



## A self-administered moxibustion-cum-massage intervention for older adults with chronic pain in the community: A randomized controlled trial

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### ABSTRACT

**Objectives:** To determine the effectiveness of a simple, self-administrable moxibustion-cum-massage intervention for relieving chronic pain and improving psychological well-being for older adults in the community.

**Design:** A randomized controlled trial.

**Setting:** Seventy-eight participants with chronic pain were randomly assigned to the intervention and waitlist control groups.

**Interventions:** Participants received two moxa sticks a day to use the moxibustion-cum-massage procedure with the help of trained volunteers or caregivers for five consecutive days.

**Main outcome measures:** Participants' pain level, sleep quality, depression and subjective well-being were measured before the intervention (T0), immediately after the intervention (T1), and one week after the intervention (T2).

**Results:** Repeated measures ANOVA revealed a significant group  $\times$  time interaction effect in subjective well-being with a medium effect size. Regarding within-group effects in the intervention group at post-intervention (T1), the subjective pain level was significantly reduced with a small effect size, while sleep quality and depression significantly improved with large effect sizes. The control group showed no significant within-group effects in these variables. Maintenance effects at follow-up (T2) were not significant.

**Conclusion:** Despite the short intervention timeframe of five days, the study revealed preliminary evidence that the moxibustion-cum-massage intervention can be an effective, self-administrable pain relief regime for older adults. A longer period of intervention time is suggested for future studies.

### 1. Introduction

Over 60 % of older adults living in the community have experienced chronic musculoskeletal pain, and although its prevalence has increased in recent years, it remains undertreated.<sup>1</sup> Chronic pain is defined as persistent or recurrent pain lasting longer than three months.<sup>2</sup> The prevalence of chronic pain among Hong Kong adults is around 35 %, and higher among older people at above 40 %.<sup>3</sup> Chronic musculoskeletal pain increases the risk of mobility limitation for elderly people, leading

to physical and cognitive functional disabilities.<sup>4,5</sup> However, chronic pain management is often inadequate, particularly among older adults, who often endure pain as part of growing old and wish to avoid being labeled a "complainer".<sup>6</sup>

Poorly managed pain may influence sleep quality, cause distress and depression, and can result in low subjective well-being. Ferretti et al.<sup>7</sup> investigated the sleep quality of 385 older Brazilian citizens and found that the elderly enduring chronic pain reported significantly poorer sleep quality than those without pain. The association between chronic

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pain and depressive symptoms has been supported by a longitudinal cohort study of 10,065 community-dwelling older adults by Whitlock et al.<sup>8</sup> A study by Tse et al.<sup>9</sup> indicated that chronic pain was positively associated with geriatric depression while negatively influencing psychological well-being.

There has been a rising demand of Traditional Chinese Medicine (TCM) use in recent years in the elderly Chinese population.<sup>10</sup> Massage, Qigong, and acupuncture are common ways to manage chronic pain in various body parts, such as the neck and shoulder.<sup>11–14</sup> As with acupuncture and acupressure, moxibustion has been used as a TCM intervention for over 2000 years in helping to alleviate pain. It is usually done by utilizing the heat and energy generated through burning dried moxa plants (*Artemisia vulgaris*, mugwort) one to two centimeters above parts of the body to regulate the effective functioning and energy flow of the median or the channels of the body.<sup>15</sup>

Although moxibustion is commonly practiced in mainland China, Hong Kong, and other Chinese communities,<sup>16</sup> there has been little relevant research on the effectiveness of moxibustion in managing chronic pain. Relevant systematic reviews showed only a tiny number of randomized controlled trials (RCTs) on the effectiveness of moxibustion in pain management with a high risk of bias and low methodological quality, such as intention-to-treat approach was not used in data handling, indicating a need for more rigorous studies.<sup>17–19</sup> Results from a meta-analysis indicated that moxibustion together with other active treatment, such as massage, had better effects on pain relief than treatment alone.<sup>17</sup> However, most existing research has been conducted in mainland China and administered in TCM hospitals where moxibustion is being provided and performed by TCM doctors on their patients, with few relevant studies found in other community contexts. Since moxibustion can be self-administered via suitable devices, it is important to explore its effectiveness in the community. Moreover, pain levels and quality of life were the usual outcomes of the existing studies on the effectiveness of moxibustion, while its ability to affect participants' psychological well-being was unknown, though the significant influence of pain on geriatric depression and psychological well-being has been supported.<sup>9</sup> Therefore, this study explored the effectiveness of a self-administered moxibustion-cum-massage intervention for older adults with chronic pain living in the community of Hong Kong. The study aimed to explore whether this easy to administer moxibustion-cum-massage intervention could 1) reduce pain and depression, and 2) improve sleep quality and subjective well-being.

## 2. Methods

### 2.1. Study design

This study was a randomized waitlist-controlled trial. From June 2016 to the end of 2018, the trial was conducted in a spacious room with ample ventilation in a community in Hong Kong. Eligible participants were randomly assigned to either the intervention or the control group by computer-generated random numbers. Participants were required to fill out a questionnaire at four different time points: a week before intervention (T0<sub>a</sub>), immediately before the intervention (T0<sub>b</sub>), immediately after the intervention (T1), and a week after intervention to test maintenance effect (T2). The preintervention data (T0) was considered by the mean of data from T0<sub>a</sub> and T0<sub>b</sub>. Ethical approval (Reference no.: UW 16-093) was obtained from the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (HKU/HA HKW IRB).

### 2.2. Sample size calculation

With reference to the studies of Lee et al.<sup>20</sup> and Walach et al.,<sup>21</sup> the effect size for the moxibustion-cum-massage program was expected to be small to medium. With a power of 0.85, alpha of 0.05, a sample size of 54 was needed (G\*Power 3.1). With an attrition rate of around 25 %,

approximately 72 participants with chronic pain were expected.

### 2.3. Participants

Participants were recruited through advertisements in the local media and in a community rehabilitation network serving chronic patients of the Hong Kong Society for Rehabilitation, a non-profit organization. Older adults aged above 55 who had suffered from musculoskeletal pain for more than three months and could understand oral and written Chinese were included. People were excluded if they: 1) were diagnosed with dementia or not able to communicate pain intensity and location with simple language; 2) had skin-related complications caused by severe diabetes or skin problems such as skin diseases, open wounds, allergies and infections; 3) had coagulopathies or were taking anti-coagulants, as heat was generated from the moxibustion on the skin of participants to stimulate blood flow; or 4) were undergoing another medical or psychosocial management study.

### 2.4. Procedures

Consent was gained from all participants before the assessment and the intervention. At each time point, participants were asked to fill out a questionnaire. After the pre-intervention measurement, participants in the intervention group were given five consecutive days moxibustion-cum-massage intervention with the help of trained volunteers or their caregivers free of charge. The control group received no treatment during the period of the study. Those still interested were offered the same intervention after the follow-up measurement.

### 2.5. Intervention

The moxibustion intervention was delivered to participants with the help of trained volunteers or caregivers. Participants received a moxibustion-cum-massage intervention for five consecutive days in a social service unit during the intervention period. Each participant received two moxa sticks a day, lasting approximately an hour and a half. A lit moxa stick encased in a rollable moxibustion device (a simple hand-held massage roller called Soothing Bliss Moxa Stick, available in Hong Kong) was used to gently massage the painful body part of the participant with a piece of therapeutic cloth on top as insulation for excessive heat from the device. The trained volunteers demonstrated how to operate the device one-by-one at the beginning of each session, and then the participants conducted it by themselves; volunteers or caregivers provided help when needed. The intervention was conducted in a spacious room with ample ventilation to ensure the smoke generated from the burning of moxa would be vented out. Fig. 1 presents part of the scene where volunteers were introducing how to use the device. All participants were advised to take thirty minutes break from eating and exercise, and to shower before and after treatment. They were also advised to drink water before and after the treatment.

### 2.6. Measures

The effectiveness of the moxibustion-cum-massage intervention was assessed by the primary outcome of pain level and by other outcome measurements of sleep quality, depression, and subjective well-being.

#### 2.6.1. Pain level

Two items measuring the current subjective pain level and the highest level of pain within the last week from the Brief Pain Inventory (BPI)<sup>22</sup> were adopted. Each item was rated from 0 to 10, where 0 refers to "no pain" and 10 refers to "extreme pain". The Chinese version of BPI has been used widely to measure chronic pain and has shown good reliability and validity.<sup>23</sup>



Fig. 1. Demonstrations on how to use the device by trained volunteers.

### 2.6.2. Sleep quality

As with the study of Hofmeister et al.,<sup>24</sup> sleep quality was measured by one item asking, “how was your overall sleep quality in the past week?” with four options ranging from “very good” to “very poor”.

### 2.6.3. Depression

The Geriatric Depression Scale (GDS)<sup>25</sup> was used to measure participants' depression. GDS contains fifteen “yes” or “no” questions regarding mood over the past week. The Chinese version of GDS has been validated as a reliable instrument for measuring depression in the elderly.<sup>26</sup> A cut-off of  $\geq 6$  was adopted to screen for diagnostic depression.<sup>27–29</sup>

### 2.6.4. Subjective well-being

One item from the Holistic Well-being Scale (HWS)<sup>30</sup> measuring spiritual well-being was adopted and a similar item measuring overall happiness was generated. The two items were rated on a 10-point scale, with higher scores indicating greater well-being.

## 2.7. Data analysis

All analysis was conducted using the IBM Statistical Package for the Social Sciences (IBM SPSS version 24, IBM Inc., USA). Continuous data were presented by the mean and standard deviation (SD). Categorical data were presented by number of cases and percentages. Demographics and baseline outcome measures were compared between the intervention and control groups to test homogeneity. Independent samples t-tests or  $\chi^2$ -tests were used.

Paired-sample t-tests were conducted to determine within-group effects (T0 vs. T1 and T0 vs. T2) on continuous variables. Repeated measures univariate analysis of variance models (ANOVA), including group  $\times$  time interactions, were constructed to test for between-group differences. The within-group effect size (ES) was calculated by Cohen's  $d$ <sup>31</sup>; where values of 0.2, 0.5, and 0.8 were applied to determine small, medium, and large effect sizes, respectively. The between-group ES was calculated by partial eta square ( $\eta^2$ ), ranging from 0 to 1, with the value of 0.01 being small, 0.08 being medium, and 0.14 being large effect sizes.<sup>32</sup> Wilcoxon signed-rank tests were used to compare categorical data change at different time points. The intention-to-treat

approach was adopted in the data analysis.

## 3. Results

### 3.1. Sample

An online screening questionnaire was completed by 201 adults suffering from chronic pain, and 190 completed online surveys were recorded. The majority of the participants were between 55 and 65 years. After checking the screening questionnaire, 122 eligible potential participants were contacted via telephone to verify their availability. The assessment questionnaire was completed at least once by 40 participants from the intervention group and 38 participants from the control group. Therefore, a total of 78 participants were included in the study. Fig. 2 presents the CONSORT diagram of the participant flow.

### 3.2. Baseline characteristics of participants

As shown in Table 1, the mean age of all participants was 59.21 years (SD = 3.84). The majority were female ( $n = 69$ , 88.5 %), suffering from knee pain ( $n = 57$ , 73.1 %). More than half of them reported poor sleep quality ( $n = 43$ , 55.1 %) and diagnostic depression ( $n = 40$ , 51.3 %). There was no statistical difference in age, gender, and type of pain, as well as the baseline measurement on the four outcomes between the intervention group and the control group (all  $p > 0.05$ ).

### 3.3. Adherence to intervention

As shown in Fig. 2, 38.8 % of the screened older adults enrolled in the study. The whole five-session moxibustion-cum-massage intervention was successfully and safely conducted, with no significant adverse events reported. Participants in the intervention group attended an average of 4.6 out of 5 sessions. The overall attendance rate was 92 %. Detailed reasons for absence are shown in Fig. 2.

### 3.4. Effectiveness of the moxibustion-cum-massage intervention

Forty subjects in the intervention group and 38 subjects in the control group were included in the intention-to-treat analysis (Tables 2 and

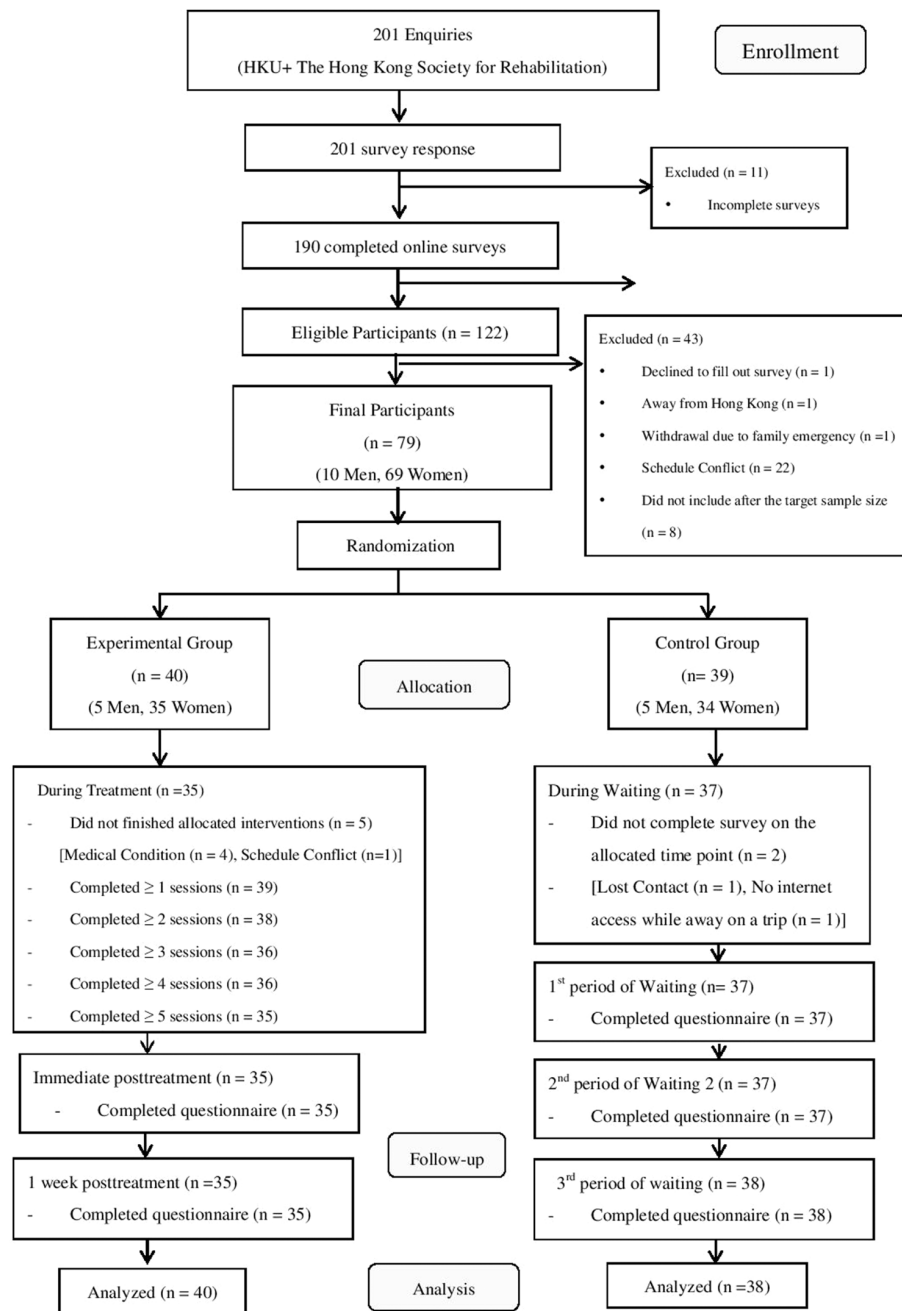


Fig. 2. CONSORT diagram of the participants flow.

3). Considering the within-group effect, the pain of the participants in the intervention group reduced significantly immediately after the intervention (T1) but not in the control group ( $p > 0.05$ ), including the current average pain level ( $p < 0.01$ ,  $d = -0.37$ ) and the worst pain level in the past week ( $p < 0.01$ ,  $d = -0.38$ ). The ES was small. Diagnostic depression reduced significantly in the intervention group ( $p < 0.05$ ,  $d = -0.76$ ) but not in the control group ( $p > 0.05$ ) at post-intervention assessment (T1). The ES was large. Sleep quality improved significantly in the intervention group ( $p < 0.01$ ,  $d = 0.93$ ) but not in the control group ( $p > 0.05$ ). The ES was large. However, those within-group effects were not significant one week after the intervention (T2; all  $p > 0.05$ ).

For the between-group effect, a significant group  $\times$  time interaction

was found in participants' well-being, including overall happiness ( $F = 3.74$ ,  $p < 0.05$ ,  $\eta^2 = 0.09$ ) and spiritual well-being ( $F = 3.67$ ,  $p < 0.05$ ,  $\eta^2 = 0.09$ ). This result indicated that over time, overall happiness and spiritual well-being significantly increased in the intervention group rather than in the control group. The ES was medium.

#### 4. Discussion

This exploratory study presented the effectiveness of a moxibustion-cum-massage intervention for older adults with chronic pain living in the community in a Chinese society of Hong Kong. Results showed that this simple intervention was feasible, could be self-administered, and was conducive to reducing pain and depression while improving sleep



**Table 1**  
Characteristics of participants at baseline<sup>1</sup>.

	Total (n = 78)	Experimental group (n = 40)	Control group (n = 38)	p
<b>Age (years)</b>	59.21 ± 3.84	59.25 ± 3.77	59.16 ± 3.96	0.92 <sup>a</sup>
<b>Gender</b>				1.00 <sup>b</sup>
<b>Female</b>	69 (88.5 %)	35 (87.5 %)	34 (89.5 %)	
<b>Male</b>	9 (11.5 %)	5 (12.5 %)	4 (10.5 %)	
<b>Type of pain</b>				0.69 <sup>b</sup>
<b>Knee</b>	57 (73.1 %)	30 (75 %)	27 (71.1 %)	
<b>Shoulder</b>	21 (26.9 %)	10 (25 %)	11 (28.9 %)	
<b>Levels of pain</b>				
<b>Average pain</b>	5.31 ± 1.90	5.73 ± 1.78	4.87 ± 1.94	0.05 <sup>a</sup>
<b>Worst pain</b>	5.92 ± 2.17	6.38 ± 2.07	5.43 ± 2.19	0.06 <sup>a</sup>
<b>Well-being</b>				
<b>Overall</b>	6.67 ± 1.43	6.68 ± 1.47	6.67 ± 1.41	0.99 <sup>a</sup>
<b>Spiritual</b>	6.49 ± 1.53	6.33 ± 1.73	6.67 ± 1.27	0.32 <sup>a</sup>
<b>Sleep quality</b>				0.16 <sup>b</sup>
<b>Very poor</b>	5 (6.4 %)	5 (12.5 %)	0 (0 %)	
<b>Poor</b>	38 (48.7 %)	21 (52.5 %)	17 (44.7 %)	
<b>Good</b>	30 (38.5 %)	11 (27.5 %)	19 (50.0 %)	
<b>Very good</b>	5 (6.4 %)	3 (7.5 %)	2 (5.3 %)	
<b>Depression</b>	40 (51.3 %)	21 (52.5 %)	19 (50 %)	1.00 <sup>b</sup>

Note. 1. Values are presented as mean ± standard deviation or n (%); a = independent sample t-test; b = chi-square test.

quality and subjective well-being, with effect sizes ranging between small and large. These results are in line with the systematic review by Chen et al.<sup>17</sup> on the effectiveness and safety of moxibustion for chronic low back pain, while also providing empirical evidence for chronic knee and shoulder pain. This study is one of the first to explore the effectiveness of a moxibustion-cum-massage intervention on sleep quality, depression, and subjective well-being of older adults with chronic pain living in the community. The results were in accordance with previous research showing that moxibustion treatment can improve sleep quality and depression.<sup>33,34</sup>

According to TCM theory, moxibustion warms the interior and dissipates the cold, resuscitates *yang* (i.e., rebalances a ying-yang imbalance in which yang is deficient), regulates and resolves stasis, and warms and activates the meridians.<sup>35</sup> The heat energy generated by moxibustion activates local specific receptors, heats sensitive immune cells and shock proteins, and activates the function of warming and communication, resulting in a variety of comprehensive effects.<sup>36</sup> Massage also helps reduce pain or recovery from painful stimuli by stimulating pressure receptors.<sup>37</sup> In this way the moxibustion-cum-massage intervention effectively reduced pain and improved the sleep quality

**Table 2**  
Intervention effect on levels of pain and well-being.

	Intervention (n = 40)					Control (n = 38)					F <sup>b</sup>	p	η <sup>2</sup>
	T0	T1 <sup>a</sup>	d1	T2 <sup>a</sup>	d2	T0	T1 <sup>a</sup>	d1	T2 <sup>a</sup>	d2			
<b>Pain</b>													
<b>Average</b>	5.73 ± 1.78	4.76 ± 2.78**	-0.37	5.08 ± 2.67	-0.29	4.87 ± 1.94	4.84 ± 2.26	-0.01	4.87 ± 2.16	0.00	2.02	0.14	0.05
<b>Worst</b>	6.38 ± 2.07	5.30 ± 3.09**	-0.38	5.40 ± 2.76	-0.40	5.43 ± 2.19	5.42 ± 2.42	-0.01	5.08 ± 2.20	-0.16	1.97	0.15	0.05
<b>Well-being</b>													
<b>Overall</b>	6.68 ± 1.47	6.88 ± 1.48	0.14	6.41 ± 1.54	-0.17	6.67 ± 1.41	6.18 ± 1.67*	-0.31	6.42 ± 1.48	-0.17	3.74	0.03*	0.09
<b>Spiritual</b>	6.33 ± 1.73	6.59 ± 1.87	0.14	6.23 ± 1.78	-0.06	6.67 ± 1.27	6.13 ± 1.82*	-0.33	6.29 ± 1.52	-0.27	3.67	0.03*	0.09

Note. a = within-group effect by paired sample t-test; b = between-group effect by repeated measures analysis of variance; \*p < 0.05; \*\*p < 0.01.

of older adults. By alleviating musculoskeletal pain, psychological health may also improve.<sup>38</sup>

Although the effects did not maintain their significance a week after the intervention, this novel, easy, and safe to use method can be self-administered by caregivers or by patients themselves for pain management, combining massage and moxibustion. This self-administered intervention can result in pain reduction and an improvement in psychological well-being among older adults living in the community.

There were several limitations of this research, one of which was the short time frame of the study. A longer time frame is suggested for future studies. Furthermore, the participants of this trial were predominantly female; thus, a bias may exist, despite the adoption of a randomized controlled design. Due to the nature of this study, it was not blinded, which may induce performance bias. Also, Chinese people have a general acceptance of moxibustion as an effective TCM intervention in health promotion, meaning that the expectancy effect cannot be underestimated. Thus, testing this in communities without a general TCM knowledge would be needed. A further limitation was that the body-mind associations between pain and psychological well-being were not explored because of the inadequate sample size.

## 5. Conclusion

This study has shown that the moxibustion-cum-massage is a promising intervention in reducing chronic pain and improving psychological well-being in older adults in a Chinese community. A longer duration of use is suggested to maintain its positive effects.

## CRediT authorship contribution statement

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by MXCY, JSMC, BHPL and SG. PPYL, LPY, CLWC, and SN helped in the conceptualization and methodology. The first draft of the manuscript was written by MXCY and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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**Table 3**  
Intervention effect on categories of depression and sleep quality<sup>1</sup>.

		Intervention group (n = 40)		Control group (n = 38)	
		T0-T1	T0-T2	T0-T1	T0-T2
Depression	Z	-2.24	-1.18	-1.63	-1.00
	P	0.03*	0.24	0.10	0.32
	D	-0.76	-0.38	-0.55	-0.33
Sleep quality	Z	2.66	0.52	0.31	0.24
	P	0.008**	0.60	0.76	0.81
	D	0.93	0.17	0.10	0.07

Note. 1 = Results of Wilcoxon signed-rank test; \*p < 0.05; \*\*p < 0.01.

agencies in the public, commercial, or not-for-profit sectors.

### Conflict of Interest statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. No conflict of interest exists in the submission of this manuscript, and the manuscript has been approved by all authors for publication. I would like to declare on behalf of my co-author that the work described was original research that has not been published previously, and not under consideration for publication elsewhere, in whole or in part.

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### Clinical Trial Registration Number and name of trial register

The study was registered in the Hong Kong University Clinical Trial Register (Registration no. HKUCTR-2056).

### Declarations of interest

None.

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