

Willingness to pay and preferences for mindfulness-based interventions among patients with chronic low back pain in the Hong Kong public healthcare sector

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ABSTRACT

Introduction: Low back pain (LBP) is a leading cause of disability worldwide. Mindfulness-based interventions (MBIs) are effective for LBP management when combined with medication and physical therapy. An understanding of patients' willingness to pay (WTP) and preferences is needed to integrate MBIs into standard LBP care. We examined WTP and preferences for MBIs, as well as associated factors, among patients with chronic LBP in the Hong Kong public healthcare sector.

Methods: A cross-sectional survey was conducted in two Hong Kong public hospitals. We used the payment card method to assess patients' WTP for MBIs and performed a discrete choice experiment to examine patients' preferences for MBIs. Tobit regression was utilised to analyse factors associated with WTP for MBIs. Patients' relative preferences for MBIs were estimated through a mixed logit model.

Results: Mean WTP for an eight-session course of MBIs was HK\$258.75±508.11. Higher pain scores, monthly family income >HK\$30 000, high school education, higher treatment expenses, and stronger belief in MBIs were associated with greater WTP. Patients were more likely to choose MBIs with lower costs, greater improvements in pain relief and the ability to perform daily activities, and a face-to-face delivery mode.

Conclusion: Patients with chronic LBP exhibited low WTP for MBIs. Strategies to improve education and awareness may enhance WTP; affordability and accessibility should be considered for individuals from diverse socio-economic backgrounds. The identified preferences provide insights for designing MBIs that align with patient needs. These findings offer valuable methodological references for other healthcare evaluations.

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New knowledge added by this study

- Patients with chronic low back pain have a low willingness to pay for mindfulness-based interventions (MBIs).
- Individuals experiencing more severe pain and possessing greater financial capacity are more willing to pay for MBIs.
- Patients prefer MBIs with lower costs, greater treatment effectiveness, and a face-to-face delivery mode.

Implications for clinical practice or policy

- These findings have practical implications for the future implementation of MBIs in chronic pain management.
- This study provides a methodological reference that could be adapted for evaluation of similar treatments in diverse international settings.

Introduction

Low back pain (LBP) is a prevalent health condition that can have disabling effects on individuals of all ages.¹ This condition also imposes substantial socio-economic costs, as evidenced by studies demonstrating its impacts on healthcare systems and workforce productivity worldwide.^{2,3}

Psychological treatments, particularly when combined with medication and physical therapy, are effective in managing LBP.⁴ Mindfulness-based interventions (MBIs; ie, evidence-based psychological approaches) have been shown to reduce pain, disability, and psychological distress associated with LBP.⁵ Moreover, studies have

香港公營醫療系統中慢性腰背痛症患者對靜觀治療的支付意願和偏好

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引言：腰背痛是全球殘疾的主要原因之一。靜觀治療在配合藥物和物理治療使用時，對於處理腰背痛是有效的。了解患者的支付意願和偏好對於將靜觀治療納入標準腰背痛護理至關重要。本研究旨在探討香港公營醫療體系中慢性腰背痛患者對於靜觀治療的支付意願和偏好及相關因素。

方法：本研究在香港兩所公立醫院進行了一項橫斷面調查。我們使用支付卡方法評估患者對靜觀治療的支付意願，並使用離散選擇實驗來檢視患者對靜觀治療的偏好。我們利用Tobit迴歸模型分析與靜觀治療的支付意願相關的因素，並使用混合Logit模型估計患者對靜觀治療的相對偏好。

結果：患者對於8次靜觀治療課程的平均支付意願為 258.75 ± 508.11 港元。疼痛程度較高、每月家庭收入超過30 000港元、高中學歷、較高的治療費用和較信任靜觀治療的患者的支付意願較高。患者更傾向於選擇費用較低、較能減輕疼痛程度和維持日常生活能力，以及面對面模式的靜觀治療。

結論：慢性腰背痛患者對靜觀治療的支付意願較低。改善教育和宣傳策略可能有助提高支付意願，並應考慮不同社會經濟背景的患者負擔能力和可及性。這些研究結果有助設計符合患者偏好的靜觀治療，還可供其他醫療評估作為參考。

emphasised the cost-effectiveness of MBIs in reducing chronic pain-related healthcare expenses and productivity losses.^{6,7} Although the exact mechanisms through which MBIs alleviate pain have not been elucidated, there is evidence that they may alter pain signal processing in the brain, fostering acceptance and non-judgemental awareness. These outcomes enhance pain tolerance and reduce emotional reactivity to pain.⁸

Other commonly used social and psychotherapeutic modalities include cognitive-behavioural therapy and acceptance and commitment therapy. Cognitive-behavioural therapy targets maladaptive thought patterns and behaviours,⁹ whereas acceptance and commitment therapy focuses on promoting psychological flexibility despite the presence of pain.¹⁰ Mindfulness-based interventions uniquely emphasise cultivating present-moment awareness and acceptance of pain sensations.¹¹ Key advantages of MBIs include their accessibility and cost-effectiveness: they can be efficiently delivered in group settings (either online or face-to-face), facilitating scalability for public healthcare initiatives.^{12,13} Moreover, they have the potential to enhance self-management skills for sustainable pain management.¹⁴ Acceptance and commitment therapy has limited empirical support and mixed results regarding its effectiveness in

terms of improving pain intensity among patients with chronic pain.^{15,16} Cognitive-behavioural therapy is a widely used and well-researched therapeutic approach for chronic pain.¹² However, it is considered suitable for one-on-one (rather than group-based) formats because it requires personalised treatment plans that address the unique needs and concerns of each patient.¹⁷ Furthermore, MBIs have demonstrated greater cost-effectiveness relative to cognitive-behavioural therapy among patients with chronic LBP.¹⁸

In Hong Kong, approximately 90% of specialist and inpatient care services and 30% of primary care services are provided by the public sector.¹⁹ Given the absence of universal health insurance or co-payment, the majority of chronic diseases (eg, LBP) are managed within the public healthcare system.²⁰ The incorporation of MBIs into standard LBP treatment within this system requires an understanding of patients' willingness to pay (WTP) and preferences. Relatively few studies have explored WTP or preferences for MBIs among patients with chronic LBP. An understanding of WTP is crucial for efforts to assess the perceived value of healthcare interventions, inform policy decisions, and guide resource allocation.^{21,22} Consideration of patient preferences in healthcare service decisions can improve uptake, adherence, efficiency, and patient satisfaction while reducing costs.^{23,24}

This study aimed to estimate WTP and preferences for MBIs among patients with chronic LBP in the public healthcare sector and to explore factors associated with WTP and preferences for MBIs.

Chronic LBP is significantly influenced by psychological factors; social determinants play a crucial role in the interpretation of chronic LBP and the ways that individuals seek and receive pain treatment.^{25,26} The socio-psychobiological model of chronic pain represents a paradigmatic shift from the conventional biopsychosocial model.^{27,28} Whereas the latter model recognises the interplay of social, psychological, and biological factors, it tends to prioritise biological determinants over social and psychological aspects.^{27,28} In contrast, the socio-psychobiological model primarily emphasises social determinants, followed by psychological and biological factors.^{27,28}

Our research, which assesses WTP and preferences for MBIs in the context of chronic LBP, aligns with the socio-psychobiological model for pain management. The examination of WTP and preferences can provide valuable insights into the socio-economic backgrounds of individuals with chronic LBP, which may strongly influence their experiences of pain and responses to pain management interventions. The findings may also clarify patients' abilities to access and afford

pain management strategies.²⁹ This aspect is particularly important because it underscores the social dimensions of chronic pain management, highlighting disparities and barriers that may exist in pain experiences and access to effective interventions. Furthermore, MBIs constitute a psychological and group-based approach to chronic pain management, addressing both psychological and social factors emphasised within the socio-psychobiological model.^{12,30} These interventions provide individuals with skills to manage psychological distress linked to chronic LBP while also promoting social support and connectivity in group settings.^{31,32} By fostering mindfulness practices, MBIs equip individuals with coping mechanisms to navigate the psychological distress often associated with chronic LBP, while also enhancing social support and connectivity within group settings.^{31,32}

Methods

Study design and setting

We conducted a prospective cross-sectional survey using convenience sampling to recruit eligible patients with chronic LBP from two Hong Kong public hospitals between September 2022 and February 2023. We utilised a discrete choice experiment (DCE) design to examine preferences for MBIs. This study adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines.

Participants

The inclusion criteria for this study were age ≥ 18 years, chronic non-specific LBP, and the ability to speak and understand Chinese. Chronic non-specific LBP was defined as pain in the lumbosacral region, with or without sciatica, that persisted for >3 months and lacked a clearly identifiable cause or pathology based on clinical evaluation, imaging, or laboratory tests. Exclusion criteria were chronic LBP with a specific identifiable cause or pathology, such as inflammatory diseases, tumours, infections, fractures, structural abnormalities, or other spinal pathologies evident on clinical evaluation, imaging, or laboratory tests. Patients who did not provide written informed consent, were pregnant, or were <6 months postpartum or post-weaning were also excluded.

Sample size calculation

To determine the sample size for evaluating WTP, we used the payment card elicitation format sample size formula established by Mitchell and Carson.³³ The formula is:

$$n = 2 (Z_{1-\alpha/2} + Z_{1-\beta})^2 (V/D)^2$$

where n is the minimum required sample size, $Z_{1-\alpha/2}$ represents the desired confidence interval, $Z_{1-\beta}$

corresponds to the value for power, V denotes the coefficient of variation (ie, ratio of estimated standard deviation of WTP to estimated mean WTP), and D is the designed effect (ie, percentage difference between true WTP and mean of estimated WTP bids). For this study, assuming $\alpha=0.05$, $\beta=0.20$, $V=0.98$ (based on a previous study evaluating WTP for reduced pain intensity among patients with chronic pain),³⁴ and $D=0.20$, the calculated minimum sample size was 470, considering a 20% non-response rate.

To explore preferences for MBI receipt using a DCE design, we applied the rule of thumb described by Orme³⁵ and Johnson and Orme.³⁶ The minimum sample size required for the main effects was calculated as follows:

$$\text{Minimum sample size} = \frac{500 \times (\text{largest levels of attributes})}{(\text{number of scenarios}) \times (\text{number of non opt-out alternatives})}$$

Under conditions of two alternatives, a maximum of four attribute levels and eight scenarios per patient, a minimum of 125 patients was required. Considering two subgroups with different characteristics and a 20% non-response rate, the adjusted minimum sample size was 312.

Survey data

A self-administered questionnaire was used to collect data. An onsite research assistant invited patients in the clinic waiting area to participate in the survey and was available to provide assistance if needed.

Independent variables

The independent variables of the study are as follows:

1. Socio-demographic characteristics: Age, gender, education level, employment status, and personal and family income were recorded.
2. General self-reported health status: A single-item self-rated health scale was used to assess participants' self-rated health, with response options ranging from 'Very good' to 'Very poor'.³⁷ Studies have shown that this scale is associated with patients' WTP for pain treatments.³⁸⁻⁴¹
3. Knowledge and usage of MBIs: Knowledge of mindfulness was assessed using two items adapted from a previous study that investigated health professionals' and health profession students' knowledge of and attitudes toward mindfulness.⁴² The items were as follows: (1) What is the extent of your knowledge of MBIs? (2) Might MBIs be useful for treating chronic pain? Usage of MBIs was determined using two items adapted from a previous study that evaluated employees' preferences for accessing MBIs.⁴³ The items were as follows: (1) Have you ever participated in mindfulness courses? (2) How many mindfulness sessions have you attended?
4. Pain-related characteristics: Pain-related characteristics included pain duration, pain

intensity, disability, and frequency of treatment for chronic LBP. Pain intensity was measured using an 11-point Numeric Rating Scale (NRS).⁴⁴ Disability was assessed using the Roland-Morris Disability Questionnaire.⁴⁵ Pain duration was determined by asking participants to report the number of months they had experienced an ongoing LBP problem. Frequency of treatment was evaluated by asking participants to report how many times they had consulted a doctor or other healthcare professional for LBP in the past 12 months.

5. Satisfaction with current treatment: An item was adapted from a previous study that assessed treatment satisfaction in patients with osteoarthritis and LBP.⁴⁶ This item asked participants to rate their satisfaction with the effectiveness of current treatment in controlling LBP.
6. Monthly expenses on current treatment: Participants were asked to report their monthly expenses with respect to chronic LBP treatment.

Dependent variables

Willingness to pay and preferences for MBIs were the two dependent variables of the current study. The payment card method was used to assess WTP for MBIs.⁴⁷ This approach minimises starting point bias and reduces the high rate of item non-response relative to other elicitation methods.⁴⁸ To ensure that participants were familiar with MBIs, we provided an introduction using a text description and a video before each participant responded to the WTP question (online supplementary Fig). Participants were presented with a range of monetary values (HK\$0 to HK\$10 000) and asked to select the value that best represented the amount they would be willing to pay for MBIs. Additionally, WTP for pain reduction was evaluated using two items adapted from a previous study that assessed WTP for reductions in chronic LBP and neck pain using the payment card method.⁴⁹ These items asked participants to indicate the amount they would be willing and able to pay out-of-pocket per month for their chronic LBP to be reduced by half or entirely eliminated. Participants unwilling to pay any amount were asked to specify their reasons.

Participants were invited to respond to eight choice sets evaluating patient preferences for MBIs. In each choice task, they were asked to select their most preferred option from two hypothetical MBIs with different attribute levels. To ensure comprehension, we included a test scenario with a dominant alternative. If participants did not choose the dominant option, research staff provided clarification. Internal validity was assessed by including a choice set with dominant pairs, in

which one alternative was clearly superior across all attributes.

Statistical analyses

Complete-case analysis was utilised for the dependent variable of WTP for MBIs. The Tobit regression model was used to estimate the associated factors.⁵⁰ This model was selected because WTP measures exhibited left-censoring (ie, a substantial proportion of zero values [46.6% of the sample]; the remaining responses indicated positive WTP for MBIs). Multicollinearity was examined using tolerance and the variance inflation factor (VIF). Continuous variables were presented as mean±standard deviation. The level of statistical significance was set at 5%.⁵¹

Study design

A DCE design was used in this study to examine the preferences of individuals with chronic LBP for MBIs. The DCE comprised four key steps: (1) conducting a literature review to identify conceptual attributes and levels; (2) conducting qualitative research to determine contextual attributes and levels; (3) integrating attributes and levels into choice sets, conducting pilot tests, and refining the questionnaire; and (4) collecting experimental data and performing data analysis.

Systematic review

A systematic review of DCEs examining patient preferences for non-surgical treatments in chronic musculoskeletal pain was conducted.⁵² Studies that used DCEs to evaluate patient preferences for the management of chronic musculoskeletal pain were included.

Qualitative research

Participants with chronic LBP were invited to discuss characteristics of MBIs they might consider valuable when deciding whether to participate in MBIs. These valued characteristics were summarised. A panel of experts from relevant fields (chronic pain, DCE methodology, and psychology) then reviewed and refined the attributes and levels, selecting six to eight attributes for inclusion.

Generation of choice sets, piloting, and refinement of the questionnaire

A D-efficient experimental design was used to generate choice sets, which were randomly assigned to five blocks. A pilot DCE survey was conducted to assess cognitive difficulty and questionnaire length. Twenty patients with chronic LBP participated in the pilot study; they provided feedback and suggestions for improvement.

Experimental data collection and data analysis

Discrete choice experiment data were collected as part of the cross-sectional survey. Respondents' relative preferences were estimated using a mixed logit model with panel specification to adjust for correlated choices within individuals. The coefficients of four variables—'improvement in capacity to perform daily life activities', 'risk of adverse events', 'improvement in pain relief', and 'out-of-pocket costs'—were assumed to be random, following a zero-bounded triangular distribution because the distribution of these random parameters should comprise only positive or negative values. 'Out-of-pocket costs' was specified as a continuous variable in the mixed logit model. The marginal WTP for different levels within each attribute was calculated through division of the negative estimated beta coefficient for each level by the estimated beta coefficient for 'out-of-pocket costs'. The log-likelihood and adjusted McFadden's pseudo-R-squared were calculated to assess model goodness of fit. Higher log-likelihood and adjusted McFadden's pseudo-R-squared values indicate a better-fitting model.^{53,54} Subgroup analyses were conducted to assess preference heterogeneity across characteristics, including age, gender, family monthly income, and education.

Results

Participant characteristics

Of the 589 participants invited, 488 questionnaires were returned, yielding a response rate of 82.9%. The study sample had a mean age of 60.06±12.72 years; 69.5% of the participants were women. The average pain duration was 6.46±8.16 years; mean NRS and Roland-Morris Disability Questionnaire scores were 4.70±2.12 and 7.58±5.63, respectively. Participant characteristics are summarised in Table 1.

Knowledge and usage of mindfulness-based interventions

Regarding knowledge and usage of MBIs, 77.3% of participants were unfamiliar with MBIs, 84.5% were uncertain about their effectiveness in treating chronic LBP, and 94.5% had never attended an MBI session. Knowledge and usage of MBIs are summarised in Table 2.

Willingness to pay for pain reduction and mindfulness-based interventions

The mean monthly WTP values for MBIs to reduce pain by half and to entirely eliminate pain were HK\$684.68±1347.43 and HK\$1102.70±1983.83, respectively. The overall mean WTP for an eight-session MBI programme was HK\$258.75±508.11. Among the participants, 237 were not willing

TABLE 1. Background characteristics of patients (n=488)*

Age, y	60.06±12.72
Gender (n=486)	
Female	338 (69.5%)
Male	148 (30.5%)
Education level (n=481)	
Primary school or below	145 (30.1%)
High school	254 (52.8%)
University or above	82 (17.0%)
Employment status (n=481)	
Full-time	131 (27.2%)
Retired	252 (52.4%)
Housewife	73 (15.2%)
Unemployed or part-time	18 (3.7%)
Indistinguishable (unsure of employment status)	2 (0.4%)
Refused to answer	5 (1.0%)
Personal monthly income, HK\$ (n=480)	
<10 000	339 (70.6%)
10 000-29 999	99 (20.6%)
30 000-49 999	26 (5.4%)
≥50 000	14 (2.9%)
Refused to answer	2 (0.4%)
Family monthly income, HK\$ (n=410)	
<10 000	187 (45.6%)
10 000-29 999	113 (27.6%)
30 000-49 999	65 (15.9%)
50 000-79 999	32 (7.8%)
≥80 000	8 (2.0%)
Refused to answer	5 (1.2%)
General self-reported health status (n=481)	
Very good	1 (0.2%)
Good	49 (10.2%)
Neither good nor poor	307 (63.8%)
Poor	100 (20.8%)
Very poor	24 (5.0%)
Pain-related characteristics	
Duration of pain, y	6.46±8.16
Pain intensity (NRS score 0-10)	4.70±2.12
Disability (RMDQ score 0-24)	7.58±5.63
Frequency of chronic LBP treatment in the past year	6.29±19.67
Satisfaction with current treatments for chronic LBP	
Very satisfied	4 (0.8%)
Satisfied	96 (19.7%)
Neither satisfied nor dissatisfied	144 (29.5%)
Dissatisfied	61 (12.5%)
Very dissatisfied	12 (2.5%)
Not applicable (did not receive treatment)	171 (35.0%)
Monthly expenses on current treatment, HK\$	607.53±1300.12

Abbreviations: HK\$ = Hong Kong dollars; LBP = low back pain; NRS = Numeric Rating Scale; RMDQ = Roland-Morris Disability Questionnaire

* Data are shown as No. (%) or mean±standard deviation

TABLE 2. Knowledge and usage of mindfulness-based interventions among patients (n=488)*

Knowledge of MBIs	
No knowledge at all	377 (77.3%)
Mild understanding	63 (12.9%)
Some knowledge	36 (7.4%)
Well-informed	10 (2.0%)
Very well-informed	2 (0.4%)
Opinions on the helpfulness of MBIs in treating chronic pain (n=483)	
Helpful	48 (9.9%)
Not helpful	27 (5.6%)
Unclear	408 (84.5%)
Usage of MBIs	
Yes	27 (5.5%)
No	461 (94.5%)
No. of MBI sessions attended (n=487)	
0	461 (94.7%)
1-2	10 (2.1%)
3-5	5 (1.0%)
6-8	5 (1.0%)
>8	6 (1.2%)

Abbreviation: MBIs = mindfulness-based interventions

* Data are shown as No. (%)

to pay for MBIs, citing reasons such as limited knowledge of MBIs, unwillingness to spend money on treatment, lack of time, and scepticism regarding MBI effectiveness (online supplementary Table 1).

Results of multicollinearity tests

Multicollinearity among the independent variables was assessed; all tolerance values were >0.25 and VIF values were <4, except for two similar variables (ie, usage of MBIs measured as a binary variable ['Yes' or 'No'] and number of MBI sessions attended). Given that only a small number of participants had attended MBIs, the variable measuring the number of MBI sessions was selected for inclusion in the Tobit regression model (online supplementary Table 2).

Factors associated with willingness to pay for mindfulness-based interventions

Factors associated with WTP for MBIs are summarised in Table 3. Participants with a higher NRS score ($\beta=81.26$; $P=0.003$), family monthly income of \geq HK\$30 000 ($\beta=320.1$; $P=0.035$), high school education ($\beta=242.94$; $P=0.045$), and higher monthly expenses on chronic LBP treatment ($\beta=0.11$; $P=0.003$) were more willing to pay for MBIs. Conversely, participants who did not believe in the usefulness of MBIs ($\beta=-528.88$; $P=0.033$) were less willing to pay for them.

Evaluation of patient preferences for mindfulness-based interventions

Conceptual attributes and levels identified through literature review

In total, 15 eligible studies were included.⁵² The attributes most frequently cited were 'capacity to realize daily life activities', 'risk of adverse events', 'effectiveness in pain reduction', and 'out-of-pocket costs', which were also ranked among the top three most important attributes. Other attributes, cited less frequently but revealing important preferences, included 'treatment frequency' and 'onset of treatment efficacy'.⁵²

Contextual attributes and levels identified through qualitative research

Eight patients with chronic LBP participated in this stage of developing contextual attributes through patient-public involvement. Two focus group interviews were conducted to identify contextual attributes. Valued characteristics of MBIs were summarised, including effectiveness in pain reduction, mood regulation, and sleep improvement; treatment environment; reliability of mindfulness instructors; reputation of the organisation; safety; affordability; flexibility (availability of online resources at all times); availability of follow-up

TABLE 3. Factors associated with willingness to pay for mindfulness-based interventions according to Tobit regression (n=488)*

	β coefficient	SE	P value
Education			
Primary school or below	Reference		
High school	242.94	121.36	0.045
University or above	263.07	170.37	0.123
Family monthly income, HK\$			
<10 000			
10 000-29 999	241.85	131.32	0.066
\geq 30 000	320.1	151.89	0.035
NRS	81.26	27.10	0.003
Monthly expenses on treating chronic LBP	0.11	0.04	0.003
Opinions on the helpfulness of MBIs in treating chronic pain			
Helpful	Reference		
Not helpful	-528.88	248.36	0.033
Unclear	-181.27	160.99	0.260

Abbreviations: HK\$ = Hong Kong dollars; LBP = low back pain; MBIs = mindfulness-based interventions; NRS = Numeric Rating Scale; SE = standard error

* Only significant variables ($P<0.05$) in the regression are shown. The following variables were included in the regression model: age, gender, education, employment, personal and family monthly incomes, general health status, duration of pain (years), number of treatments for chronic LBP in the past year, NRS, Roland-Morris Disability Questionnaire, satisfaction with current treatments for chronic LBP, monthly expenses on chronic LBP treatment (HK\$), knowledge of MBIs, opinions on the helpfulness of MBIs in treating chronic pain, and usage of MBIs

courses; and a group-based course format. Three experts finalised the selection of seven attributes for inclusion (Table 4).

Pilot study of discrete choice experiment

Only minor changes in terminology were applied to attribute levels after the pilot study. This pilot study verified the attributes and their levels, as presented in Table 4. The pilot study also indicated that most patients understood the instructions and attributes. Only minor layout adjustments were made—some participants reported that the font size was too small.

Factors associated with patients' preferences for mindfulness-based interventions

After the exclusion of participants who declined to answer DCE questions due to difficulties in comprehension or unwillingness to respond (n=69, 14.1%) and those with missing DCE responses (n=4, 0.8%), the final participant count was reduced to 415. Among these participants, six (1.4%) did not pass the

dominance test; thus, 409 participants were included in the analysis. The results of the DCE examining factors associated with patients' preferences for MBIs are presented in Table 5. Participants were more likely to choose MBIs with lower out-of-pocket costs, higher levels of pain relief, and

TABLE 4. Attributes and levels included in the final discrete choice experiment

Attribute	Levels
Effectiveness in pain reduction	Mild; Moderate; Large
Capacity to perform daily life activities	Mild; Moderate; Large
Out-of-pocket costs	HK\$1000; HK\$2000; HK\$4000
Treatment frequency	Once per week; Twice per week; Three times per week
Group size	1 person; 2-6 people; 7-12 people; >12 people
Treatment mode	Face-to-face; Online
Risk of adverse events	1%; 2%; 4%

Abbreviation: HK\$ = Hong Kong dollars

TABLE 5. Factors influencing patients' preferences for mindfulness-based interventions according to a mixed logit model (n=409)

	β coefficient	SE	P value	MWTP (95% CI)
Improvement in capacity to perform daily life activities				
Small	Reference			
Moderate	0.198	0.069	0.004	0.102 (0.031-0.172)
Large	0.36	0.088	<0.001	0.185 (0.097-0.275)
Risk of adverse events				
0.1%	Reference			
0.5%	0.112	0.068	0.097	0.058 (-0.009 to 0.125)
1%	0.034	0.091	0.710	0.017 (-0.074 to 0.109)
Improvement in pain relief				
Small	Reference			
Moderate	0.844	0.072	<0.001	0.433 (0.365-0.505)
Large	1.572	0.101	<0.001	0.808 (0.712-0.908)
Out-of-pocket costs	-1.947	0.079	<0.001	
Treatment frequency				
Once per week	Reference			
Twice per week	-0.086	0.068	0.210	-0.044 (-0.111 to 0.024)
Three times per week	0.032	0.087	0.710	0.017 (-0.072 to 0.105)
Group size				
1 person	Reference			
2-6 people	-0.035	0.086	0.684	-0.018 (-0.104 to 0.07)
7-12 people	-0.157	0.085	0.064	-0.081 (-0.166 to 0.004)
>12 people	-0.106	0.108	0.326	-0.055 (-0.166 to 0.054)
Treatment mode				
Online	Reference			
Face-to-face	0.34	0.068	<0.001	0.174 (0.107-0.241)

Abbreviations: 95% CI = 95% confidence interval; MWTP = marginal willingness to pay; SE = standard error

greater improvements in capacity to perform daily life activities. Face-to-face treatment modes were preferred over online formats. Regarding model fit, the log-likelihood and adjusted McFadden's pseudo-R-squared for the mixed logit model were -1502.8 and 0.330, respectively.

Subgroup analyses

The results of subgroup analyses are presented in online supplementary Tables 3 to 6. Preferences differed substantially between age-groups, family income levels, and education levels, but showed no gender-based significant differences. Improvement in the capacity to perform daily life activities was an important attribute when selecting MBIs for older participants, those with lower family monthly income, and those with higher education level; this attribute was not important for younger participants and those with higher family monthly income and lower education level. Group size was an important attribute for younger participants and those with higher family monthly income but not for older participants or those with lower family monthly income. Younger participants and those with higher family monthly income preferred MBIs with a group size of one person, rather than 7 to 12 people. Treatment mode was an important attribute for participants with lower family monthly income and higher education level but not for those with higher family monthly income and lower education. Participants with lower family monthly income and higher education preferred face-to-face treatment over online treatment. Furthermore, participants with lower family monthly income and older age placed greater priority on out-of-pocket costs for MBIs, as indicated by substantially larger regression coefficients for out-of-pocket costs in subgroup analyses.

Discussion

Consistent with previous studies,^{34,49} we found that patients with higher pain scores, higher family income, and higher monthly expenses on LBP treatment were more willing to pay for MBIs. Comparison of WTP for MBIs in this study to a national survey on WTP for complementary and alternative medicine treatments in England⁵⁵ revealed that participants in the present study had a lower WTP. One possible explanation for this discrepancy is that complementary and alternative medicine practices, such as acupuncture and herbal medicine, are more established in some cultures; MBIs are relatively new and may be less familiar to our study population.

In Hong Kong's public healthcare system, physiotherapy and occupational therapy for chronic pain cost HK\$80 per visit. If MBIs followed this

fee structure, eight sessions would cost a total of HK\$640. However, the current WTP for MBIs is HK\$258.75, approximately 40% of this cost. Notably, WTP was calculated in a population with limited knowledge of MBIs. Increased awareness of their efficacy may enhance WTP, aligning it more closely with the existing fee structure.

Our study evaluating preferences for MBIs confirmed previous findings that chronic pain treatment preferences are significantly influenced by treatment effectiveness and out-of-pocket costs.^{52,56,57} However, in contrast to prior studies,^{52,56,57} we found that the risk of adverse events was not an attribute considered important by patients with chronic LBP during MBI selection. One possible explanation is that the risk of adverse events from psychological interventions is lower and less severe than the risk of such events associated with pharmacological or exercise-based interventions.⁵⁸⁻⁶⁰ Additionally, we observed that treatment mode constituted an important attribute of MBIs, consistent with investigations of exercise therapy preferences among patients with chronic pain.³⁹

Our study focused on assessing WTP and preferences for MBIs in chronic LBP, following the socio-psychobiological model that prioritises social and psychological factors over biological factors.^{27,28} This approach provides insights into the socio-economic backgrounds of patients with chronic LBP and highlights their pain experiences and access to pain management strategies, emphasising the social dimension of chronic pain management. Mindfulness-based interventions, as a psychological and group-based approach, equip individuals with skills to manage psychological distress related to chronic LBP while fostering social support and connectivity through group interaction.

The current approach to chronic pain care often results in the underutilisation of high-value care (eg, psychological therapies) and overuse of low-value care, including invasive procedures and opioid medications.^{4,28} The adoption and implementation of a socio-psychobiological model could serve as an effective strategy for establishing pain care systems that prioritise high-value care.^{27,28}

Despite the recognised value of MBIs in chronic pain management, their limited integration into clinical practice may be attributed to patients' unfamiliarity and lack of knowledge about these interventions, coupled with insufficient investment in primary care resources. Additionally, economic incentives often favour high-volume practice models in primary care settings.²⁸ Thus, there is an urgent need for educational initiatives to enhance awareness and knowledge of MBIs among individuals with chronic LBP, as well as increased investment in primary care resources.

This study provided critical insights into the

integration of MBIs for chronic LBP management within the Hong Kong public healthcare system. In the context of Hong Kong's public healthcare settings, we propose integrating MBIs as an intermediary step between primary care and specialist care for chronic LBP management. Primary care providers could identify patients experiencing psychological and social distress who may benefit from MBIs and facilitate their referral for MBI treatment. Patients whose condition does not improve after an MBI could then be referred to specialist clinics. This approach could substantially reduce waiting times for chronic LBP treatment within the Hong Kong public healthcare system.

Strengths and limitations

This study has several strengths. To our knowledge, it is the first investigation to assess WTP and preferences for MBIs in chronic pain management; it included a comprehensive list of independent variables covering key factors that influence WTP. Additionally, the study utilised a mixed logit model to consider preference heterogeneity within the sample. Furthermore, a rigorous systematic review and qualitative interviews informed the attributes and levels used in the DCE. However, certain limitations should be acknowledged. First, participants' limited knowledge of MBIs may have influenced WTP and preferences. Second, participants were recruited through convenience sampling from outpatient clinics in two Hong Kong public hospitals, which may have introduced selection bias that skewed the sample composition and limited its representativeness. This limitation may affect the generalisability of the findings beyond the specific group sampled. Third, the cross-sectional design of the study precluded establishment of causal relationships between WTP and preferences for MBIs, as well as associated factors.

Although WTP and preferences are essential considerations for MBI implementation, they should not be the sole determinants. Factors such as cost-effectiveness, impact on quality of life, and infrastructure availability must also be considered. Further research is required to provide additional evidence for implementation within the Hong Kong public healthcare system. Nevertheless, this study established a rationale for assessing WTP and preferences for MBIs, with a methodology that can be adapted for healthcare evaluations in other countries.

Conclusion

This study highlights the need to increase awareness of MBIs for chronic LBP management within the public healthcare system. The findings indicate low WTP among participants, suggesting a gap in

understanding and utilisation. Notably, individuals with higher pain scores, higher family income, and higher monthly LBP treatment expenses, as well as a stronger belief in MBIs, were more willing to pay for such interventions; these observations indicate targeted demand. Patient preferences favoured lower costs, face-to-face treatment, and enhanced effectiveness. These findings provide practical insights for designing patient preference-aligned MBIs and will serve as valuable references for future healthcare evaluations.

Author contributions

Concept or design: M Zhu, PKH Mo, RWS Sit.

Acquisition of data: M Zhu.

Analysis or interpretation of data: All authors.

Drafting of the manuscript: M Zhu.

Critical revision of the manuscript for important intellectual content: All authors.

All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

As an editor of the journal, RWS Sit was not involved in the peer review process. Other authors have disclosed no conflicts of interest.

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Ethics approval

This research was approved by the Joint Chinese University of Hong Kong–New Territories East Cluster Clinical Research Ethics Committee, Hong Kong (Ref. No.: 2022.279). The research was conducted in accordance with the Declaration of Helsinki. All participants provided written informed consent before completing the questionnaire.

Data availability

The datasets generated during and/or analysed during the current study are not publicly available due to ethics restrictions. A request for the code can be made directly to the corresponding author.

Supplementary material

The supplementary material was provided by the authors and some information may not have been peer reviewed. Accepted supplementary material will be published as submitted by the authors, without any editing or formatting. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by the Hong Kong Academy of Medicine and the Hong Kong Medical Association. The Hong Kong Academy of Medicine and the Hong Kong Medical Association disclaim all liability and responsibility arising from any reliance placed on the content. To view the file, please visit the journal online (<https://doi.org/10.12809/hkmj2311445>).

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