceptance contributed the most variance to impact of depressive symptoms while general acceptance made the strongest contribution to depressive symptoms. Committed action did not significantly contribute to variance for any of the outcomes in these multivariate analyses.

We also tested the effect of varied approaches to the regression analyses. Examination of the data using the stepwise rather than standard entry regression method did not show a significant change in the results, hence we report only one set of regression analyses here. In a final set of analyses, we tested whether a change in entry order of pain intensity and the PF variables in the multiple regression equation would make a significant change in their contributed variance to the DVs. In these analyses pain intensity was entered after the PF variables in the stepwise regression equation. There were no significant changes in variance accounted for from pain versus PF from doing this.

Discussion

This study focused on two aims. The first was to examine with quantitative methods, psychological treatment barriers and needs derived from a previous qualitative study

[21] and treatment delivery preferences in PMC users, non-PMC users, and non-users of conventional healthcare treatment with chronic pain in Singapore. The second was to examine the relevance of the PF model to daily functioning for this group by investigating associations between PF and pain-related outcomes.

Preliminary results indicate that users of conventional healthcare treatment, especially those utilizing services at PMC had a different profile from non-users of conventional medical treatment. PMC users were more likely to be women, suffering longer pain duration, with higher pain intensity, pain interference and impact of depressive symptoms, and lower pain acceptance. This result is not surprising as PMC is one of only two specialized pain services within re-structured (partially government funded) hospitals in Singapore with the capacity to provide interdisciplinary care. It is only natural that patients with a higher negative impact of pain in their lives and continue to struggle with managing pain would seek specialty healthcare services. Interestingly, pain duration was the only differentiating factor between those that sought PMC services and those that sought conventional medical treatment elsewhere. It would appear that patients' decision to seek more specialized care was primarily based on the duration of pain suffering itself rather than on factors associated with the wider impact of pain on daily functioning. The design of healthcare systems and referral processes for specialist care in the public hospitals in Singapore may contribute to this.

In general, PMC users, non-PMC users and non-users shared mostly similar opinions on many factors that may discourage and encourage psychological treatment uptake. In particular, cost of treatment was identified as a main barrier, while proof of treatment success was identified as a main facilitator to treatment

uptake. Patients seeking pain services view the costs of treatment in Singapore as high and expressed a lower willingness to pay for other forms of treatments other than medications and doctor visits [21]. In this current study, participants expressed a willingness to pay an average of S\$37.46 per psychology session. Psychology sessions are currently charged at approximately S\$90.00 per session at PMC [47], an amount much higher than the amount that participants are willing to pay. Addressing this practical barrier of treatment costs in relation to patients' needs in Singapore, as well as providing evidence for psychological treatment in the treatment of chronic pain, may increase treatment uptake.

Based on participants' preferences, designing psychological treatment formats that include face-to-face treatment perhaps combined with online treatment may increase treatment uptake. Preliminary findings from a recent feasibility trial combining face-to-face and internet-based treatment for chronic pain, conducted in Singapore, appear to support such a treatment delivery format [48]. High treatment satisfaction (81.8%) was reported in this study. As suggested, distribution of leaflets and brochures providing information about treatment may further promote psychological treatment uptake. Of course such materials must be carefully designed and used in conjunction with other methods [49]. Distributing educational materials during the face-to-face consultation with health professionals knowledgeable of psychological treatments and with whom patients share a therapeutic relationship may help [21]. Data on psychological treatment preferences here were collected from a relatively small sample of chronic pain patients from one pain clinic and from the community. As such, these results are tentative and need to be further verified.

As for the second aim of this study, in general, results from this cross-sectional study showed associations between our selected measures of daily functioning and the measures of PF, and at least partially supported our predictions. From these we cannot confirm a causal role; however, we can claim that the PF processes are plausible contributors to patient functioning in this population. Processes of PF may also play a role in patients' treatment choices and preferred treatment delivery format for psychological treatment identified here.

Preliminary correlation analyses between PF and participant demographics resulted in only a small relationship shown for years of education with acceptance of pain. The pattern of results obtained, suggest that processes of PF here do not distinguish people based on these types of background characteristics.

Our wider analyses of the relationship between PF with pain interference, depressive symptoms and impact of depressive symptoms yielded mostly small to moderate correlations ($r = -0.25$ to 0.68). A minimal negative relationship exists between PF and pain intensity. This result is not surprising as the relationship between the processes of PF and pain is expected to be indirect at best [7-8]. These results point to the utility in incorporating elements of PF in the design and content of psychological treatments for chronic pain in Singapore. In particular, designing treatments focused on increasing pain acceptance and general acceptance, reinforcing an outcome based on engaging in meaningful activities rather than one

aimed to reduce pain itself may be more effective. Providing such treatments to PMC users, for whom the impact of pain is highest, may also be the best platform for treatment delivery.

The present correlation results are also similar to previous correlation studies, suggesting a significant role of processes of general acceptance [33, 50] and pain acceptance [44, 51] in the well-being and daily functioning of people with chronic pain. Treatment outcome studies have also shown a moderate negative relationship between PF and pain interference [52] and psychological flexibility and depression [53-55]. Results imply that increasing PF may lead to lower interference in daily life due to pain and improve emotional functioning.

Regression analyses suggest that PF may have a unique role to play in pain interference, depressive symptoms and impact of depressive symptoms. PF continued to make a unique contribution to these DVs after controlling for background variables of age, gender, education, pain duration and pain intensity. In particular, acceptance of pain contributed the strongest increment of variance among the PF processes to impact of depressive symptoms, and general acceptance made the strongest contribution to depressive symptoms. Committed action did not make a significant unique contribution to any of the DVs.

Committed action did not perform as well as acceptance of pain and general acceptance in explaining variance in pain interference and depressive symptoms in our study. This result is inconsistent with the findings from a validation study of the 18-item Committed Action Questionnaire (CAQ) [34]. In that study, committed action

was significantly related to better quality of life, lower levels of depression and better social functioning beyond the contributions of pain intensity and acceptance of pain. Compared to this previous study, our current sample was less disabled by pain, had experienced a significantly shorter pain duration, mild to moderate pain intensity and relatively mild depressive symptoms, with many participants still working in either full-time or part-time work. It is possible that the lower levels of disability in our sample contributed to the poor performance of the CAQ here, or perhaps there are other population, healthcare system, or cultural differences that obscure the types of behaviour patterns observed previously. Another possibility could be the way that our sample understood and responded to items on the CAQ, based on potential cultural or language differences, but this too would need to be further investigated. We note another unexpected result in the current data, in that there was only a small correlation between the two subscales that formed the CAQ, unlike results found in the validation study [34].

Study Limitations

This study has its limitations. First, this was a cross-sectional, one-time, self-report, questionnaire study. The study design did not allow for comparison of data over time and did not include an experimental manipulation so we cannot draw definite conclusions about causal relations between PF and functioning. Treatment intervention studies including mediation analyses could be one way to further examine the unique contribution of PF to functioning.

Secondly, this study relied on self-reports, including self-reports from anonymous sources who accessed the online version of the questionnaire. Although unlikely, it is possible that participants could have accessed the questionnaire more than once. The online questionnaire was designed to discourage participants from completing it more than once. Unless there were participants who had time to access the survey from more than one device, duplicate data collection is unlikely. The drawback of self-reports is that sometimes patient reports may not precisely reflect actual behavior, which may compromise the validity and accuracy of our results.

The sample studied is selective in that it only included participants who accessed the healthcare services at the PMC, or a public website affiliated with one hospital in Singapore. We are also unable to fully account for the relatively low usage of healthcare services found in our sample. We might have found different results from a different sample recruited through different recruitment methods. This possibility can be tested in future studies.

This is only one study conducted on the questions addressed, and in one sample population, in one country in Southeast Asia. This is not a definitive study by any means. At the same time it is a first step and further steps ought to be made to further develop and then implement treatment for chronic pain in Singapore, perhaps including treatments based on PF.

Conclusion

Despite the study limitations, the current study reveals potentially important practical information for future psychological treatment development for chronic pain in Singapore. Results from our study also preliminarily support the utility of the PF model as relevant within a Southeast Asian chronic pain population. Designs of psychological treatment incorporating elements of PF, focused on engaging patients in meaningful activities rather than focused on getting rid of pain itself may prove more effective. Other facets of PF, such as those focused on cognitive and self-related influences [56] also merit further study in settings and contexts not only in Singapore but also in other countries in Southeast Asia.

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Table 1: Summary of demographics of PMC users, non-PMC users and non-treatment users

		PMC Users	Non-PMC	Non-Users
		Mean (SD)	Mean (SD)	Mean (SD)
Age		45.75 (13.39)	45.90 (12.42)	44.05 (12.93)
Pain duration***		61.41 (70.43)	39.92 (67.35)	28.11 (52.30)
Average years of education		12.64 (3.30)	13.62 (2.87)	13.57 (3.09)
		PMC Users	Non-PMC	Non-Users
		No. (%)	No. (%)	No. (%)
Sex*	Male	21 (30.4)	32 (47.1)	35 (55.6)
	Female	48 (69.6)	36 (52.9)	35 (55.6)
Race	Chinese	50 (72.5)	61 (89.7)	55 (87.3)
	Malay	8 (11.6)	3 (4.4)	4 (6.3)
	Indian	9 (13.0)	2 (2.9)	2 (3.2)
	Eurasian	1 (1.4)	1 (1.5)	2 (3.2)
Pain Site**	Low back	36 (52.2)	25 (36.8)	19 (30.2)
	Upper	10 (14.5)	6 (8.8)	13 (20.6)
	extremities			
	Legs/feet	3 (4.3)	16 (23.5)	23 (36.5)
	Others	10 (14.5)	14 (20.6)	5 (7.9)

PMC: Those utilizing PMC services, Non-PMC: Utilizing pain services elsewhere, Non-User: Not utilizing services at PMC or any pain service elsewhere.

Note: *p < .05, **p < .01, ***p < .001

Table 2: Summary of means, standard deviations (SD) and mean differences on measures of functioning and psychological flexibility

	PMC	Non-PMC	Non-user	
	Mean(SD)	Mean (SD)	Mean(SD)	<i>F</i> (2, 199)
<i>Dependent Variables</i>				
Pain intensity**	4.69 (2.21)	3.74 (2.37)	3.29 (2.14)	7.38, <i>p</i> = 0.001
Pain interference*	3.60 (2.64)	2.91 (2.55)	2.32 (2.14)	4.47, <i>p</i> = 0.01
Depressive Symptoms	6.38 (6.66)	4.81 (6.27)	4.06 (4.87)	2.57, <i>p</i> = 0.08
Impact of Depressive Symptoms***	0.58 (0.50)	0.34 (0.48)	0.27 (0.45)	8.64, <i>p</i> = 0.00
<i>Process Measures</i>				
Chronic Pain Acceptance Questionnaire-8*	26.41 (6.80)	28.10 (6.36)	29.60 (6.14)	4.06, <i>p</i> = 0.02
Acceptance Action Questionnaire-II	22.78 (12.44)	19.24 (9.61)	19.40 (9.84)	2.36, <i>p</i> = 0.10
Committed Action Questionnaire	66.70 (13.53)	67.51 (12.91)	66.97 (13.63)	0.07, <i>p</i> = 0.94

PMC: Those utilizing PMC services, Non-PMC: Utilizing pain services elsewhere, Non-User: Not utilizing services at PMC or any pain service elsewhere.

Note: **p* < .05, ***p* < .01, ****p* < .001

Table 3: Summary of healthcare visits for PMC user, Non-PMC users and non-users

	PMC Users	Non-PMC Users	Non-Users
	Median (Range)	Median (Range)	Median (Range)
MC Days	1.5 (0-365)	1 (0-90)	0 (0-30)
	PMC Users	Non-PMC Users	Non-Users
	No. (%)	No. (%)	No. (%)
Two or less doctor visits in the past 3-months	57 (82.6)	55 (80.9)	60 (95.2)
Zero use of A & E visits in the past 3-months	66 (95.7)	64 (94.1)	61 (97.1)
Two or less hospitalisations in the past 3-months	67 (97.1)	64 (94.1)	62 (98.4)

Table 4: Summary of means, standard deviation (SD) and mean differences between PMC users, Non-PMC users and non- treatment users on barriers to psychological treatment

Barriers	PMC	Non-PMC	Non-user	<i>F</i> (2, 199)
	Mean (SD)	Mean(SD)	Mean(SD)	
High cost of treatment	7.10 (2.84)	8.09 (2.42)	7.78 (2.60)	2.52, <i>p</i> = 0.08
Lack of information about CBT**	6.36 (2.72)	7.47 (2.65)	7.73 (2.51)	5.12, <i>p</i> = 0.007
Calling the treatment psychological	4.91 (3.13)	5.62 (3.02)	5.33 (2.99)	0.93, <i>p</i> = 0.40
Stigma	3.51 (3.51)	2.85 (3.00)	3.41 (3.21)	0.80, <i>p</i> = 0.45
Poor social support	4.64 (3.59)	4.21 (3.25)	4.00 (3.65)	0.58, <i>p</i> = 0.56
Hospital-based treatment	4.48 (3.42)	4.63 (3.19)	5.40 (3.12)	1.49, <i>p</i> = 0.23
Lack of explanation by referring health professional	6.42 (2.95)	7.21 (2.82)	7.44 (2.64)	2.44, <i>p</i> = 0.09
Poor relationship with health professionals	6.12 (3.13)	6.46 (3.22)	7.14 (2.96)	1.85, <i>p</i> = 0.16

PMC: Those utilizing PMC services, Non-PMC: Utilizing pain services elsewhere, Non-User: Not utilizing services at PMC or any pain service elsewhere.

Note: ***p* < .01

Table 5: Correlation matrix of measures of pain intensity, functioning and process variables

	Pain Intensity	Pain Int.	DS	IDS	CPAQ-8	AAQ-II	CAQ
Pain Intensity	1	0.67**	0.44**	-0.25**	-0.15*	-0.18*	-0.13
Pain Int.	0.64**	1	0.67**	-0.20**	0.69**	-0.38**	-0.26**
DS	0.44**	0.67**	1	-0.20**	-0.41**	-0.52**	-0.36**
IDS	0.43**	0.65**	0.63**	1	-0.38**	-0.37**	-0.25**
CPAQ-8	-0.15*	0.69**	-0.41**	-0.38**	1	0.48**	0.50**
AAQ-II	-0.18*	-0.38**	-0.52**	-0.37**	0.48**	1	0.45**
CAQ	-0.13	-0.26**	-0.36**	-0.25**	0.50**	0.45**	1

Pain Int.: Pain Interference; DS: Depressive Symptoms; IDS: Impact of Depressive Symptoms; CPAQ-8: Chronic Pain Acceptance Questionnaire-8; AAQ-II: Acceptance and Action Questionnaire-II; CAQ: Committed Action Questionnaire.

Note: *p < .05, **p < .01

Table 6: Results of hierarchical regression analyses examining psychological flexibility in relation to measures of functioning

Block	Predictor	β	ΔR^2 Block	Total R^2
<i>Pain Interference</i>				
1.	Sex	-0.04	0.08**	0.57***
	Age	-0.09		
	Education	-0.01		
	Pain Duration	-0.02		
2.	Pain Intensity	0.60***	0.35***	
3.	CAQ	0.08	0.14***	
	AAQ	-0.20**		
	CPAQ	-0.29***		
<i>Depressive Symptoms</i>				
1.	Sex	-0.03	0.09**	0.44***
	Age	-0.02		
	Education	-0.07		
	Pain Duration	0.06		
2.	Pain intensity	0.34***	0.14***	
3.	CAQ	-0.06	0.22***	
	AAQ	-0.38***		
	CPAQ	-0.13		
<i>Impact of Depressive Symptoms</i>				
1.	Sex	0.05	0.08**	0.34***
	Age	-0.21		
	Education	0.09		
	Pain Duration	0.04		
2.	Pain intensity	0.34***	0.12***	
3.	CAQ	0.04	0.14***	
	AAQ	-0.17*		
	CPAQ	-0.31***		

CAQ: Committed Action Questionnaire; AAQ: Acceptance and Action Questionnaire II; CPAQ: Chronic Pain Acceptance Questionnaire-8

Note: * $p < .05$, ** $p < .01$, *** $p < .001$