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The effectiveness of an integrated pain management program for older persons and staff in nursing homes

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ABSTRACT

This study examined the effects of an 8-week integrated pain management program (IPMP) on enhancing the knowledge and attitude toward pain management among staff; and improving the pain, quality of life, physical and psychosocial functions, and use of non-drug therapies for the elderly in nursing homes. Nursing home staff ($N = 147$) and residents ($N = 535$) were recruited from ten nursing homes. Nursing homes were randomly assigned into an experimental group ($N = 296$) with IPMP or control group ($N = 239$) without IPMP. The IPMP consisted of pain education for staff and physical exercise and multisensory stimulation art and craft therapy for residents. Data were collected before and after the IPMP. The staff demonstrated a significant improvement in knowledge and attitude to pain management, with the survey score increasing from 8.46 ± 3.74 to 19.43 ± 4.07 ($p < 0.001$). Among the residents, 74% had experienced pain within the previous 6 months, with pain intensity of 4.10 ± 2.20. Those in the experimental group showed a significantly better reduction in pain scores than the control group, from 4.19 ± 2.25 to 2.67 ± 2.08 ($p < 0.001$). Group differences were also found in psychological well-being, including happiness, loneliness, life satisfaction and depression ($p < 0.05$), and the use of non-drug methods ($p < 0.05$). These results suggested that IPMP is beneficial for staff, and is effective in reducing geriatric pain and negative impacts. Management support and staff involvement in the program are important for its long-term continuation.

1. Introduction

The increase in the aging population is accompanied by greater demand for long-term healthcare services. It is estimated that more than 40% of older adults aged 65 or above will spend time in a nursing home (Sandberg et al., 2001). Pain is commonly found among older persons, particularly those living in nursing homes (Ferrell et al., 1990; Hollenack and Zarowitz, 2006). Most aged-related diseases, such as arthritis, rheumatism and neuropathy, cause chronic pain and functional disability (Ferrell et al., 1990; Hurley et al., 2003; Chung and Wong, 2007). Without proper pain management, nursing home residents will suffer from many aspects of disabilities, resulting in deterioration in their health condition and quality of life.

Pain is a multidimensional phenomenon with biological, psychological, social and spiritual issues needing to be considered (Clark, 1999). Besides the pain itself, older persons suffer from functional disability. Consequently, they may become more dependent and inactive. With a lack of understanding of their pain, they become anxious, depressed and hopeless, which further compromises their quality of life. A common concept among older persons is that oral analgesics are harmful, even though they are prescribed by physicians. They refuse to take drugs, or take them only once they cannot tolerate the pain any longer. However, oral analgesics usually need time to be effective in the body; older persons thus have to suffer pain for several hours. On the social aspect, older persons living in nursing homes may not see their family and friends frequently. As a result, they feel lonely and unhappy, which probably makes them dwell more on their pain and health problems (Weiner et al., 1999). In general, life in a nursing home is relatively boring compared with that in the community. Even though a variety of activities are organized by the staff in nursing homes, it seems that only the more active and physically independent residents like to participate.

In order to break down the negative consequences of pain and environmental insufficiency in the nursing home, an effective, feasible and multidimensional pain management program should be promoted. The multidisciplinary approach to pain management has been highly recommended in recent decades (Lorig et al., 1999; Becker et al., 2000; Corran et al., 2001; Dysvik et al., 2004; Gallagher, 2005). It consists of an approach to address different aspects of pain and works as an integrated model aiming to encourage active participation and enhance self-coping capacity for controlling pain.

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Physical exercise is an effective pain management approach in reducing pain, increasing physical mobility or preventing physical decline, and improving psychosocial well-being and quality of life (Blackham et al., 2008; Callahan, 2009; Yumin et al., 2010; Kim et al., 2011; Tse et al., 2011). Physical exercise can be regarded as a self-management skill that people can perform in their own time without using healthcare resources in the longer run. For some elderly people, their condition is too difficult to perform general exercises, thus easy and tailor-made exercises are needed (Hurley et al., 2003; Neame and Doherty, 2005).

The use of multisensory elements for the management of dementia and chronic pain is called 'Snoezelen', a term combining two Dutch words meaning 'to sniff' and 'to doze' (Schofield, 1996). The concept of Snoezelen was to stimulate all of the primary senses: vision, hearing, touching, taste, and smell simultaneously. It aimed at facilitating rest and helping to overcome fatigue. It creates a peaceful environment and sense of safety for the elderly (Kewin, 1991). Multisensory therapy has been used in relaxation, pain reduction, and improving quality of life (Schofield and Hutchinson, 2002), and it is inexpensive (Keefe et al., 1992). Likewise, the use of art and craft therapy taps into the creative process, which allows individuals to express their deepest emotions (Malchiodi, 1999; Johnson and Sullivan-Marx, 2006) and improves psychological well-being, quality of life and physical symptoms including pain (Favara-Scacco et al., 2001; Nainis et al., 2006; McCaffrey, 2007). Tse and Ho (2010) showed that a multisensory stimulation art and craft program were effective in reducing pain, enhancing psychological well-being, and increasing the use of non-drug therapies for the elderly.

Although pain is common among nursing home residents, they are at risk of not having appropriate assessment and treatment (Achterberg et al., 2010). The professional staff such as nurses and social workers may have learnt pain management, yet, their heavy workloads easily make them underestimate the number and severity of geriatric pain problems. Western and local nurses are found to have inadequate knowledge and negative attitudes toward pain management (Brown et al., 1999; Tse and Chan, 2004; Carr, 2007). Also, front-line healthcare professionals, including health workers and personal care workers, provide direct care to nursing home residents and spend more time with them. However, they may only receive basic education and not have adequate knowledge and training on pain management (Allcock et al., 2002; Jones et al., 2004). In addition, the majority of older persons prefer not to use oral drugs for pain relief (Tse et al., 2010), thus the use of both drug and non-drug strategies is promoted among staff and residents. The nursing home staff plays an important role in pain management care. It is important for them to understand pain and how to manage it.

Therefore, the objectives of the present study were to provide an integrated pain management program (IPMP) to nursing home staff and residents, consisting of pain education training for staff and a physical exercise program and multisensory stimulation art and craft therapy for elderly residents. We investigated the effect of the IPMP on increasing the knowledge and attitude to pain management among staff, and examined it effects on reducing pain, improving physical and psychological functions, enhancing quality of life and the use of non-pharmacological methods among nursing home residents.

2. Materials and methods

2.1. Participants

Staff and older persons from 10 local nursing homes were recruited. The staff included healthcare professionals of various ranks, including registered nurses, enrolled nurses and healthcare assistants. Older persons that fit the inclusion criteria of being aged 60 or above, having experienced pain in the previous 6 months, being able to communicate in Chinese, and being oriented to time and place were invited to join the study. Those with cognitive impairment, a history of mental disorders, physically too weak to perform exercise, and bed-bound were excluded. Fig. 1 shows the CONSORT flow diagram of the study. Written informed consent was given to each staff member and older person before the study commenced. The study was approved by the ethics committee of the local university.

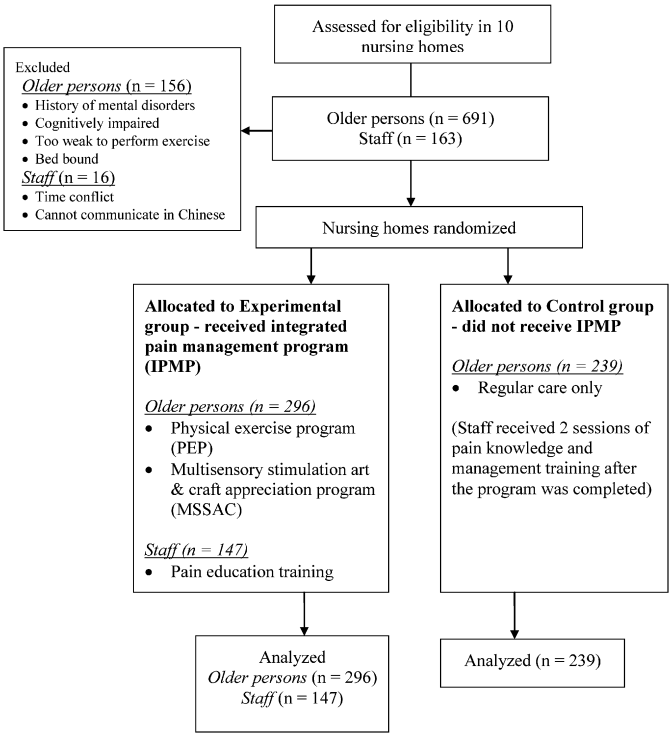

Fig. 1. CONSORT flow diagram of the participants.

2.2. Randomization

The nursing homes were randomly allocated to the experimental group or the control group by a computerized randomization table. Staff and residents in the experimental group received the IPMP, while those in control group received regular care without IPMP.

2.3. The IPMP

The IPMP consisted of an 8-week program conducted with two target groups, staff and residents. Details of the IPMP are shown in Table 1. For the staff training, the research team (including registered nurses and physiotherapists) conducted a one-hour session of pain education each week for 8 weeks. Two identical sessions were conducted within the same week to attract and cater for the maximum attendance of staff on shift duty. Attendance was recorded in each session, and make-up classes were provided for staff who could not attend the pain education program due to vacation leave. The pain education program included mechanisms of pain and its impacts on the staff and the elderly in the home. There were also demonstrations of various pain assessment strategies and the use of oral analgesics, including their effects and side-effects, as well as the use of various non-drug strategies in pain management, including deep breathing and relaxation techniques. In order to prevent injury in patient care and patient

Table 1
Integrated pain management program: physical exercise program and multisensory stimulation art and craft appreciation therapy program for the elderly, and pain education training for staff.

Week	Elderly		Staff
	Physical exercise program (60 min/session, 1 session/week)	Multisensory stimulation, art and craft therapy (60 min/session, 1 session/week)	Pain education training (60 min/session, 2 concurrent sessions/week)
1	Shoulder and neck exercises	• Breathing and relaxation exercises • Five sensation therapy; using the sense of touch, smell, taste, hearing and vision	• Pain situation in their nursing home • Survey for pain knowledge and attitude
2	Back exercises	• Making a photo album • Making a paper fan	• Definition of pain • Pain assessment
3	Knee exercises	• Making paper flowers and a vase • Making a dried flower bag	• Use of analgesics for mild pain relief and side-effects, e.g., NSAIDs and aspirin • Health assessment: abdominal examination
4	Hip exercises	• Making festival decorations • A tea gathering and experience sharing	• Use of analgesics for moderate to severe pain relief and side-effects, e.g., codeine, morphine • Health assessment: neurological examination
5	Acupressure techniques		• Psychological well-being for elderly • Use of non-pharmacological strategies for pain relief
6	Balancing exercises		• Pain assessment and treatment • Understanding and managing knee and back pain
7	Introduce non-drug therapy		• Exercise for nursing staff • Understanding and managing shoulder and neck pain
8	Revision and reflection		• Questionnaire and short interview • Revision and reflection

transfers, as well as strengthening the physical function of the staff, our physiotherapist shared and practiced muscle strengthening and stretching techniques for staff during the pain education program.

For residents, the IPMP included a one-hour physical training session (PEP) and one hour of either multisensory stimulation therapy or art and craft activity per week. The PEP included muscle strengthening, stretching and balance, and was conducted in small groups of 10–15 elderly residents. Specific exercises were taught by the physiotherapist according to the functional level and abilities of these residents. Exercise pamphlets were given after each lesson so as to encourage the older people to practice in their own time. They were also taught to use non-drug methods such as heat, cold, deep breathing, relaxation and acupressure therapy to relieve pain. The staff was encouraged to attend. Regarding the multisensory stimulation art and craft therapy approach (MSSAC), the research team conducted an alternative of 1-h multisensory therapy or art and craft therapy once a week. In the multisensory session, the elderly participants were instructed to control pain through relaxation techniques and use of the 5 primary senses: touch, smell, taste, hearing and vision. Fragrant essential lotion was given to them to apply on their neck and hands. They were also instructed to close their eyes and take deep breaths while listening to the relaxing music, look at attractive pictures and imagine the environments, and smell the essential oil that was distributed by a diffuser. Hot herbal tea was provided to stimulate the taste buds. In the art and craft session, older persons made artwork such as photo albums, paper flowers, and paper fans using scissors, glue, origami paper and colorful art materials to facilitate fine motor activities and multisensory stimulation. They designed the artworks themselves in a creative manner, and discuss the process of the art and craft session with each other to enhance the social connection. Upon completion of the art and craft sessions, they could bring their finished products back and show them to their family members and friends during their visits.

2.4. Outcome measures

2.4.1. Demographic data

The demographic data of the staff were collected, including age, gender, position, education level, experience since training, experience of working in nursing homes, whether attending a pain course or not, the frequency with which they met elderly persons with pain during their daily care, and nursing specialty (for nurses). They then completed a survey about their knowledge and attitude to pain management (see Section 2.4.2). Older persons were invited to attend an interview before the study to share their demographic characteristics, including age, gender, marital status, education level, previous occupation, personal health condition, and pain in the previous 6 months. The use of oral analgesic drug and non-drug methods for pain control was also recorded. Afterwards, they were asked to complete several questionnaires as below (see Sections 2.4.3–2.4.6). All data were collected by the blinded research assistant.

2.4.2. Staff knowledge and attitude survey regarding pain

Before and after the IPMP education sessions, each member of staff was asked to finish the Nurses' Knowledge and Attitude Survey Regarding Pain (NKASRP), which was originally developed by Ferrell and McCaffery (1987) and then translated in Chinese (NKASPR-C) by Tse and Chan (2004). The NKASPR-C consists of 25 items about pain assessment, the use of analgesics and general pain management. Items 1–16 are "true or false" questions assessing the general knowledge, symptoms and treatment of pain. Items 17–25 are multiple-choice questions that deal primarily with pharmacotherapeutics. One mark is given for each correct answer, thus the maximum total score of the NKASPR-C is 25. Higher marks indicate better knowledge and attitude to pain management. The test–retest reliability was 0.81, and the content validity was 0.87.

2.4.3. Pain intensity

The self-reported pain intensity was measured by the Cantonese Verbal Rating Scales (VRS) and marked on a body chart (Fig. 2). The VRS consists of a series of words commonly used to describe pain: 0 = no pain, 1 = very mild pain, 2 = uncomfortably painful, 3 = tolerable pain, 4 = distressingly painful, 5 = very distressingly painful, 6 = intense pain, 7 = very intense pain, 8 = utterly horrible pain, 9 = excruciatingly unbearable pain, and 10 = unimaginably unspeakable pain (Chung et al., 1999). The older persons read the options and chose the one that best described their pain. The reliability and validity of the Cantonese VRS has been established previously (Chung et al., 2002; Liu et al., 2003).

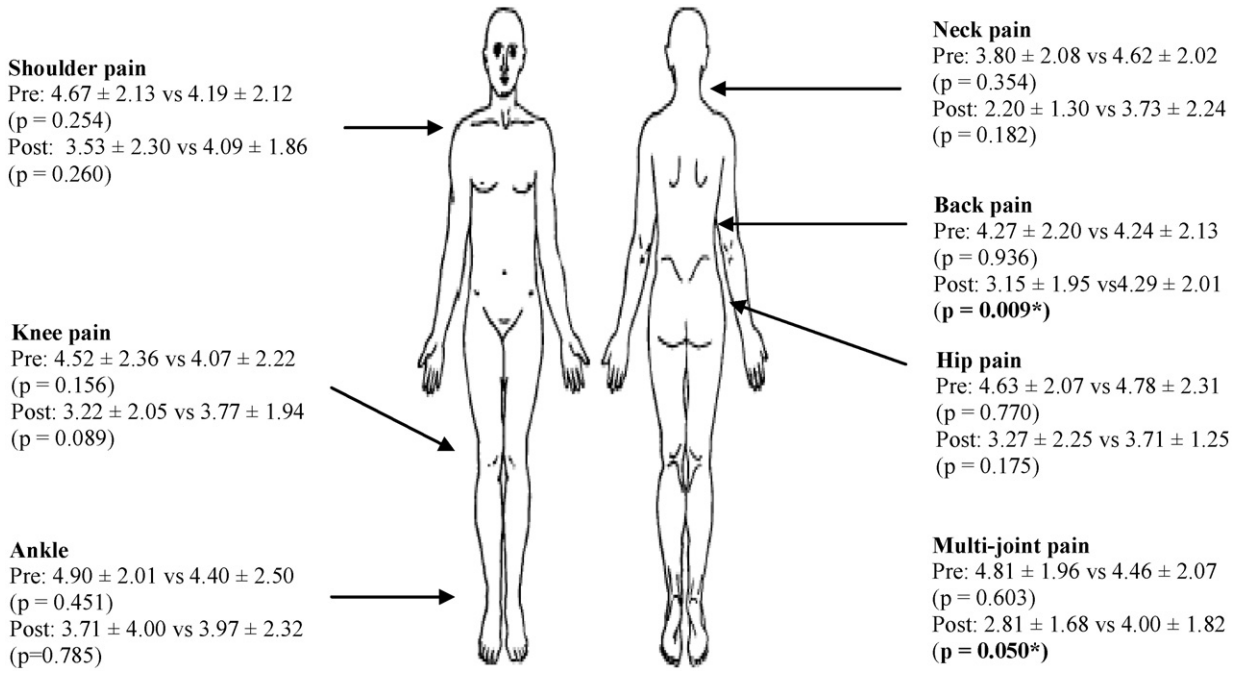

Fig. 2. Pain score at the painful sites (experimental vs control), mean ± S.D. *Note*: $^{*}p \leq 0.05$ was considered statistically significant.

2.4.4. Physical functions

Barthel Index was used to evaluate the self-care functional ability for the activities of daily living among the older persons. It consists of 10 items including presence or absence of fecal and urinary incontinence, and independence in grooming, toileting, feeding, personal hygiene, transfers, walking, dressing, climbing stairs and bathing (Mahoney and Barthel, 1965). The score varies from item to item and the maximum total score is 20, indicating total independence (Shyu et al., 2008). The Elderly Mobility Scale (EMS) assessed the older persons' mobility, and consists of 7 questions focusing on mobility independence in position changes and in walking mobility (Smith, 1994). The score varies from item to item and the maximum total score is 20, indicating total independence (Proser, 1997; Ng et al., 2008). The joint ranges of motion (ROM) were obtained in the older persons in the experimental group. This focused on the degree of movement of neck rotation, shoulder flexion and abduction, hip flexion, knee flexion, and lumbar rotation measured by a goniometer. The physiotherapist taught the research assistant how to measure the range of motion for each target joint, and required them to practice before the study to minimize the measurement error.

2.4.5. Quality of life

Health Survey Short Form questionnaire (SF-12), which consists of 12 questions to generate physical and mental component subscale scores (Ware et al., 1996), measured the quality of life of the older persons. Each score ranges from 0 to 100, with higher scores indicating better health status. A Chinese version of the SF-12 was used, which has been found to be valid and equivalent for the Hong Kong Chinese population (Lam et al., 2005).

2.4.6. Psychosocial well-being

The Chinese version of the subjective happiness scale (Lyubomirsky and Lepper, 1999) was used to assess the older persons' happiness level. It consists of 4 items rated on a 7-point Likert scale. The total scores range from 4 to 28, with higher scores signifying higher subjective happiness. The Cronbach's alpha is 0.79–0.94. The test–retest reliability ranges from 0.55 to 0.90. The revised UCLA Loneliness Scale was used to measure people's loneliness (Russell, 1996). The scale consists of 20 items to measure participants' feelings of loneliness and social isolation using a 4-point Likert scale with a rating 1 = never, 2 = seldom, 3 = sometimes, 4 = always. The total range of possible scores is 20–80, with higher scores indicating greater loneliness. The Chinese version was used, with a Cronbach's alpha of 0.90 (Chou et al., 2005). The Chinese version of the Life Satisfaction Index-A (Chi and Boey, 1992) form scale consists of 18 questions related to five different components: zest, resolution and fortitude, congruence between desired and achieved goals, positive self-concept, and mood tone. Items score 1 = agree and 0 = disagree. Higher scores indicate greater life satisfaction. The Cronbach's alpha is 0.7 and internal consistency is 0.62. The Chinese version of the Geriatric Depression Scale was used to measure depression (Yesavage et al., 1983; Mui, 1996). The scale consists of 15 questions with a rating 1 = yes, 0 = no, with higher scores indicating more depression. Cronbach's alpha of internal consistency is 0.89, and the test–retest reliability is 0.85.

2.5. Data analyses

Demographic data was collected before the study. Scores of NKASPR-C, pain intensity, physical functions, psychosocial well-being, quality of life, and the use of drug and non-drug therapies were collected before and after the 8-week IPMP program. The Statistical Package for the Social Sciences (PASW, version 17) for Windows was used for statistical analysis. Descriptive statistics calculated the means and standard deviations. The Chi-square test analyzed the difference in the demographic data between the experimental and control groups. The pair-test and independent *t*-test analyzed the within- and between-group differences of the outcome variables, respectively.

3. Results

A total of 147 staff and 535 older persons participated in the study. The demographic data are shown in Tables 2 and 3. The participating staff included nurses and workers, most of whom were middle-aged. Surprisingly, 75% of them had not attended a pain course before but were frequently encountering elderly in

Table 2
Demographic characteristics of nursing staff in the experimental group ($N = 147$), number of participants and percentage.

	N (%)
Gender	
Male	3 (2.0)
Female	144 (98.0)
Age (years)	
≤25	2 (1.4)
26–35	23 (15.6)
36–45	66 (44.9)
>45	56 (38.1)
Position	
Registered nurse	46 (31.3)
Enrolled nurse	32 (21.8)
Personal care worker	50 (34.0)
Health worker	17 (11.6)
Others	2 (1.4)
Experience since training (years)	
0–5	61 (41.5)
6–10	34 (23.1)
11–20	37 (25.1)
21–30	9 (6.2)
>30	6 (4.1)
Speciality experience	
Medical and Geriatrics	24 (16.3)
Surgery	12 (8.2)
Orthopedics	9 (6.1)
Neurosurgery	0 (0.0)
Oncology	2 (1.4)
Operation theater	8 (5.4)
Pediatrics	10 (6.8)
Gynecology	6 (4.1)
Accident and emergency	5 (3.4)
Out-patient department	4 (2.7)
Nursing home experience (years)	
0–5	72 (49.0)
6–10	37 (25.2)
11–20	31 (21.1)
>20	7 (4.8)
Education level	
Certification	106 (72.1)
Diploma	29 (19.7)
Undergraduate	11 (7.5)
Postgraduate	1 (0.7)
Attending pain course	
Yes	37 (25.2)
No	110 (74.8)
Pain frequency of patients in your care	
No	19 (12.9)
Once a week or less	33 (22.4)
Several times a week	51 (34.7)
Once a day	16 (10.9)
More than once a day	28 (19.0)

pain in their duties. Most of the older persons were widowed and had not received formal education. Around 40% of them had been living in nursing homes for 1–3 years, while another 28% of them had been living in homes for 10 years or more. There were 396 older persons (74%) who had suffered from pain in the previous 6 months. Among them, 46.5% had used oral analgesic drugs and 57.6% had used non-drug methods.

No significant differences were found in the use of drug and non-drug therapy, pain intensity, quality of life, psychological wellbeing and pain belief between the experimental and control groups at the baseline (Tables 4–6). The physical functions measured by EMS and the Barthel ADL index were significantly higher in the experimental group, therefore the baseline measures were treated as covariates when calculating the post-treatment effect for these two variables.

The staff demonstrated significantly better knowledge and attitudes toward the pain management after the pain education training, with the NKASRP-C score increasing from 8.46 ± 3.74 at the baseline to 19.43 ± 4.07 after the 8-week training ($p < 0.001$).

The baseline pain intensity among the older persons with pain was 4.10 ± 2.20. After completing the program, the pain intensity in both groups decreased significantly (both $p < 0.05$); the VRS score in the experimental group was significantly lower than in the control group (experimental group 2.67 ± 2.08 vs control group 3.29 ± 2.24, $p = 0.008$) and the change of VRS score was also different between the two groups (experimental group -1.70 ± 2.53 vs control group -0.69 ± 2.45, $p < 0.001$) (Table 4). The VRS scores for each painful site are shown in Fig. 2.

After justifying the baseline measures of the Barthel index and EMS by entering them as covariates in the analyses, the post-treatment Barthel index and EMS showed no significant within- or between-group differences (all $p > 0.05$). For the ROMs measured in the experimental group, all ROMs of the neck, shoulders, back, hips and knee joints had increased significantly by the end of the program (all $p < 0.001$) (Table 5).

The SF-12 showed that the quality of life in both physical and mental scores in the experimental group was not significantly improved. However, the scores in the control group had significantly worsened after the program ($p < 0.05$). No between-group difference was found (Table 5).

The experimental group showed significantly higher self-perception in happiness and life satisfaction, and lower perception in loneliness and depression after the IPMP program (all $p \leq 0.001$). The control group did not reveal any significant difference (Table 5). There were significant between-group differences in the changes in these variable scores (all $p < 0.05$).

Table 6 showed the number of subjects using the non-drug therapies before and after the program among the older persons with pain. The experimental group had a significant increase in the number of subjects using massage, resting, hot pad, cold pad, listening to music and deep breathing methods (all $p < 0.05$). By contrast, the control group experienced no significant increase or even a decrease in the number of subjects using those methods. As a result, significant group differences were demonstrated in the use of massage, resting, watching TV, listening to music and deep breathing.

4. Discussion

The present study recruited 535 older persons and 147 staff in local nursing homes to provide an IPMP. The IPMP skills taught, including physical exercise training, multisensory stimulation and art and crafts therapy, were largely inexpensive and would be easy to implement in nursing home settings for older persons. They can also be regarded as self-treatment skills on relieving pain and improving the negative impacts of pain.

The staff receiving pain management training significantly improved their knowledge and attitude toward pain management. The IPMP program aimed at providing knowledge of pain and its management methods such as analgesic drugs and their effects, and exercises for particular pain. The staff can apply the knowledge to avoid work injuries, and strengthen and relax themselves to reduce their pain and disabilities. Their active participation and positive experience of the program also enabled them to manage pain problems in older persons during their work duties. Strong participation and management support are critical components for conducting a successful program. The continued implementation of the pain management program in nursing homes is suggested. After obtaining the appropriate training, the staff are able to share their knowledge with their colleagues and teach the older persons. They can help with the long-term carrying out of pain management in the nursing home as a daily routine, which is beneficial for both the elderly and the staff.

In this study, more than 70% of older persons had experienced pain in the previous 6 months, with a moderate level of pain, i.e.

Table 3
Demographic characteristics of older persons in the study, number of participants and percentage.

	Total participants ($N=535$)	Experimental group ($N=296$)	Control group ($N=239$)	Group difference p-value
	N (%)	N (%)	N (%)	
Gender				<0.153
Male	147 (27.5)	74 (25.0)	73 (30.5)	
Female	388 (72.5)	222 (75.0)	166 (69.5)	
Age (years) (mean ± S.D.)	85.17 ± 6.48	85.37 ± 6.45	84.87 ± 6.49	<0.530
60–70	18 (3.4)	11 (3.7)	7 (2.9)	
71–80	115 (21.5)	57 (19.3)	58 (24.3)	
81–90	336 (62.8)	190 (64.2)	146 (61.1)	
91–100	65 (12.1)	38 (12.8)	27 (11.3)	
Above 101	1 (0.2)	0 (0.0)	1 (0.4)	
Marital status				<0.014*
Single	42 (7.9)	26 (8.8)	16 (6.7)	
Married	113 (21.1)	50 (16.9)	63 (26.4)	
Divorced	10 (1.9)	3 (1.0)	7 (2.9)	
Widowed	370 (69.1)	217 (73.3)	153 (64.0)	
Education level				<0.028*
No formal education	294 (55.0)	177 (59.8)	117 (49.0)	
Primary education	194 (36.2)	100 (33.8)	94 (39.3)	
Secondary education	42 (7.9)	18 (6.1)	24 (10.0)	
Tertiary education	5 (0.9)	1 (0.3)	4 (1.7)	
Previous occupation				<0.091
Primary industry	89 (16.6)	42 (14.2)	47 (19.7)	
Second industry	193 (36.1)	114 (38.5)	79 (33.1)	
Tertiary industry	108 (20.2)	53 (17.9)	55 (23.0)	
Housework	145 (27.1)	87 (29.4)	58 (24.3)	
Year(s) in nursing home				<0.001*
1–3 years	211 (39.4)	94 (31.8)	117 (49.0)	
4–6 years	93 (17.4)	54 (18.2)	39 (16.3)	
7–9 years	84 (15.7)	51 (17.2)	33 (13.8)	
10 years or above	150 (27.5)	97 (32.8)	50 (20.9)	
Past health history				
Stroke	132 (24.7)	59 (19.9)	73 (30.5)	<0.005*
Hypertension	350 (65.4)	195 (65.9)	155 (64.9)	<0.804
DM	112 (20.9)	62 (20.9)	50 (20.9)	<0.538
Heart disease	158 (29.5)	88 (29.7)	70 (29.3)	<0.536
Cataract	234 (43.7)	149 (50.3)	85 (35.6)	<0.001*
Glaucoma	27 (5.0)	15 (5.1)	12 (5.0)	<0.980
Parkinsonism	20 (3.7)	11 (3.7)	9 (3.8)	<0.976
Previous fracture	112 (20.9)	68 (23.0)	44 (18.4)	<0.197
Impaired renal function	21 (3.9)	15 (5.1)	6 (2.5)	<0.130
Arthritis	105 (22.6)	55 (18.6)	50 (24.2)	<0.418
Respiratory disease	77 (16.6)	40 (13.5)	37 (17.9)	<0.506
Gouty	23 (10.9)	16 (12.4)	7 (8.5)	<0.380
COAP	17 (8.1)	10 (7.8)	7 (8.5)	<0.838
Presence of pain				<0.242
Yes	396 (74.0)	225 (76.0)	171 (71.5)	
No	139 (26.0)	71 (24.0)	68 (28.5)	
Use of oral analgesic				<0.664
Yes	249 (46.5)	137 (46.3)	112 (46.9)	
No	286 (53.5)	159 (53.7)	127 (53.1)	
Use of non-drug therapy				<0.474
Yes	308 (57.6)	179 (60.5)	129 (54.3)	
No	227 (42.4)	117 (39.5)	110 (46.0)	

Note: Chi square test was used to compare experimental and control groups.
* $p \leq 0.05$ was considered statistically significant.

Table 4
Pain score in experimental and control pain groups, mean ± S.D.

	Experimental group ($N=225$)			Control group ($N=171$)			Group difference	
	Pre mean ± S.D.	Post mean ± S.D.	p-Value β^1	Pre mean ± S.D.	Post mean ± S.D.	p-Value β^2	p-Value α^1	p-Value α^2
Pain score (Change of pain score)	4.19 ± 2.25 (−1.70 ± 2.53)	2.67 ± 2.08 (−0.69 ± 2.45)	0.000* (0.000*)	3.98 ± 2.13	3.29 ± 2.24	<0.009*	<0.379	<0.008*

Note: β^1, baseline vs post: experimental pain group (paired sample t-test); β^2, baseline vs post: control pain group (paired sample t-test); α^1, baseline: experimental pain group vs control pain group (independent sample t-test); α^2, post: experimental pain group vs control pain group (independent sample t-test).
* $p \leq 0.05$ was considered statistically significant.

Table 5
Physical, quality of life and psychological parameters, mean ± S.D.

		Total participants ($N=535$)	Experimental group ($N=296$)			Control group ($N=239$)			Group difference		
		Mean ± S.D.	Pre mean ± S.D.	Post mean ± S.D.	p-Value β^1	Pre mean ± S.D.	Post mean ± S.D.	p-Value β^2	p-Value α^1		p-Value α^2
Physical											
Elderly mobility		15.79 ± 4.92	16.44 ± 4.23	15.86 ± 4.76	<0.344	15.03 ± 5.53	14.77 ± 5.46	<0.399	<0.001*		<0.371#
(Change)			(−0.23 ± 3.71)				(−0.21 ± 4.07)			(0.964)	
Barthel ADL		17.64 ± 3.94	18.20 ± 3.10	17.99 ± 4.93	<0.928	16.94 ± 4.66	16.50 ± 4.71	<0.248	0.000*		0.186#
(Change)			(0.02 ± 4.26)				(−0.17 ± 3.14)			(0.565)	
Range of motion											
Neck rotation	Left	–	50.92 ± 15.57	64.01 ± 15.99	0.000*	–	–	–	–		–
	Right	–	52.22 ± 16.16	63.95 ± 17.76	0.000*	–	–	–	–		–
Shoulder flexion	Left	–	139.53 ± 27.22	152.08 ± 22.99	0.000*	–	–	–	–		–
	Right	–	138.09 ± 31.66	152.37 ± 25.50	0.000*	–	–	–	–		–
Shoulder abduction	Left	–	131.39 ± 31.44	148.57 ± 26.07	0.000*	–	–	–	–		–
	Right	–	125.50 ± 32.98	143.63 ± 27.60	0.000*	–	–	–	–		–
Lumbar flexion		–	14.80 ± 13.35	20.07 ± 15.12	0.000*	–	–	–	–		–
Lumbar rotation	Left	–	46.76 ± 17.34	59 89 ± 19.15	0.000*	–	–	–	–		–
	Right	–	48.41 ± 17.72	62.22 ± 21.26	0.000*	–	–	–	–		–
Hip flexion	Left	–	54.58 ± 34.60	64.31 ± 39.81	0.000*	–	–	–	–		–
	Right	–	54.67 ± 36.16	63.90 ± 39.82	0.000*	–	–	–	–		–
Knee flexion	Left	–	51.87 ± 36.14	64.19 ± 42.42	0.000*	–	–	–	–		–
	Right	–	52.97 ± 35.94	64.39 ± 41.23	0.000*	–	–	–	–		–
Quality of life											
SF-12 physical		36.85 ± 10.64	36.67 ± 10.74	34.65 ± 11.11	<0.276	37.07 ± 10.55	35.47 ± 10.75	<0.025*	<0.728		<0.496
(Change)				(−1.07 ± 11.43)			(−1.37 ± 10.63)			(0.817)	
SF-12 Mental		57.69 ± 7.27	57.39 ± 7.47	56.98 ± 7.80	<0.352	58.05 ± 7.02	56.94 ± 7.31	<0.043*	<0.406		<0.973
(Change)				(0.59 ± 7.37)			(−1.05 ± 8.30)			(0.076)	
Psychological											
Happiness		18.42 ± 5.95	18.22 ± 6.06	19.32 ± 5.54	0.000*	18.67 ± 5.80	18.35 ± 6.12	<0.256	<0.393		<0.069
(Change)				(1.86 ± 5.52)			(−0.32 ± 6.01)			(0.000*)	
Loneliness		40.62 ± 11.79	40.98 ± 11.77	39.49 ± 10.52	0.000*	40.17 ± 11.80	40.41 ± 12.60	<0.711	<0.429		<0.383
(Change)				(−3.35 ± 10.90)			(0.24 ± 11.61)			(0.000*)	
Life satisfaction		9.78 ± 4.24	9.78 ± 4.37	10.14 ± 4.22	0.000*	9.77 ± 4.08	9.56 ± 4.13	<0.057	<0.979		<0.129
(Change)				(1.07 ± 4.01)			(−0.21 ± 3.50)			(0.000*)	
Depression		6.10 ± 3.95	6.14 ± 3.92	5.93 ± 3.79	<0.001*	6.04 ± 3.99	6.00 ± 4.13	<0.590	<0.771		<0.856
(Change)				(−0.77 ± 3.53)			(−0.05 ± 3.33)			(0.021*)	

Note: β^1, baseline vs post: experimental pain group (paired sample t-test); β^2, Baseline vs post: control pain group (paired sample t-test); α^1: baseline: experimental pain group vs control pain group (independent sample t-test); α^2: post: experimental pain group vs control pain group (independent sample t-test).

* $p \leq 0.05$ was considered statistically significant.

\# p-Value was adjusted by adding the pre-test value as covariance.

Table 6
Use of non-drug therapy in elderly residents with pain before and after the IPMP, number of participants and percentage.

Non-drug methods	Participants with pain ($N=396$)	Experimental group ($N=225$)			Control group ($N=171$)			Group difference	
		Pre	Post	Within-group p-value	Pre	Post	Within-group p-value	Pre p-value	Post p-value
	N (%)	*N* (%)	*N* (%)		*N* (%)	*N* (%)			
Topical ointment	267 (67.4)	158 (70.2)	130 (57.8)	<0.654	109 (63.7)	96 (54.9)	<0.936	<0.246	<0.289
Massage	99 (25.0)	50 (22.2)	60 (26.7)	<0.022*	49 (28.7)	39 (22.3)	<0.475	<0.143	<0.028*
Resting	36 (9.1)	25 (11.1)	54 (24.0)	0.000*	11 (6.4)	17 (9.7)	<0.153	<0.109	<0.000*
Physiotherapy	30 (14.6)	17 (16.2)	16 (7.1)	<0.850	13 (12.9)	13 (7.4)	<0.894	<0.500	<0.646
Hot pad	27 (6.8)	14 (6.2)	23 (10.2)	<0.030*	13 (7.6)	10 (5.7)	<0.422	<0.589	<0.084
Watching TV	12 (3.0)	7 (3.1)	8 (3.6)	<0.541	5 (2.9)	1 (0.6)	<0.146	<0.679	<0.041*
Listening to music	6 (1.5)	7 (2.2)	13 (5.8)	<0.043*	1 (0.6)	0 (0.0)	<0.355	<0.283	<0.001*
Chatting to friends	5 (1.9)	2 (1.4)	5 (2.2)	<0.112	3 (2.5)	1 (0.6)	<0.434	<0.522	<0.110
Deep breathing	4 (1.0)	3 (1.3)	37 (16.4)	0.000*	1 (0.6)	3 (1.7)	<0.241	<0.519	0.000*
Cold pad	4 (1.0)	2 (0.9)	11 (4.9)	<0.004*	2 (1.2)	3 (1.7)	<0.526	<0.782	<0.076

Note: Chi-square test was used to compare experimental and control groups.
* $p \leq 0.05$ was considered statistically significant.

4.10 ± 2.20, which confirms the high prevalence of pain in older persons living in nursing homes (Ferrell, 1991; Chung and Wong, 2007). The demographic data show that 25% of the elderly participants were aged between 60 and 80, which was below the mean age of the study. The pain prevalence among this group is also high, i.e. 20.5%. They have probably spent more than 10 years in nursing homes during the last period of their lives. The multidisciplinary pain management program and self-management techniques are therefore very important to them in reducing pain and its related problems.

By participating in the IPMP, the residents experienced significant reduction in their pain intensity, with scores reduced from 4.19 ± 2.25 to 2.67 ± 2.08 ($p < 0.001$). The change in the pain score in the experimental group was also significantly larger than that in the control group, which did not receive the IPMP. Besides pain reduction, there were also positive results in psychological well-being. Exercises strengthen the muscle weakness and stretch the tightened soft tissues, and are thus effective in improving pain symptoms and psychosocial functions (Ettinger and Afable, 1994; Hurley et al., 2003; Liddle et al., 2004; Long et al., 2004; Roddy et al., 2005); acupressure and non-drug pain relief methods such as relaxation, deep breathing, and hot and cold introduced in the exercise program may also have contributed to the pain reduction (Hsieh et al., 2004, 2006; NIH Technology Assessment Conference Statement, 1995). The multisensory stimulation art and craft therapy enabled the elderly to relax and be distracted from their pain. Their ability to perform exercise and use multisensory art and craft treatment can motivate them to control or manage pain when it occurs, which may reduce their perceived pain intensity, improve their psychological status, and increase their confidence in exercising by themselves (Bandura, 1977; Hurley et al., 2003; Vong et al., 2011). In addition, we conducted IPMP as a group therapy, so that they could discuss the program with their fellow residents, share with friends and enhance the social relationship and cognitive function, reducing the sense of boredom and loneliness in the nursing home.

The findings showed that 47% of older persons used oral analgesics and 58% used non-drug methods to control pain. These results were comparable to those of a previous study (Tse et al., 2010). Furthermore, that study surprisingly found that 14.5% of elderly in pain had not received any form of pain control. This suggests that older persons in the Chinese population prefer not to take analgesics unless they cannot tolerate their pain. Therefore, non-pharmacological methods should be the mainstay of pain management for them. The present study showed that after receiving IPMP, a significantly greater number of older persons used non-drug therapy methods, especially massage, listening to music and deep breathing, which were the IPMP components we had taught in the sessions. The elderly were encouraged to use these methods and practice in their spare time. We believe that the continued use of these methods can relieve their pain effectively.

We did not find significant improvement in quality of life measured by SF-12 in the experimental group. By contrast, the SF-12 scores in the control group were significantly decreased, which implies that the IPMP contributed to preventing deterioration in the quality of life of the nursing home residents.

Due to concerns regarding homogeneity and safety, we only recruited subjects who were physically able to tolerate exercise. Also, because of the use of self-reported outcome measures, we recruited older persons who were verbally communicate and cognitively intact. Other older persons who could not express themselves verbally and were bed-bound were excluded from the present study. We acknowledge that pain in that group of older persons is also common. Future study can adopt specific assessment and management for them. On the other hand, since pain is also common in the young elderly population, future study can focus on a young elderly group to provide pain self-management, which may highly reduce the health and social burden at an earlier stage of life. Our physical outcomes in terms of EMS and Barthel index did not reveal any significant improvement. This may be due to the high functional capacity among the subjects at the baseline, especially the experimental group. In addition, the use of non-parametric measures may not be sufficiently sensitive to detect a short-term improvement in physical function. Measures using parametric scales such as the Timed Up and Go test and the Timed Chair Stand test (Csuka and McCarty, 1985; Shumway-Cook et al., 2000) may be more sensitive to detect the short-term effect and can be used for future study. Since we were limited by time and nursing home policy, we could only conduct assessments at the baseline and after the 8-week program. A longer follow-up is suggested to examine the continuity of the use of pain management methods and the effects of the program for both nursing home residents and staff.

5. Conclusions

Chronic pain is common among older persons in nursing homes. Nursing homes are probably the place in which they will spend the rest of their lives, thus it is important for healthcare workers to provide a painless and comfortable environment for their elderly residents. The integrated pain management program included a pain education program that enhanced the staff's knowledge and attitude toward pain management. Integrated physical exercise and multisensory stimulation art and craft

therapy for the elderly are effective in reducing their pain and improving their psychological well-being.

Conflict of interest statement

None.

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