THE EFFECTIVENESS OF AN ELECTRONIC PAIN MANAGEMENT PROGRAMME (EPAIN) FOR WORKING POPULATION WITH CHRONIC PAIN: A RANDOMIZED CONTROLLED TRIAL

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The Effectiveness of an Electronic Pain Management Programme (ePain) for Working Population with Chronic Pain: A Randomized Controlled Trial

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CERTIFICATE OF ORIGINALITY

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Abstract

Background

The prevalence of pain is high in the working population. Persistent pain becomes a chronic condition. The working population either bears their pain to work, or takes a sick leave. Their work performance can be affected. It can cause work loss, in terms of both working days and money. Pain services are inadequate to satisfy the demand. The long wait times in out-patient clinics means that pain sufferers must wait for a long period before an appointment.

Pain causes both physical disturbance and psychological distress to individuals. An extended duration of pain predicts the presence of depression, anxiety, and stress. People living with chronic pain report a lower level of quality of life, as their physical activity levels are affected.

Pain self-efficacy acts as a contributor to mediate the negative effects of chronic pain. People with higher pain self-efficacy would decrease pain avoidance behaviours and depression. Based on the self-efficacy of behavioural change, building up pain self-efficacy means that chronic pain sufferers believe in their ability to manage their pain and attain a better pain situation. Members of the working population with self-care ability have the capacity to self-manage their

pain to improve their pain self-efficacy, gain relief from the negative effects of pain, and enhance their quality of life.

Pain management programmes are used to empower participants with self-management skills and reduce their pain severity and disability. Aerobic exercise, cognitive coping skills training, pain acceptance and normal activity, progressive muscle relaxation and imagery, and ergonomic and posture training are included. These programmes are mainly delivered through face-to-face and group-based sessions. The sessions are often held during office hours and overlap with working hours. Members of the working population may not be available to attend all sessions.

eHealth is an alternative method and solution to tackle the difficulties involved in attending face-to-face sessions. The advancement of information technology allows participants to join programme anywhere and at any time, with an electronic device and network. Internet-based pain programmes should be used to deliver pain management education to the working population in order to reduce their pain and address the difficulties involved in attending pain management programmes in person.

There is a lack of studies examining how Internet-based studies affect pain severity in chronic pain sufferers and in the Chinese population. Previous groundwork found a high prevalence of chronic pain in the Hong Kong working population. They preferred accessing the Internet and healthcare professionals to deliver pain management education. An electronic pain management programme (ePain) was developed to tackle their pain problems. The self-efficacy theory of behavioural change was adopted as the theoretical framework for the main study.

Aims and objectives

The study aimed to develop, implement, and evaluate the effectiveness of an electronic pain management programme (ePain) for members of the working population with chronic pain.

The study's primary objective was to develop and evaluate the effectiveness of ePain to decrease pain severity in the working population with chronic pain. The secondary objective was to evaluate the effectiveness of ePain in members of the working population suffering from chronic pain in the improvement of pain self-efficacy, pain interference, levels of depression, anxiety and stress, and quality of life.

Methods and outcome measures

ePain was developed in a systematic and evidenced-based approach. A systematic review was conducted to identify effective non-pharmacological interventions for pain management. The essence of online learning, including self-paced learning, learner control, and self-directed learning, was integrated into the development of ePain. The issue of data security was considered. An expert panel was formed to validate the ePain contents. The expert panel rated the content as having good relevancy. Five workers with chronic pain were recruited to conduct a usability test of ePain. The usability test received a satisfactory score, implying that participants perceived it to be a positive user experience and accepted ePain. Strategies to ensure treatment fidelity were applied during the ePain development phase.

The study was a double-blinded randomised controlled trial. Participants were recruited by snowball sampling, including social media, distributing recruitment pamphlets in community centres, and sending invitations to companies. A total of 319 members of the working population who lived with chronic pain were randomised to either the intervention group or the control group. Participants

were aged from 15 to 65, performed a formal job during the seven days before the study or worked for pay or profit during the seven days before the study, were able to read and understand traditional Chinese, had experienced non-cancer chronic pain for at least three months, had a pain score of one or above in the Chinese version of the Brief Pain Inventory (BPI-C), and had a computer or mobile phone to access ePain.

The intervention group participants received ePain, while the control group read a pain education pamphlet. Participants' levels of pain severity and pain interference were recorded by the Chinese version of Brief Pain Inventory (BPI-C); pain self-efficacy were measured by the Chinese version of the Pain Self-Efficacy Questionnaire (PSEQ-HK); depression, anxiety, and stress were measured by the Chinese version of the Depression Anxiety Stress Scale (DASS-21); and quality of life was measured by the Hong Kong version of the World Health Organization Quality of Life Instruments (WHOQOL-BREF (HK)).

Data were collected at baseline, interim evaluation (T1) at Week 3, post-intervention evaluation (T2) at Week 6, and follow-up evaluation (T3) at Week 12. Demographic data and pain-related sick leave information were collected at

baseline. Feedback from the intervention group participants was collected to explore the usefulness and user experience of ePain. Changes in participant knowledge level were measured by the frequency of pages viewed and quiz results.

Generalized Estimating Equation (GEE) was used to analyse the changes in outcomes between the intervention and control groups, within group (time) effects, and the intervention effects (group x time). Pairwise analysis comparing the outcomes between time points by groups was conducted. The primary analysis was intention-to-treat (ITT) analysed data from T0 to T2 to reduce bias resulting from a participant dropout rate.

Results

A total of 319 participants joined the main study, with 160 participants in the intervention group and 159 participants in the control group. A majority of participants were female (77.4%), with a mean age of 43.64, without chronic illness (69.3%) and not taking long term medications (77.7%). The demographic characteristics did not present significant differences at baseline.

At baseline, the mean score of pain severity of all participants was 4.16 (SD

= 1.90), pain self-efficacy was 41.56 (SD = 12.23), and pain interference was 3.74 (SD = 1.92).

The total participants' mean scores of total score of depression, anxiety, and stress was 12.86 (SD = 8.63), depression was 12.82 (SD = 9.59), anxiety was 11.68 (SD = 8.38), and stress was 17 (SD = 9.62). For quality of life, the mean score of overall quality of life was 3.23 (SD = 0.65), overall health and well-being was 2.30 (SD = 0.75), physical health domain was 13.33 (SD = 2.32), psychological domain was 11.62 (SD = 1.58), social relationships domain was 12.41 (SD = 3.03), and environment domain was 11.98 (SD = 2.50).

At baseline, there were no significant differences noted between the mean scores of pain severity, pain self-efficacy, pain interference, anxiety, stress, and all quality of life domains in the intervention and control groups.

When comparing the two groups over time, from T0 to T2 of the pain-related outcomes in the GEE analysis, there were no significant differences found. Statistical significances were noted for pain severity ($p = 0.002$) and pain interference ($p = 0.04$) at T1. The intervention group presented significant effects

on the pain severity from T0 to T1 ($p = 0.001$) and from T0 to T2 ($p = 0.000$). There was significant difference in pain interference from T0 to T2 ($p = 0.000$). The control group did not present any significant effects in any pain-related outcomes in the GEE analysis.

In the GEE analysis for psychological outcomes, no significant findings were presented when comparing the results between groups over time and between time points by group from T0 to T2. Significant effect was presented in overall health and well-being from T0 to T2 when comparing results between the intervention group and control group ($p = 0.04$). In pairwise comparison in the intervention group, significant effects were found in overall health and well-being ($p = 0.02$) from T0 to T1. The control group showed significant effects in overall health and well-being from T0 to T1 ($p = 0.003$) and from T0 to T2 ($p = 0.001$).

The participants' knowledge level demonstrated improvements with a high passing rate (96.2%) in 53 participants who completed the quizzes. The participants reported satisfaction with ePain's usefulness and user experience. Their feedback was divided into four categories: enhancing pain knowledge and management, positive learning experience of pain management, positive user

experience from the technical aspects of ePain, and suggestions for improving ePain.

Discussion

There were 319 participants randomized in the study. In the intervention group, there were 160 participants in the intervention group and 159 participants in the control group. After the baseline assessment, the intervention group participants started ePain and the control group participants received a pain education pamphlet. The outcomes measured were the levels of pain severity, pain self-efficacy, pain interference, depression, anxiety, stress and quality of life. They were assessed at baseline (T0), interim evaluation at Week 3 (T1), post-intervention evaluation at Week 6 (T2) and follow-up evaluation at Week 12 (T3). The results were compared between groups and time points from T0 to T2 by GEE.

The strengths of ePain were demonstrated in the protocol development and characteristics of the intervention. ePain was developed in a systematic way. The intervention built with self-efficacy theory of behavioral change. An online survey was conducted to determine the prevalence of pain in the working population, the source of information for pain management and the preferred contents in ePain.

The contents of ePain were validated by an expert panel with good relevancy. A usability test was conducted and high level of satisfaction was resulted.

The outcomes did not show significant results in the pain severity, pain self-efficacy, pain interference, depression, anxiety, stress and quality of life when comparing between the intervention group and control group from T0 to T2. The insignificant results may relate to several reasons. The duration of the intervention may be inadequate to improve the pain severity, pain self-efficacy, pain interference, depression, anxiety, stress and quality of life. The low response rate of the evaluations at T2 may bound the observations of the outcomes.

Limitations were identified from the study. There were dropouts of participants across time points and caused low response rate of 29.2% at T2. The low response rate was comparable to other Internet-based programmes without incentives. The low response rate contributed to the missing data. GEE was adopted in the study and no imputation was conducted. Member of the working population without a computer or mobile phone and Internet access were unable to join the study. The participants recruited mainly comprised of the professionals and clerical staff. The effects of ePain might not be demonstrated in the blue collars.

The contents of ePain focused on the physiological interventions for pain relieve. The psychological support for pain should be included in future studies.

Conclusion

The results demonstrated that ePain was ineffective at reducing pain severity; improving pain self-efficacy; decreasing pain interference, levels of depression, anxiety, and stress; and enhancing quality of life in the working population with chronic pain. The pain knowledge level increased in the intervention group. ePain equipped intervention group participants with pain and self-management knowledge. The intervention group participants noted a positive user experience of ePain, finding it to be useful to their situation. Their positive feedback and learning experiences motivated them to continue managing their pain, and their pain situation would continue to improve.

There were reasons contributing to the insignificant results, including participants' dropout, research method and intervention. Suggestions and recommendation for the limitations and future studies were discussed.

Publications and presentations

Publications

1. Tang, S.K., Tse, M.M.Y., Leung, S.F., & Fotis, T. (2020). The effectiveness of an electronic pain management programme for the working population with chronic pain: Study protocol for a randomized controlled trial. *Trials, 21*:421. doi: 10.1186/s13063-020-04348-5.
2. Tang, S.K., Tse, M.M.Y., Leung, S.F., & Fotis, T. (2020). Acute and chronic musculoskeletal pain situations among the working population and their pain education needs: An exploratory study. *Family Practice, 37*(4), 445-452. doi: 10.1093/fampra/cmaa013
3. Tang, S.K., Tse, M.M.Y., Leung, S.F., & Fotis. T. (2019). The effectiveness, suitability, and sustainability of non-pharmacological methods of managing pain in community-dwelling older adults: A systematic review. *BMC Public Health, 19*: 1488 (2019). doi:10.1186/s12889-019-7831-9

Conference presentations

1. Tang, S.K., Tse, M.M.Y., Leung S.F., & Fotis T. (2020). The usefulness and user experience of an electronic pain management programme for working population. Poster presented at the 27th Annual Congress of Gerontology, Hong Kong Association of Gerontology.

2. Tang, S.K., Tse, M.M.Y., Leung S.F., & Fotis T. (2020). Community partnership in Internet-based interventions: Experience gained in an electronic pain management programme. Poster presented at National Harford Center of Gerontological Nursing Excellence (NHCGNE) 2020 Leadership Conference.

3. Tang, S.K., Tse, M.M.Y., Leung S.F., & Fotis T. (2019). An electronic pain management programme for working population: What has been learnt from the user attrition? Poster presented at the 26th Annual Congress of Gerontology, Hong Kong Association of Gerontology.

4. Tang, S.K., Tse, M.M.Y., Leung, S.F., & Fotis, T. (2019). Validating an electronic pain management programme (ePain) for working population in Hong Kong: Reviews from expert panels and chronic pain sufferers. Poster presentation at the 22nd East Asian Forum of Nursing Scholars (EAFONS) 2019, Singapore.

5. Tang, S.K., Tse, M.M.Y., Leung S.F., & Fotis T. (2018). Exploring the preference of eHealth for pain education in Hong Kong population: Plan for the future. Oral presentation presented at 15th Congress on Long Term Care in Chinese Communities cum 25th Annual Congress of Gerontology & 7th Cross-border Elderly Care Seminar, Hong Kong.

6. Tang, S.K., Tse, M.M.Y., Leung S.F., & Fotis T. (2018). Examine acute and chronic pain situations in Hong Kong working populations. Concurrent session presented at the 6th Edition of International Conference on Pain Management & 7th Edition of International Conference on Internal Medicine & Patient Care, Vienna, Austria.
7. Tang, S.K., Tse, M.M.Y., Leung, S.F., & Fotis, T. (2017). Development of an online pain management programme for the population with chronic pain: Process and implication. Poster presented at the 24th Annual Congress of Gerontology, Hong Kong Association of Gerontology.
8. Tang, S.K., Tse, M.M.Y., & Leung S.F. (2017). Prevalence of pain in working population in Hong Kong: An online survey. Concurrent session presented at the 20th East Asian Forum of Nursing Scholars, Hong Kong.
9. Tang, S.K., Tse, M.M.Y. & Leung, S.F. (2016). Effectiveness of non-pharmacological pain management in community-dwelling older adults: A systematic review. Poster presented at the Inaugural Conference, Centre for Gerontological Nursing, School of Nursing, The Hong Kong Polytechnic University, Hong Kong.
10. Tang, S.K., Tse, M.M.Y. & Leung, S.F. (2015). Electronic pain management across lifespan: A review of literature. Poster presentation at 18th East Asian

Forum of Nursing Scholars of Integrating Sciences and Humanities in Doctoral Nursing Education, Taipei, Taiwan.

Award

First Place poster presentation, 22nd East Asian Forum of Nursing Scholars (EAFONS) 2019, Singapore

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List of Abbreviations

BCC	National Institutes of Health Behavior Change Consortium
BPI-C	Chinese version of the Brief Pain Inventory
CSUQ	Computer System Usability Questionnaire
DASS-21	Depression Anxiety Stress Scale
ePain	Electronic pain management programme
GEE	Generalized Estimating Equation
ICT	Information and communication technologies
I-CVI	Item-level of Content Validity Index
INFOQUAL	Information Quality
INTERQUAL	Interface Quality
ITT	Intention-to-treat
PSEQ-HK	Pain Self-Efficacy Questionnaire
SYSUSE	System Usefulness
WHOQOL-BREF (HK)	The World Health Organization Quality of Life Instruments

Chapter 1 Introduction

1.1 Introduction

Pain is a common problem in the working population. Previous literature has shown the prevalence of pain was high in the working population. They bear the pain or take sick leave to manage their pain. Their pain are in attention for management in order to reduce the work loss and maintain the functioning of the society.

This chapter outlines the study background. It starts with a definition of pain, an overview of the working population in Hong Kong, the prevalence of pain in the working population, and projected work loss related to chronic pain. It is followed by introducing the pain service in Hong Kong, the self-initiated treatments taken by chronic pain sufferers, and the problems identified for pain management in the working population. The study aims and objectives, research hypothesis, significance and the organisation of the thesis chapters are illustrated.

1.2 Definition of pain

Pain is ‘an unpleasant sensory and emotional experience associated with, or

resembling that associated with, actual or potential tissue damage' (Raja et al., 2020). It refers to non-cancer pain, and can be differentiated by duration. Acute pain refers to pain present for less than three months, and chronic pain is pain existing for three months or more (International Association for the Study of Pain, 2012).

Pain can be found in all ages and ethnic groups. There are different reasons for the presence of pain. The pathophysiology of pain can be divided into two type, nociceptive pain, and neuropathic pain. Nociceptive pain results from 'actual or threatened damage to neural tissue and activation of nociceptors'. It is related to trauma, injuries, and infections (Howe & Stephens, 2016). Neuropathic pain is defined by 'a lesion, disease or dysfunction of the somatosensory nervous system'. It can happen at a peripheral level, central level, or as a mixed type (Howe & Stephens, 2016).

When acute pain persists in an individual and remains untreated, it can gradually become chronic pain (Feizerfan & Sheh, 2015). The transition involves a complex interaction and process. The repeated pain stimulation can lead to a prolonged inflammatory process in the tissues and pathophysiological changes in the processing of pain (Feizerfan & Sheh, 2015; Lavand'homme, 2011). The alteration in pain processing is found from the periphery to the central nervous system (Feizerfan & Sheh,

2015). Chronic pain can develop when acute pain remains untreated or is treated inadequately.

1.3 Prevalence of pain in the working population in Hong Kong and worldwide

The prevalence of pain in the working population was found to be high. According to an epidemiological survey involving 2,126 community-dwelling adults in Hong Kong, 45.9% of respondents were in pain. People aged 45 to 64 experienced the highest prevalence of pain, at up to 60.1%. Other age groups also suffered a high prevalence of pain. For people ages 18 to 29, the rate was 43.5%, and from ages 30 to 44, it was 49.9%. Chronic pain was found in 87.4% of respondents. Back, head, upper extremities, lower extremities, and abdomen were the commonest pain sites. Pain affected their daily life, including mood, work performance, mobility, and sleep (Chung & Wong, 2007).

A cross sectional survey also found a high prevalence of pain in the working population. The survey involved 5,001 participants, and presence of chronic pain was reported in 1,731 of the respondents, with a 34.9% prevalence of pain. Legs, back, and head were the commonest pain sites. Some respondents reported they had one pain site (65%), while others reported multiple pain sites (35%). Pain intensity was rated on an

11-point rating scale. Participants rated 4.02 (SD = 2.95) for present pain, 5.22 (SD = 2.95) for average pain, and 7.21 (SD = 2.10) for the worst pain. Pain-related absence from work was 0.98 days per three months (Wong & Fielding, 2011).

A survey that focused on Japan's pain profile involved 2,701 respondents. The prevalence of chronic pain was 39.3%, and in the working population, it was 52.7%. Lower back, knees, shoulders, and neck were the commonest pain sites among respondents. Chronic pain was 5.2 (SD = 2.3) rated on a 11-point rating scale. Respondents who reported severe pain rated their pain intensity as 6.7 (SD = 1.5). Pain sufferers were absent from work for 9.6 days per year. Work losses resulted in JPY$1,935 billion, equivalent to USD$19.9 billion (Inoue et al., 2015).

The prevalence of pain in western countries was lower than in Hong Kong. In the United States, 19% of 6,775 respondents in a survey reported chronic pain. Chronic pain and disability were highly correlated in the respondents. Also, the respondents were unable to work because of pain-related disability (Kennedy et al., 2014). In another study, in Germany, 24.9% of 3,011 respondents had non-neuropathic chronic pain while 41.9% had mild pain. Those with non-neuropathic chronic pain took six days of sick leave, while those with neuropathic pain took 20 days (Ohayon & Stingl, 2012).

Studies have demonstrated that chronic pain is a worldwide problem. The prevalence of pain was found to be higher in adults in Hong Kong compared to adults in other countries. Also, the worst pain severity was up to 7.21 (SD = 2.10) on an 11-point rating scale. The pain situation in Hong Kong is serious, and requires attention from healthcare professionals to relieve the problem.

1.4 Overview of the Hong Kong working population

The population in Hong Kong reached approximately 7,500,700 by the end of 2019 (Census and Statistics Department, 2020a). The number continues to grow and by the year 2043, the population is projected to reach 8.22 million (Census and Statistics Department, 2015). The largest portion of the population is comprised of adults aged 15 to 64 who make up society's labour force (Census and Statistics Department, 2012b). The labour force increased from 3,437,992 in 2001 to 3,727,407 in 2011 (Census and Statistics Department, 2012a). Up to the fourth quarter of 2019, the labour force was 3,941,800 and the labour force participation rate was 60.1% (Census and Statistics Department, 2020c). According to the terms and definition of the Population Census, the working population is 'persons aged 15 and over who should be engaged in performing work for pay or profit during the seven days before the Census; or have

formal job attachment during the seven days before the Census (Census and Statistics Department, 2012b). The number of employed persons making up working population was approximately 3,768,800 (Census and Statistics Department, 2020b).

1.5 Projected work loss in Hong Kong related to chronic pain

A high prevalence of pain was noticed in the adult population who make up the working population. The problem of chronic pain can be further illustrated by projecting work loss. The median hourly wage of an individual is HKD$70.5 (Census and Statistics Department, 2020d). It is estimated that an individual works eight hours per day. With reference to Wong and Fielding's survey (2011), the prevalence of chronic pain was 34.9% and pain-related absence from work was 0.98 days per three months. The working population was approximately 3,768,800 persons (Census and Statistics Department, 2020b). Based on the figures, the estimated work loss was HKD$88 billion per year. However, this is not the complete picture of work loss, because there are people who bear their pain and continue to work. Their productivity would be affected and contribute to a certain degree of work loss that is not being measured.

1.6 Pain service in Hong Kong

In Hong Kong, both the public and private sectors of the healthcare system provide pain services. The Department of Health and the Hospital Authority support public sector health services. The Hospital Authority is the only pain service provider. The Department of Health does not offer pain clinics for pain service. In the Hospital Authority, there is both acute and chronic pain management, with in-patient and out-patient services (Hospital Authority, 2021a, 2021b). When a patient needs a pain service appointment, a referral letter issued by a doctor is required and then submitted to the pain clinic of their living region, as set by the Hospital Authority. Then, an appointment is arranged.

Chen et al.'s study (2004) illustrated pain service in the New Territories East Cluster of the Hospital Authority. The New Territories East Cluster serves approximately 1.2 million people out of Hong Kong's total population. The out-patient pain clinic in this cluster works in a multidisciplinary approach, with three consultation sessions per week. In Chen et al.'s study (2004), 248 patients joined the survey, with 70% between the ages of 31 to 60. They had chronic and complex pain, with a median duration of 2.3 years. More than 80% had chronic pain persisting for more than 12 months. Musculoskeletal back pain and neuropathic pain were the commonest types of

pain. Also, 44% of respondents had pain from their limbs and 40.7% had more than one pain site. Despite these types of pain situations, the referral rate to pain service is low. Only 3.6% of cases received were referred from general practitioners. In other words, pain patients remained in the community with their general practitioner, or were referred to a primary specialist, instead of approaching a pain service (Chen et al., 2004).

1.7 Self-initiated treatments taken by chronic pain sufferers

Self-initiated treatment in pain management refers to the interventions applied by patients to manage their pain. Pharmacological and non-pharmacological interventions can be included as self-initiated treatments (Vallerand et al., 2005). Chronic pain sufferers tend to use self-initiated treatment, as they perceived these treatments to be effective. Analgesics, exercise, and rest are common self-initiated treatments (Ng et al., 2002). Also, people did not attend accident and emergency departments or outpatient departments when in pain. They took over-the-counter medications or other non-pharmacological alternatives for pain management (Chung & Wong, 2007). Patients with pain used multiple interventions, such as physiotherapy and traditional Chinese medicine, to manage their pain (Chen et al., 2004). In Chen et al.'s survey (2004), the participants who chose to use self-administered therapies rather than seeking medical advice were younger adults. However, whether these types of self-initiated treatments

are used properly and effectively remains unknown.

1.8 Problems identified in pain management in Hong Kong's working population

Hong Kong is famous as a cosmopolitan city. The people in Hong Kong work hard for their living. They have an average of 14.9 vacation days per year (UBS, 2020a). Work per year in Hong Kong is 2,170.6 hours and ranks 16th among 77 cities in the world (UBS, 2020b). This busy work schedule possibly contributes to people's pain situations, and limits them from seeking medical help to treat the pain and rest. Also, work may restrict them from attending regular follow-up appointments in pain clinics, or even visiting a doctor for pain treatment, because of the time and effort involved.

Pain service is solely provided by the Hospital Authority in the public sector of the healthcare system. The scarcity of pain services and long wait times in specialist out-patient clinics are problems that exist in the current public healthcare system. The longest wait time for an appointment in specialist out-patient clinics was in orthopaedics and traumatology. It took 176 weeks for a stable new case to have a first appointment (Hospital Authority, 2020). In one of the Hospital Authority clusters, the pain clinic operates three sessions per week. Patients wait at least a half year for an appointment (Chen et al., 2004). They must bear their pain before their appointment.

In addition, people prefer to use self-initiated treatments to manage their pain. Some attempt multiple pain management interventions. Pain sufferers need to know how to correctly and properly apply these interventions, and whether there are side effects. The concept of self-management emerges to help to ease health service demand, and matches the expectations of pain sufferers to relieve their pain. They can be equipped with essential pain management knowledge and skills. The use of information technology in healthcare is growing rapidly. It can be combined with pain management education, to promote self-management among the population and enhance pain self-efficacy and self-management of pain sufferers.

When pain sufferers are equipped with pain knowledge and self-management skills, they would have autonomy and better control over their pain. They become actively involved in pain management, in addition to following the pain treatments recommended by doctors and healthcare professionals. Also, the healthcare professional's role shifts to be a consultant to support pain sufferers, and even become a collaborator with them. The focus of pain education by healthcare professionals should include the dissemination of pain knowledge, and skills and techniques to handle pain. This is a possible way to enable pain sufferers to identify their pain problems and

relieve pain by improving their pain management ability.

1.9 Aims and objectives

The study aimed to develop, implement, and evaluate the effectiveness of an electronic pain management programme (ePain) to address the needs of the working population with chronic pain.

The study's primary objective was to develop and evaluate the effectiveness of ePain in improving pain severity in the working population with chronic pain. The secondary objective was to evaluate ePain's effectiveness in the working population with chronic pain in terms of reducing pain self-efficacy, pain interference, levels of depression, anxiety and stress, and improving quality of life.

1.10 Research hypothesis

The study research hypothesis was there were improvement in pain severity, pain self-efficacy, pain interference, depression, anxiety, stress, and quality of life between the intervention group and control group before and after the intervention.

1.11 Study significance

Pain affects the working population in terms of physical disturbance and psychological distress. Decreasing the pain of the working population would help them to relieve their discomfort in the long run and promote psychological health and quality of life. The high prevalence of chronic pain indicates that pain is a common problem in the working population. Chronic pain must be handled. The study addresses the demand and need for pain management in the working population.

The working population is the largest proportion of the population. Workers support society through their productivity, in a variety of different occupations. Persistent pain in the working population brings physical discomfort and limits their capacity and proficiency in their job. ePain can improve pain self-efficacy, thus allowing workers better control over their pain situation. Their work performance would not be affected by pain. In the long run, the work loss to society and workers' loss of workdays could be reduced.

ePain was hosted on the Internet, facilitating the working population to start and continue pain education anywhere and at any time. It addresses scheduling problems, with the working population unable to attend pain clinic follow-ups due to busy work

schedules and the long wait times for pain service. With wide and good network coverage, participants can access the Internet anywhere and at any time using their electronic devices, such as computers and mobile phones. The working population was educated and equipped with adequate computer and Internet access skills to participate in the study. The study was Internet-based, to make their access to ePain as convenient as possible.

The study contributed to fill the gap in investigating the effects of Internet-based pain programmes on pain severity. In addition, the study presented quantitative data on pain self-efficacy, pain interference, levels of depression, anxiety and stress, and quality of life in the working population. It provided qualitative data on how the working population accepted the use of Internet-based pain programmes as a pain management intervention.

The information and data collected in the study will allow future Internet-based studies to enhance their effectiveness. The improvements in the study outcomes serve as an indicator that Internet-based interventions can relieve the working population's pain problems. The ePain theoretical framework and development process contribute to the general body of knowledge on Internet-based interventions.

The qualitative data, including usefulness and user experience, would provide evidence to support user interface design and enhance the user experience in future studies. The participants' first-person reports of their feelings and impressions should be addressed and taken into consideration when designing the user interface. The participants favour a user-friendly and easy to use user interface, which would help retain study participants.

1.12 Chapter organization

There is a total of nine chapters in this thesis. This chapter is an introduction and explanation of the study background. The prevalence of pain in the working population and pain services in Hong Kong are discussed.

Chapter 2 provides an overall review of the literature about pain, its relationship with psychological health, and the use of self-initiated treatments by chronic pain sufferers. The use of eHealth in health education and promotion programmes are identified from the literature. Systematic reviews of the effectiveness of Internet-based pain programmes were retrieved. The knowledge gap in Internet-based interventions to improve pain severity is presented.

Chapter 3 describes the study's theoretical framework. The self-efficacy of behavioural change is illustrated. Chapter 4 presents the results of an online survey, which aims to explore the prevalence of pain in Hong Kong's working population, their pain management strategies, and their source of information for pain management and their preferred contents in ePain.

Chapter 5 illustrates the development of ePain, which comprises the content development, integration of the essence of online learning, a review by an expert panel, and conducting a usability test. The usability test results are presented. Strategies to ensure ePain's fidelity are described. Chapter 6 describes the methods of the main study, including study design, setting, sampling, interventions, outcome measurements, randomisation and blinding, data collection, and plan for data analysis.

Chapter 7 reports the findings of the main study. Chapter 8 discusses the main findings and limitations. Chapter 9 addresses the implications for practice, makes recommendations for future research, and concludes the thesis.

Chapter 2 Literature review

2.1 Introduction

The working population forms the largest proportion of society. Previous studies have shown that the prevalence of pain is high in the working population. The working population supports society's functioning. Workers bear their pain to continue to work, and some take pain-related sick leave. However, a majority do not attend pain management clinics (Chung & Wong, 2007). Also, pain services in Hong Kong remain scarce.

Pharmacological and non-pharmacological interventions are used to manage pain. People tend to use multiple interventions and choose their own interventions when they experience pain. However, whether they are using these self-initiated treatments correctly remains a question, as this affects the pain control effects of self-initiated treatments.

Online programmes for health education can be a solution to help the working population gain control over their pain situation. Online programmes, on the Internet, allow access any time and anywhere. Previous studies using online programmes as an

intervention to deliver health education for different diseases have demonstrated satisfactory outcomes (Heinrich et al., 2012; Williams et al., 2010).

This chapter provides literature and information, including the relationship between pain, depression, anxiety, stress, and quality of life. The theoretical framework the study adopted is the self-efficacy theory of behavioural change, and its use in health promotion and the self-management of disease will be discussed.

2.2 Literature Review

2.2.1 The relationships between pain, pain self-efficacy, depressive mood, anxiety, stress, and quality of life

Pain is not only a physical disturbance that brings uncomfortable feelings, it can also lead to psychological distress. Psychological distress and its relevance to pain has been illustrated and revealed in the literature. The psychological distresses related to pain include depressive mood, anxiety, and stress. Moreover, poorer quality of life has been found to be associated with the presence of pain in an individual.

To manage the negative effects of pain, pain self-efficacy is important to mediate

and determine pain behaviours and disability (Asghari & Nicholas, 2001). Pain self-efficacy refers to "confidence in ability to perform specific tasks or confidence in performing more generalised constructs like coping with pain" (Nicholas, 2007). People with higher pain self-efficacy decrease their pain avoidance behaviours (Asghari & Nicholas, 2001). Better pain self-efficacy is important to alleviate depressive symptoms (Skidmore et al., 2015). Self-efficacy and pain intensity in chronic pain sufferers can predict their development of disability and depression (Arnstein et al., 1999).

A systematic review by Martinez-Calderon et al. (2018) found that a higher level of self-efficacy in chronic musculoskeletal pain sufferers contributed a positive effect to physical functioning, physical activity participation, health status, work status, and satisfaction with performance and efficacy beliefs. Levels of pain intensity, disability, disease activity, depressive symptoms, presence of tender points, fatigue, and presenteeism were lower, with a better self-efficacy belief (Martinez-Calderon et al., 2018).

Building up pain self-efficacy in chronic pain sufferers means they would believe in their ability to manage pain and be less affected by the physical disturbances and

psychological distress of pain. The working population is comprised of adults aged 15 to 64. They are productive and serve as the human resources of society. They have the ability to self-care and are active in the activities of daily living. They have the capacity to learn and apply self-management for their pain after receiving pain management education. Pain management programmes, which aim to develop and increase pain self-efficacy, provide an opportunity for the working population to increase their own abilities to manage pain. They come to believe they can manage their pain. When pain self-efficacy increases, members of the working population with chronic pain would be more willing to adapt pain management strategies. This leads to a decrease in pain severity and psychological distress, and improved quality of life.

In individuals with chronic pain, depressive mood and anxiety are often present. In a survey done in Israel, half of respondents with chronic pain reported significant symptoms of depression and anxiety, and showed affective pain and sensory pain were correlated with depression and anxiety (Lerman et al., 2015). With the progression of chronic pain, the possibility of developing a depressive mood and anxiety becomes larger. Persons with chronic pain may not suffer a depressive mood and anxiety in the beginning. However, depressive mood and anxiety can arise when a person experiences a longer duration of chronic pain (Gerrits et al., 2014). The onset and persistent presence

of chronic pain is a risk factor for a person to experience depressive mood and anxiety.

Stress has a close relationship with chronic pain. A strong association between psychological stress or stress factors and chronic non-specific arm pain was found, and stress in turn can influence chronic pain (Ortego et al., 2016). Also, in a study investigating the relationship between chronic pain in osteoarthritis of the knee, perceived stress and cellular aging demonstrated a correlation with chronic pain and high stress levels, which play a role in cellular aging, compared to those with lower stress (Sibille et al., 2012). Chronic pain and chronic stress was found to have a neuroanatomical and physiological overlap related to suppressed hippocampal neurogenesis and the sharing of a common fear conditioning model to erase negative memories (Abdallah & Geha, 2017).

Quality of life is often reported as being affected by chronic pain. People with musculoskeletal pain had lower levels of health-related quality of life, including sleeping, elimination, discomfort, and vitality (Paananen et al., 2011). Also, people with pain-related activity difficulties revealed they suffered from impaired health-related quality of life (Strine et al., 2005). Higher pain intensity contributed to a decreased level of quality of life, especially in the physical domain of health-related quality of life

(Dueñas et al., 2016). The level of quality of life was found to be lower in chronic pain patients than in the general population, and in people with other long-term diseases (Hadi et al., 2019). These examples show that pain had markedly reduced the level of quality of life in individuals suffering from chronic pain.

The relationship between chronic pain and psychological distress can be viewed in multiple aspects, including neurobiology, psychological and social experience, and psychoemotional and socioemotional processes. Psychological distresses are interrelated. A person's emotions can be regulated by cognition and behaviours. The fear of pain can make a person feel anxious. The presence of chronic pain was associated with psychological stress. Chronic pain sufferers had a higher chance of exposure to stressful events, such as medical procedures and unemployment. In addition, chronic pain sufferers may not be aware of their behaviours and communication with others. Their interpersonal relationships can be affected, and this can increase their stress (Lumley et al., 2011). With the presence of high pain intensity, individuals had higher anxiety levels and lower levels of quality of life. Their depression level contributed to the physical quality of their life (Wong & Fielding, 2011). These studies showed that pain can affect people by bringing physical discomfort, psychologically inducing different distresses, and negatively influencing their quality

of life.

2.2.2 Content and delivery of existing pain management programmes

Using face-to-face sessions to deliver pain management programmes is the traditional way. This method has been adopted by many researchers. A systematic review and meta-analysis by Du et al. (2011) aimed to examine the effects of self-management programmes on chronic musculoskeletal pain. They evaluated 19 randomised controlled trials, from the 1970s to 2010, searching in Medline and Embase. The results showed that 78.9% of the randomised controlled trials were face-to-face group sessions, with only two studies involving online education. The meta-analysis results showed the self-management programmes had a moderate and significant effect on decreasing pain at four-month and six-month follow-up. Arthritis-related disability presented a small and significant reduction effect at 12-month follow-up (Du et al., 2011).

The Du et al. (2017) systematic review and meta-analysis focused on finding the effectiveness of self-management programmes on chronic low back pain patients' pain intensity and disability. They searched for randomised controlled trials up to June 2015. The databases covered were Pubmed, Cochrane Library, Web of Science, Elsevier

(Science Direct), and CINAHL. Thirteen randomised controlled trials were included. Eight were delivered as face-to-face sessions, and five were Internet-based studies. The studies used exercise aerobic exercise, cognitive coping skills training, pain acceptance and normal activity, progressive muscle relaxation and imagery, and ergonomic and posture training as the pain management strategies. The meta-analysis showed that pain intensity was decreased, and had a moderate and significant pain reduction effect in the immediate post-intervention period, and at three-month, six-month and 12-month follow up. Disabilities decreased and demonstrated moderate and significant effects in the immediate post-intervention period and at three-month follow-up, and small and significant effects were noted at six-month and 12-month follow-up (Du et al., 2017).

The programmes were effective and inexpensive to empower patients with self-management techniques. However, the participants were required to attend fixed and specified sessions. They needed to take time off work and travel to the venue. The self-management programmes required at least one healthcare professional to conduct the sessions. The face-to-face sessions often took place during the clinics' opening hours, office hours, or in follow-up appointments. The working population may not be able to take time off work to attend these kinds of sessions. These arrangements and the format of the face-to-face sessions are not feasible for the working population, preventing them

from joining pain management programmes. To overcome the difficulties of attending face-to-face sessions, eHealth should be considered.

2.2.3 eHealth, its use and pain education

eHealth is ‘the use of information and communication technologies (ICT) for health’ (World Health Organization, 2017). It emphasises an increase in efficiency, quality enhancement, being evidence-based, patient empowerment, encouragement, education, exchange of information and communication, a boundaries extension to obtain health services, and ethics and equity in the patient population through the potential benefits of eHealth (Alpay et al., 2010; Eysenbach, 2001). The Internet becomes a channel to deliver health information. Using information technology to conduct a self-management education programme for chronic disease is an increasing trend. The components of Internet-delivered healthcare include ‘consumer education’, ‘disease management’, ‘clinical decision support’, ‘physician / consumer communication’, and ‘administrative efficiencies’. With advancements in technology, such as wireless devices and networks, eHealth continues to expand worldwide. As a result, patients can obtain health information from the Internet without geographical or time limitations (Ball & Lillis, 2001).

Studies using a web-based programme to enhance patients' disease knowledge and self-management abilities have demonstrated satisfactory findings. A web-based diabetes interaction education programme in Dutch showed improvements in the knowledge level of Type 2 diabetes patients (Heinrich et al., 2012). Fibromyalgia patients participating in an Internet-based behavioural self-management programme had their pain reduced, improved their physical functioning and were highly satisfied with the programme (Williams et al., 2010). A chronic pain self-management programme using a psychological approach showed that participants completing the programme presented with decreased pain severity, depression, and stress and anxiety levels. Their perceived control and pain knowledge improved (Ruehlman et al., 2012).

The use of online health programmes is becoming a trend to deliver health-related education. The satisfactory outcomes of previous online health programmes show the possibility of using Internet-based programmes to deliver health education. The knowledge level and disease management abilities of participants improved (Heinrich et al., 2012; Ruehlman et al., 2012; Williams et al., 2010). They were highly satisfied with the online programmes. The advantages of eHealth were demonstrated in the studies, including increased efficiency of information delivery, and patient empowerment and encouragement. Therefore, pain education programmes can be

developed and delivered through the Internet in order to help the pain situation of the working population, who have a great need for pain education, and must manage their pain.

In the eHealth intervention, participants were concerned about privacy and security, while at the same time wished to control their own health. Also, the technology design should be user-centred and human focused, to make eHealth acceptable to participants (Granja et al., 2018). These factors should be emphasised when developing an eHealth intervention.

Systematic reviews about the effectiveness of Internet-based pain management programmes were retrieved. El-Metwally (2015)'s systematic review included 20 randomised controlled trials from 2010 to 2014 in PubMed, and examined the programmes on chronic pain, acute non-specific pain, and disease-related pain. Websites were developed for chronic pain participants. The content in one of the studies included automated walking goals using a pedometer, feedback, motivational messages, and social support through an e-community. Other studies used online Mindful Socio-emotional Regulation modules, and active management with a group-based cognitive behavioural approach. The studies demonstrated that participants benefited from

decreased pain intensity, and enhanced functionality and psychological health (El-Metwally, 2015).

A systematic review by Buhrman et al. (2016) had 22 randomised controlled trials, searched from 1990 to March 2015 in existing systematic reviews, MEDLINE, PsycINFO, CINAHL, and the Cochrane Library. It aimed to evaluate the effects of Internet-based programmes for pain and headaches in terms of pain and disability, catastrophising, depression, and anxiety. Cognitive behavioural therapy, acceptance and committee therapy or both therapies were adopted in the interventions. Significant reductions were seen in interference and disability, pain, catastrophising, depression, and anxiety. Small to moderate effect sizes in the above outcomes were reported in the trials (Buhrman et al., 2016).

The systematic reviews included studies starting from 2000. Using Internet-based programmes for pain management is a pioneering technique in the area of pain management. Limited randomised controlled trials were conducted. The trials focused on examining the reduction of pain severity. There was a lack of studies to illustrate how Internet-based studies affect the pain self-efficacy of chronic pain sufferers. The existing study populations were from western countries, for example, the United States,

Sweden, and Australia (Buhrman et al., 2016; El-Metwally, 2015). The effects of Internet-based pain programmes on a Chinese population were unknown.

Delivering pain management programmes via eHealth can offset the limitations of face-to-face programmes. The Hochlehnert et al. (2006) study, using a computerised information tool to help chronic pain patients, demonstrated that computerised information can allow participants to freely decide how long they spent and learnt the programme content, and how they used the information. Computerised information helped provide a high standard of disease information to patients, improving their disease knowledge, and saving them the time required for face-to-face education. Better communication between patients and healthcare professionals was achieved, as the patients were better equipped with the facts about the disease (Hochlehnert et al., 2006).

2.2.4 Characteristics of Internet-based interventions

Internet-based intervention is defined ‘a primarily self-guided intervention programme that is executed by means of a prescriptive online programme operated through a website and used by consumers seeking health- and mental-health related assistance’. The intervention programme itself attempts to create positive change and or improve/enhance knowledge, awareness, and understanding via the provision of

sound health-related material and use of interactive web-based components' (Barak et al., 2009). Barak et al. (2009) stated that programme content, multimedia choices, provision of interactive online activities and provision of guidance and supportive feedback are essential in Internet-based interventions.

Danaher and Seeley (2009) reviewed the methodological issues in Internet-based studies including participant recruitment, engagement and social validity. These issues contributed to the representativeness and external validity of the study. Approaches to increase participant recruitment and engagement should be considered (Danaher & Seeley, 2009).

Hermes et al. (2019) stated the measurement of implementation outcomes of behavioural intervention technology. They focused to illustrate health information technology that help the users with behavioural, psychosocial, or chronic health conditions. Computer software, websites, mobile apps and wearable sensors were used to deliver behavioural intervention technology. The acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration and sustainability were recommended to evaluate the implementation of behavioural intervention technologies. It involved data collection on these items to look for the use of the

intervention at the participant level and administrator level.

Data security is an important issue in Internet-based studies. Eagleson et al. (2017) presented their feasibility study to illustrate how privacy being maintained. The researchers should take up the responsibility to data protection and secure the privacy. They showed the process to address the data types and delivery, privacy and security. For data types and deliver, it included the study population, location of data storage and logging and retention of data. Privacy comprised of information security, information access, disclosure and consent. For security, the focus put on the hosting environment and authentication. The strategies aided data protection and security (Eagleson et al., 2017).

2.3 Executive summary

Pain is a bio-psycho-social phenomena that affects the working population. The physical disturbance of chronic pain brings discomfort to the working population. Psychological distress appears in relation to chronic pain. People with chronic pain are more prone to depression, anxiety, stress, and a lower level of quality of life, which are interrelated. Pain self-efficacy works as a predictor of a person's pain avoidance behaviours, depressive symptoms, and disability. Higher pain self-efficacy levels exert

a positive effect on a person's physical health and work status.

The traditional way to deliver pain management programmes is through face-to-face sessions. Although the programmes are effective for chronic pain sufferers, there are limitations in terms of fixed and specified sessions, and they require healthcare professionals to conduct the sessions. The arrangement of face-to-face sessions is typically not feasible for the working population to join and engage in a pain management programme.

The use of information technology has emerged in different health education programmes, and their results illustrate the possibility of using eHealth for pain education and management. The advantages of information technology and the Internet, including anytime and anywhere access, would be beneficial and match the needs of the working population. A pain education and management programme should be designed and developed to meet the demand for pain management by the working population, and examine its effectiveness on chronic pain, psychological distress, and quality of life.

Systematic reviews focused on the effects of Internet-based pain programmes on

pain were retrieved. The results of the systematic reviews illustrate that Internet-based pain programmes reduce pain sufferers' pain severity. However, the studies did not examine the effects on pain self-efficacy, nor did they cover a Chinese population.

The characteristics of Internet-based interventions were illustrated. The intervention should include programme contents, multimedia, interactive online activities, guidance and supportive feedback. Recruitment of participants, engagement, social validity and data security should be addressed in Internet-based interventions. Recommendations for the evaluation of Internet-based interventions were on the acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration and sustainability.

Chapter 3 Theoretical framework

3.1 Introduction

The study's goal was to develop an electronic pain management programme (ePain) and examine its effectiveness on chronic pain in the working population. A theoretical framework is needed to construct and guide the intervention's development. Based on Bandura's theory of self-efficacy of behavioural change, ePain was designed and developed.

This chapter elaborates the theoretical framework of the study, which was derived from the Bandura's theory of self-efficacy.

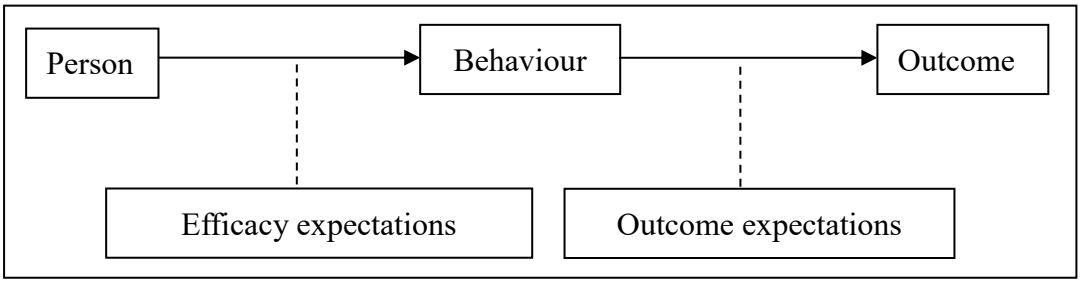
3.2 Bandura's theory of self-efficacy of behavioural change

Self-efficacy is 'people's domain-specific perceptions of their ability to perform the actions necessary to achieve desires outcomes' (Gallagher, 2012). It is an important indicator to measure patients' ability to manage their own health condition (Bodenheimer et al., 2002). The concept of self-efficacy was first introduced by Bandura in 1977. In his theory, people would actively engage in activities to gain

experience when they perceived this would allow them to enjoy a higher level of self-efficacy. Stimuli that 'either signify events to come or indicate probable response consequences' would encourage people to change their behaviour (Bandura, 1977). To involve people in actively participating in the coping process and changing their choice of activities and behaviours, a higher level of perceived self-efficacy is required (Bandura & Adams, 1977).

In the self-efficacy theory of behavioural change, a person's efficacy expectations and outcome expectancy modulates behaviour and the outcomes of the change. Efficacy expectation is 'the conviction that one can successfully execute the behaviour required to produce the outcomes'. Outcome expectancy is 'a person's estimate that a given behaviour will lead to certain outcomes'. It assumes that procedures can create and strengthen the expectations of personal efficacy (Bandura, 1977). (see Figure 3.1)

Figure 3.1 Self-efficacy theory of behavioural change

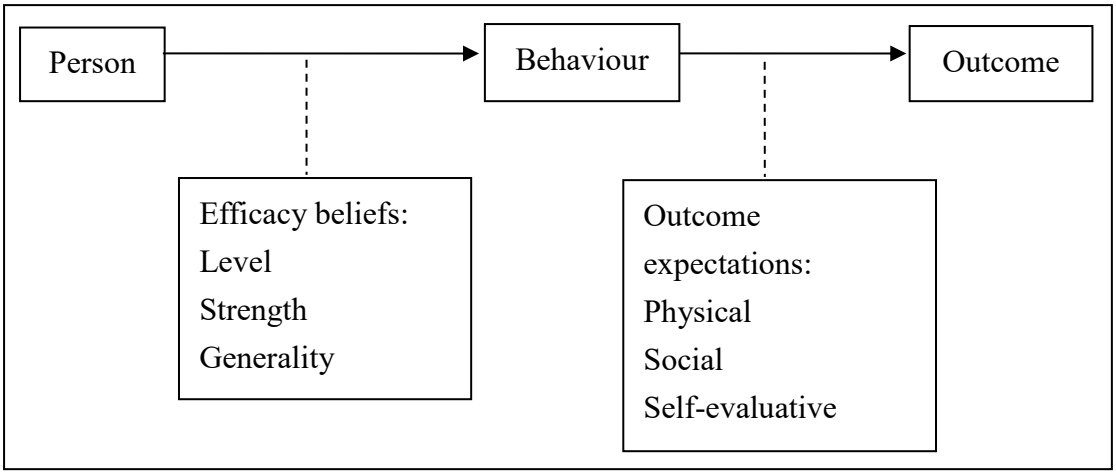


(Bandura, 1977)

3.3 Self-efficacy in health promotion

Self-efficacy is an important factor to determine whether a person would take action to improve the conditions they are facing, resulting in a better outcome. In a health setting, people can achieve a high level of self-efficacy if they can manage their own diseases and health condition. Bandura (1998) discussed how health promotion can be integrated with his self-efficacy theory of behavioural change. Self-efficacy and self-regulatory elements can be integrated with disease prevention and health promotion programmes. The efficacy expectations of a person would build up their self-efficacy. It can determine how persons regulate their motivation, affect, and behaviour. The outcome expectations would cover the areas of physical and social well-being, and would be self-evaluative. The expected outcomes would reflect a person's health behaviour. It also contributes to the effects of lifestyle habits on health behaviours. When a person has positive outcome expectations, their health behaviours would be enhanced (Bandura, 1998). (see Figure 3.2)

Figure 3.2 Self-efficacy in health promotion



(Bandura, 1998)

A literature review by Marks et al. (2005) illustrated the way that self-management health education programmes incorporate self-efficacy elements to help people manage chronic disease. It included different health education programmes for diseases such as arthritis, cancer, and diabetes, as well as hip fractures. The self-efficacy theory has been successfully implemented in these programmes. The perception of self-efficacy in participants can be a long-term indicator to determine whether they can successfully maintain positive health behaviours. The interventions can influence participants in a positive way by helping them improve their behaviours and their ability to self-manage their health condition. Their belief in self-efficacy can also mediate their level of motivation, mood, and health promotion attitude. Self-efficacy was a predictor for disease management behaviours and perceived control over patients' health condition. Better levels of self-efficacy would indicate better control of stress and health status.

To improve self-efficacy, the health education programmes used different learning strategies and skills mastery training, for example, setting goals and homework (Marks & Allegrante, 2005; Marks et al., 2005).

The duration of self-efficacy development is different in each person. No definite duration was found in the research to prove how long participants took to develop self-efficacy. Studies examining self-efficacy in different diseases or pain were retrieved to determine the duration of self-efficacy. Upon completion of the studies, participants demonstrated significant improvements in self-efficacy. The duration of the interventions ranged from four days to 20 weeks. Patients with pain took three to 10 weeks to improve their self-efficacy (Unsal & Kasikci, 2010; Wells-Federman et al., 2002), and four days to 20 weeks were needed for disease-specific programmes for diseases such as obesity, diabetes mellitus, and multiple sclerosis (Bas & Donmez, 2009; Campbell et al., 2011; Ng et al., 2013). A community project by Hoon et al. (2017), which improved public self-efficacy in pain management, was held for two weeks, with one session per week. However, the above studies did not come to a consensus on the required duration of a programme to develop self-efficacy in participants. Although no definite duration was found, the above health programmes demonstrated successful improvements in self-efficacy within three to 10 weeks. Tailor-made disease health

programmes can be designed and implemented to meet the needs of the targeted participants.

3.4 Theoretical framework

Figure 3.3 Study theoretical framework

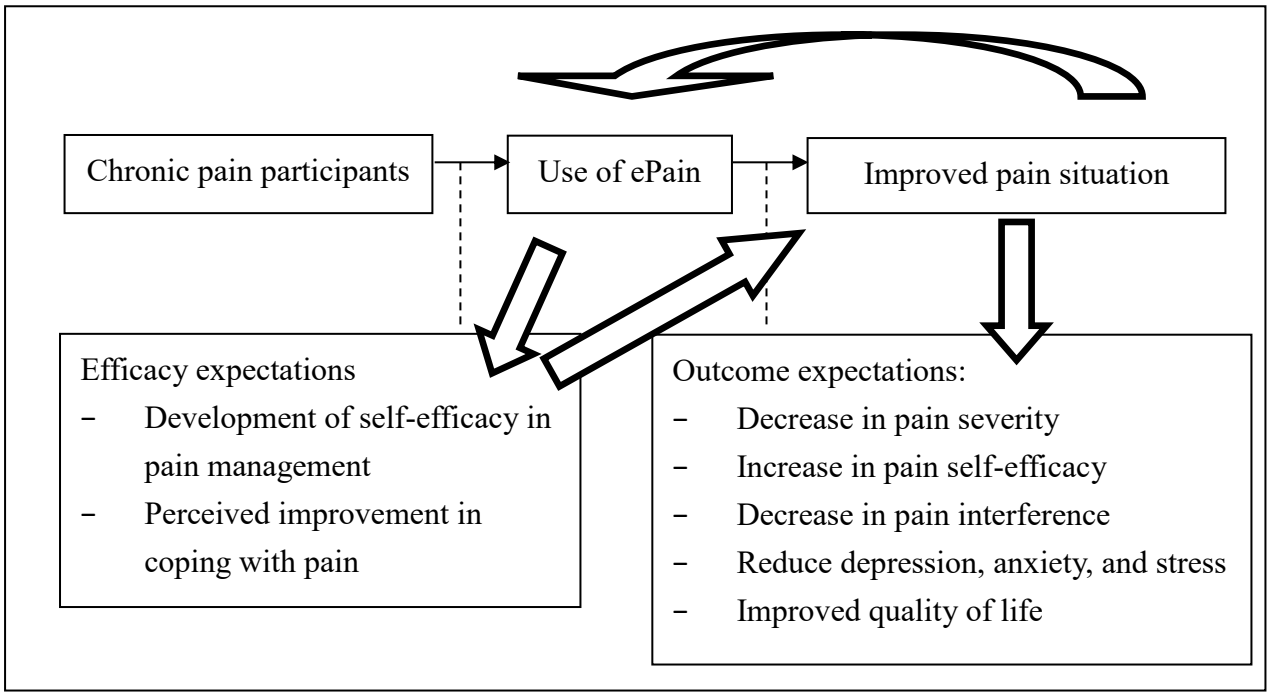


Figure 3.3 demonstrates the theoretical framework of the study, which is based on the self-efficacy theory of behavioural change by Bandura (1977). An electronic pain management programme (ePain) was developed. Chronic pain sufferers joined ePain and engaged in the programme.

When the participants decided to join ePain, they would have expectations about

improving their pain situation. These efficacy expectations would be made up of the development of self-efficacy in pain management, and perceived improvements in coping with pain. Efficacy expectations enabled the participants to start ePain. The efficacy expectations would be continuously present when they continued their participation with ePain, and contribute to improvements in pain situation. Participants would experience and foresee increased levels of self-efficacy by engaging in ePain. These expectations would strengthen participants' belief in improving their pain, and engage them to remain and continue using ePain.

Outcome expectations arise during the process of using ePain. Participants would expect a decrease in pain severity and pain interference, an increase in pain self-efficacy, reduced levels of depression, anxiety and stress, and improvement in quality of life. ePain can help them to achieve their outcome expectations, and eventually become the outcome. When participants reach the desired outcome, they may expect to achieve a higher level of outcome and contribute back to the outcome expectations. Therefore, they can further decrease their pain severity, pain interference, depression, anxiety, and stress, improve their level of self-efficacy and quality of life.

3.5 Executive summary

The self-efficacy theory of behavioural change was adopted as the theoretical framework of the main study, guiding the design and development of ePain. The chronic pain participants who joined ePain would have expectations about improving their pain situation. Their participation contributed to an increase in their outcome expectations, including improvements in pain severity, pain self-efficacy, pain interference and levels of depression, anxiety and stress, and quality of life. When they experienced such changes, they perceived ePain as an effective pain management intervention. They would continue using ePain and further decrease their pain severity.

Chapter 4 Groundwork of the main study

4.1 Introduction

From the literature search, there were cross-sectional studies conducted to examine the prevalence of pain in Hong Kong (Chung & Wong, 2007; Wong & Fielding, 2011). The prevalence of pain was high in the Hong Kong population, reaching up to 45.9% (Chung & Wong, 2007). However, the targeted participants were the general public, and telephone interviews were used to contact the participants. The study focused on the working population and online users, in which the targeted participants and contact methods were different from those in the previous surveys. Previous surveys did not specifically examine the working population. The pain characteristics, pain management preferences, and preferences in the use of the Internet for the pain education of the working population were not investigated. Also, one of the surveys was done in 2007, so updated information would be needed in the development of the ePain.

It was necessary to explore, understand, and update the pain situation of members of the working population suffering from acute and chronic pain. An online survey on the Internet was used to reach potential participants. It collected information to identify

the pain education components related to the working population and the pain topics they were interested in. The data collected aided in the development of ePain. Therefore, an online survey was conducted to reach the working population who are also online users and potential ePain participants, and to update their pain situations.

This chapter illustrates the groundwork of the main study. The objectives, methods, results, discussion, and its implications for the main study are presented.

4.2 Online survey objectives

The objectives of the online survey were

- To explore the prevalence of acute and chronic pain among the working population in Hong Kong;
- To understand their pain management strategies;
- To determine source of information for pain management and their preferred contents in ePain

4.3 Methods

4.3.1 Study design

A cross-sectional online survey was used. A questionnaire was developed for use in the study.

4.3.2 Samples and procedure

The total Hong Kong labour force was 3,727,407 according to the 2011 Population Census (Census and Statistics Department, 2012a). A 95% confidence level and a 7% margin of error was adopted to calculate the sample size of the online survey. The estimated sample size was 196.

The inclusion criteria of the online survey were:

- Adults aged 15 or above;
- Who had performed a job during the seven days before joining the survey or who had worked for pay or profit during the seven days before participating in the survey;
- Who could understand Chinese;
- Who had an electronic device that they could use to access the Internet.

Participants were recruited by snowball sampling. Participant recruitment started by posting a link on social media, to attract a wide range of participants. The participants could forward the survey link to others. The survey was hosted on Google Form. The data collected were stored in Google Drive. Google provides an information security service and data encryption for users (Google, 2016). The research team was the only party with the login name and password to access the account. Data retrieved from the Google account were locked in a computer with a password, and use was restricted to the research team.

4.3.3 Survey Content Validity Index

The survey was reviewed and validated by one registered nurse and two occupational therapists with expertise in pain management. The Item-level of Content Validity Index (I-CVI) score was 1.0. The results indicate the content was valid (Polit & Beck, 2006; Polit et al., 2007).

4.3.4 Outcomes

The questionnaire used in the online survey was developed with five sections to

gather information about the pain situation and pain education preferences of the working population, to aid in the development of ePain. There were five sections in the survey. These include pain history, pain management preferences, source of pain management education received by participants, preferences in using the Internet, and participant demographic characteristics. Table 4.1 shows the information collected in each section.

Table 4.1 Online survey sections

Sections	Title of the sections	Number of items in each section	Outcomes
1	Pain history of the participants	7	• Duration of pain • Pain severity (0 – 10 numeric scale) • Pain locations • Reasons for the presence of pain • Patterns of pain
2	Management of pain	15	• Use of pharmacological and non-pharmacological interventions for managing pain • Activities of daily living affected by pain • Level of perceived depressed mood
3	Source of pain management education received by the participants	5	• Where to obtain pain education materials • Adequacy of the pain education • Mode of delivering pain education • The content the participants

			preferred in an electronic pain management programme
4	Preference of using the Internet	3	• Number of hours spent on the Internet per day • The tools the participants' used to access the Internet • The activities performed on the Internet
5	Demographic characteristics of the participants	10	• Gender • Age • Marital status • Occupation • Education level • Living status • Monthly income • Health history

First, the participants needed to indicate whether they were experiencing any pain. Those answering 'Yes' would be directed to the remaining sections. Those who answered 'No' would proceed to section three. Each item had to be completed in a section before the participants could move on to the next section. They were allowed to revise their choices before survey submission. The items in the sections were not randomised.

4.3.5 Ethical considerations

Ethical approval was granted from the Human Subjects Subcommittee of the Hong

Kong Polytechnic University (Reference number: HSEARS20160804003). The information sheet was available when the participants accessed the survey. They were required to read through the information sheet, which provided a full explanation of the survey's nature, purpose, procedure, and duration. The participants gave their consent to participate in the survey by clicking the 'Continue' button, and the survey began.

4.3.6 Data analysis

The IBM Statistical Package for the Social Sciences, SPSS for Windows version 23.0 was used. The demographic characteristics and outcomes were examined by a chi-square test and a Mann-Whitney U Test. A p-value of 0.05 was considered statistically significant.

4.4 Results

4.4.1 Demographic characteristics

A total of 210 participants completed the online survey. There were 141 participants who reported they had pain (67.1%). A majority of participants was female (70.5%). Their mean age was 38.02. More than half of participants were single (55.2%) and had attained a post-secondary education level (66.7%). Nearly half of participants

who presented with pain were professionals (acute pain group: 45%; chronic pain group: 41.6%). Most did not have any chronic illnesses (81.9%). There were no statistical differences found in the demographic characteristics between the non-pain and pain group participants. Table 4.2 presents the participant demographic characteristics.

Table 4.2 Demographic characteristics of 210 participants

	n (%)								
	Total (n = 210)		Non-pain group (n = 69)		Pain group (n = 141)				p-value[#]
					Acute pain (n = 40)		Chronic pain (n = 101)		
	n	%	n	%	n	%	n	%	
Presence of pain	-		69	32.9	40	28.4	101	71.6	-
Gender									0.84
Male	62	29.5	21	30.4	11	27.5	30	29.7	
Female	148	70.5	48	69.6	29	72.5	71	70.3	
Age									0.06
Mean	38.02								
15-30	90	42.9	32	46.4	22	55	36	35.6	0.64
31-50	70	33.4	20	29	11	27.5	39	38.6	
51-70	50	23.7	17	24.6	7	17.5	26	25.7	
Marital status									0.95
Single	116	55.2	40	58	27	67.5	49	48.5	
Married	85	40.5	26	37.7	12	30	47	46.5	
Divorced	6	2.9	2	2.9	1	2.5	3	3	
Widowed	3	1.4	1	1.4	0	0	2	2	
Occupation									0.11

Managers and administrators	21	10	8	11.6	2	5	11	10.9	
Professionals	76	36.2	16	23.2	18	45	42	41.6	
Associate professionals	37	17.6	11	15.9	6	15	20	19.8	
Clerical support workers	34	16.2	15	21.7	6	15	13	12.9	
Service and sale workers	13	6.2	4	5.8	3	7.5	6	5.9	
Craft and related workers	5	2.4	2	2.9	1	2.5	2	2	
Plant and machine operators and assemblers	6	2.9	4	5.8	1	2.5	1	1	
Elementary occupations	11	5.2	6	8.7	2	5	3	3	
Others	7	3.3	3	4.3	1	2.5	3	3	
Education level									0.11
No formal education	1	5	1	1.4	0	0	0	0	
Primary level	12	5.7	7	10.1	2	5	3	3	
Secondary level	57	27.1	19	27.5	6	15	32	31.7	
Post-secondary level	140	66.7	42	60.9	32	80	66	65.3	
Living status									0.86
Alone	20	9.5	8	11.6	3	7.5	9	8.9	
With spouse	28	13.3	11	15.9	5	12.5	12	11.9	
With spouse and children	61	29	18	26.1	8	20	35	34.7	
With children	10	4.8	4	5.8	1	2.5	5	5	
With relatives	83	39.5	25	36.2	21	52.5	37	36.6	
With friends	8	3.8	3	4.3	2	5	3	3	
Monthly income (USD$)									0.60
768 or below	14	6.7	8	11.6	2	5	4	4	

767 - 1280	10	4.8	3	4.3	2	5	5	5	
1281 - 2562	77	36.7	23	33.3	17	42.5	37	36.6	
2563 - 3843	39	18.6	13	18.8	9	22.5	17	16.8	
3844 - 5124	32	15.2	10	14.5	7	17.5	15	14.9	
5125 - 7686	22	10.5	6	8.7	3	7.5	13	12.9	
7687 or above	16	7.6	6	8.7	0	0	10	9.9	
Personal health history (Multiple answers can be chosen)									
No chronic illnesses	162	81.9	61	88.4	32	80	79	78.2	0.09
Hypertension	11	5.2	2	2.9	5	12.5	4	4	0.29
Diabetes mellitus	6	2.9	1	1.4	3	7.5	2	2	0.39
Heart disease	4	1.9	1	1.4	2	5	1	1	0.74
Stroke	1	0.5	0	0	0	00	1	1	0.48
Gout	5	2.4	1	1.4	0	0	4	4	0.54
Respiratory disease	4	1.9	1	1.4	0	0	3	3	0.74
Arthritis	10	4.8	3	4.3	1	2.5	6	5.9	0.84
Cataract	1	0.5	0	0	0	0	1	1	0.48
Others	11	5.2	1	1.4	3	7.5	7	6.9	0.09

Percentages may not add up to 100% because of rounding.

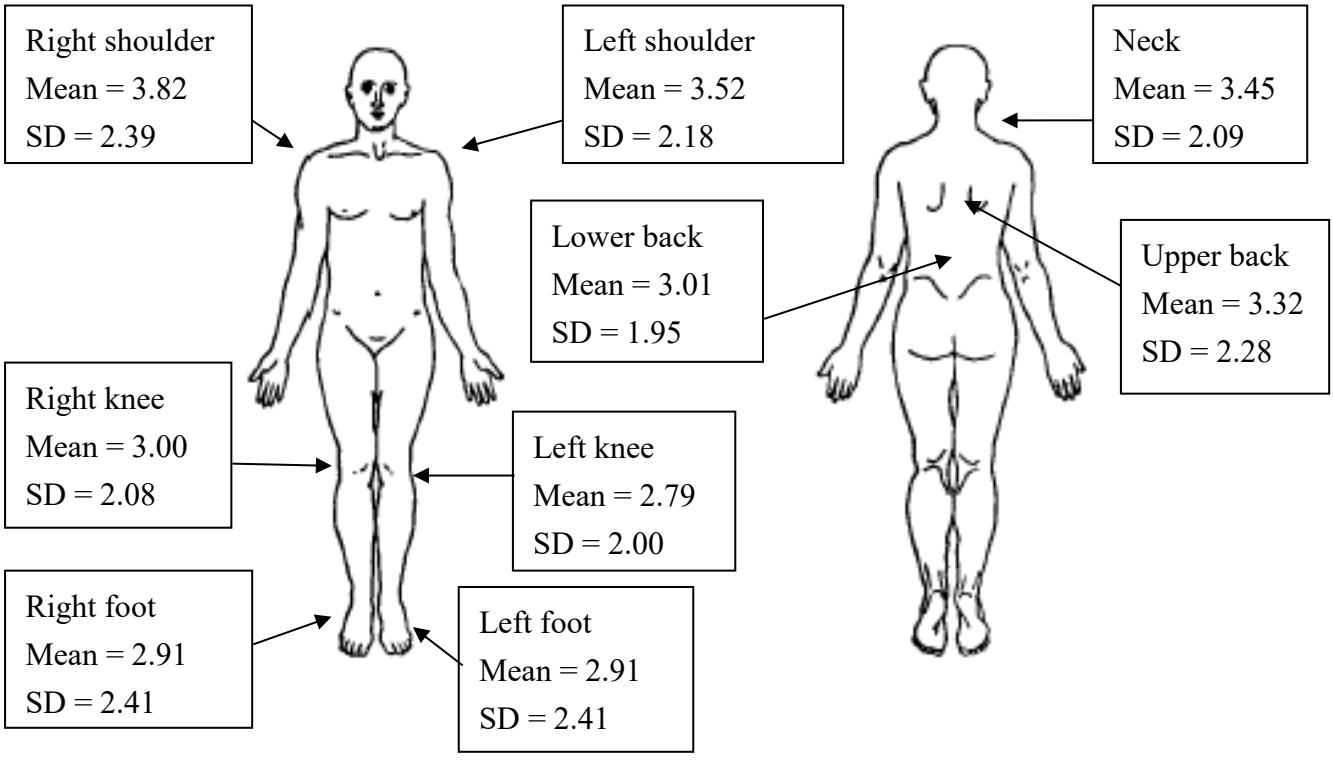
[#] A Chi Square Test was used to compare the non-pain and pain groups.

*$p < 0.05$ was considered significant.

4.4.2 Prevalence of pain and pain situations of the pain participants

Among the 141 participants who reported pain, 40 had acute pain (28.4%) and 101 had chronic pain (71.6%). In the whole survey population, the prevalence of acute pain was 19%, while the prevalence of chronic pain was 48.1%. The total mean pain severity of all pain participants was 2.85 (SD = 1.57), which included acute pain mean severity (mean = 2.46, SD = 2.35) and chronic pain mean severity (mean = 3.01, SD = 1.62). The most common pain sites were the neck and bilateral shoulders. The right shoulder had the highest mean pain severity of 3.82 (SD = 2.39). Figure 4.1 illustrates the mean pain severity of participants.

Figure 4.1 Mean pain severity of 141 pain participants



Straining (70.9%) and stress (39%) were the top reasons for having pain. For the chronic pain participants, 64.4% explained that their pain could be present at any time and was intermittent. The acute pain participants reported that an episode of pain could persist for an average of two hours, while it was four hours for chronic pain participants.

4.4.3 Preferences in pain management in acute and chronic pain participants

Table 4.3 shows the pain management methods used by the acute and chronic pain participants. Up to 70% of the acute and chronic pain participants did not take any analgesics when they experienced pain. However, 46.1% of participants considered analgesics to be an effective measure to reduce pain severity ($p < 0.05$). Still, 31.2% did not consider taking any forms of analgesic when in pain. Participants perceived that non-pharmacological interventions were useful for pain relief (acute pain group: 82.5%; chronic pain group: 82.2%). Massage, bed rest, and the use of a hot pad were the most common non-pharmacological interventions used for pain management. They would buy and take over-the-counter medications (30.5%) and self-administered non-pharmacological interventions (48.9%). However, 29.8% of participants did not attempt to take any interventions to reduce pain.

Table 4.3 Pain management methods used by the 141 pain participants

	Total (n = 141)		Acute pain (n = 40)		Chronic pain (n = 101)		p-value[#]
	n	%	n	%	n	%	
Take analgesics when pain is present							
Yes	42	29.8	12	30	30	29.7	0.97
No	99	70.2	28	70	71	70.3	
Perceived usefulness of analgesics							
Yes	65	46.1	26	65	39	38.6	0.01*
No	32	22.7	4	10	28	27.7	
Would not consider taking any form of analgesics	44	31.2	10	25	34	33.7	
Non-pharmacological interventions used by the participants [+]							
Massage	92	64.8	25	62.5	67	66.3	
Bed rest	56	39.4	20	50	36	35.6	
Exercise	54	38	12	30	42	41.6	
Hot pad	54	38	15	37.5	39	38.6	
Analgesic balm or oil	49	34.5	6	15	43	42.6	
Perceived usefulness of non-pharmacological interventions							
Yes	116	82.3	33	82.5	83	82.2	0.49
No	12	8.5	2	5	10	9.9	
Would not consider using any non-pharmacological interventions	13	9.2	5	12.5	8	7.9	
Interventions chosen when pain presents [+]							
Self-administering non-pharmacological interventions	69	48.9	19	47.5	50	49.5	0.83

Buy and take over-the-counter medications that do not require a prescription	43	30.5	11	27.5	32	31.7	0.63
Did not attempt any interventions	42	29.8	15	37.5	27	26.7	0.21
Seek help from doctors	31	22.1	6	15	25	24.8	0.20

Percentages may not add up to 100% because of rounding.

[#] A Chi Square Test was used to compare the two groups.

*$p < 0.05$ was considered significant.

[+] Multiple answers could be chosen.

4.4.4 Pain and perceived depressed mood and quality of life

Depressive mood, activities of daily living, and participant quality of life were affected by pain. Table 4.4 presents the psychological effects of pain on acute and chronic pain sufferers. For the participants with chronic pain, 78.1% perceived they seldom to often experienced a depressed mood, compared to more than the 67.5% of participants with acute pain ($p = 0.023$). Overall, 68.1% of the pain participants reported that their activities of daily living were affected by pain, with the percentage being higher among chronic pain participants, at 74.3% ($p = 0.012$). A total of 84.4% of pain participants stated that their quality of life was seldom to often affected by pain. The figure was higher among chronic pain participants (88.2%) than acute pain participants (75%) ($p = 0.004$).

Table 4.4 Psychological effects of pain on acute and chronic pain sufferers (n = 141)

	Total (n = 141)		Acute pain (n = 40)		Chronic pain (n = 101)		p-value[#]
	n	%	n	%	n	%	
Depressed mood because of pain[@]							
None	35	24.8	13	32.5	22	21.8	0.023*
Seldom	68	48.2	22	55	46	45.5	
Sometimes	31	22	4	10	27	26.7	
Often	7	5	1	2.5	6	5.9	
Activities of daily living were affected by pain[#]							
Yes	96	68.1	21	52.5	75	74.3	0.012*
No	45	31.9	19	47.5	26	25.7	
Quality of life was affected[@]							
None	22	15.6	10	25	12	11.9	0.004*
Seldom	66	46.8	22	55	44	43.6	
Sometimes	39	27.7	6	15	33	32.7	
Often	14	9.9	2	5	12	11.9	

Percentages may not add up to 100% because of rounding.

[#] A Chi Square Test was used to compare the two groups.

[@] A Mann-Whitney U Test was used.

*$p < 0.05$ was considered significant.

4.4.5 Internet usage and preferences in pain education

Table 4.5 shows participant preferences in pain management education and Internet use. All 210 participants, no matter whether they lived with pain or had no pain, were invited to provide information about their Internet usage and their preferences in terms of pain education. The most popular topic was non-pharmacological methods of pain management (78.1%). For Internet usage, 87.2% of participants spent at least one

hour per day on the Internet, and mobile phone was the most frequently used device to access the Internet. They obtained pain education from the Internet (64.8%) and healthcare professionals (61%). A majority of participants (85.7%) reported they had not received adequate pain education. They rated public pain services as inadequate (91.4%).

Table 4.5 Participants' preferences in pain management education and their Internet use (n = 210)

	Frequency	
	n	%
Pain management topics in which the participants expressed an interest (Multiple answers could be chosen)		
Non-pharmacological methods of pain management	164	78.1
Pharmacological methods of pain management	137	65.2
The relationship between pain and disease	114	54.5
Definition and mechanisms of pain	98	46.7
How pain affects an individual's physical and psychological health	83	39.5
Time spent on the Internet per day		
Less than one hour	27	12.9
1 – 2 hours	65	31
3 – 6 hours	75	35.7
More than 6 hours	43	20.5
Device most frequently used for accessing the Internet		
Computer	69	32.9
Mobile phone	138	65.7
Both	3	1.4
Places to get information about pain management (Multiple answers could be chosen)		
Internet	136	64.8
Healthcare professionals	128	61
Friends	66	31.4
Media	39	18.6
Pamphlets	26	12.4
Posters	8	3.8

Percentages may not add up to 100% because of rounding.

4.5 Discussion

The results of the online survey examined and updated the pain situation of the Hong Kong working population. Similarities in the demographics between the participants and the Hong Kong labour force were found, except that in this survey, a higher percentage of participants had a higher education level (66.7%) and worked as professionals (36.5%) (Census and Statistics Department, 2017).

The prevalence of chronic pain reached 71.6% in the pain group. When compared to previous studies, the prevalence of pain in the working population (67%) in this online survey was higher. Previous studies have shown the Hong Kong general population's prevalence of pain ranged from 34.9% to 45.9% (Chung & Wong, 2007; Wong & Fielding, 2011). This indicates the working population requires help in handling their pain.

Participants' upper limbs presented with a higher pain severity than other parts of the body. One possible reason for the occurrence of pain in the upper limbs could be related to computer and Internet use, with improper posture. Office workers who frequently used computers reported work-related musculoskeletal pain (Cho et al., 2012; Mikkel et al., 2014). Risk factors contributing to musculoskeletal disorders included

the use of a mouse and keyboard, and a prolonged sitting position (Ariëns et al., 2001; Sarquis et al., 2016). If a person failed to maintain proper posture, pain could result in the neck and upper back (Aryaie et al., 2017; Ehsani et al., 2017).

An issue of note discovered in this online survey, was that a majority of pain sufferers did not take analgesics (70.2%). Although pain sufferers were aware of the usefulness of analgesics, they did not take or consider trying analgesics. They were more interested in the usefulness of non-pharmacological interventions for pain management. Possible reasons for them to avoid analgesics could be a fear of the side effects of analgesics, and lack of adequate knowledge about these medications (Liu et al., 2007). Then, they tended to use non-pharmacological interventions for pain management, such as massage and bed rest. Massage may have an immediate and short-term pain-relieving effect on neck and shoulder pain (Kong et al., 2013). This explains why participants chose massage as the most favoured choice among non-pharmacological interventions.

The prevalence of chronic pain (71.6%) was much higher than acute pain (28.4%), as found in the online survey. This could be due to people not treating their pain in the acute phase, and the acute pain then transitioning to chronic pain (Feizerfan & Sheh,

2015; Lavand'homme, 2011). The working population would take sick leave or even be unable to work due to functional disability (Azevedo et al., 2012). In addition, participants with chronic pain experienced more depressive moods (32.6%), and lower quality of life (44.6%) than the acute pain sufferers ($p < 0.05$). Chronic pain contributed negatively to depressive mood and quality of life (Lerman et al., 2015; Paananen et al., 2011). Pain education should be provided to pain sufferers, especially to chronic sufferers, in order to reduce the negative impacts brought about by chronic pain.

4.6 Limitations

Some limitations were identified in the online survey. The working population who did not have an electronic device and Internet access would not be able to participate in the online survey. The results were limited in terms of generalizability and validity. The limitation of the margin of error and snowball sampling decreased the power of the survey and representativeness. In the non-pain group, the psychological parameters were not assessed. A sub-group analysis was not conducted for different age groups of the participants.

4.7 Implications for the main study

Through the online survey, a need to develop and provide pain education to the working population was identified. As pain education and pain services are inadequate, the use of an online pain management programme would be beneficial, especially for the working population, who have busy work schedules. Their opinions were collected in this online survey and were used during the ePain development process, with the contents tailor-made to meet the preferences and needs of the working population.

4.8 Executive summary

An online survey was conducted to explore the prevalence of acute and chronic pain in the working population in Hong Kong, their pain management strategies, and their preferences for using electronic pain management materials. A total of 210 participants responded to the online survey, 67% of whom were in pain. Of the group in pain, 71.6% suffered from chronic pain. The pain severity ranged from 2.82 to 3.82 on a 10-point numeric scale. Of the participants, 85.7% reported they had not received adequate pain management education, and 91.4% agreed that pain services were inadequate. They obtained pain management education through the Internet and healthcare professionals.

Healthcare professionals should pay attention to the high prevalence of pain in the working population. An online pain management programme could be a solution to address pain problems in the working population.

Chapter 5 Development of ePain

5.1 Introduction

This chapter outlines the development of ePain. The process generating the ePain contents, and the integration of the essence of online learning into ePain, are presented. After content development, an expert panel reviewed ePain and the results are illustrated. A usability test was conducted with five chronic pain sufferers in the working population, to test ePain's performance and acceptability. The feedback collected from the expert panel and usability test were used to modify and enhance ePain before launching. ePain fidelity was maintained by strategies based on the Treatment Fidelity Workgroup of the National Institutes of Health Behavior Change Consortium (BCC), and the strategy details are shared in this chapter.

5.2 ePain Contents

The contents of ePain were generated from a literature review and the results of the online survey.

A systematic review was conducted to identify effective non-pharmacological

interventions for pain management. The interventions were acupressure, acupuncture, guided imagery, qigong, periosteal stimulation, and Tai Chi (Tang et al., 2019). Although the systematic review targeted interventions involving older adults, information from professional associations and articles studying the effects of these interventions on adults were retrieved, to ensure the interventions were applicable and suitable for adults.

The online survey indicated the content preferences of the working population, which was the targeted study population. The survey participants preferred pain management topics focused on both non-pharmacological (78.1%) and pharmacological methods of pain management (65.2%) (Tang et al., 2020).

Based on the literature review and online survey, ePain had two themes, including self-directed learning of pain knowledge and self-management techniques. Three chapters covered self-directed learning on pain knowledge, and four chapters focused on self-management techniques. Table 5.1 shows the themes and chapters.

Table 5.1 Themes and chapters of ePain

Theme	Chapters
Self-directed learning of pain knowledge	Introduction to pain
	Pain-related diseases and syndromes
	Occupational diseases related to pain
Self-management techniques	How to manage your pain
	Pharmacological approaches to pain management
	The non-pharmacological management of pain
	Exercise for relieving pain

In the self-directed learning chapter, the definition of pain, pain theories, the factors contributing to pain, and how pain contributes to an individual's physical, psychological, and social aspects, were introduced. Also, it includes content on diseases, syndromes, and occupational diseases in which pain can occur.

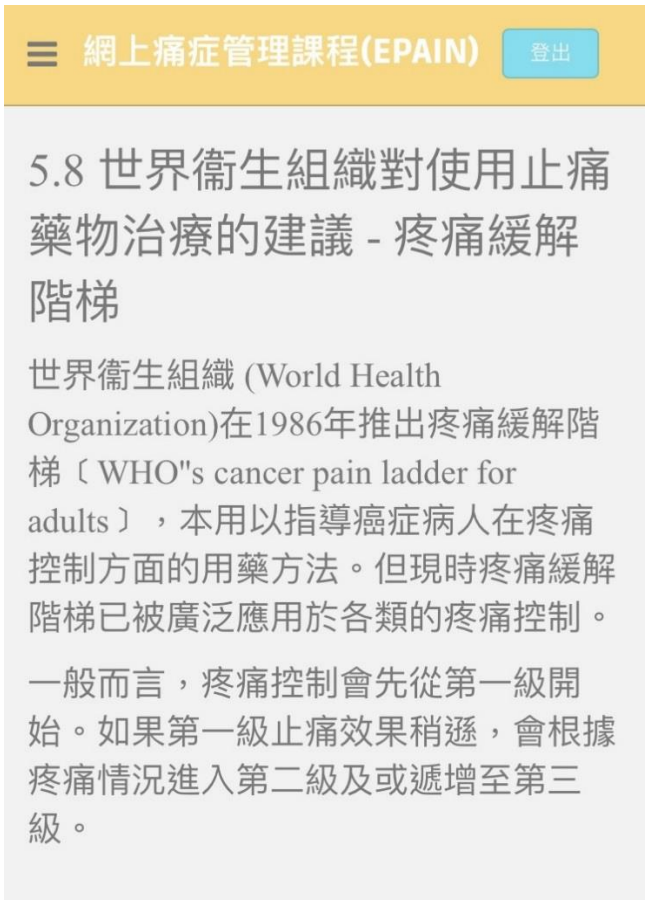
In the self-management technique chapters, participants learnt how to plan their own pain management interventions. Evidence-based pharmacological and non-pharmacological interventions were shared. Pharmacological interventions using the World Health Organization Analgesic Ladder was introduced (World Health Organization, 2016). Commonly used analgesics, for example, paracetamol and tramadol, were included. Medication uses, dosages, side effects, and precautions were mentioned. The non-pharmacological management of pain included the interventions identified in the systematic review. In addition, the opinions gathered from the online survey related to the ePain content were taken into consideration. Further searches on

the topics that survey participants were interested in were searched and added to the ePain contents. Pain management from a Chinese traditional medicine perspective was shared. There was an introduction to, and demonstrations of exercises that can help relieve pain.

ePain was written in Chinese. The contents were displayed in an interactive way. Photographs, videos, and diagrams were used to illustrate the contents. The design of the ePain user interface was colourful and user friendly. Participants could access ePain from mobile phones and computers. A programmer was responsible for ePain's technical development, support, and user interface design. Participants accessed ePain from computers and mobile phones, as shown in Appendices 11 and 12. Figure 5.1 and Figure 5.2 show screen captures of ePain from a computer view and a mobile phone view.

Figure 5.1 Screen capture of ePain from computer view

Figure 5.2 Screen capture of ePain from mobile phone view



To understand how the participants progressed and their understanding of the content, quizzes were set at the end of each chapter. The participants would click the option, 'I understand the contents of the chapter' and proceed to the quiz. The questions in the quiz were generated from the chapters. There were six true/false questions in each chapter. The quiz results were displayed immediately to participants and were recorded in ePain. It was optional for the participants to attempt the quizzes.

ePain provided a portal for the participants to record their experiences and pain management learning. In addition, a fill-in table was set to allow the participants to record their usage of pharmacological and non-pharmacological interventions to manage pain. It included intervention type, frequency of usage per day and per week, and the perceived intervention effectiveness. Each participant had their own record, which they could retrieve on ePain.

To facilitate communication between the participants and research team, a message column was available for participants to send comments on the use of ePain and to contact the research team when they had questions. Also, a function that sent the ePain link to others was provided, so that participants could invite new participants.

5.3 Integration of the essence of online learning into ePain

Online learning is used in school to allow students "flexibility, learning on their own, staying home from school and working online" (Harvey et al., 2014). The learners liked online learning, as they enjoyed having choices and a sense of control, and could learn the things they were interested in (Song & Bonk, 2016). The elements and essence of online learning were incorporated into ePain, to enhance the experience and facilitate ePain participant learning.

The elements of online learning, including self-paced learning, learner control, and self-directed learning, were integrated during the development of ePain (Lim, 2016). Self-paced learning is "an interactive mode of learning over the Internet that each learner does on his or her own, at his or her pace and in his or her own time" (Lim, 2016).

When self-paced learning was put into ePain, it helped the participants fulfil their personal learning objectives and maximise their freedom to learn (Soyemi et al., 2012). In ePain, the intervention group participants could access all content. The concepts of learner control and self-directed learning were used to allow the intervention group participants to select the content that suited their pain condition or the content they

preferred to start with, or to follow the plan set by the research team (Lim, 2016; Rhode & Krishnamurthi, 2016). This arrangement could provide participants with a great sense of comfort in learning (Rhode & Krishnamurthi, 2016). Also, it increases the motivation to learn (Lim, 2016). The three ePain elements - self-paced learning, learner control, and self-directed learning - provided participants with opportunities to learn to self-manage pain in their own way.

ePain is an online programme in which the participants had no face-to-face contact. Multiple channels were established to handle communication between the participants and the research team. A “Contact Us” function was set in ePain to allow the participants to send messages to the research team whenever necessary. Also, instant messaging accounts, including WhatsApp and WeChat, were set up. An email account for ePain was created. With these measures, a positive social interaction environment was generated.

To monitor participant progress, measure the treatment dosage and participant learning preferences for the pain management techniques and topics they were the most interested in, a page view count was set up for each page of the ePain content. This recorded the amount of content accessed by participants, and provided the research

team with insights into the topics and content favoured by participants.

5.4 Data security

The programmer was responsible for technical development and support. Participants were required to use their email address to sign up for an ePain account, and could register one email address once only. Their email address was the login name, and they set their own password for their login. ePain did not allow participants to access other participants' data. The programmer monitored data security throughout the study period.

ePain was hosted in Google Drive. Only the research team members had the login name and password to access the Google account. Information security service was provided by Google. Google provides encryption for its services (Google, 2016). All downloaded data were stored in a secure server with password protected. Only the research team had the password to access the server.

5.5 Expert panel review

Healthcare professionals who are experts in pain management were invited to form

an expert panel to review the ePain content. There were five experts, including a physician, two nurses, a physiotherapist, and an occupational therapist. A full explanation of the objectives and study design were given. The experts were asked to rate the relevance of each ePain chapter on a four-point Likert scale (1 = highly relevant; 2 = quite relevant; 3 = somewhat relevant; 4 = not relevant). In addition, they provided comments and suggestions for further improvements to ePain. A Traditional Chinese Medicine Practitioner was consulted on the content related to Chinese medicine.

The expert panel rated the content as having good relevancy. The ratings ranged from 1.0 to 1.4, with a mean score of 1.3. The interrater reliability was 0.81. The chapters that received the highest relevance were “Introduction to pain”, “How to manage your pain”, and “Pharmacological approach to pain management”. The expert panel regarded ePain as relevant, simple, clear, and informative. Major elements of pain management were covered. They also recommended revising some of the wordings.

The expert panel agreed that the questionnaire was highly relevant and appropriate for use in assessing the study outcomes. They thought it matched the study objectives. Other expert panel comments included whether it was suitable to study the psychological effects brought about by pain, and to add an “Others” option to the

questionnaire, to allow participants fill in their own answers.

Modifications were made to ePain according to the expert panel's comments and suggestions, and before conducting the usability test.

5.6 Usability test

Usability is "the capacity in human functional terms to be used easily and effectively by the specified range of users given specified training and user support, to fulfil the specified range of tasks, within the specified range of environmental scenarios" (Shackel, 2009). Usability testing is defined as "to evaluate a product or service by testing it with representative users" (Usability.gov, 2019). To find out how the participants performed when using ePain and their acceptance of the system, a usability test was adopted. Also, it helped assess the system interfaces and evaluate the user experience with ePain.

5.6.1 Subject and sampling

Five participants with chronic pain were recruited for the usability test. This is an adequate sample size to detect potential problems in a system (Nielsen & Landauer,

1993). The participants were recruited from social media. Convenience sampling was adopted.

5.6.2 Usability test procedure

A 20-minute briefing session was provided to each participant, to provide information about the study objectives and the applications and functions of ePain. A testing account was created for this usability test. The participants used the testing account and password to log into ePain, which allowed them to access all of the ePain content. At the end of the usability test, they completed the Computer System Usability Questionnaire.

5.6.3 Instrument

The Computer System Usability Questionnaire (CSUQ), developed by IBM, is a questionnaire with 19 items. It “assesses user satisfaction with system usability” and “allows participants to provide an overall evaluation of the system they used”. There are three factors in the CSUQ, namely System Usefulness (SYSUSE), Information Quality (INFOQUAL), and Interface Quality (INTERQUAL). One item is the overall score of the participants’ satisfaction level with the system. A seven-point scale was

used to rate the items, with a score of one representing “strongly agree” and a score of seven representing “strongly disagree”. A “Not applicable” option was set outside of the scale. CSUQ had satisfactory reliability, with a coefficient alpha of 0.89. Satisfactory validity and sensitivity resulted by assessing the scale sensitivity to variables that could affect the scale, with a p-value ranging from 0.02 to 0.1 (Lewis, 1995). The participants were invited to provide their feedback in the “Opinions on ePain” column.

5.6.4 Statistical analysis

The demographic data and CSUQ items were analysed using a descriptive approach. Their means, standard deviations, and percentages were calculated. For the items rated “Not applicable” or not answered by participants, the average scores were calculated from the total number of items answered.

5.6.5 Usability test results

5.6.5.1 Demographic characteristics of the usability test participants

There were five participants who were recruited and completed the usability test: four females (80%) and one male (20%). Their mean age was 39.4 years. Three

participants were single and had attained a post-secondary education level (60%). Two participants were married and had a post-secondary education level (40%). All usability test participants reported chronic pain. Table 5.2 shows the usability test participant demographic characteristics.

Table 5.2 Demographic characteristics of the participants in the usability test (n = 5)

		n (%)
Gender		
	Female	4 (80)
	Male	1 (20)
Age		
	Mean	39.4
	Range	28 – 64
Marital Status		
	Single	3 (60)
	Married	2 (40)
Occupation		
	Professionals	1 (20)
	Associate professionals	1 (20)
	Clerical support workers	2 (40)
	Elementary occupations	1 (20)
Level of education		
	Secondary level	2 (40)
	Post-secondary level	3 (60)
With chronic pain		
	Yes	5 (100)

Percentages may not add up to 100% because of rounding.

5.6.6 Quantitative data of the usability test

Table 5.3 presents the mean scores of the CSUQ items. The mean score for SYSUSE was 1.5 (SD = 0.50), INFOQUAL was 1.56 (SD = 0.76), INTERQUAL was

1.8 (SD = 0.56), and the overall satisfaction level was 1.6 (SD = 0.50). ePain received a very high level of satisfaction from participants. Item 7 ("It was easy to learn to use this system") had the best score and the mean score was 1.0. Item 9 ("The system gave error messages that clearly told me how to fix problems") received the fewest responses (n = 1). Four participants selected "Not applicable" as the answer for item 9. This indicated that participants were able to use ePain independently, in the way they desired, and did not need any system messages to help them.

Table 5.3 Descriptive statistics on the CSUQ items

Items	n	Mean±SD
System usefulness (SYSUSE)		
1. Overall, I am satisfied with how easy to use this system.	5	1.4±0.548
2. It was simple to use this system.	5	1.6±0.548
3. I could effectively complete the tasks and scenarios using this system.	5	1.4±0.548
4. I was able to complete the tasks and scenarios quickly using this system.	4	2.25±1.258
5. I was able to efficiently complete the tasks and scenarios using this system.	5	1.6±0.548
6. I felt comfortable using this system.	5	1.6±0.894
7. It was easy to learn to use this system.	5	1.0±0.000
8. I believe I could become productive quickly using this system.	4	1.25±0.500
Information quality (INFOQUAL)		
9. The system gave error messages that clearly told me how to fix problems.	1	1.0 (SD: NA)
10. Whenever I made a mistake using the system, I could recover easily and quickly.	4	2.25±2.500
11. The information (such as online help, on-screen messages, and other documentation) provided with this system was clear.	5	1.4±0.548
12. It was easy to find the information I needed.	5	1.6±0.548

13. The information provided for the system was easy to understand.	5	1.4±0.548
14. The information was effective in helping me complete the tasks and scenarios.	5	1.6±0.894
15. The organisation of information on the system screens was clear.	5	1.4±0.548
Interface quality (INTERQUAL)		
16. The interface of this system was pleasant.	5	2.0±0.707
17. I liked using the interface of this system.	5	1.8±0.837
18. This system has all the functions and capabilities I expect it to have.	5	1.6±0.548
19. Overall, I am satisfied with this system.	5	1.8±0.447

Note:

7-point scale, 1 = strongly agree, 7 = strongly disagree

CSUQ: Computer System Usability Questionnaire

NA: Not applicable

5.6.7 Qualitative data of the usability test

All usability test participants provided their feedback to ePain. The comments were categorised into ePain strengths and barriers to using ePain.

5.6.7.1 ePain strengths perceived by the usability test participants

All participants agreed that ePain is well designed and user friendly. They stated that the content was clear and easy to understand. Four participants liked the ePain graphics, photographs, and exercise videos - elements they believed made the content more interesting. One participant showed appreciation for the quizzes provided in each chapter. The quizzes help reinforce what they had learnt about the main concepts of

pain management.

5.6.7.2 Barriers to using ePain reported by the usability test participants

Two participants said the font size in the list of contents was too small to read. One participant suggested that the chapter subtitles be bolded in order to locate the content more easily.

Refinements were made to ePain according to the usability test results, before the launch of the main study.

5.7 Fidelity of ePain

In online studies, treatment fidelity measures is to confirm the implementation of the intervention remains consistent during the study (Eaton et al., 2011). The Treatment Fidelity Workgroup of the National Institutes of Health Behavior Change Consortium (BCC) was adopted in ePain to maintain and assess treatment fidelity. It is a framework allowing researchers to conceptualise the areas to be included in treatment fidelity. Ensuring treatment fidelity can increase a study's internal validity, external validity, construct validity, and statistical power (Moncher & Prinz, 1991). Study design, training providers, delivery and receipt of treatment, and enactment of treatment skills

are the five framework areas (Bellg et al., 2004). Table 5.4 illustrates the strategies used for ensuring ePain treatment fidelity.

Table 5.4 Strategies used for ensuring ePain treatment fidelity

Five areas of treatment fidelity	Strategies used in ePain
Study design	The ePain contents are validated by an expert panel. The contents are standardised and a fixed amount of information is disclosed to the participants. The frequency with which the intervention group participants view the pages is recorded. User instructions are available on the ePain welcome page, and the key features of ePain are introduced. Emails are sent to the participants to remind them to continue the intervention. A backup of the ePain content and website is available to tackle technical problems. A weekly backup of the data is conducted in ePain.
Training providers	Training is provided to the administrator, since a provider is not required in ePain. The training of the administrator includes checking on ePain participant progress and status on a weekly basis, including monitoring the registration records and data, answering questions related to technical problems involving ePain, and sending reminder messages to the participants.
Delivery of treatment	The ePain content is standardised and shown to both the intervention group and control group. Fill-in tables are available to allow the intervention group participants to record their usage of pain management strategies and write their experience in pain management. Entry restrictions are set to prevent cross-contamination between the intervention group and control group.
Receipt of treatment	Quizzes are set after each chapter. Fill-in tables are available, so that the intervention group participants can record their use of pain management strategies.
Enactment of treatment skills	Participants in both groups need to complete the outcome measurement questionnaire to report changes in their pain situations. Participants are encouraged to provide information on their progress and express their opinions at any time via ePain and email. The dosage of the intervention is measured by the frequency with which pages are viewed. The outcomes are compared between the participants in the intervention group and control group.

5.7.1 Study design

Study design is ‘a study that can adequately test its hypotheses in relation to its

underlying theory and clinical processes' (Bellg et al., 2004). The goal in designing a study is to ensure the treatment dose is the same within conditions, the dosage is equivalent across conditions, and to set up a plan to deal with the setbacks encountered in the study implementation (Bellg et al., 2004). ePain was developed with a theoretical model and supported by literature. The contents were validated by the expert panel, made up of a group of healthcare professionals with expertise in pain management, and the contents were consistent with the study objectives and with Bandura's theory of self-efficacy of behavioural change. The ePain system could be set to ensure a standardised and fixed amount of information was shown to the intervention and control group participants. Also, the frequency of pages viewed by the intervention group participants was used to track their learning. User instructions were provided on the welcome page, and the key features introduced. A backup of the ePain contents and website was available to use if technical problems occurred with the website. In addition, the collected data were backed up weekly and kept in a password locked computer to ensure data security. Only the research team had the right and password to access the data.

5.7.2 Training providers

Training providers refers to how to ensure that providers could appropriately

deliver the intervention to the participants (Bellg et al., 2004). The provider is well-trained, and able to implement and adhere to the intervention. ePain did not need a provider to deliver the intervention. Therefore, the training was provided to the research team member who is the ePain administrator. The administrator received training in the operation from the programmer who developed the ePain system. Return demonstration of the operation was satisfactory. The administrator was accountable for checking participant progress and status on a weekly basis, including examining the registration records, data monitoring, answering technical queries from participants, and sending reminder messages to participants to complete and return the questionnaires. The research team supervised the administrator's performance during the study period.

5.7.3 Delivery of treatments

Delivery of treatment is monitoring the delivery and the intervention implementation process as designed (Bellg et al., 2004). ePain did not have a provider to deliver the intervention. The intervention group participants accessed the ePain content directly. The administrator checked ePain weekly to ensure the system was working and determine whether any problems had arisen. The participants could make use of the fill-in tables to record their use of both pharmacological and non-pharmacological pain management interventions. These strategies supplemented the

monitoring of the delivery process and ePain's effectiveness. In addition, a restriction was set in ePain so that participants would not be able to access the opposite group's programme when they logged in.

5.7.4 Receipt of treatments

Receipt of treatment focuses on "processes that monitor and improve the ability of patients to understand and perform treatment-related behavioral skills and cognitive strategies during treatment delivery" (Bellg et al., 2004). This is related to whether the participants "actually receive" the intervention (Borrelli, 2011). To investigate participants' level of understanding of the content, quizzes were sent after each chapter and before logging out of ePain. Their answers were recorded in ePain. The administrator checked their answers and progress in completing the quizzes. Furthermore, the participants could fill in the tables to record the pain management interventions used. Reminders sent to the participants also prompted the participants to login and continue ePain.

5.7.5 Enactment of treatment skills

Enactment of treatment skills is "to monitor and improve the ability of patients to

perform treatment-related behavioural skills and cognitive strategies in relevant real-life settings" (Bellg et al., 2004). It is participants' actual use of their pain treatment skills in a particular situation and time (Bellg et al., 2004). To evaluate the enactment of treatment skills, strategies such as direct observations, self-reports, and provider reports are commonly adopted (Borrelli, 2011). In ePain, direct observations and provider reports were not applicable. In self-report, the participants completed and returned the outcome measurement questionnaire to report any changes in their pain situation. They could report their progress and send their opinions at any time through ePain and email the administrator. The administrator checked the inbox and responded to the comments if any. The frequency of the page views in each chapter was recorded. The participant outcomes in both groups were compared for differences, to show the intervention group participants' new skills learnt in ePain.

5.8 Executive summary

The development of ePain involved a systematic and comprehensive process. It started with generation of the content, from literature and the results of the online survey. Self-directed learning - of pain knowledge and pain self-management techniques – were delivered. Under self-directed learning about pain, there were three chapters, including "Introduction of pain", "Pain-related diseases and syndromes", and "Occupational

disease related to pain". For self-management techniques, there were four chapters: "How to manage your pain", "Pharmacological approaches to pain management", "The non-pharmacological management of pain", and "Exercise for relieving pain".

ePain was delivered in Chinese. The design of ePain was colourful and user-friendly. Photographs, videos, and diagrams were adopted for content illustration. ePain can be accessed through mobile phones and computers.

Quizzes were set at the end of each chapter, to determine the participants' understanding of the content. Participants could record their usage of pharmacological and non-pharmacological interventions in ePain.

ePain integrated the essence of online learning to enhance the participant experience and participant learning, including self-paced learning, learner control, and self-directed learning. In addition, to maintain communication between the participants and research team, a "Contact us" function and instant messaging accounts were set up. A page view count was used to track the volume of content accessed by participants.

An expert panel was formed with professional healthcare expertise in pain

management. A good relevancy of the content with a mean score of 1.3 on a four-point Likert scale resulted, which was one mark equal to highly relevant.

A usability test was conducted to determine ePain participant performance, participant acceptance of ePain, and to assess the system interface and user experience. After accessing and using ePain, the participants filled in the Computer System Usability Questionnaire (CSUQ) to evaluate their user experience and provide their opinions. Five chronic pain participants were recruited, including four females (80%) and one male (20%), with a mean age of 39.4. ePain had a very high level of satisfaction, with an overall satisfaction score of 1.6 (SD = 0.50), with a score of one representing strongly agreeing with the CSUQ items, and a score of seven representing strongly disagree. Positive feedback was provided by the participants. The participants agreed that ePain was well designed, user friendly, and the content was clear and easy to understand.

Strategies to ensure treatment fidelity were integrated into ePain during the development process. The Treatment Fidelity Workgroup of the National Institutes of Health Behavior Change Consortium was adopted. There were five areas covered in the consortium, including study design, training providers, delivery of treatment, receipt of

treatment, and enactment of treatment skills. ePain took a systematic and evidence-based approach to create the study design and content. An expert panel validated the content. Since ePain was delivered online, an administrator received training to operate ePain. Standardised content was delivered to the participants, and entry restrictions were set to prevent participant cross-contamination between the intervention and control groups. Participants were required to complete the outcome measurement questionnaire to report their pain situations. ePain page view frequency was recorded to review the dosage.

ePain was refined according to the expert panel review and the usability test results before launching.

Chapter 6 Methods

6.1 Introduction

This chapter discusses the methods of the main study - including study design, settings, sampling, and outcome measures, followed by the details of randomisation and blinding, data collection, and data analysis.

6.2 Study design

The study was a randomised controlled trial design. Participants were randomly assigned to the intervention group or the control group. The intervention group could access ePain. The control group would download a pain education pamphlet.

6.3 Study setting

ePain was hosted and conducted on the Internet. Participants were recruited by snowball sampling, through social media, and by distributing recruitment pamphlets in community centres. Invitations were sent to companies to recruit participants to join the study. Potential companies were searched via the Internet. The companies receiving the invitations included offices, drivers, fast food shops, and furniture companies,

covering different workloads, and a wide variety of the working population and occupations. A function to send the ePain link to others was set in ePain, so that existing participants could invite new participants.

6.4 Study sample

6.4.1 Sample size estimation

The sample size was calculated with reference to the effect size of the experimental group in the Ruehlman et al. (2012) study. There were no previous Internet-based pain management programmes using pain self-efficacy as their primary outcome. The effect size - generated from the pre-test and post-test pain severity score - was 0.47. With an effect size of 0.47, power 0.8, and 5% alpha, the number of participants required for the present study was 114. The intervention group and control group had 57 participants respectively.

The dropout rate in previous Internet-based studies was calculated and ranged from 7.5% to 10% (Ruehlman et al., 2012; Williams et al., 2010) . To obtain an adequate number of participants for the main study, a 30% dropout rate was set. Therefore, a total of 148 participants was required, with 74 participants in each group.

6.4.2 Inclusion criteria

The participant inclusion criteria were:

1. Adults aged from 15 to 65 (65 is the normal retirement age of the civilian officers in Hong Kong) (Civil Service Bureau, 2017);
2. Performed a formal job during the seven days before joining the study or worked for pay or profit during the seven days before the study;
3. Able to read and understand traditional Chinese;
4. With non-cancer chronic pain for at least three months;
5. With a pain score of one or above in a numeric rating scale from zero to 10 in the Chinese version of the Brief Pain Inventory (BPI-C);
6. Owned a computer or tablet or a mobile phone, and able to use the device to access ePain.

6.4.3 Exclusion criteria

The participant exclusion criteria were:

1. With terminal illness;
2. With cancer and receiving active treatment;

3. With impaired vision or auditory function that would affect them in accessing ePain.

6.5 Intervention group

The intervention group participants entered ePain when they had completed the baseline assessment and fulfilled the inclusion criteria. All ePain contents were opened to the participants, who could access the content during the study period.

6.6 Control group

The control group participants downloaded a pain education pamphlet after the baseline assessment. The pain education pamphlet included information from ePain's first chapter, 'Introduction to pain'. ePain was opened to the control group participants when they had completed the end point evaluation (T3).

6.7 ePain duration

There is no defined duration for a person to reduce pain severity, as illustrated in the literature. Face-to-face and online pain education studies were searched to determine the duration of the main study. The duration for face-to-face programmes

varied, for example, two sessions with one week apart, or four sessions in two weeks (Hoon et al., 2017; Kempke et al., 2014). In addition, the duration for web-based pain education programmes' post-intervention assessment differed - from after the sixth week, to six months after joining the study (Ruehlman et al., 2012; Williams et al., 2010). There was no consensus on programme duration to achieve a positive study outcome.

ePain opened all of its contents to participants after the baseline assessment. Participants were able to access ePain via the Internet anytime and from anywhere. An adequate dosage of ePain was expected to be administered to participants. With reference to online pain education, six weeks would be a reasonable time point for participants to receive an adequate dosage of ePain. In order to monitor participant progress, participant interim evaluation took place in the third week and post-intervention evaluation at sixth week after joining the study. Furthermore, the follow-up evaluation was set at the twelfth week as a follow-up evaluation.

6.8 Outcome measurements

The outcome measurements included demographic data and outcome variables. The primary outcome of the study is pain severity. The secondary outcomes are pain

self-efficacy and pain interference, depression, anxiety and stress, and quality of life. For the purpose of reporting the results, the outcomes are categorised into pain-related outcomes, psychological outcomes, and quality of life. The questionnaire used in the main study is shown in Appendices 4 to 10.

6.8.1 Demographic characteristics

Demographic data were collected, including gender, age, marital status, occupation, education level, living status, monthly income, personal health history, and use of long-term medications.

6.8.2 Primary outcome: Pain severity

Pain severity was measured by the Chinese version of the Brief Pain Inventory (BPI-C), which has been validated for use in chronic pain patients (Tan et al., 2004). There are four pain severity items, including the worst pain, least pain, average pain and pain right now. A pain severity mean score is composed of the four severity items. The numeric rating scale ranges from zero to 10, indicating ‘no pain’ to ‘pain as bad as you can imagine’. The Cronbach coefficient alpha of the pain severity scale was 0.894 (Wang et al., 1996).

6.8.3 Secondary outcomes

6.8.3.1 Pain self-efficacy

Pain self-efficacy was measured by the Pain Self-Efficacy Questionnaire. There are 10 items. A seven-point scale was used to rate the items, with zero marks referring to feeling 'not at all confident' and six marks referring to feeling 'completely confident'. Results can total a maximum of 60 marks, with a higher score representing a stronger self-efficacy belief. The Cronbach's alpha for internal consistency of the items is 0.92 (Nicholas, 2007). The Chinese version of the Pain Self-Efficacy Questionnaire (PSEQ-HK) is available, with a Cronbach's alpha coefficient of 0.93. The test-retest reliability coefficient is 0.75. The SF36-BP and the PSEQ-HK are significantly correlated with $r = 0.402$ (Lim et al., 2007).

6.8.3.2 Pain interference

Participant pain interference were measured by the Chinese version of the Brief Pain Inventory (BPI-C) (Tan et al., 2004). There are seven pain interferences including general activity, mood, walking ability, normal work, relations with other people, sleep and enjoyment of life. The numeric rating scale ranges from zero to 10, indicating 'does not interfere' to 'completely interferes'. The Cronbach coefficient alpha of the pain

interference scale was 0.915 (Wang et al., 1996).

6.8.3.3 Depression, anxiety, and stress

Depression Anxiety Stress Scale (DASS-21) was adopted to measure the levels of depression, anxiety, and stress (Psychology Foundation of Australia, 2018). In DASS-21, there are three subscales for depression, anxiety, and stress. Each subscale has seven items. The rating scale ranged from zero, representing, “Did not apply to me at all” to a score of three meaning, “Applied to me very much, or most of the time”. Five grades of the scores, which are normal, mild, moderate, severe, and very severe, can be presented after calculation of the scores. The internal consistency was satisfactory with a reliability of $\rho = 0.94$. For the subscales, the depression scale was $\rho = 0.87$, anxiety scale was $\rho = 0.69$, and stress scale was $\rho = 0.89$ (Gloster et al., 2008). A Chinese version of the DASS-21 is available. The phi coefficient between depression-anxiety was 0.92, anxiety-stress was 0.94, and depression-stress was 0.91 in the confirmatory factor analysis of the DASS-21 Chinese version (Moussa et al., 2001).

6.8.3.4 Quality of life

The level of quality of life was assessed by the Hong Kong version of the World

Health Organization Quality of Life Instruments (WHOQOL-BREF(HK)) (Leung et al., 2005). The instrument contains a total number of 28 items and adopts a five-point scale. There are two questions referring to overall quality of life and overall health well-being. The remaining items refer to four domains, namely physical health, psychological, social relationships, and environment (Harper & Power, 1998; Leung et al., 2005). The Cronbach's alpha coefficients were satisfactory, with physical health domain 0.77, psychological domain 0.8, social relationships domain 0.59, and environment domain 0.76. The inter-rater reliability was 0.8 to 0.91 for the four domains (Leung et al., 2005).

6.8.4 Pain-related sick leave

Sick leave information related to the participants' pain problems was gathered. The number of sick leaves taken, whether participants continued to work despite any pain, any rest taken during working hours when pain was present, and the duration of rest were all asked about.

6.8.5 Participant feedback

Feedback was collected through a questionnaire. The perceived usefulness of ePain was asked about. The user experience was rated on a 7-point rating scale, with a

score of one representing “Absolutely disagree”, and a score of seven representing “Absolutely agree”. Open-ended questions were used to allow participants to provide their comments and suggestions.

6.9 Randomisation and blinding

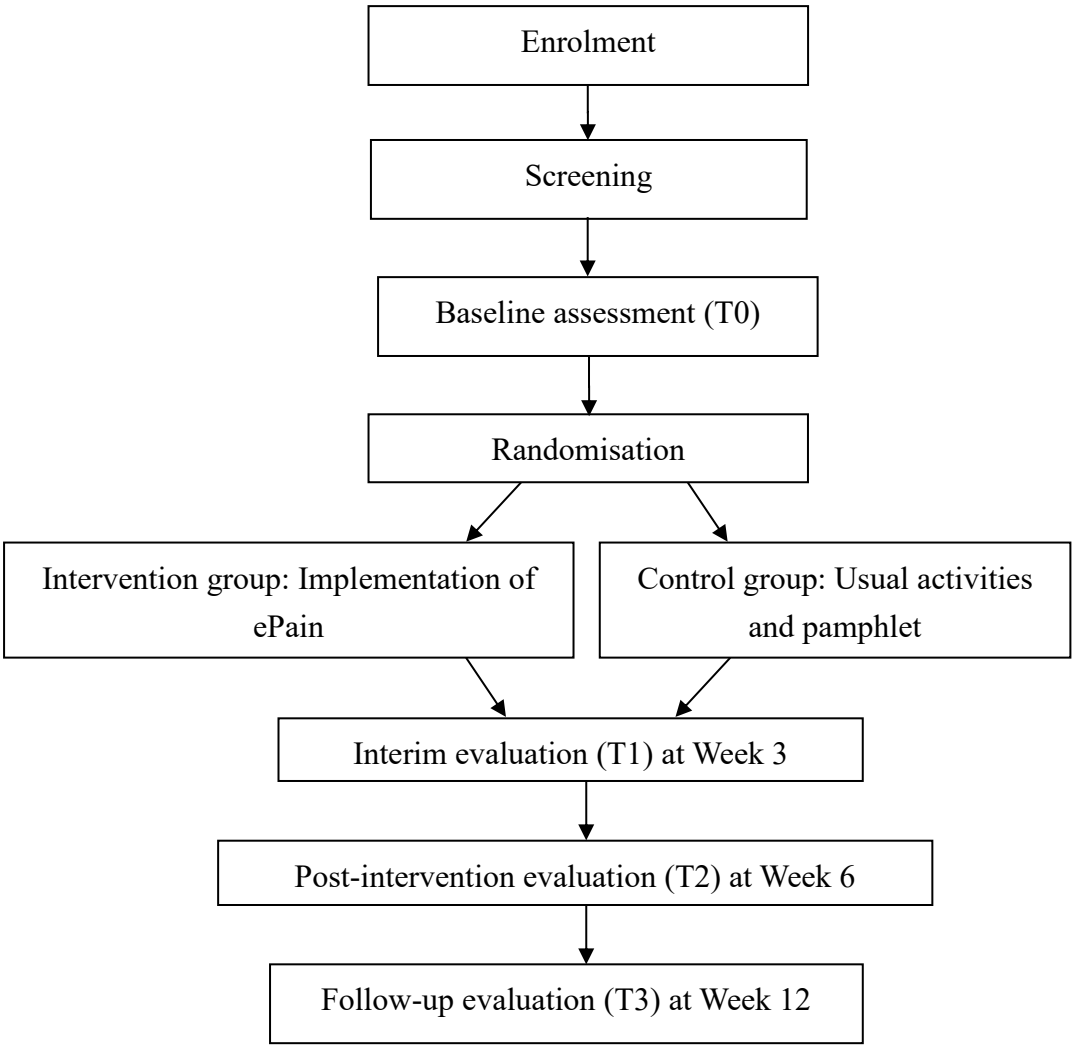
Permuted block randomisation was adopted. It refers to ‘randomizing participants with blocks such that an equal number are assigned to each treatment’ (Efird, 2011). A block size of four and an allocation of 1:1 was used. The block sequences were AABB, ABAB, ABBA, BAAB, BABA, and BBAA, with A representing the intervention group and B the control group. The block sequences were programmed into ePain. The research team was blinded to the sequences and could not change them. The participants were blinded to the sequences and were randomly assigned according to the sequence.

6.10 Data collection

The data collection process took place on the Internet. The participants used their email address to register an account in ePain. Each participant had their own ePain account. After registration, the participants were required to complete the eligibility screening, to ensure they fit the study inclusion criteria. Then, they would complete the

assessment questionnaire and were randomised to either the intervention group or the control group. There were four time points for data collection: baseline (T0), interim evaluation (T1) at Week 3, post-intervention evaluation (T2) at Week 6, and follow-up evaluation (T3) at Week 12. The evaluations were set to monitor participant progress, acceptance, and effectiveness of ePain, and to report whether any difficulties occurred when using ePain. Figure 6.1 illustrates the ePain data procedure.

Figure 6.1 ePain data collection procedure



Participants in both groups received reminders through WhatsApp or email at Weeks 3, 6, and 12 after joining the study and completed the assessment questionnaire at T1, T2, and T3. Demographic data were collected at T0. Outcomes - including pain severity, pain self-efficacy, pain interference, depression, anxiety and stress, and quality of life - were collected at all time points. Opinions and feedback were collected at T1, T2, and T3.

During the process of completing the questionnaires, messages popped up to notify participants if they had missed any items. Incomplete items were highlighted to invite participants to complete them.

6.11 Data analysis

The IBM Statistical Package for Social Science, SPSS for Windows version 25.0 was used to analyse the quantitative data. The data collected were downloaded from ePain and transferred directly to SPSS.

6.11.1 Data cleaning

Data cleaning is to 'detect and remove errors and inconsistencies from data in order to improve the quality of data' (Rahm & Do, 2000). The procedure is essential before performing a statistical analysis. It provides quality assurance and determines study validity.

6.11.2 Data monitoring and missing data management

When the participants filled in the questionnaire, ePain screened whether there

were items they had missed answering. Participants immediately received a pop-up message and the items were highlighted to remind them to complete the missing question. Therefore, no missing items were found, with the exception of open-ended questions asking for comments and opinions. Missing data caused by participants dropping out were estimated within the Generalized Estimating Equation (GEE). GEE is a population average model and designed for repeated measures. It estimates the results when there are missing data, and no replacement or imputation of data was done (Salazar et al., 2016).

Data were screened to determine any irrational data, for example, participants aged 16 or below being married. No abnormalities were found after screening.

6.11.3 Data analysis

Data collected at baseline - including demographic characteristics, scores of pain severity, pain self-efficacy, pain interference, depression, anxiety, stress, and quality of life - were analysed using descriptive analysis. For the baseline continuous variables, means and standard deviations were presented. For continuous variables that were not normally distributed, median and standard deviations were presented. Categorical data would be reported by frequencies and percentages. To ensure baseline data

homogeneity of the intervention and control groups, chi-square test was used for categorical data, and the two-sample independent t-test was used for continuous data.

The Generalized Estimating Equation (GEE) was used in the study. GEE is an extension of generalised linear models (Bell et al., 2018). It can be applied to 'longitudinal data where observations are no longer independent' and includes all participants, even if they missed some time points (Salazar et al., 2016). Also, in GEE the data were assumed to be normally distributed, regardless of the data distribution (Overall & Tonidandel, 2004). The between group effects of the intervention group and control group, within group (time) effects, and interaction effects (group x time) were computed to examine ePain's effect over time. Standard errors, mean difference, p-value, and 95% CI for mean difference were reported using GEE. Regression analysis was used to examine the association between the frequency of pages viewed in ePain and the outcomes. The level of significance was considered when a p-value was less than 0.05.

The estimated effect size (Cohen's d) was used to report the magnitude or importance of the findings (Fritz et al., 2012).

6.11.4 Sensitivity analysis

Performing sensitivity analysis can help determine the robustness of the findings (Thabane et al., 2013). In the study, intention-to-treat (ITT) was used as the primary analysis. Completer analysis was applied as a secondary analysis and performed separately. Consistency of the findings from the primary analysis and sensitivity analysis can consolidate the study conclusion (Thabane et al., 2013).

Regardless of the treatment actually received, subsequent withdrawal from treatment, or deviation from the protocol, ITT included all participants who were randomised at the beginning of the study (Armijo-Olivo et al., 2009; Gupta, 2011). It can keep the prognostic balance as from the initial randomisation, preserve the sample size, and maintain statistical power and the greatest generalisability (Gupta, 2011). The participants included in the ITT analysis were those who were randomised after the collection of baseline data.

6.12 Ethical considerations

Ethical approval was granted from the Human Subjects Ethics Subcommittee of the Hong Kong Polytechnic University (Reference Number: HSEARS 20181009005).

The participants were recruited on a voluntary basis. An information sheet with a complete explanation of the study's nature, purpose, procedure, and duration was displayed on the ePain welcome page and before participants registered their accounts. The participants were required to read through the information sheet. Informed consent was obtained from each participant when they chose 'Continue' to agree to participate in the study. Participants were ensured their absolute right of withdrawal from the study at any time during the study period. Confidentiality and anonymity were strictly assured throughout the study.

6.13 Executive summary

This chapter has explained the study methods. The study was a randomised controlled trial. ePain was delivered on the Internet. Participants were recruited by snowball sampling, from social media, and distributing recruitment pamphlets at community centres. The sample size calculated was 148 participants, with 74 participants in the intervention group and control group respectively.

The intervention group participants entered ePain when they had finished the baseline assessment, while the control group participants downloaded a pain education pamphlet. The ePain contents were open to the intervention group participants. With

the Internet, which allows access anytime and anywhere, an adequate ePain dosage was expected to be achieved by six weeks. The evaluations were set at the third week for interim evaluation, the sixth week for post-intervention evaluation, and the twelfth week for follow-up evaluation.

The outcome measurements included demographic data, pain severity, pain self-efficacy, pain interference, depression, anxiety, stress, and quality of life. Participant feedback on perceived usefulness and the user experience were collected.

Mean and standard deviations of the outcomes were presented. The Generalized Estimating Equation (GEE) was adopted to examine ePain's effects over time within both groups and between groups. Regression analysis was used to determine the association between the frequency of page views in ePain and the outcomes. Sensitivity analysis was performed to strengthen the study findings.

Chapter 7 Results

This chapter presents the study results. First, it starts with participant baseline characteristics. The means scores of pain-related outcomes, psychological outcomes, and quality of life are presented. GEE analysis of the ePain effects, and an analysis of page view frequency and quiz results on ePain outcomes are reported. Participant response rate is followed. Participant feedback is shared. The chapter ends with a sensitivity analysis.

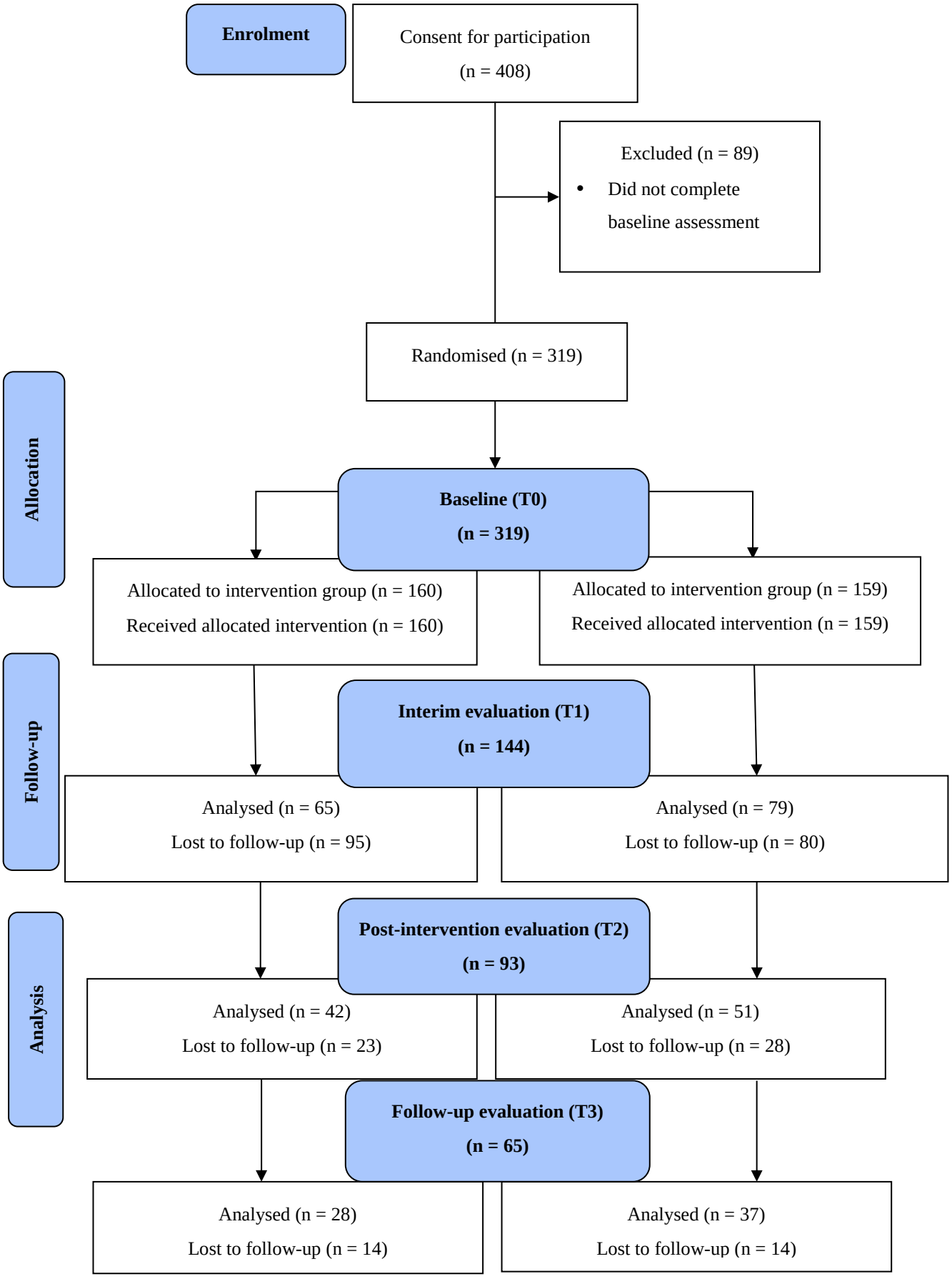
7.1 Study participants

A total of 408 participants consented to participate in the study. Eighty-nine participants did not complete the baseline assessment and were not randomised. In total, there were 319 participants included at baseline and randomised into either the intervention group or the control group.

Data were collected at three time points after the baseline assessment. At T1, 95 participants from the intervention group and 80 participants from the control group were lost to follow-up. At T2, 23 and 28 participants from the intervention group and control group respectively did not continue the study. At T3, there were 28 participants

in the intervention group and 37 participants in the control group. Figure 7.1 shows the study flow and participant recruitment.

Figure 7.1 Study flow and recruitment of participants into the study



7.2 Participants' demographic characteristics at baseline

In this section, the participant baseline data are presented, including demographic characteristics, pain-related sick leave, mean scores of pain-related outcomes, pain sites, pain descriptions used by participants to describe their pain, pain treatments adopted, perceived pain relieving effects of the pain treatments, and the mean scores of psychological outcomes and quality of life.

Table 7.1 shows the participant demographic characteristics. A majority of participants was female (77.4%). Their mean age was 43.64 (SD = 13.33). Nearly half were married (49.8%). In terms of occupation, 36.7% worked as professionals and 20.7% as clerical support workers. Over half had attained a post-secondary education level (67.4%). They lived either with their parents (32%), with their spouse and children (27.9%), or with a spouse (19.4%). Most did not have any chronic illnesses (69.3%) and did not use long-term medications (77.7%). They had pain that persisted for an average of 7.28 months (SD = 4.39). No significant differences were noted when comparing the demographic characteristics of the intervention group and control group.

Table 7.1 Participant demographic characteristics at baseline

	Total (n = 319)		Intervention group (n = 160)		Control group (n = 159)		p-value[+]
	n	%	n	%	n	%	
Gender							0.61
Female	247	77.4	122	76.3	125	78.6	
Male	72	22.6	38	23.8	34	21.4	
Age							0.73
Mean (SD)	43.64 (13.33)		43.47 (13.47)		43.82 (13.22)		
Range	20 – 65		20 – 65		20 – 65		
Marital status							0.76
Single	135	42.3	66	41.3	69	43.4	
Married	159	49.8	81	50.6	78	49.1	
Divorced	21	6.6	10	6.3	11	6.9	
Widow	4	1.3	3	1.9	1	0.6	
Occupation							0.85
Managers and administrators	37	11.6	20	12.5	17	10.7	
Professionals	117	36.7	54	33.8	63	39.6	
Associate professionals	31	9.7	15	9.4	16	10.1	
Clerical support workers	66	20.7	34	21.3	32	20.1	
Service and sale workers	38	11.9	21	13.1	17	10.7	
Craft and related workers	9	2.8	4	2.5	5	3.1	
Plant and machine operators and assemblers	4	1.3	3	1.9	1	0.6	
Elementary occupations	9	2.8	6	3.8	3	1.9	

Others	8	2.5	3	1.9	5	3.1	
Education level							0.55
No formal education	0	0	0	0	0	0	
Primary level	9	2.8	4	2.5	5	3.1	
Secondary level	95	29.8	52	32.5	43	27	
Post-secondary level	215	67.4	104	65	111	69.8	
Living status							0.94
Alone	33	10.3	17	10.6	16	10.1	
With parents	102	32	49	30.6	53	33.3	
With spouse	62	19.4	32	20	30	18.9	
With spouse and children	89	27.9	44	27.5	45	28.3	
With children	18	5.6	11	6.9	7	4.4	
With relatives or friends	15	4.7	7	4.4	8	5.0	
Monthly income (HKD$)							0.53
Below 6000	35	11	18	11.3	17	10.7	
6001-10000	30	9.4	13	8.1	17	10.7	
10001-20000	77	24.1	46	28.7	31	19.5	
20001-30000	65	20.4	31	19.4	34	21.4	
30001-40000	38	11.9	18	11.3	20	12.6	
40001-60000	52	16.3	22	13.8	30	18.9	
Above 60001	22	6.9	12	7.5	10	6.3	
Personal health history (Multiple answers can be chosen)							
No chronic illnesses	221	69.3	105	65.6	116	73	0.16

Hypertension	26	8.2	13	8.1	13	8.2	0.99
Diabetes mellitus	17	5.3	9	5.6	8	5	0.81
Heart disease	5	1.6	4	2.5	1	0.6	0.18
Stroke	2	0.6	1	0.6	1	0.6	0.99
Gout	3	0.9	2	1.3	1	0.6	0.57
Respiratory disease	7	2.2	3	1.9	4	2.5	0.70
Arthritis	27	8.5	14	8.8	13	8.2	0.85
Cataract	7	2.2	1	0.6	6	3.8	0.06
Others	41	12.9	24	15	17	10.7	0.25
Long term use of medications	71	22.3	38	23.8	33	20.8	0.52
Duration of pain (months)							
Mean (SD)	7.28 (4.39)		7.74 (4.30)		6.82 (4.45)		0.13

Percentage may not add up to 100% because of rounding

[+]Chi Square Test was used to compare intervention and control groups.

*$p < 0.05$ was considered as significant

Table 7.2 and Table 7.3 report participant pain-related sick leave. There were 23.5% of participants (n = 75) who took sick leave with a certificate due to pain, while 76.5% (n = 244) continued to work, despite the presence of pain. A total of 27.9% of participants (n = 89) needed rest when the pain was present while they were at work, and 72.1% (n = 206) chose to continue to work. The mean of minimum sick leave taken was 1.59 days, and the maximum was 35.85 days.

Table 7.2 Pain-related sick leave taken by participants

	Total (n = 319)		Intervention group (n = 160)		Control group (n = 159)	
	n	%	n	%	n	%
Sick leave						
Taken sick leave certificate related to pain	75	23.5	36	22.5	39	24.5
Continue to work despite pain	244	76.5	124	77.5	120	75.5
Rest at work						
Rested during work when pain present	89	27.9	46	28.7	43	27
Continued to work despite pain	230	72.1	206	71.3	116	73

Table 7.3 Days of pain-related sick leave taken by participants

	Total (n = 75)		Intervention group (n = 36)		Control group (n = 39)	
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
Minimum days of pain-related sick leave	1.59 (1.11)	1 – 7	1.57 (1.09)	1 – 5	1.61 (1.15)	1 – 90
Maximum days of pain-related sick leave	35.85 (121.55)	1 – 735	15.09 (23.68)	1 – 90	54.97 (165.68)	1 – 735

The outcomes were grouped into two categories: pain-related outcomes, and psychological outcomes and quality of life. Pain-related outcomes included pain severity, pain self-efficacy and pain interference. Psychological outcomes and quality of life included total score of depression, anxiety and stress, depression, anxiety, stress, and quality of life (overall quality of life, overall health and well-being, physical health domain, psychological domain, social relationships domain and environment domain of quality of life). In this section, the results of the pain-related outcomes, and psychological outcomes and quality of life from the baseline assessment are presented.

Table 7.4 reports the participant mean scores of pain severity, pain self-efficacy, and pain interference at baseline. The scores ranged from zero to 60. For pain severity and pain interference, they ranged from zero to 10. A lower score represents lower pain

severity and pain interference. For pain self-efficacy, a higher score represents a higher and stronger level of pain self-efficacy. The participant mean score, including pain severity was 4.16 (SD = 1.90), pain self-efficacy, was 41.56 (SD = 12.23) and pain interference was 3.74 (SD = 1.92). There were no significant differences between the groups at baseline in terms of outcomes.

Table 7.4 Pain-related outcomes at baseline

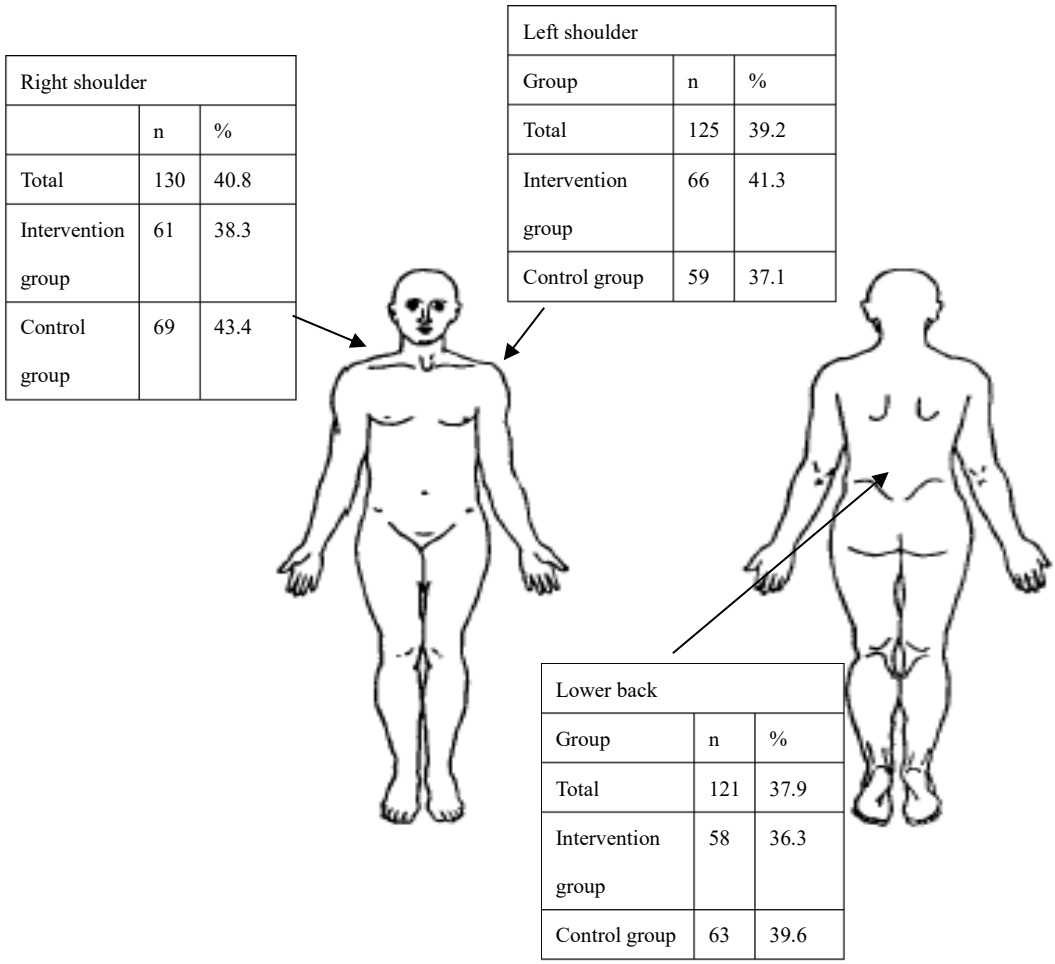
	Total (n = 319)	Intervention group (n = 160)	Control group (n = 159)	p-value^
	Mean (SD)	Mean (SD)	Mean (SD)	
Pain severity	4.16 (1.90)	4.36 (2.00)	3.96 (1.77)	0.06
Pain self-efficacy	41.56 (12.23)	40.97 (12.86)	42.16 (11.57)	0.39
Pain interference	3.74 (1.92)	3.94 (2.03)	3.55 (1.78)	0.07

^ Independent t-test was used to compare intervention group and control groups

*$p < 0.05$ was considered as significant

The participants reported their pain sites. The top three pain sites were right shoulder (n = 130, 40.8%), left shoulder (n = 125, 39.2%), and lower back (n = 121, 37.9%). Figure 7.2 illustrates the top three pain sites reported by participants.

Figure 7.2 Top three pain sites of participants



Right shoulder		
	n	%
Total	130	40.8
Intervention group	61	38.3
Control group	69	43.4

Left shoulder		
Group	n	%
Total	125	39.2
Intervention group	66	41.3
Control group	59	37.1

Lower back		
Group	n	%
Total	121	37.9
Intervention group	58	36.3
Control group	63	39.6

Different descriptions were chosen by participants to describe the pain they experienced, as illustrated in Table 7.5. The intervention group and control group participants shared similar pain descriptions. Aching (n = 272, 85.3%), nagging (n =244, 76.5%), and tiring (n = 231, 72.4%) were the top three pain descriptions chosen by participants.

Table 7.5 Pain description used by participants to describe their pain in intervention group and control group at baseline

	Total (n = 319)		Intervention group (n = 160)		Control group (n = 159)	
	n	%	n	%	n	%
Aching	272	85.3	137	85.6	135	84.9
Nagging	244	76.5	127	79.4	117	73.6
Tiring	231	72.4	115	71.9	116	73.0
Exhausting	174	54.5	83	51.9	91	57.2
Numb	144	45.1	71	44.4	73	45.9
Throbbing	131	41.1	65	40.6	66	41.5
Tender	117	36.7	52	32.5	65	40.9
Unbearable	102	32.0	56	35.0	46	28.9
Sharp	98	30.7	52	32.5	46	28.9
Miserable	90	28.2	42	26.3	48	30.2
Penetrating	85	26.6	46	28.7	39	24.5
Shooting	80	25.1	38	23.8	42	26.4
Gnawing	43	13.5	21	13.1	22	13.8
Burning	42	13.2	22	13.8	20	12.6
Stabbing	32	10.0	19	11.9	13	8.20

Multiple answers can be chosen

Various types of pain treatments were used by participants to relieve their pain. There were 60% of participants (n = 199) who did not attempt any treatment to reduce the pain. Pain relieving treatments used included physiotherapy (n = 30, 9.1%), exercise (n = 20, 6%), acupuncture (n = 16, 4.8%), massage (n = 14, 4.2%), analgesics (n = 13, 3.9%), tui na (n = 9, 2.7%), hot pad (n = 8, 2.4%), Chinese medicine (n = 6, 1.8%), and rest (n = 4, 1.2%). The details are shown in Table 7.6.

Table 7.6 Pain treatments adopted by the participants at baseline

	Total (n = 319)		Intervention group (n = 160)		Control group (n = 159)	
	n	%	n	%	n	%
Not taking any treatments	199	60.1	100	59.5	99	60.7
Physiotherapy	30	9.1	13	7.7	17	10.4
Exercise	20	6.0	9	5.4	11	6.7
Acupuncture	16	4.8	9	5.4	7	4.3
Massage	14	4.2	6	3.6	8	4.9
Analgesics	13	3.9	6	3.6	7	4.3
Others	12	3.6	9	5.4	3	1.8
Tui na	9	2.7	6	3.6	3	1.8
Hot pad	8	2.4	6	3.6	2	1.2
Chinese medicine	6	1.8	2	1.2	4	2.5
Rest	4	1.2	2	1.2	2	1.2

Multiple answers can be chosen

Participants rated the pain-relieving effect of the treatments they applied. For those who rated the pain treatments as effective, 62.7 % of participants (n = 200) had 0% to 30% of the pain relieved, 19.1% (n = 61) found that 31% to 60% of the pain was relieved, and 18.2% (n = 58) achieved a 61% to 100% reduction in pain. Table 7.7 indicates the pain-relieving effect of the current pain treatment, as perceived by the participants.

Table 7.7 Perceived pain-relieving effect of the current pain treatment at baseline

	Total (n = 319)		Intervention group (n = 160)		Control group (n = 159)	
	n	%	n	%	n	%
0 – 30 %	200	62.7	101	63.1	99	62.3
31 – 60%	61	19.1	29	18.1	32	20.1
61 – 100%	58	18.2	30	18.8	28	17.6

Table 7.8 presents the participant mean scores of depression, anxiety, stress, and quality of life at baseline. A higher score in depression, anxiety, and stress represents a worsening level of symptoms. The mean scores of the psychological outcomes, including the total score of depression, anxiety, and stress was 12.86 (SD = 8.63), depression was 12.82 (SD = 9.59), anxiety was 11.68 (SD = 8.38), and stress was 17 (SD = 9.62). For quality of life, a higher score represents a better level of quality of life. The mean score of overall quality of life was 3.23 (SD = 0.65), overall health and well-being was 2.3 (SD = 0.75), physical health domain was 13.33 (SD = 2.32), psychological domain was 11.62 (SD = 1.58), social relationships domain was 12.41 (SD = 3.03), and environment domain was 11.98 (SD = 2.50). Among the domains, the physical health domain had the highest score. The total score of depression, anxiety and stress, and depression had significant differences between the groups at baseline ($p < 0.05$).

Table 7.8 Psychological outcomes and quality of life at baseline

	Total (n = 319)	Intervention group (n = 160)	Control group (n = 159)	p-value^
	Mean (SD)	Mean (SD)	Mean (SD)	
Depression, anxiety, and stress				
Total score	12.86 (8.63)	14.03 (9.24)	11.71 (7.85)	0.02*
Depression	12.82 (9.59)	14.71 (10.03)	10.98 (8.79)	0.01*
Anxiety	11.68 (8.38)	12.53 (8.98)	10.82 (7.67)	0.09
Stress	17.00 (9.62)	18.03 (10.05)	16.00 (9.10)	0.08
Quality of life				
Overall quality of life	3.23 (0.65)	3.19 (0.68)	3.27 (0.60)	0.25
Overall health and well-being	2.30 (0.75)	2.35 (0.79)	2.25 (0.70)	0.24
Physical health domain	13.33 (2.32)	13.23 (2.40)	13.42 (2.25)	0.46
Psychological domain	11.62 (1.58)	11.49 (1.65)	11.75 (1.51)	0.14
Social relationships domain	12.41 (3.03)	12.13 (3.29)	12.70 (2.72)	0.10
Environment domain	11.98 (2.50)	11.86 (2.52)	12.10 (2.47)	0.40

^ Independent t-test was used to compare intervention group and control groups

*$p < 0.05$ was considered as significant

The post-intervention effects of ePain on changes in pain-related outcomes, and psychological outcomes and quality of life are described. The mean differences in the outcome scores across time points from T0 to T1 and T0 to T2 are presented. The comparison of the outcomes between groups over time from T0 to T2, and pairwise comparison comparing the outcomes between time points by group were conducted using GEE. Effect sizes are reported.

7.3 Pain-related outcomes at T0, T1, and T2

7.3.1 Pain severity

Table 7.9 Pain severity at T0, T1, and T2 In the intervention group, the mean pain severity was reduced from 4.36 (SD = 2.55) at T0 to 3.72 (SD = 3.22) at T1 and 3.58 (SD = 3.35) at T2. In the control group, the mean pain severity was 3.96 (SD = 2.37) at T0, then increased to 4.06 (SD = 2.94) at T1 and decreased to 3.69 (SD = 3.94) at T2. Table 7.9 shows the mean scores of pain severity at T0, T1, and T2. Figure 7.3 shows the changes of pain severity from T0 to T2.

Table 7.9 Pain severity at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen'd)
Pain severity				
T0	4.36 (2.55)		3.96 (2.37)	
T1	3.72 (3.22)	-0.22	4.06 (2.94)	0.04
T2	3.58 (3.35)	-0.26	3.69 (3.94)	-0.08

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

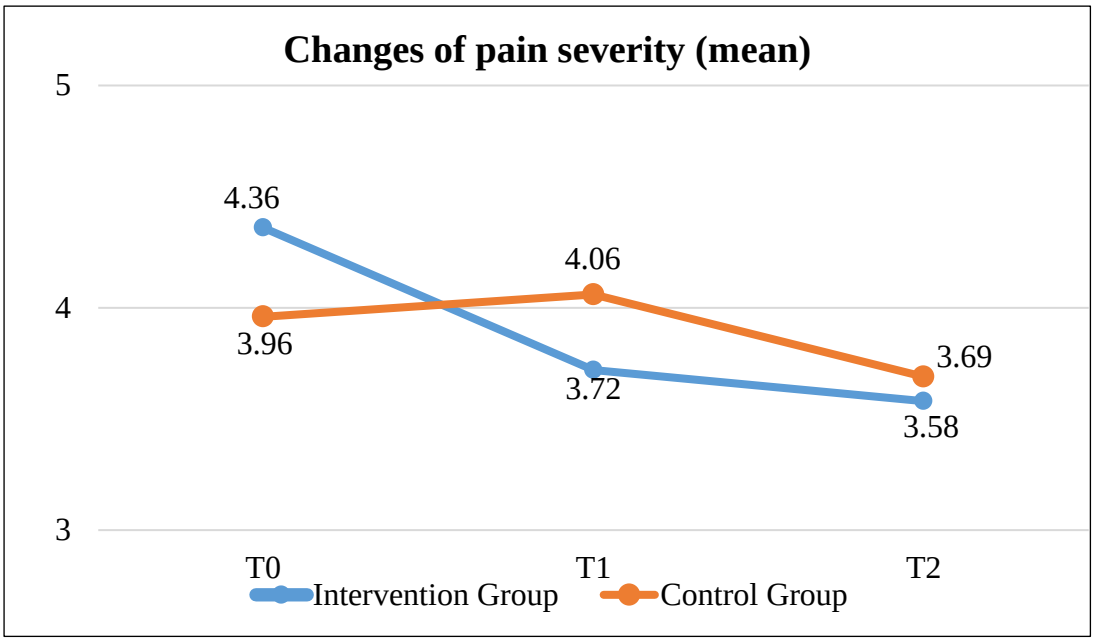
Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.3 Changes of pain severity from T0 to T2

(0 = no pain; 10 = pain as bad as you can imagine)



In the GEE model, significant effects ($p < 0.05$) were present in the interaction effects between groups and time points (T1: $p = 0.002$). Significant effects ($p < 0.05$) were noted in the pairwise analysis of comparing pain severity between time points by group from T0 to T1 (MD = -0.64, 95% CI = -1.01, -0.27, $p = 0.001$) and from T0 to T2 (MD = -0.78, 95% CI = -1.20, -0.35, $p = 0.000$). Table 7.10 shows the results of the GEE of pain severity between the two groups over time from T0 to T2. Table 7.11 presents the pain severity between time points by group from T0 to T2.

Table 7.10 Comparison of pain severity between both groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Pain severity								
Group		0.40	0.21	-0.01	0.83	3.61	0.06	
Time	T1	0.10	0.15	-0.20	0.41	0.45	0.50	
	T2	-0.27	0.22	-0.70	0.17	1.47	0.23	
Group *Time	T1	-0.75	0.25	-1.23	-0.26	9.21	0.002*	-0.11
	T2	-0.51	0.31	-1.12	0.10	2.69	0.10	-0.13

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean change and the pooled standard deviation of the two groups

Table 7.11 Comparison of pain severity between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Pain severity					
Intervention group	T0 – T1	-0.64 (0.19)	-1.01	-0.27	0.001*
	T0 – T2	-0.78 (0.22)	-1.20	-0.35	0.000*
Control group	T0 – T1	0.10 (0.16)	-0.20	0.41	0.50
	T0 – T2	-0.27 (0.22)	-0.70	0.17	0.23

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.3.2 Pain self-efficacy

In the intervention group, the mean score of pain self-efficacy was enhanced from 40.97 (SD = 16.54) to 43.09 (SD = 19.74) and 43.96 (SD = 29.70) at T2. In the control group, there was a slight improvement in the mean scores of pain self-efficacy from 42.04 (SD = 15.69) at T0 to 43.11 (SD = 19.43) at T1, and 42.68 (SD = 25.38) at T2. Table 7.12 presents the means scores of pain self-efficacy at T0, T1 and T2. Figure 7.4 shows the changes of pain self-efficacy from T0 to T2.

Table 7.12 Pain self-efficacy at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen'd)
Pain self-efficacy				
T0	40.97 (16.54)		42.04 (15.69)	
T1	43.09 (19.74)	0.12	43.11 (19.43)	0.06
T2	43.96 (29.70)	0.12	42.68 (25.38)	0.03

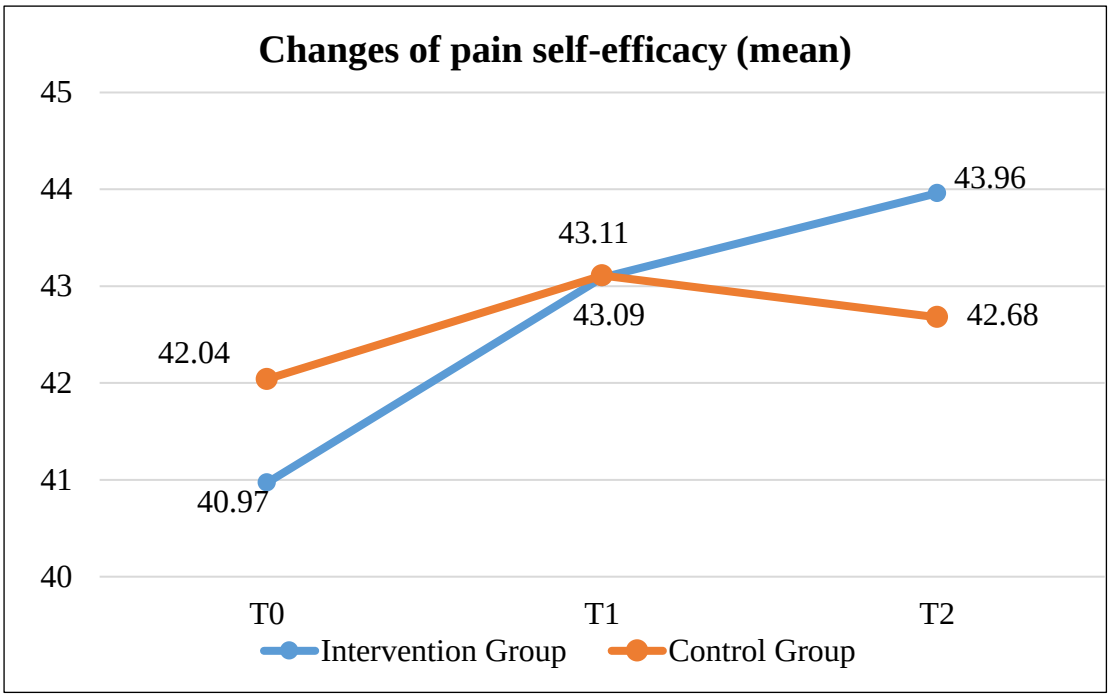
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.4 Changes of mean scores of pain self-efficacy from T0 to T2
(Total score = 60, higher score indicated a higher pain self-efficacy)



No significant effects were noted in the interaction effects between groups and time points of pain self-efficacy in GEE model as shown in Table 7.13. No significant differences were shown in in pairwise analysis comparing the results between time points by group as shown in Table 7.14.

Table 7.13 Comparison of pain self-efficacy between both groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Pain self-efficacy								
Group		-1.07	1.37	-3.77	1.63	0.61	0.44	
Time	T1	1.07	1.01	-0.92	3.06	1.12	0.29	
	T2	0.65	1.39	-2.07	3.36	0.22	0.64	
Group * Time	T1	1.06	1.59	-2.06	4.16	0.44	0.51	0.00
	T2	2.34	2.28	-2.13	6.82	1.05	0.31	0.08

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean change and the pooled standard deviation of the two groups

Table 7.14 Comparison of pain self-efficacy between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Pain self-efficacy					
Intervention group	T0 – T1	2.13 (1.22)	-0.27	4.52	0.08
	T0 – T2	2.99 (1.81)	-0.57	6.54	0.10
Control group	T0 – T1	1.07 (1.01)	-0.91	3.06	0.29
	T0 – T2	0.64 (1.37)	-2.07	3.36	0.64

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.3.3 Pain interference

The mean pain interference was 3.94 (SD = 2.60) at T0, and improved to 3.55 (SD = 3.67) at T1, and 3.10 (SD = 3.83) at T2. In the control group, the mean score of pain interference was 3.55 (SD = 2.37) at T0, increased to 3.75 (SD = 3.40) at T1, and reduced to 3.23 (SD = 4.21) at T2. Table 7.15 shows the mean scores of pain interference. Figure 7.5 shows the changes of pain interference from T0 to T2.

Table 7.15 Pain interference at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen'd)
Pain interference				
T0	3.94 (2.60)		3.55 (2.37)	
T1	3.55 (3.67)	-0.12	3.75 (3.40)	0.07
T2	3.10 (3.83)	-0.26	3.23 (4.21)	-0.09

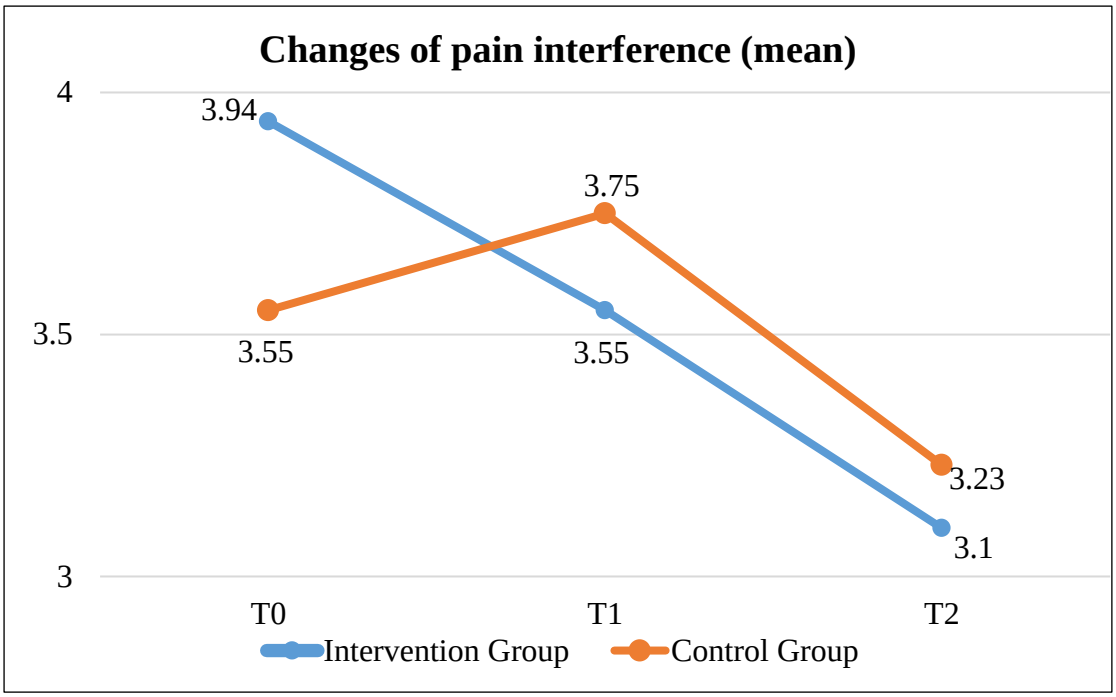
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.5 Changes of mean scores of pain interference from T0 to T2
(0 = did not interfere; 10 = completely interfere)



Significant effects ($p < 0.05$) was present in pain interference (interaction effects between groups and time points: T1: $p = 0.04$) when comparing the results between the two groups over time as shown in Table 7.16. In pairwise analysis of comparison between time points by group, statistical significance was presented in pain interference from T0 to T2 (MD = -0.84, 95% CI = -1.28, -0.40, $p = 0.000$) and is shown in Table 7.17.

Table 7.16 Comparison of pain interference between both groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen' s d)
				Lower	Upper	Wald χ^2	p-value	
Pain interference								
Group		0.40	0.22	-0.03	0.82	3.31	0.07	
Time	T1	0.20	0.21	-0.17	0.58	1.09	0.30	
	T2	-0.32	0.26	-0.83	0.18	1.58	0.21	
Group *Time	T1	-0.59	0.28	-1.15	-0.03	4.24	0.04*	-0.06
	T2	-0.52	0.34	-1.19	0.15	2.30	0.13	-0.14

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean change and the pooled standard deviation of the two groups

Table 7.17 Comparison of pain interference between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Pain interference					
Intervention group	T0 – T1	-0.39 (0.21)	-0.80	0.03	0.07
	T0 – T2	-0.84 (0.23)	-1.28	-0.40	0.000*
Control group	T0 – T1	-0.20 (0.19)	-0.57	0.17	0.30
	T0 – T2	-0.32 (0.26)	-0.82	0.18	0.21

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.4 Psychological outcomes and quality of life at T0, T1, and T2

7.4.1 Total scores of depression, anxiety and stress

In the intervention group, the score was 13.89 (SD = 11.86) at T0, and decreased to 13.01 (SD = 17.30) at T1 and 12.40 (SD = 18.60) at T2. The control group showed a slight decrease in the total score of depression, anxiety, and stress and it was 11.67 (SD = 10.62) at T0, increased to 12.06 (SD = 14.95) at T1, and decreased to 11.02 (SD = 15.72) at T2. Table 7.18 presents the mean scores of total score of depression, anxiety and stress. Figure 7.6 shows the changes of total depression, anxiety and stress from T0 to T2.

Table 7.18 Total score of depression, anxiety and stress at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Total score of depression, anxiety, and stress				
T0	13.89 (11.86)		11.67 (10.62)	
T1	13.01 (17.30)	-0.06	12.06 (14.95)	0.03
T2	12.40 (18.60)	-0.10	11.02 (15.72)	-0.05

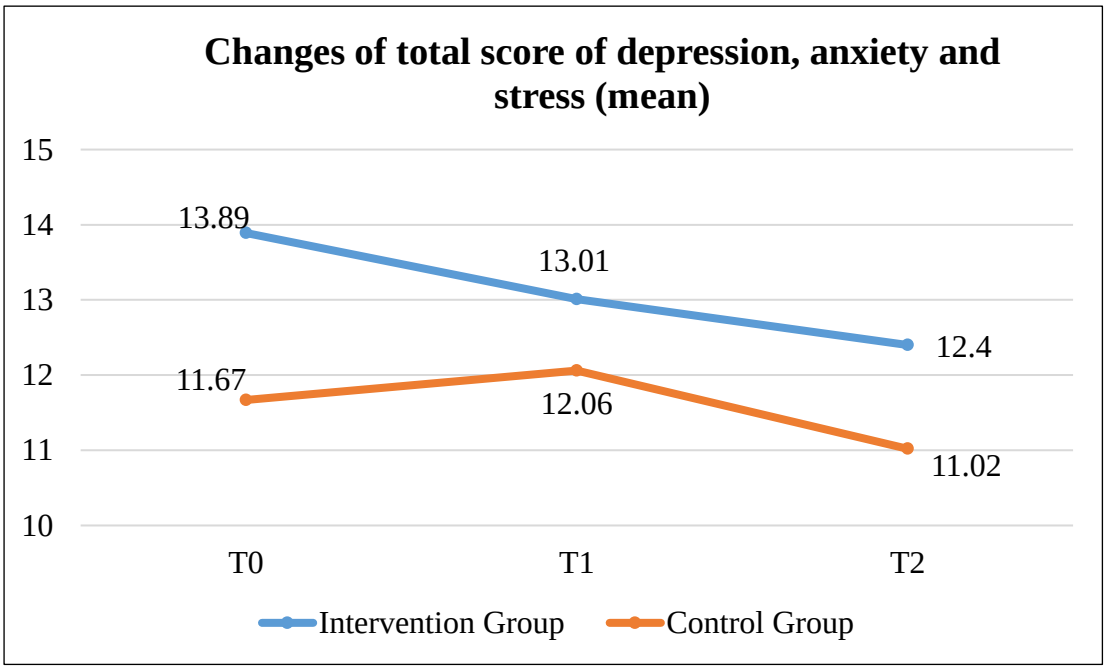
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.6 Changes of mean scores of total score of depression, anxiety and stress from T0 to T2
(Total score = 42, lower score represented a better total score of depression, anxiety and stress)



Significant effects ($p < 0.05$) were noted in comparison between group ($p = 0.03$) in the total score of depression, anxiety and stress. There were no statistical significance noted in the total score of depression, anxiety, and stress when comparing time pointe by group. Table 7.19 presents the GEE results of the total score of depression, anxiety, and stress between the two groups over time. Table 7.20 presents the pairwise analysis of comparing the total score of depression, anxiety, and stress between time points by group.

Table 7.19 Comparison of total score of depression, anxiety and stress between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Total score of depression, anxiety, and stress								
Group		2.22	1.00	0.27	4.18	4.97	0.03*	
Time	T1	0.39	0.88	-1.32	2.11	0.20	0.65	
	T2	-0.64	0.98	-2.57	1.29	0.43	0.51	
Group * Time	T1	-1.27	1.33	-3.88	1.33	0.92	0.34	0.06
	T2	-0.85	1.53	-3.85	2.15	0.31	0.58	0.05

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two groups

Table 7.20 Comparison of total score of depression, anxiety, and stress between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Total score of depression, anxiety, and stress					
Intervention group	T0 – T1	-0.88 (1.00)	-2.84	1.08	0.38
	T0 – T2	-1.49 (1.17)	-3.79	0.81	0.21
Control group	T0 – T1	0.39 (0.88)	-1.32	2.11	0.65
	T0 – T2	-0.64 (0.98)	-2.57	1.28	0.51

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.4.2 Depression

In the intervention group, the mean score of depression was 14.41 (SD = 12.74) at T0, and reduced to 13.33 (SD = 16.61) at T1 and 13.16 (SD = 20.34) at T2. In the control group, the mean score of depression was 10.93 (SD = 11.80) at T0, increased to 11.64 (SD = 14.84) at T1 and reduced to 9.86 (SD = 15.99) at T2. Table 7.21 presents the mean scores of depression at T0, T1 and T2. Figure 7.7 shows the changes of depression from T0 to T2.

Table 7.21 Depression at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Depression				
T0	14.41 (12.74)		10.93 (11.80)	
T1	13.33 (16.61)	-0.07	11.64 (14.84)	0.05
T2	13.16 (20.34)	-0.07	9.86 (15.99)	-0.08

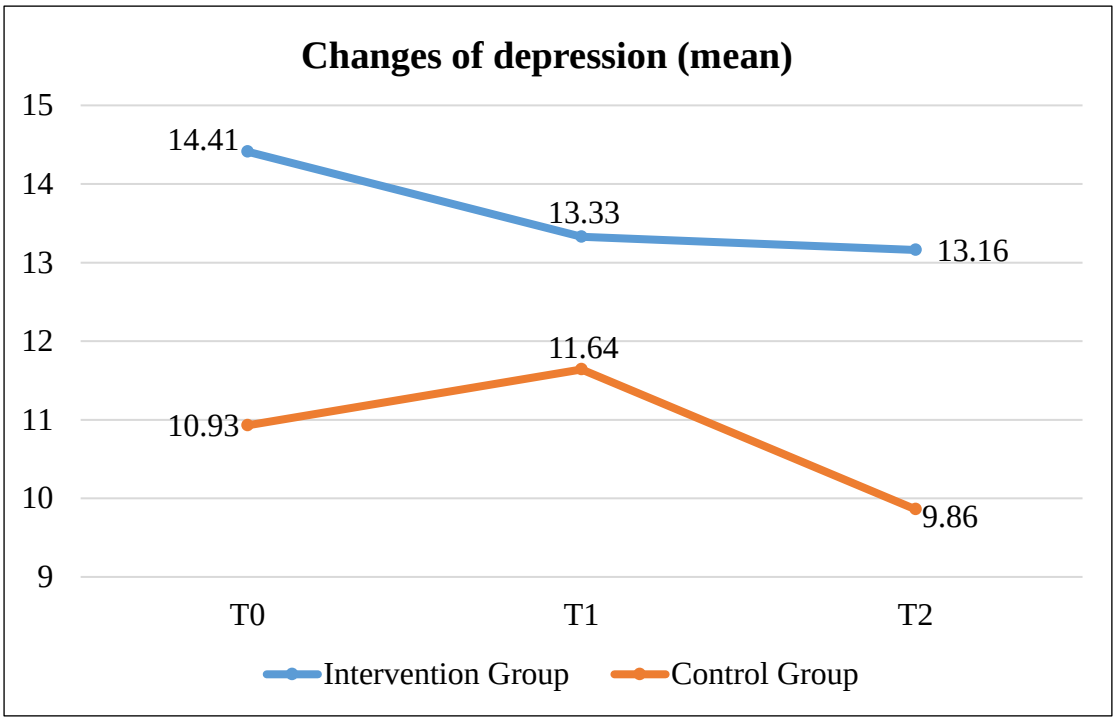
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.7 Changes of mean scores of depression from T0 to T2
(Total score = 42, lower score represented a better score of depression)



Significant effects ($p < 0.05$) were noted in group comparison ($p = 0.003$) of depression. There were no significant differences noted when comparing the results in the intervention group and control group. Table 7.22 shows the comparison of depression between two groups over time of depression. Table 7.23 presents the comparison of depression between time points by group.

Table 7.22 Comparison of depression between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Depression								
Group		3.48	1.16	1.19.	5.75	8.89	0.003*	
Time	T1	0.70	0.88	-1.01	2.42	0.64	0.42	
	T2	-1.07	1.07	-3.17	1.03	1.00	0.32	
Group * Time	T1	-1.78	1.41	-4.53	0.97	1.60	0.21	0.11
	T2	-0.17	1.83	-3.76	3.41	0.01	0.92	0.14

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two groups

Table 7.23 Comparison of depression between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Depression					
Intervention group	T0 – T1	-1.08 (1.10)	-3.23	1.08	0.33
	T0 – T2	-1.25 (1.49)	-4.15	1.66	0.40
Control group	T0 – T1	0.70 (0.88)	-1.01	2.42	0.42
	T0 – T2	-1.07 (1.07)	-3.17	1.03	0.32

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.4.3 Anxiety

In the intervention group, the mean score of anxiety was 12.41 (SD = 11.19) at T0, increased to 13.72 (SD = 18.58) at T1 and decreased to 12.80 (SD = 18.39) at T2. The mean score of anxiety was 10.62 (SD = 10.28) at T0, rose to 11.42 (SD = 16.08) at T1, and decreased to 10.41 (SD = 15.62) at T2 in the control group. Table 7.24 presents the mean scores of anxiety at T0, T1 and T2. Figure 7.8 shows the changes of anxiety from T0 to T2.

Table 7.24 Anxiety at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Anxiety				
T0	12.41 (11.19)		10.62 (10.28)	
T1	13.72 (18.58)	0.09	11.42 (16.08)	0.06
T2	12.80 (18.39)	0.03	10.41 (15.62)	-0.02

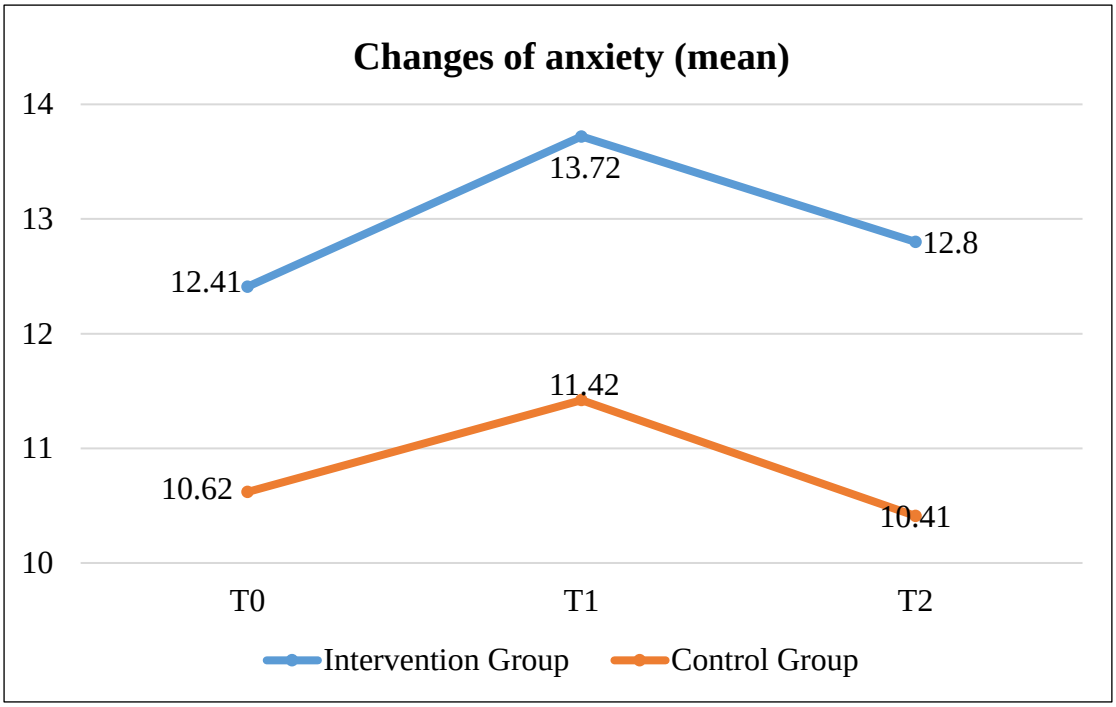
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.8 Changes of mean scores of anxiety from T0 to T2
(Total score = 42, lower score represented a better score of anxiety)



There were no significant differences noted in the comparison of results between two groups over time and between time points by group in anxiety. Table 7.25 shows the GEE results of anxiety between the two groups over time. Table 7.26 presents the pairwise comparison of anxiety between time points by group.

Table 7.25 Comparison of anxiety between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Anxiety								
Group		1.79	1.01	-0.20	3.77	3.12	0.08	
Time	T1	0.80	1.10	-1.35	2.96	0.53	0.47	
	T2	-0.21	1.09	-2.34	1.92	0.04	0.85	
Group * Time	T1	0.51	1.65	-2.73	3.75	0.10	0.76	0.13
	T2	0.61	1.68	-2.68	3.89	0.13	0.72	0.15

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two groups

Table 7.26 Comparison of anxiety between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Anxiety					
Intervention group	T0 – T1	1.31 (1.23)	-1.10	3.72	0.29
	T0 – T2	0.40 (1.28)	-2.10	2.90	0.76
Control group	T0 – T1	0.80 (1.10)	-1.35	2.96	0.47
	T0 – T2	-0.21 (1.09)	-2.34	1.92	0.85

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.4.4 Stress

In the intervention group, the mean score of stress was 17.92 (SD = 12.82) at T0, and reduced to 16.55 (SD = 19.77) at T1 and 15.43 (SD = 21.06) at T2. In the control group, the mean score of stress was 15.93 (SD = 12.21) at T0, and reduced to 15.48 (SD = 15.59) at T1 and 14.77 (SD = 18.77) at T2. Table 7.27 shows the mean scores of stress at T0, T1 and T2. Figure 7.9 presents the changes of stress from T0 to T2.

Table 7.27 Stress at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Stress				
T0	17.92 (12.82)		15.93 (12.21)	
T1	16.55 (19.77)	-0.08	15.48 (15.59)	-0.03
T2	15.43 (21.06)	-0.14	14.77 (18.77)	-0.07

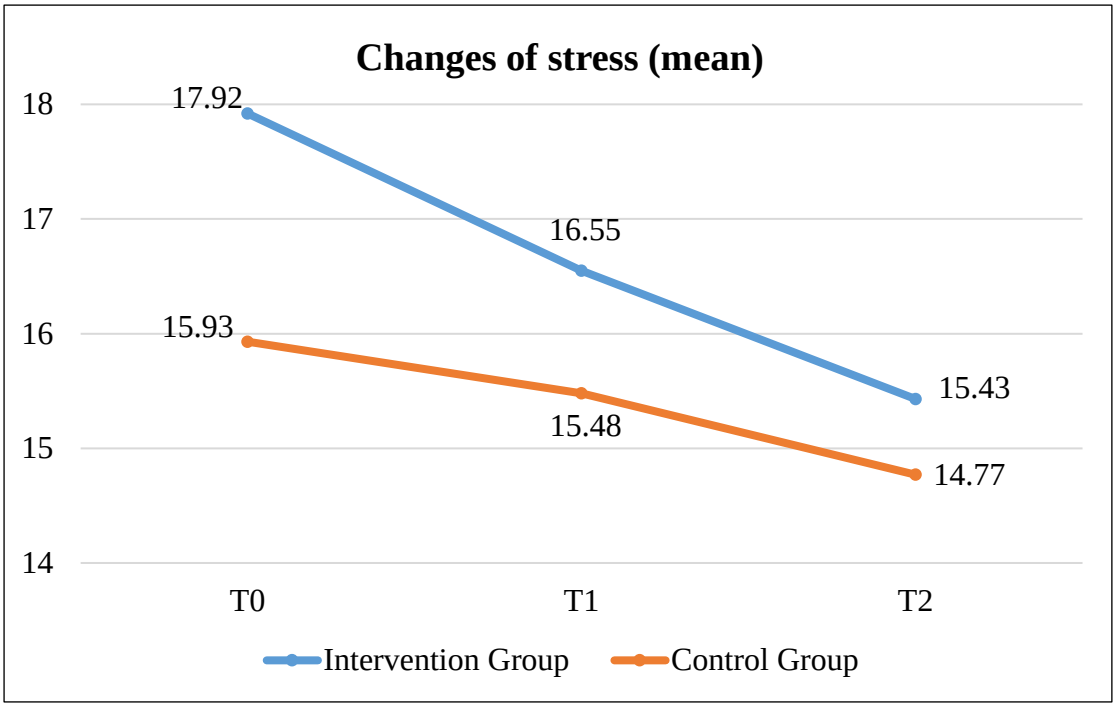
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.9 Changes of mean scores of stress from T0 to T2
(Total score = 42, lower score represented a better score of stress)



No significant differences were noted in stress in the comparison of results between the two groups over time and between time points by group. Table 7.28 presents the GEE results of stress between the two groups over time. Table 7.29 shows the results of pairwise analysis of stress between time points by group.

Table 7.28 Comparison of stress between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Stress								
Group		1.99	1.13	-0.22	4.19	3.12	0.08	
Time	T1	-0.45	0.87	-2.16	1.26	0.27	0.61	
	T2	-1.16	1.22	-3.54	1.23	0.90	0.34	
Group * Time	T1	-0.92	1.49	-3.83	2.00	0.38	0.54	0.06
	T2	-1.33	1.84	-4.94	2.28	0.52	0.47	-0.03

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two groups

Table 7.29 Comparison of stress between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Stress					
Intervention group	T0 – T1	-1.37 (1.21)	-3.73	1.00	0.26
	T0 – T2	-2.49 (1.38)	-5.20	0.22	0.07
Control group	T0 – T1	-0.45 (0.87)	-2.16	1.26	0.61
	T0 – T2	-1.16 (1.22)	-3.54	1.23	0.34

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.5 Quality of life

7.5.1 Overall quality of life

In the intervention group, the mean score of overall quality of health was 3.19 (SD = 0.88) at T0, and improved to 3.26 (SD = 1.30) at T1 and 3.33 (SD = 1.70) at T2. In the control group, the mean score of overall quality of life was 3.27 (SD = 0.81) at T0, and increased slightly to 3.29 (SD = 0.93) at T1 and 3.29 (SD = 1.29) at T2. Table 7.30 shows the mean scores of overall quality of life at T0, T1 and T2. Figure 7.10 presents the changes of overall quality of life from T0 to T2.

Table 7.30 Overall quality of life at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Overall quality of life				
T0	3.19 (0.88)		3.27 (0.81)	
T1	3.26 (1.30)	0.07	3.29 (0.93)	0.02
T2	3.33 (1.70)	0.11	3.29 (1.29)	0.02

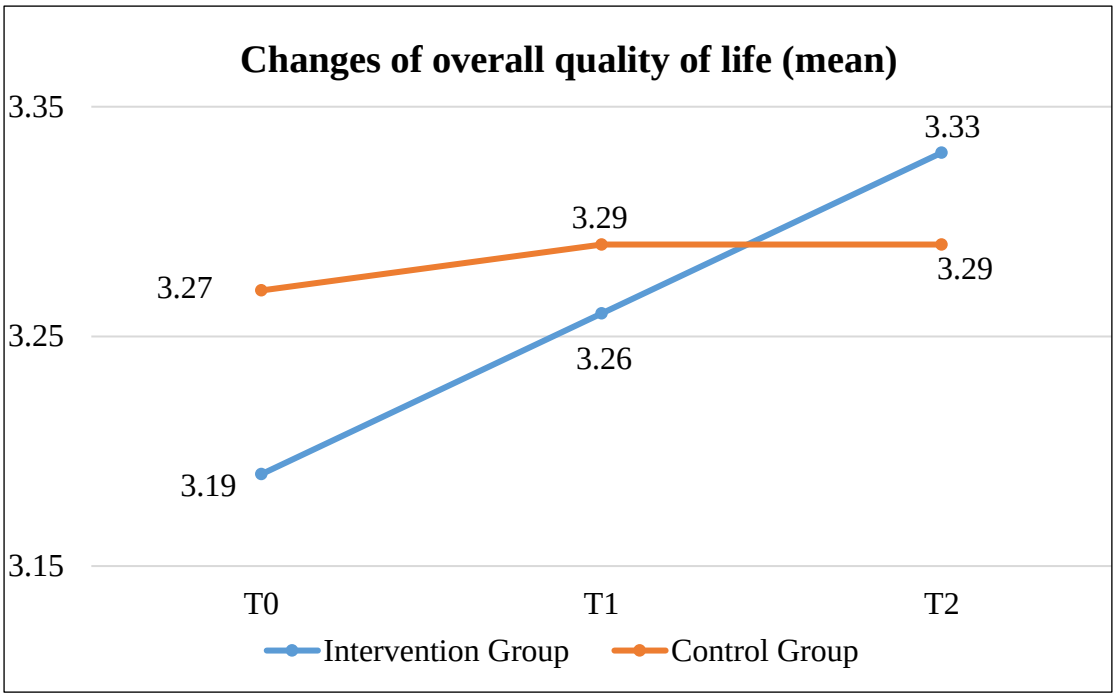
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.10 Changes of mean scores of overall quality of life from T0 to T2
(Higher score indicated a higher quality of life)



There were no statistical differences noted in the results when comparing overall quality of life between the two groups over time and between time points by group of. Table 7.31 presents the comparison between the two groups over time of overall quality of life. Table 7.32 shows the pairwise comparison of the results between time points by group.

Table 7.31 Comparison of overall quality of life between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Overall quality of life								
Group		-0.08	0.07	-0.22	0.06	1.33	0.25	
Time	T1	0.02	0.05	-0.08	0.12	0.10	0.76	
	T2	0.02	0.08	-0.14	0.18	0.06	0.81	
Group * Time	T1	0.06	0.10	-0.13	0.25	0.36	0.55	-0.02
	T2	0.13	0.10	-0.13	0.38	0.95	0.33	0.05

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two group

Table 7.32 Comparison of overall quality of life between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Overall quality of life					
Intervention group	T0 – T1	0.07 (0.08)	-0.08	0.23	0.35
	T0 – T2	0.14 (0.10)	-0.05	0.34	0.15
Control group	T0 – T1	0.02 (0.05)	-0.09	0.12	0.76
	T0 – T2	0.02 (0.08)	-0.14	0.18	0.81

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.5.2 Overall health and well-being

In the intervention group, the mean score of overall health and well-being was 2.35 (SD = 1.01) at T0, and increased to 2.55 (SD = 1.56) at T1 and 2.39 (SD = 1.50) at T2. In the control group, the mean score of overall health and well-being was 2.25 (SD = 0.94), and rose to 2.49 (SD = 1.31) at T1 and 2.57 (SD = 1.61) at T2. Table 7.33 presents the mean scores of overall health and well-being at T0, T1 and T2. Figure 7.11 shows the changes of overall health and well-being from T0 to T2.

Table 7.33 Overall health and well-being at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Overall health and well-being				
T0	2.35 (1.01)		2.25 (0.94)	
T1	2.55 (1.56)	0.15	2.49 (1.31)	0.21
T2	2.39 (1.50)	0.03	2.57 (1.61)	0.24

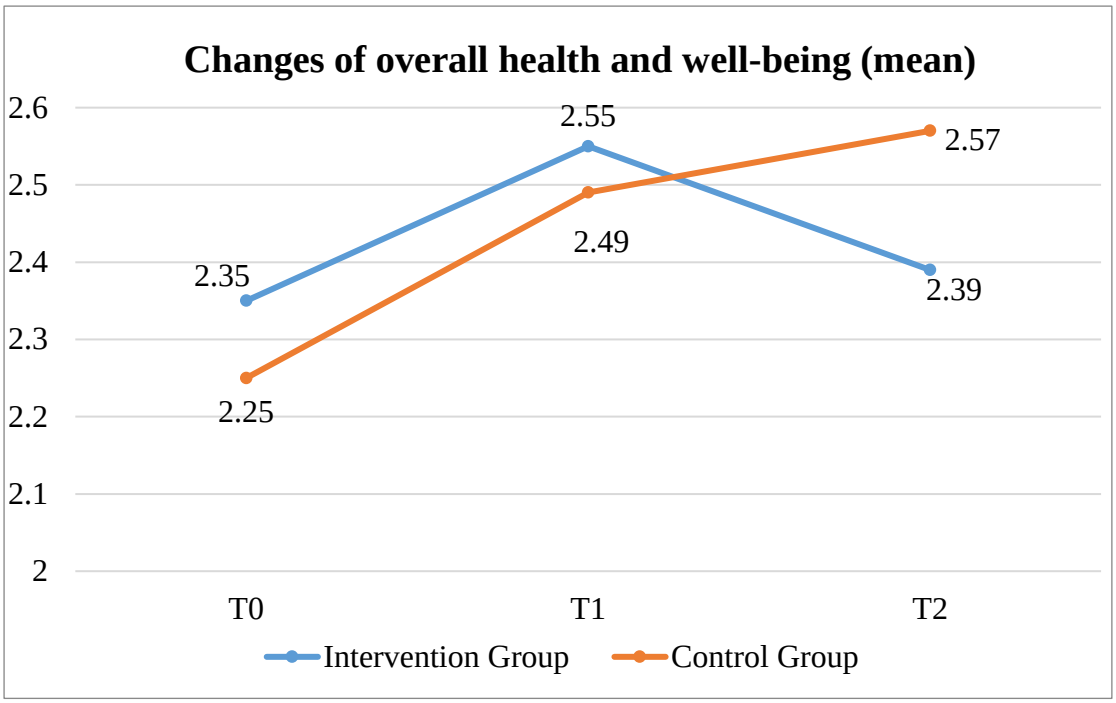
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.11 Changes of mean scores of overall health and well-being from T0 to T2 (Higher score indicated a higher overall health and well-being)



Significant effects were found in overall health and well-being when comparing the results between two groups over time (Time points: T1: $p = 0.01$, T2: $p = 0.01$; interactions between groups and time points: T2: $p = 0.04$) as shown in Table 7.34. In the intervention group, significant effects ($p < 0.05$) were noted in the overall health and well-being of quality of life (T0 – T1: $p = 0.02$). In the control group, the overall health and well-being (T0 – T1: $p = 0.003$, T0 – T2: $p = 0.001$) presented significant effects ($p < 0.05$). Table 7.35 presents the comparison between time points by group of overall health and well-being.

Table 7.34 Comparison of overall health and well-being between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Overall health and well-being								
Group		0.10	0.08	-0.07	0.27	1.40	0.24	
Time	T1	0.24	0.08	0.08	0.40	8.79	0.01*	
	T2	0.32	0.10	0.13	0.50	11.01	0.01*	
Group * Time	T1	-0.04	0.12	-0.28	0.20	0.11	0.74	0.04
	T2	-0.27	0.13	-0.54	-0.01	4.16	0.04*	0.11

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two groups

Table 7.35 Comparison of overall health and well-being between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Overall health and well-being					
Intervention group	T0 – T1	0.20 (0.09)	0.03	0.38	0.02*
	T0 – T2	0.04 (0.09)	-0.14	0.23	0.64
Control group	T0 – T1	0.24 (0.08)	0.08	0.40	0.003*
	T0 – T2	0.32 (0.10)	0.13	0.50	0.001*

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.5.3 Physical health domain

In the intervention group, the mean score of physical health domain was 13.23 (SD = 3.09) at T0, and increased to 13.51 (SD = 4.91) at T1 and 13.51 (SD = 5.67) at T2. In the control group, the mean score of physical health domain was 13.42 (SD = 3.02) at T0, and increased slightly to 13.57 (SD = 3.36) at T1 and reduced to 13.47 (SD = 4.72) at T2. Table 7.36 shows the mean scores of physical health domain of quality of life. Figure 7.12 presents the changes of physical health domain of quality of life from T0 to T2.

Table 7.36 Physical health domain of quality of life at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Physical health domain				
T0	13.23 (3.09)		13.42 (3.02)	
T1	13.51 (4.91)	0.07	13.57 (3.66)	0.04
T2	13.51 (5.67)	0.06	13.47 (4.72)	0.01

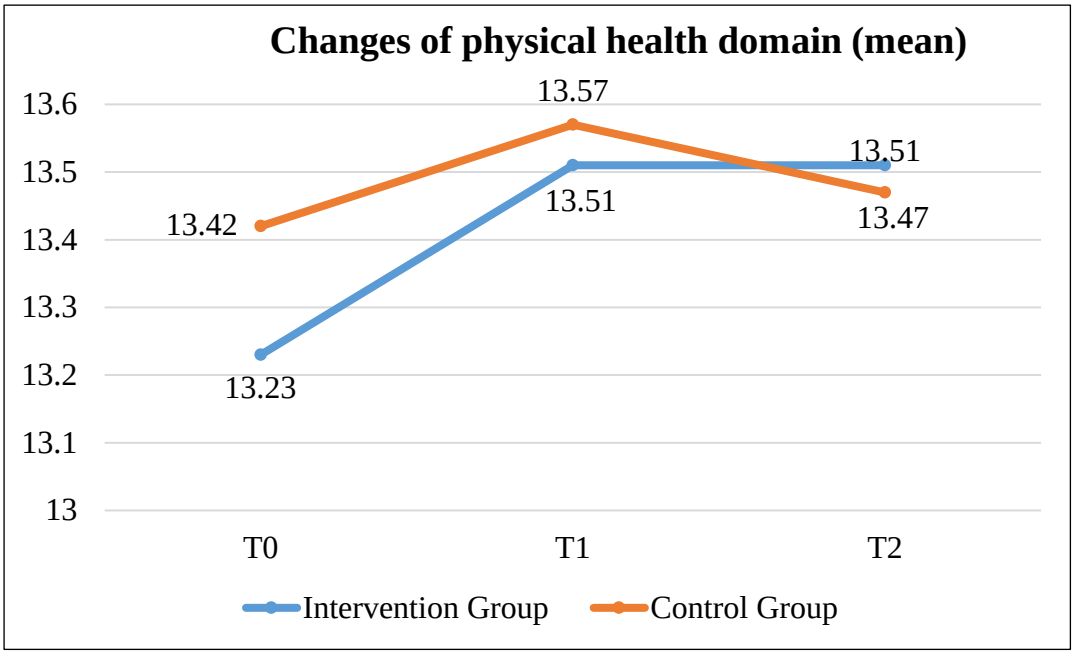
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.12 Changes of mean scores of physical health domain of quality of life from T0 to T2
(Higher score indicated a higher quality of life)



There were no significant differences when comparing physical health domain of quality of life between two groups over pain and in pairwise analysis. Table 7.37 presents the comparison between the two groups over time of physical health domain. Table 7.38 shows the pairwise analysis of comparing the physical health domain between time points by group.

Table 7.37 Comparison of physical health domain of quality of life between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Physical health domain								
Group		-0.20	0.26	-0.70	0.31	0.56	0.45	
Time	T1	0.15	0.17	-0.19	0.49	0.73	0.39	
	T2	0.05	0.25	-0.43	0.53	0.04	0.84	
Group * Time	T1	0.14	0.32	-0.49	0.76	0.19	0.67	-0.01
	T2	0.23	0.39	-0.52	0.98	0.35	0.55	0.02

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two groups

Table 7.38 Comparison of physical health domain of quality of life between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Physical health domain					
Intervention group	T0 – T1	0.28 (0.27)	-0.24	0.81	0.29
	T0 – T2	0.28 (0.29)	-0.30	0.85	0.34
Control group	T0 – T1	0.15 (0.17)	-0.19	0.49	0.39
	T0 – T2	0.05 (0.25)	-0.43	0.53	0.84

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.5.4 Psychological domain

In the intervention group, the mean score of psychological domain was 11.49 (SD = 2.12) at T0, and increased to 11.61 (SD = 2.91) at T1 and 11.64 (SD = 3.07) at T2. In the control group, the mean score of psychological health domain was 11.75 (SD = 2.03) at T0, and rose to 11.85 (SD = 2.46) at T1 and 12.01 (SD = 3.02) at T2. Table 7.39 shows the mean scores of psychological domain of quality of life at T0, T1 and T2. Figure 7.13 presents the changes of psychological domain of quality of life form T0 to T2.

Table 7.39 Psychological domain of quality of life at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Psychological domain				
T0	11.49 (2.12)		11.75 (2.03)	
T1	11.61 (2.91)	0.05	11.85 (2.46)	0.04
T2	11.64 (3.07)	0.06	12.01 (3.02)	0.10

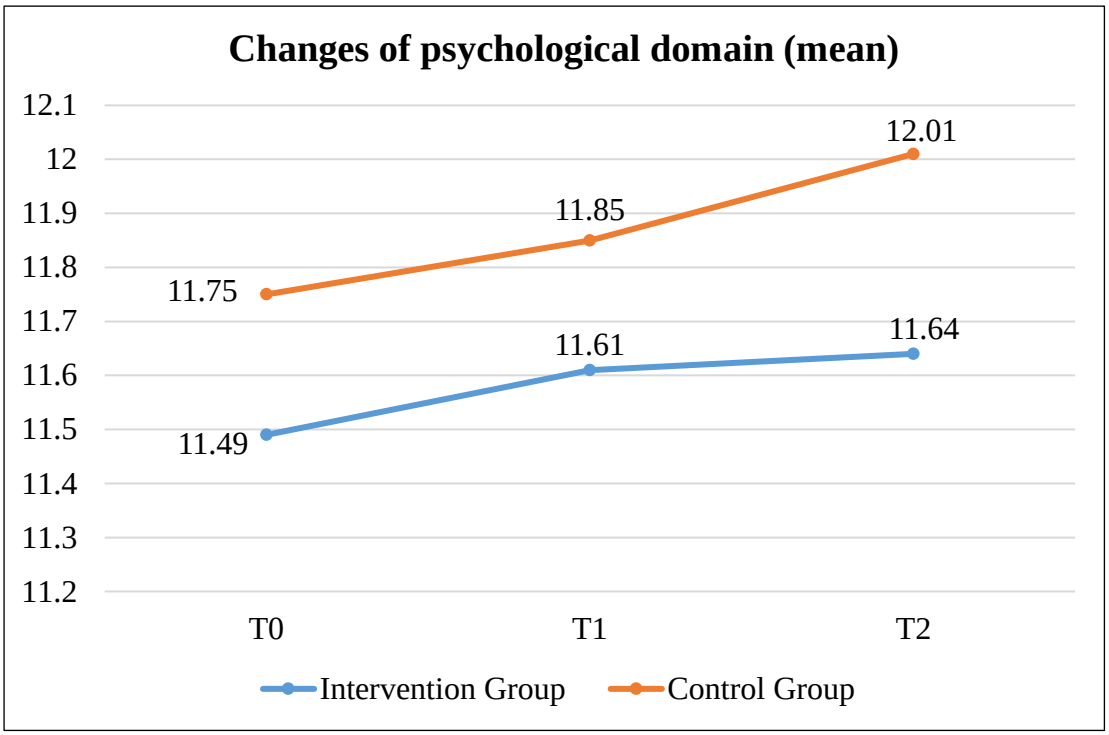
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.13 Changes of mean scores of psychological domain of quality of life from T0 to T2
(Higher score indicated a higher quality of life)



There were no significant differences noted in the results of psychological domain of quality of life in GEE model. Table 7.40 presents the comparison results between two groups over time of psychological health domain of quality of life. Table 7.41 presents the pairwise comparison of the psychological domain of quality of life.

Table 7.40 Comparison of psychological domain of quality of life between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Psychological domain								
Group		-0.26	0.18	-0.61	0.08	2.25	0.13	
Time	T1	0.09	0.12	-0.15	0.34	0.59	0.44	
	T2	0.25	0.16	-0.06	0.58	2.51	0.11	
Group * Time	T1	0.03	0.20	-0.36	0.42	0.02	0.89	-0.09
	T2	-0.11	0.23	-0.57	0.35	0.22	0.64	-0.04

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two groups

Table 7.41 Comparison of psychological domain of quality of life between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Psychological domain					
Intervention group	T0 – T1	0.12 (0.16)	-0.19	0.43	0.44
	T0 – T2	0.15 (0.17)	-0.18	0.48	0.38
Control group	T0 – T1	0.09 (0.12)	-0.15	0.34	0.44
	T0 – T2	0.26 (0.16)	-0.06	0.58	0.11

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.5.5 Social relationships domain

In the intervention group, the mean score of social relationship domain was 12.13 (SD = 4.24) at T0, and rose to 12.50 (SD = 5.99) at T1 and reduced to 12.45 (SD = 7.17) at T2. In the control group, the mean score of social relationship domain was 12.70 (SD = 3.66) at T0, decreased to 12.59 (SD = 4.72) at T1 and 12.36 (SD = 6.29) at T2. Table 7.42 shows the mean scores of social relationship domain of quality of life. Figure 7.14 presents the changes of social relationships domain of quality of life from T0 to T2.

Table 7.42 Social relationship domain of quality of life at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Social relationships domain				
T0	12.13 (4.24)		12.70 (3.66)	
T1	12.50 (5.99)	0.07	12.59 (4.72)	-0.02
T2	12.45 (7.17)	0.05	12.36 (6.29)	-0.07

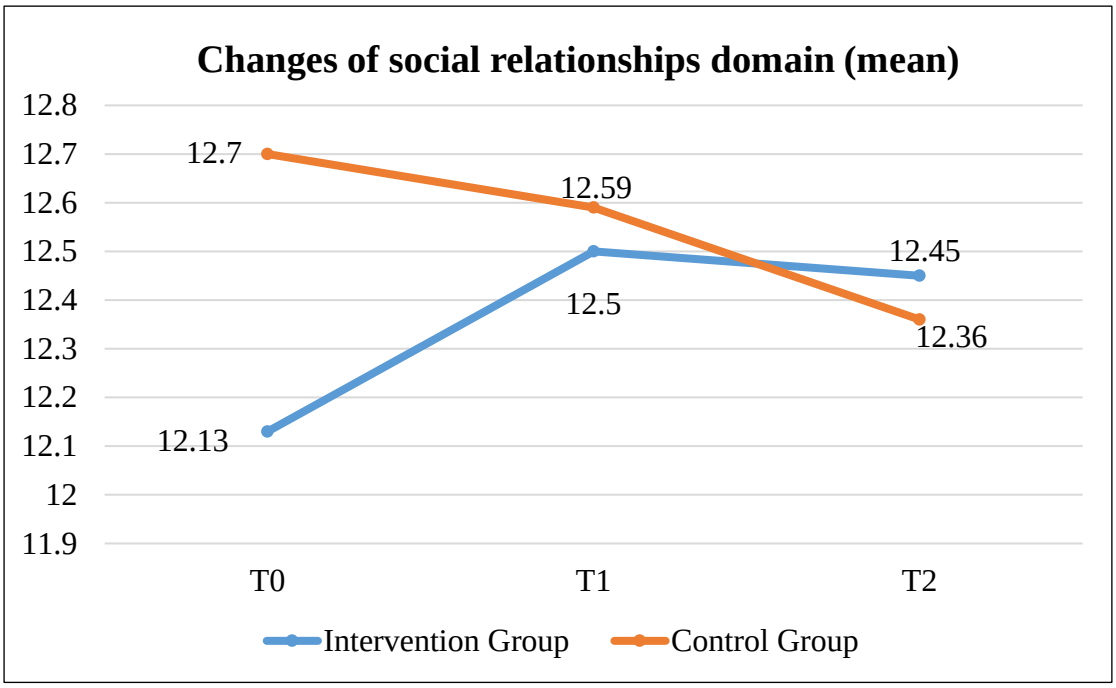
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.14 Changes of mean scores of social relationships domain of quality of life from T0 to T2
(Higher score indicated a higher quality of life)



The GEE results of the social relationships domain of quality of life shows no significant differences. Table 7.43 presents the comparison of results between two groups over time. Table 7.44 presents the results of pairwise comparison of social relationships domain of quality of life.

Table 7.43 Comparison of social relationships domain of quality of life between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen' s d)
				Lower	Upper	Wald χ^2	p-value	
Social relationships domain								
Group		-0.56	0.34	-1.22	0.10	2.78	0.10	
Time	T1	-0.11	0.24	-0.57	0.37	0.19	0.66	
	T2	-0.34	0.36	-1.03	0.36	0.90	0.34	
Group * Time	T1	0.48	0.41	-0.33	1.28	1.36	0.24	-0.02
	T2	0.65	0.56	-0.45	1.74	1.35	0.25	-0.04

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two groups

Table 7.44 Comparison of social relationships domain of quality of life between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Social relationships domain					
Intervention group	T0 – T1	0.37 (0.33)	-0.28	1.02	0.26
	T0 – T2	0.31 (0.43)	-0.53	1.16	0.47
Control group	T0 – T1	-0.10 (0.24)	-0. 57	0. 36	0.66
	T0 – T2	-0.34 (0.36)	-1.03	0.36	0.34

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.5.6 Environment domain

In the intervention group, the mean score of environment domain was 11.86 (SD = 3.25) at T0, and increased to 12.05 (SD = 4.79) at T1 and decreased to 11.85 (SD = 5.69) at T2. In the control group, the mean score of environment domain was 12.10 (SD = 3.32) at T0, and decreased to 12.04 (SD = 4.23) at T1 and 12.04 (SD = 4.86). Table 7.45 shows the mean scores of environment domain of quality of life at T0, T1 and T2. Figure 7.15 presents the changes of environment domain of quality of life from T0 to T2.

Table 7.45 Environment domain of quality of life at T0, T1, and T2

	Intervention group (n = 160)		Control group (n = 159)	
	Mean (SD)	Within group Effect size (Cohen's d)	Mean (SD)	Within group Effect size (Cohen's d)
Environment domain				
T0	11.86 (3.25)		12.10 (3.32)	
T1	12.05 (4.79)	0.05	12.04 (4.23)	-0.02
T2	11.85 (5.69)	0.00	12.04 (4.86)	-0.01

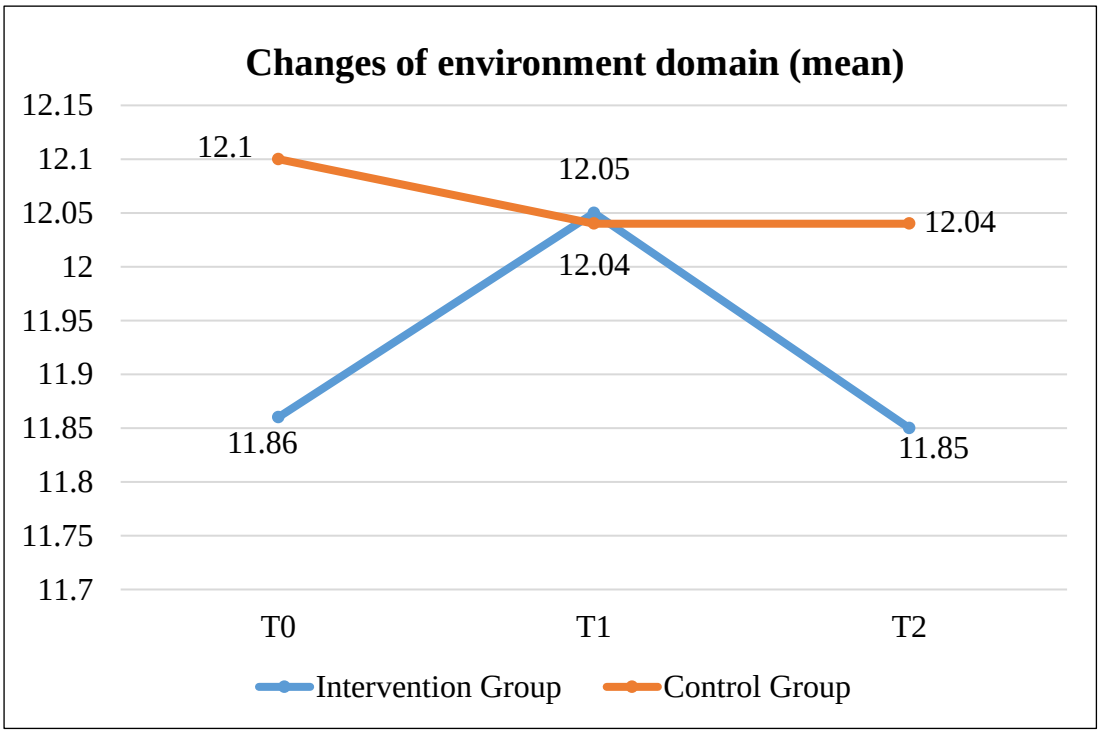
T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Effect size: Within-group difference in mean and the pooled standard deviation of the two groups compare to T0 (baseline)

Positive Cohen'd = increase in scores over time

Negative Cohen'd = decrease in scores over time

Figure 7.15 Changes of mean scores of environment domain of quality of life from T0 to T2
(Higher score indicated a higher quality of life)



There were no statistical differences in the GEE results of environment domain of quality of life. Table 7.46 presents the GEE results of environment domain of quality of life comparing the results between the two groups over time. Table 7.47 shows the comparison of the results between time points by group.

Table 7.46 Comparison of environment domain of quality of life between the two groups over time from T0 to T2

		B	SE	95% confidence interval				Effect size (Cohen's d)
				Lower	Upper	Wald χ^2	p-value	
Environment domain								
Group		-0.24	0.28	-0.79	0.31	0.73	0.39	
Time	T1	-0.07	0.19	-0.44	0.31	0.12	0.73	
	T2	-0.06	-0.24	-0.52	0.40	0.06	0.80	
Group * Time	T1	0.25	0.31	-0.36	0.87	0.64	0.42	0.00
	T2	0.05	0.38	-0.71	0.80	0.01	0.91	-0.05

*p < 0.05 was considered as significant

Primary endpoint: T0 – T2

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Effect size: Between-group difference in mean and the pooled standard deviation of the two groups

Table 7.47 Comparison of environment domain of quality of life between time points by group from T0 to T2

		Mean difference (SE)	95% confidence interval		p-value
			Lower	Upper	
Environment domain					
Intervention group	T0 – T1	0.19 (0.25)	-0.31	0.68	0.46
	T0 – T2	-0.01 (0.30)	-0.61	0.58	0.96
Control group	T0 – T1	-0.07 (0.19)	-0.44	0.31	0.73
	T0 – T2	-0.06 (0.24)	-0.52	0.40	0.80

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.6 Participant response rate and end-point for data analysis

There was a dropout of participants across all time points. Attrition was found by the loss of follow-up at each time point. The response rate was calculated for the total number of participants, and participants in the intervention group and control group at each time point. Table 7.48 illustrates the response rates at each time point.

Table 7.48 Participant response rates at each time point

	Total participants	Intervention group	Control group
Time points	%	%	%
T0 to T1	45.1	40.6	49.7
T0 to T2	29.2	26.2	32.1
T0 to T3	20.4	17.5	23.3

The response rate was low from T0 to T3. Since intention-to-treat analysis was adopted in the study, bias may exist. To reduce bias, descriptive data of the 319 participants would be presented, and GEE was performed up to T2.

There were 16 participants who dropped out of the study and provided feedback: eight participants were from the intervention group and eight were from the control group.

Table 7.49 presents participants' reasons for dropping out of the study. The reasons

included loss of interest, already obtained adequate knowledge from ePain, a busy schedule that meant they were unable to continue ePain, and learning pain management techniques from others.

Table 7.49 Reasons for dropping out of the study

	Intervention group (n = 8)		Control group (n = 8)	
	n	%	n	%
Loss of interest	1	12.5	0	0
Already obtained adequate knowledge from ePain	2	25	1	12.5
Busy schedule meant I was unable to continue ePain	4	50	5	62.5
Learnt pain knowledge from others	0	0	4	50
Pain was resolved after joining ePain	1	12.5	1	12.5
The content was boring	0	0	1	12.5

Multiple answers can be chosen

Other feedback collected was put into the category “Related to the questionnaire”. There were four participants who provided their comments, three from the intervention group (Participants A to C) and one from the control group (Participant D). They stated:

“The questionnaire is too long.” (Participant A)

“I completed the questionnaire a few times and it looks similar.” (Participants A, C)

“It would be better not to have the questionnaire.” (Participant B)

“There are too many questions.” (Participant C)

“It would be better to shorten the questionnaire.” (Participant D)

7.7 Representativeness of data from the total retained participants

No significant differences in the demographic characteristics and outcomes between the total retained and total participants who dropped out were found, with the exception of cataracts ($p = 0.02$). The baseline characteristics were compared between the total number of participants retained in the study and those who dropped out, to ensure the loss of follow-up did not create any threat to the study validity and to provide information about attrition bias (Dumville et al., 2006; Moher et al., 2012). Also, it presented how the total retained participants can represent the eligible participants in the study (Moher et al., 2012). A total of 144 participants was retained in the study, while 175 participants dropped out. The details are shown in Table 7.50 and Table 7.51.

Table 7.50 Representativeness of data from the total retained participants by comparison of baseline demographic characteristics

	Total retained participants (n = 144)		Total participants who dropped out (n = 175)		p-value[+]
	n	%	n	%	
Gender					0.35
Female	115	79.9	132	75.4	
Male	29	20.1	43	24.6	
Age					0.07
Mean (SD)	43.62 (13.63)		43.66 (13.11)		
Range	22 – 65		20 – 65		
Marital status					0.75
Single	62	43.1	73	41.7	
Married	70	48.6	89	50.9	
Divorced	11	7.6	10	5.7	
Widowed	1	0.7	3	1.7	
Occupation					0.29
Managers and administrators	16	11.1	21	12	
Professionals	65	43.1	55	31.4	
Associate professionals	15	10.4	16	9.1	
Clerical support workers	27	18.8	39	22.3	
Service and sales workers	12	8.3	26	14.9	
Craft and related workers	3	2.1	6	3.4	
Plant and machine operators and	3	2.1	1	0.6	

assemblers					
Elementary occupations	4	2.8	5	2.9	
Others	2	1.4	6	3.4	
Education level					0.77
No formal education	0	0	0	0	
Primary level	4	2.8	5	2.9	
Secondary level	40	27.8	55	31.4	
Post-secondary level	100	69.4	115	65.7	
Living status					0.77
Alone	15	10.4	18	10.3	
With parents	50	34.7	52	29.7	
With spouse	27	18.8	35	20	
With spouse and children	41	28.5	48	27.4	
With children	6	4.2	12	6.9	
With relatives or friends	5	3.5	10	5.7	
Monthly income (HKD$)					0.77
Below 6000	12	8.3	23	13.1	
6001-10000	14	9.7	16	9.1	
10001-20000	35	24.3	42	24	
20001-30000	32	22.2	33	18.9	
30001-40000	17	11.8	21	12	
40001-60000	26	18.1	26	14.9	
Above 60001	8	5.6	14	8	

Personal health history (Multiple answers can be chosen)					
No chronic illnesses	99	68.8	122	69.7	0.85
Hypertension	10	6.9	16	9.1	0.48
Diabetes mellitus	8	5.6	9	5.1	0.87
Heart disease	3	2.1	2	1.1	0.50
Stroke	2	1.4	0	0	0.12
Gout	2	1.4	1	0.6	0.45
Respiratory disease	2	1.4	5	2.9	0.37
Arthritis	13	9	14	8	0.74
Cataract	0	0	7	4	0.02*
Others	19	13.2	22	12.6	0.87
Long-term use of medications	34	23.6	37	21.1	0.60
Duration of pain (months)					
Mean (SD)	7.39 (4.33)		7.19 (4.45)		0.81

Percentage may not add up to 100% because of rounding

[+]Chi Square Test was used to compare intervention and control groups.

*$p < 0.05$ was considered as significant.

Table 7.51 Comparison of baseline pain-related outcomes, psychological outcomes, and quality of life of total retained and total participants who dropped out

	Total retained participants (n = 144)	Total dropped out participants (n = 175)	p-value^
	Mean (SD)	Mean (SD)	
Pain severity	4.13 (1.69)	4.18 (2.05)	0.82
Pain self-efficacy	42.01 (11.07)	41.19 (13.13)	0.56
Pain interference	3.61 (1.75)	3.85 (2.04)	0.27
Depression, anxiety, and stress			
Total score	12.25 (8.24)	13.37 (8.95)	0.27
Depression	11.73 (9.07)	13.76 (9.94)	0.09
Anxiety	11.19 (8.11)	12.08 (8.60)	0.39
Stress	16.98 (9.25)	17.02 (9.95)	0.97
Quality of life			
Overall quality of life	3.28 (0.65)	3.19 (0.64)	0.22
Overall health and well-being	2.28 (0.77)	2.31 (0.73)	0.73
Physical health domain	13.27 (2.30)	13.37 (2.35)	0.70
Psychological domain	11.78 (1.57)	11.49 (1.59)	0.11
Social relationships domain	12.46 (2.85)	12.37 (3.18)	0.79
Environment domain	12.15 (2.46)	11.84 (2.53)	0.28

^ Independent t-test was used to compare intervention group and control groups

*$p < 0.05$ was considered as significant

The retained participants and the dropped out participants presented almost similar demographic characteristics and outcomes. Most of the data were without statistical significance. The retained participants could be representative of the study's eligible participants.

7.8 Changes in participant knowledge level

In this section, the changes in knowledge level of the intervention group participants are illustrated. The frequency of page views and quiz results in ePain are counted. Regression analysis is conducted to examine the associations between the frequency of page views and the dependent variables, which are the study outcomes. Relationships between the frequency of the quizzes passed with the dependent variables, and the quiz results (pass/fail) and the dependent variables are analysed.

7.8.1 Frequency of page views in each chapter in the intervention group

The frequency of page views in each chapter are summarised in Table 7.52. The total frequency of the page views was 3,127. Chapter 1 was the most frequently viewed chapter (n = 869, 28%).

Table 7.52 Frequency of page views in each chapter in the intervention group

	Frequencies of pages viewed	%
	n	
Chapter 1 Introduction to pain	869	28
Chapter 2 Pain-related diseases and syndromes	788	25
Chapter 3 Occupational diseases related to pain	344	11
Chapter 4 How to manage your pain	57	1.8
Chapter 5 Pharmacological approaches to pain management	186	5.9
Chapter 6 The non-pharmacological management of pain	380	12.2
Chapter 7 Exercise for relieving pain	503	16.1
Total pages viewed	3127	100

Table 7.53 shows the regression analysis for the frequency of page views and dependent variables. There were no associations observed between frequency of page views and all dependent variables.

Table 7.53 Regression analysis for frequency of page views and dependent variables at T2

Dependent variables	B	p-value	95% confident interval	R^2
Pain severity	-0.002	0.61	[-0.008, 0.005]	0.006
Pain self-efficacy	0.03	0.32	[-0.03, 0.08]	0.02
Pain interference	-0.003	0.39	[0.01, 0.004]	0.02
Depression, anxiety, and stress				
Total score	-0.02	0.19	[-0.05, 0.01]	0.04
Depression	-0.018	0.42	[-0.06, 0.03]	0.02
Anxiety	0.002	0.90	[-0.04, 0.04]	0.000
Stress	-0.03	0.14	[-0.06, 0.009]	0.05
Quality of life				
Overall quality of life	0.001	0.38	[-0.002, 0.004]	0.02
Overall health and well-being	-3.50	0.98	[-0.003, 0.003]	0.000
Physical health domain	0.01	0.07	[-0.001, 0.02]	0.07
Psychological domain	0.005	0.14	[-0.002, 0.01]	0.04
Social relationships domain	0.01	0.07	[-0.001, 0.02]	0.07
Environment domain	0.01	0.07	[-0.001, 0.02]	0.07

*$p < 0.05$ was considered as significant

7.8.2 Frequency of quiz results and the effect on outcomes

Table 7.54 shows the results of the quizzes by the participants. The quizzes were set upon completion of each chapter. It was optional for the participants to attempt the quizzes. A participant who attained 50% or above of the correct answers in each section's quizzes was counted. There were 160 participants allocated to the intervention group, and 53 intervention group participants attempted all the quizzes. A total of 96.2% of participants passed in the first attempt of quizzes.

Table 7.54 Number of intervention group participants attempted and passed the quizzes at their first attempt

	Total number of participants	
	n	%
Attempted all the quizzes	53	100
Passed quizzes[β]	51	96.2

[β]Quiz results attaining 50% of correct answers were considered a pass

Table 7.55 presents the regression analysis of the frequency of quizzes passed and dependent variables at T2. There was an association between the frequency of quizzes passed and the social relationships domain of quality of life ($p = 0.049$). No other significant differences were found with other outcomes.

Table 7.55 Regression analysis for frequency of quizzes passed and dependent variables at T2

Dependent variables	B	p-value	95% confident interval	R^2
Pain severity	-0.07	0.25	[-0.19, 0.05]	0.06
Pain self-efficacy	0.26	0.54	[-0.60, 1.12]	0.02
Pain interference	-0.06	0.34	[-0.19, 0.07]	0.04
Depression, anxiety, and stress				
Total score	-0.53	0.10	[-1.16, 0.10]	0.13
Depression	-0.47	0.44	[-1.74, 0.80]	0.04
Anxiety	-0.64	0.23	[-1.73, 0.45]	0.09
Stress	-0.60	0.11	[-1.33, 0.14]	0.12
Quality of life				
Overall quality of life	0.004	0.89	[-0.06, 0.06]	0.001
Overall health and well-being	-0.004	0.87	[-0.06, 0.05]	0.001
Physical health domain	0.14	0.17	[-0.06, 0.33]	0.08
Psychological domain	0.06	0.35	[-0.07, 0.18]	0.04
Social relationships domain	0.24	0.049*	[0.001, 0.49]	0.15
Environment domain	0.19	0.07	[-0.01, 0.40]	0.13

*$p < 0.05$ was considered as significant

Table 7.56 illustrates the relationship between the quiz results to the changes in outcomes from T0 to T2. There were no associations observed between quiz results and the changes in all dependent variables.

Table 7.56 Relationship between the quiz results (pass or fail) to the changes in outcomes from T0 to T2 (n = 26)

Outcomes	Pass (n = 24)				Fail (n = 2)				p-value[@]
	Improved		Static/Decline		Improved		Static/Decline		
	n	%	n	%	n	%	n	%	
Pain severity	15	62.5	9	37.5	1	50.0	1	50.0	1.00
Pain self-efficacy	14	58.3	10	41.7	0	0	2	100	0.20
Pain interference	15	62.5	9	37.5	1	50.0	1	50.0	1.00
Depression, anxiety, and stress									
Total score	12	50.0	12	50.0	1	50.0	1	50.0	1.00
Depression	7	30.4	16	69.6	1	50.0	1	50.0	1.00
Anxiety	3	13.0	20	87.0	1	50.0	1	50.0	0.30
Stress	12	50.0	12	50.0	1	50.0	1	50.0	1.00
Quality of life									
Overall quality of life	7	29.2	17	70.8	0	0	2	100	1.00
Overall health and well-being	6	25.0	18	75.0	0	0	2	100	1.00
Physical health domain	15	62.5	9	37.5	0	0	2	100	0.17
Psychological domain	10	41.7	14	58.3	0	0	2	100	0.51
Social relationships domain	14	58.3	10	41.7	0	0	2	100	0.20
Environment domain	15	62.5	9	37.5	0	0	2	100	0.17

*$p < 0.05$ was considered as significant

[@]Fisher's exact test was used.

Participants who passed a quiz at least once was considered a pass in the analysis.

The changes are divided into two groups: improved outcome and static/declining outcomes

7.9 Participant feedback on ePain

This section presents the quantitative and qualitative feedback collected from the

intervention group participants, and evaluates its perceived usefulness and user experience.

A total of 83 intervention group participants provided feedback. Table 7.57 shows the evaluation of the perceived usefulness of ePain by intervention group participants. The participants perceived ePain to be satisfactory in its usefulness in terms of increasing their pain knowledge, helping them formulate a pain management plan, and relieving their pain.

Table 7.57 Evaluation of perceived usefulness of ePain by the intervention group participants

	Total (n = 83)	
		%
ePain can help in increasing pain knowledge	69	83.1
ePain can help formulate participant's own pain management plan	51	61.4
ePain can help in relieving pain	46	55.4

Multiple answers can be chosen

As shown in Table 7.58, the intervention group participants had a positive and satisfactory level of user experience on the content, design, and overall satisfaction of ePain, with a mean score ranging from 4.42 to 4.53 rated on a 7-point Likert scale.

Table 7.58 Evaluation of user experience of ePain by the intervention group participants

	Total (n = 83)
	Mean (SD)
The contents are easy to understand	4.53 (1.45)
The design of ePain is user friendly	4.38 (1.52)
Satisfaction with ePain	4.42 (1.42)

Rated on 7-point Likert Scale

A total of 13 participants shared their reasons for completing the study. (Participants E to Q). The feedback was put into categories to understand ePain's strengths and limitations. The feedback was divided into four categories: 'enhancing pain knowledge and management', 'positive learning experience about pain management', 'positive user experience with the technical aspects of ePain', and 'suggestions for ePain improvement'.

Category 1. Enhancing pain knowledge and management

Eight participants from the intervention group provided their comments in this category. They stated:

"The contents are easy to understand." (Participant E)

"I know more about the definition of pain and pain management." (Participants E, F, H, I, J, K)

"ePain can help me relieve my pain." (Participants E, G)

"It reminds me to keep alerting myself to my body and pain in daily life."

(Participant F)

“Learnt about how to self-manage pain.” (Participant K)

Category 2: Positive learning experience about pain management

Four participants from the intervention group contributed to category 2. They reflected:

“I know much more about different aspects and pain-related diseases.” (Participants E, J, L)

“ePain is like an encyclopedia of pain.” (Participant M)

“There is a lot of information available.” (Participant L)

“I can select the topics that I am interested in and read about them.” (Participant L)

Category 3: Positive user experience from the technical aspects of ePain

Four participants from the intervention group reported their experiences related to category 3. They stated:

“The design and layout of the system are user friendly.” (Participants E, H)

“Simple and easy to use.” (Participants G, H, M)

Category 4: Suggestions for ePain improvement

Four intervention group participants provided suggestions for improving ePain. They reflected:

“The questionnaire is too long.” (Participants N and O).

“The participant was too busy to finish the content.” (Participant P)

“The font size of the questionnaire could be larger.” (Participant Q)

7.10 Sensitivity analysis

Sensitivity analysis was performed to compare the differences in findings between the intention-to-treat (ITT) and the completer analysis. Participants included in the completer analysis were those who continued to study and completed all evaluations. The data from both analyses were compared from T0 to T2. The consistency of the results in the sensitivity analysis supports and concludes the findings.

Table 7.59 shows the number of participants who were included in the ITT and completer analysis. In ITT, there were 160 participants in the intervention and 159 participants in the control group. In completer analysis, there were 28 participants in the intervention group and 37 participants in the control group.

Table 7.59 Number of participants between ITT and completer analysis by group

Group	ITT analysis (n = 319)	Completer analysis (n = 65)
Intervention group	160	28
Control group	159	37

Table 7.60 presents the results of the outcomes between the two groups over time, and Table 7.61 shows the results of the outcomes between time points by group obtained from both analyses, covering the time points from T0 to T2. The results of the outcomes in ITT that were different from completer analysis were pain severity, pain interference, total score of depression, anxiety and stress and overall quality of life. For other outcomes, similar results were observed in both analyses.

Table 7.60 Comparisons of the outcomes between both groups over time between ITT and completer analysis

			ITT		Completer analysis	
			Wald χ^2	Sig.	Wald χ^2	Sig.
Pain severity	Group		3.61	0.06	0.08	0.78
	Time	T1	0.45	0.50	0.06	0.80
		T2	1.47	0.23	1.99	0.16
	Group*Time	T1	9.21	0.002*	2.26	0.13
		T2	2.69	0.10	0.76	0.38
Pain self-efficacy	Group		0.61	0.44	0.003	0.96
	Time	T1	1.12	0.29	3.29	0.07
		T2	0.22	0.64	0.14	0.71
	Group*Time	T1	0.44	0.51	1.09	0.30
		T2	1.05	0.31	0.01	0.92
Pain interference	Group		3.31	0.07	0.01	0.91
	Time	T1	1.09	0.07	0.04	0.84
		T2	1.58	0.30	1.67	0.20
	Group*Time	T1	4.24	0.04*	1.17	0.28
		T2	2.30	0.13	0.05	0.82
Depression, anxiety, and stress						
Total score	Group		4.97	0.03*	2.25	0.13
	Time	T1	0.20	0.65	0.08	0.77
		T2	0.43	0.51	0.56	0.45
	Group*Time	T1	0.92	0.34	0.001	0.98

		T2	0.31	0.58	0.006	0.94
Depression	Group		8.89	0.003*	4.65	0.03*
	Time	T1	0.64	0.42	0.27	0.60
		T2	1.00	0.32	0.02	0.88
	Group*Time	T1	1.60	0.21	0.35	0.55
		T2	0.01	0.92	0.19	0.66
Anxiety	Group		3.12	0.08	0.74	0.39
	Time	T1	0.53	0.47	0.12	0.73
		T2	0.04	0.85	0.01	0.94
	Group*Time	T1	0.10	0.76	0.24	0.62
		T2	0.13	0.72	0.31	0.58
Stress	Group		3.12	0.08	2.17	0.14
	Time	T1	0.27	0.61	0.64	0.42
		T2	0.90	0.34	1.45	0.23
	Group*Time	T1	0.38	0.54	0.14	0.71
		T2	0.52	0.47	0.05	0.82
Quality of life						
Overall quality of life	Group		1.33	0.25	1.35	0.25
	Time	T1	0.10	0.76	0.00	1.00
		T2	0.06	0.81	0.91	0.34
	Group*Time	T1	0.36	0.55	0.26	0.61
		T2	0.95	0.33	4.34	0.04*
Overall health and well-being	Group		1.40	0.24	0.25	0.62

	Time	T1	8.79	0.01*	3.13	0.08
		T2	11.01	0.01*	7.16	0.01*
	Group*Time	T1	0.11	0.74	0.22	0.63
		T2	4.16	0.04*	5.75	0.02*
Physical health domain	Group		0.56	0.45	0.14	0.71
	Time	T1	0.73	0.39	0.78	0.38
		T2	0.04	0.84	0.01	0.92
	Group*Time	T1	0.19	0.67	0.01	0.92
		T2	0.35	0.55	0.21	0.65
Psychological domain	Group		2.25	0.13	0.51	0.47
	Time	T1	0.59	0.44	0.52	0.47
		T2	2.51	0.11	2.46	0.12
	Group*Time	T1	0.02	0.89	0.44	0.51
		T2	0.22	0.64	1.20	0.27
Social relationships domain	Group		2.78	0.10	2.44	0.12
	Time	T1	0.19	0.66	0.09	0.77
		T2	0.90	0.34	0.50	0.48
	Group*Time	T1	1.36	0.24	0.02	0.89
		T2	1.35	0.25	1.85	0.17
Environment domain	Group		0.73	0.39	0.46	0.50
	Time	T1	0.12	0.73	0.43	0.51
		T2	0.06	0.80	0.01	0.93
	Group*Time	T1	0.64	0.42	1.34	0.25

	T2	0.01	0.91	0.04	0.84

*p < 0.05 was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

Reference group for Group: Control group

Reference group for Time: Baseline

Reference group for Group*Time: Group (Control group)*Time (T0)

Table 7.61 Comparison of the outcomes between time points by group between ITT and completer analysis

			ITT		Completer analysis	
			Mean difference (SE)	Sig.	Mean difference (SE)	Sig.
Pain severity	Intervention group	T0 – T1	-0.64 (0.19)	0.001*	-0.49 (0.31)	0.11
		T0 – T2	-0.78 (0.22)	0.000*	-0.69 (0.33)	0.04*
	Control group	T0 – T1	0.10 (0.16)	0.50	0.05 (0.19)	0.80
		T0 – T2	-0.27 (0.22)	0.23	-0.34 (0.24)	0.16
Pain self-efficacy	Intervention group	T0 – T1	2.13 (1.22)	0.08	0.07 (1.90)	0.97
		T0 – T2	2.99 (1.81)	0.10	0.82 (2.29)	0.72
	Control group	T0 – T1	1.07 (1.01)	0.30	2.53 (1.40)	0.07
		T0 – T2	0.64 (1.37)	0.64	0.56 (1.48)	0.71
Pain interference	Intervention group	T0 – T1	-0.39 (0.21)	0.07	-0.37 (0.27)	0.17
		T0 – T2	-0.84 (0.23)	0.000*	-0.50 (0.23)	0.03*
	Control group	T0 – T1	-0.20 (0.19)	0.30	0.06 (0.30)	0.84
		T0 – T2	-0.32 (0.26)	0.21	-0.41 (0.32)	0.20
Depression, anxiety, and stress						
Total score	Intervention group	T0 – T1	-0.88 (1.00)	0.38	-0.39 (1.34)	0.77
		T0 – T2	-1.49 (1.17)	0.21	-0.77 (1.63)	0.64
	Control group	T0 – T1	0.39 (0.88)	0.65	-0.33 (1.16)	0.77
		T0 – T2	-0.64 (0.98)	0.51	-0.93 (1.24)	0.45
Depression	Intervention group	T0 – T1	-1.08 (1.10)	0.33	-0.80 (1.98)	0.69
		T0 – T2	-1.25 (1.49)	0.40	-1.43 (2.39)	0.55

	Control group	T0 – T1	0.70 (0.88)	0.42	0.50 (0.96)	0.60
		T0 – T2	-1.07 (1.07)	0.32	-0.21 (1.41)	0.88
Anxiety	Intervention group	T0 – T1	1.31 (1.23)	0.29	1.51 (1.56)	0.34
		T0 – T2	0.40 (1.28)	0.76	1.07 (1.62)	0.51
	Control group	T0 – T1	0.80 (1.10)	0.47	0.48 (1.39)	0.73
		T0 – T2	-0.21 (1.09)	0.85	-0.09 (1.30)	0.94
Stress	Intervention group	T0 – T1	-1.37 (1.21)	0.26	-1.87 (1.75)	0.28
		T0 – T2	-2.49 (1.38)	0.07	-2.64 (1.97)	0.18
	Control group	T0 – T1	-0.45 (0.87)	0.61	-1.05 (1.31)	0.42
		T0 – T2	-1.16 (1.22)	0.34	-2.06 (1.70)	0.23
Quality of life						
Overall quality of life	Intervention group	T0 – T1	0.07 (0.08)	0.35	0.07 (0.11)	0.52
		T0 – T2	0.14 (0.10)	0.15	0.21 (0.11)	0.04*
	Control group	T0 – T1	0.02 (0.05)	0.76	0.19 (0.16)	0.23
		T0 – T2	0.02 (0.08)	0.81	0.08 (0.16)	0.60
Overall health and well-being	Intervention group	T0 – T1	0.20 (0.09)	0.02*	0.11 (0.14)	0.38
		T0 – T2	0.04 (0.09)	0.64	-0.07 (0.11)	0.52
	Control group	T0 – T1	0.24 (0.08)	0.003*	0.19 (0.11)	0.08
		T0 – T2	0.32 (0.10)	0.001*	0.32 (0.12)	0.007*
Physical health domain	Intervention group	T0 – T1	0.28 (0.27)	0.29	0.18 (0.36)	0.61
		T0 – T2	0.28 (0.29)	0.34	0.22 (0.30)	0.46
	Control group	T0 – T1	0.15 (0.17)	0.39	0.23 (0.26)	0.38
		T0 – T2	0.05 (0.25)	0.84	0.03 (0.30)	0.92

Psychological domain	Intervention group	T0 – T1	0.12 (0.16)	0.44	-0.05 (0.23)	0.81
		T0 – T2	0.15 (0.17)	0.38	0.00 (0.19)	1.00
	Control group	T0 – T1	0.09 (0.12)	0.44	0.15 (0.21)	0.47
		T0 – T2	0.26 (0.16)	0.11	0.30 (0.19)	0.12
Social relationships domain	Intervention group	T0 – T1	0.37 (0.33)	0.26	0.19 (0.50)	0.70
		T0 – T2	0.31 (0.43)	0.47	0.62 (0.53)	0.24
	Control group	T0 – T1	-0.10 (0.24)	0.66	0.11 (0.36)	0.77
		T0 – T2	-0.34 (0.36)	0.34	-0.29 (0.41)	0.48
Environment domain	Intervention group	T0 – T1	0.19 (0.25)	0.46	0.29 (0.29)	0.33
		T0 – T2	-0.01 (0.30)	0.96	0.05 (0.25)	0.83
	Control group	T0 – T1	-0.07 (0.19)	0.73	-0.19 (0.29)	0.51
		T0 – T2	-0.06 (0.24)	0.80	-0.03 (0.30)	0.93

*$p < 0.05$ was considered as significant

T0: Baseline; T1: Interim evaluation 1; T2: Post-intervention evaluation

7.11 Executive summary

A total of 319 participants joined the study, with 160 participants in the intervention group and 159 participants in the control group. There were four time points for data collection: baseline (T0), interim evaluation 1 (T1), post-intervention evaluation 2 (T2), and follow-up evaluation (T3).

At baseline, the participant demographics characteristics did not have significant differences between groups. Most participants were female (77.4%), with a mean age of 43.64, no chronic illnesses (69.3%) and were not taking long-term medications (77.7%).

The outcomes were divided into two groups, pain-related outcomes, psychological outcomes, and quality of life. At baseline, the participants had persistent pain for an average of 7.28 months. (SD = 4.39). The mean score of pain severity was 4.16 (SD = 1.90), pain self-efficacy was 41.56 (SD = 12.23) and pain interference was 3.74 (SD = 1.92).

Seventy-five participants (23.5%) took sick leave with a certificate when they were in pain, while 244 participants (76.5%) chose to continue working and bear the

pain. Also, 72.1% did not rest when they experienced pain during the work day. They took a minimum sick leave of 1.59 days and a maximum of 35.85 days of pain-related sick leave during a pain episode.

The baseline means scores of participants with the total score of depression, anxiety, and stress was 12.86 (SD = 8.63), depression was 12.82 (SD = 9.59), anxiety was 11.68 (SD = 8.38), and stress was 17 (SD = 9.62). For quality of life, the mean score of overall quality of life was 3.23 (SD = 0.65), overall health and well-being was 2.30 (SD = 0.75), physical health domain was 13.33 (SD = 2.32), psychological domain was 11.62 (SD = 1.58), social relationships domain was 12.41 (SD = 3.03), and environment domain was 11.98 (SD 2.50).

Pain severity, pain self-efficacy, pain interference, anxiety, stress, and all quality of life domains did not present significant differences between the intervention and control groups at baseline.

In the intervention group, the means of all pain-related outcomes improved from T0 to T1 and from T0 to T2. In the GEE analysis, significant effects ($p < 0.05$) were present in pain severity and pain interference when comparing both groups over time

from T0 to T1 and between time points by group in the intervention group from T0 to T2. The intervention group experienced a better pain situation and improvement than the control group.

The mean improved in the total score of depression, anxiety, and stress, depression and stress from T0 to T1 and T0 to T2 in the intervention group. In GEE analysis, the total score of depression, anxiety and stress, and depression resulted in significant effects ($p < 0.05$) in group when comparing the outcomes between the two groups over time. The intervention group enjoyed stronger improvement in psychological outcomes than the control group.

The mean was increased in the overall quality of life, overall health and well-being, and physical health domain, psychological health domain and social relationships domain in the intervention group. In GEE analysis, overall health and well-being resulted in significant effects ($p <0.05$) when comparing the outcomes between the two groups over time and between time points by group. There were no changes to other domains.

Participants dropped out across time points from T0 to T3. A total of 144

participants remained after T0. A total of 175 participants dropped out. To examine if the total number of retained participants could be representative of the eligible study participants, their baseline demographic characteristics and all outcomes were compared to those of the total number of participants who dropped out. No significant differences were found in a majority of the demographic characteristics and outcomes, with the exception of cataracts ($p = 0.02$). The total retained participants can represent the eligible study participants. ITT was adopted to analyse the outcomes from T0 to T2.

The changes in participant knowledge level were measured by the frequency of page views and ePain quiz results. The total frequency of page views was 3,127. Chapter 1 “Introduction to pain” ranked the highest in terms of views ($n = 869$, 28%). Regression analysis was conducted to examine the associations between the frequency of page views and the dependent variables in the intervention group reported as a change in knowledge level. No significant associations were noted.

There were 53 intervention group participants who attempted the ePain quizzes, with a passing rate of 96.2%. There was an association between the frequency of quizzes passed and the social relationship domains ($p = 0.049$). There were no significant findings in the other outcomes. The quiz results (pass/fail) did not show a

significant relationship to the changes in the dependent variables.

The participants perceived satisfactory usefulness and user experience with ePain. Their feedback was divided into four categories, namely enhancing pain knowledge and management, a positive learning experience about pain management, a positive user experience from the technical aspect of ePain, and suggestions for improving ePain.

To determine whether there were any differences between the ITT and completer analysis results, sensitivity analysis was conducted using data from T0 to T2. Similar results were found in both analyses. The consistency of the results in the ITT and completer analyses concludes the ePain findings.

To conclude, upon ePain completion, did not show significant differences in pain severity, pain self-efficacy, pain interference, psychological outcomes and quality of life when comparing the outcomes between intervention group and control group. Positive feedback was received from the participants about their positive learning experiences in pain management.

Chapter 8 Discussion

8.1 Introduction

This chapter discusses and explains the main study results. The participant demographic characteristics are compared to the total Hong Kong population and a local study about the prevalence of chronic pain. The participants' baseline pain intensities are compared to a previous pain prevalence study conducted in Hong Kong and Japan. The strengths of ePain, and the effects on pain-related outcomes, psychological outcomes, and quality of life are explained. Then, it is followed by the study limitations, implications for practice, and recommendations for future research.

8.2 Demographic characteristics

The participants' demographic characteristics were reported in the previous chapter. Participant demographic characteristics are compared with the Hong Kong Population By-census 2016 and similar studies that investigated the prevalence of chronic pain in the general population aged 18 or above in Hong Kong (Census and Statistics Department, 2017; Tang et al., 2020; Wong & Fielding, 2011). By such comparison, the external validity and the generalisability of the study can be drawn (LaCoursiere, 2003; Westreich et al., 2019). Demographic characteristics available and

comparable to the main study were retrieved.

Demographic characteristics are compared between the participants and the Hong Kong Population By-census 2016. The demographic data related to people aged 15 or above in the general population or working population were retrieved, whenever data were available. There were 3,756,612 members of the Hong Kong working population in 2016. In the Hong Kong Population By-census 2016, the sex ratio of the labour force was 1,041 males to 1,243 females, and the median age was 42.3. In the main study, a majority of participants was female (77.4%), with a mean age of 43.64. The percentages of occupations were similar except for professionals and associate professionals, which was higher in the study. All participants had received an education, while 20% of the aged 15 or above in the Hong Kong Population By-census had no formal education. The median monthly income was HKD$15,000 in Hong Kong, and 44.5% of participants had an income ranging from HKD$10,001 to HKD $30,000.

In the Wong and Fielding (2011) study, 5,001 adults responded to the survey. The survey recruited adults aged 18 or above. The percentage of female participants (54.8%) was higher than male participants (45.2%), while in the main study the proportion of females was higher than males. Adults aged 18 to 29 was the largest participant group

(25%) in the Wong and Fielding (2011) study. For education level, only 3.7% of participants had not received any formal education. A majority of the participants in the Wong and Fielding (2011) study (83.9%) had similar monthly income levels (below HKD$40,000) when compared to the main study's participants.

When compared to the online survey, the main study's demographic data showed similar findings. In both the online survey and the main study, more than 70 percent of participants were female. The mean age was 38.02 in the online survey, while in the main study, it was 43.64. The largest proportion of participants worked as professionals (online survey: 36.2%, main study: 36.7%), had attained a post-secondary education level (online survey: 66.7%, main study: 67.4%) with monthly income ranging from HKD$10,001 to HKD$20,000 (online survey: 36.7%, main study: 24.1%).

The demographic characteristics in the main study shared similarities with the Hong Kong working population, the Wong and Fielding (2011) study, and the online survey, including the distribution of gender, age, occupation, education level, and monthly income. Living status and personal health history were not compared, because these data were not available from the Hong Kong Population By-census 2016 and Wong and Fielding (2011).

The participants presented similar pain severities when compared with studies in Hong Kong and Japan. The total pain severity score in the main study was 4.16 (SD = 1.90), and 4.02 (SD = 2.95) in the Wong and Fielding (2011) study, 3.01 (SD = 1.62) in the online survey and 5.2 (SD = 2.3) in the Inoue et al. (2015) study.

Therefore, the demographic characteristics and pain severity in the main study were comparable to the Hong Kong working population and adult population with chronic pain in Hong Kong.

8.3 ePain Strengths

ePain strengths are discussed from the perspectives of protocol development and ePain characteristics.

8.3.1 Protocol development of ePain

ePain was developed in a systematic, rigorous, and scientific way. The study can be replicated using a well-developed protocol.

ePain is built with Bandura's self-efficacy theory of behavioural change (Bandura, 1977). It is a strong theoretical framework to support the development and operation of the study. An online survey was conducted to update the prevalence of pain and the pain management preferences of the working population in Hong Kong (Tang et al., 2020). ePain was validated by an expert panel consisting of pain experts, including a doctor, nurses, physiotherapist, and occupational therapist. A usability test was carried out to make sure the content and user interface were acceptable to chronic pain participants. Treatment fidelity was ensured by following the framework of the Treatment Fidelity Workgroup of the National Institutes of Health Behavior Change Consortium (BCC) (Bellg et al., 2004). The stepwise and systematic development process can help other researchers become familiar with the intervention and how the intervention contributes to outcome improvements.

The main study was conducted in a randomised controlled trial design and strictly followed the study protocol. The block size used in permuted block randomisation was programmed in ePain and run randomly. The researchers could not modify the randomisation or sequence. The research team was blinded to the allocation. The participants were randomly assigned either to the intervention group or the control group, and blinded to the block size and sequence. Double-blinded randomisation was

carried out in the main study.

8.3.2 Integration of essences of online learning into ePain

The essence of online learning is integrated into ePain. The essences are self-paced learning, learner control, and self-directed learning (Lim, 2016). ePain covers a wide range of pain education topics, including introduction to pain, pain-related diseases and syndromes, and occupational diseases related to pain. Also, self-management techniques, including pharmacological approaches and non-pharmacological approaches to pain management, are introduced.

Chronic pain participants can access all information in ePain, and focus on the topics they are interested in for further learning. Self-paced learning can help participants to learn about pain management to fulfil their own personal learning objectives, and allows maximum freedom in learning (Soyemi et al., 2012). Chronic pain participants can follow the recommendations of ePain or follow their own needs to start their intervention.

For learner control and self-directed learning, ePain provides participants with the autonomy to choose the content they want to learn. Chronic pain participants would

feel comfort and increased motivation to learn (Lim, 2016; Rhode & Krishnamurthi, 2016).

Communication is an important issue that is addressed in ePain. ePain operates online, with no face-to-face contact between participants and researchers. Multiple channels are developed to allow participants to contact the researchers when necessary. A “Contact Us” function, official e-mail account, and instant messaging accounts, including WhatsApp and WeChat, are available. Participants can send their questions through these channels. In addition, the research team can offer a timely reply and show there is always a helping hand. Rosenberg and Asterhan (2018) study noted that secondary students felt teachers were “highly available” and had a closer relationship with them through WhatsApp interactions. Making use of technology to maintain communications is successfully demonstrated in ePain.

ePain participant progress was monitored using different strategies. A page view count was set for each page of the contents, and recorded the viewing frequencies, allowing the research team to trace which topics and content were the most favoured by participants. “Chapter 1 Introduction to pain” received the highest number of page views (n = 869, 28%) of the seven chapters. It showed that participants were more

interested in the knowledge-based content of ePain.

Each participant had their log record to fill in with the pain management interventions adopted. When the participants completed a chapter of ePain, a quiz with true or false answers prompted them to answer the questions, which allowed their learning to be consolidated. The participation rate in the quizzes was 33% among the 160 intervention group participants, and the pass rate was 96.2%. The satisfactory participation rate and high passing rate indicates that intervention group participants felt confident about showing their competence in pain knowledge after engaging in ePain. The research team could retrieve the pain management intervention log record and quiz results to check how the participants worked in ePain, and their increased knowledge level and understanding of the content.

ePain as an online platform has shown it is an affordable and repetitive intervention. ePain is hosted on the Internet. The participants can join ePain at any time. In addition, the researchers can recruit participants from anywhere and at any time. Also, participants can access ePain at their convenience, without the boundaries of time or venue. As chronic pain presents itself in the participants, sustaining ePain on the Internet can allow participants to continue enhancing their self-management skills and

practice.

8.4 Pain prevalence update in the Hong Kong working population and their pain management preferences

The main study's groundwork, which was the online survey, found a high prevalence of chronic pain among the working population, and provides new information on their preference for using an Internet-based intervention as their preferred pain management approach.

The online survey targeted the pain situations of the working population and supported the development of the main study. The prevalence of chronic pain was 71.6% in the participants who reported pain. It updated the information from previous literature that 34.9% to 45.9% of the Hong Kong general population experienced pain (Chung & Wong, 2007; Wong & Fielding, 2011). Hong Kong is a commercial city where people work in offices with computers. This results in neck and bilateral shoulders being the commonest pain sites in the working population. The online survey addressed the pain problems of the working population, and served as a strong and supportive groundwork for the main study.

The working population's preferences for pain management were investigated in the online survey. The participants indicated they preferred to receive pain management information through the Internet (64.8%) and healthcare professionals (61%). ePain met users' expectations by delivering pain management education through the Internet, and ePain was hosted and supported by healthcare professionals.

8.5 Pain-related outcomes: Effects of ePain

Insignificant results on pain-related outcomes were found in this study. There were no significant differences found in the pain severity, pain self-efficacy and pain interference between the intervention group and control group after six weeks' intervention (T2).

There were no statistical significances in pain severity and pain interference when comparing the results between two groups. The mean scores of pain severity decreased by 0.78 in six weeks in the intervention group. Significant difference was noted when comparing the pain severity between both groups over time from T0 to T1 ($p = 0.002$), and in the intervention group when comparing between time points from T0 to T1 ($p = 0.001$) and from T0 to T2 ($p = 0.000$). Pain interference decreased by 0.84 in the

intervention group. There were significant differences showed at T1 when comparing between both groups over time ($p = 0.04$) and in the intervention group ($p = 0.000$) from T0 to T2.

The results showed inconsistency when comparing with the existing literatures. There were studies using existing online platforms to deliver pain education materials, and the participants' pain levels improved. Rod (2016) study used a blog to deliver pain self-management education for chronic pain patients, and revealed a reduction in patients reporting severe pain. A pilot study by Swain et al. (2020), using an open source learning platform to develop their online pain programme, showed that both pain severity and pain interference were reduced. A study by Bennell et al. (2017) recruited adults with chronic knee pain aged 50 or above to participate in their Internet education intervention of pain management and Skype sessions, drawing on the expertise of a physiotherapist for exercise. The participants demonstrated significant improvements in pain intensity (Bennell et al., 2017). The Lin et al. (2017) acceptance and commitment therapy-based online treatment for adult chronic pain patients reported a significant decrease in pain interference after nine weeks of intervention and at a follow-up assessment six months after the intervention.

In the intervention group, the mean of pain self-efficacy improved from T0 to T2, with a difference of 2.99. No statistical significance resulted at T1 and T2 in the GEE analysis when comparing between time points by group. There was no significant difference when comparing the findings between the intervention group and the control group.

The study found that pain self-efficacy improved in the intervention group only and no statistical difference was noted between groups. Face-to-face pain self-management programme sessions have proven improvements in self-efficacy (Damush et al., 2016). The Dear et al. (2013) pain course, an Internet-delivered cognitive behavioural pain management course, aimed to improve disability, depression, and anxiety, and demonstrated the efficacy of an Internet-based pain programme as a treatment for patients suffering from chronic pain. Pain self-efficacy improved in the treatment group post-treatment and at three months follow-up, as shown by a large within group effect size. A multidisciplinary approach chronic pain management programme, namely Reboot Online in Australia, increased participants' pain self-efficacy after completion of the eight-week programme (Smith et al., 2019). The main study showed that the intervention group saw an improvement in their mean score of pain self-efficacy upon ePain completion. All of these studies found that Internet-based

pain management programmes can help improve pain self-efficacy in adults living with chronic pain.

There were several reasons that may contribute to the insignificant results in the study and inconsistency with literatures. The duration of the intervention may not be adequate to reach a significant reduction of the levels of pain-related outcomes. ePain opened all the contents since the intervention group participants completed their baseline assessment at T0. They were encouraged to complete all the contents in ePain. It was expected a six-week period would be reasonable to achieve a significant decrease in pain severity, pain interference and increase pain self-efficacy (Hoon et al., 2017; Kempke et al., 2014; Ruehlman et al., 2012; Williams et al., 2010). Some participants may not be able to complete all the contents within six weeks. Although their pages viewed were tracked in ePain, their weekly progress on the contents should be tracked. A progress bar can be set in ePain to show to the participants the completeness of ePain. Reminders can be sent to them to encourage completing the remaining contents and activities in ePain.

The low response rate for the evaluations at T2 may limit the observation of the changes of pain severity, pain self-efficacy and pain interference. The response rate for

the study at T2 was 29.2%. For those participants dropped out of the study, the changes of the pain-related outcomes and if the changes were related to the intervention were unable to be observed. ePain may have effects to help the dropped out participants to relieve their pain severity, pain interference and improve pain self-efficacy. Since no evaluations could be received from these dropped out participants, it was insufficient to analyse the effects of ePain on the pain-related outcomes.

8.6 Psychological outcomes and quality of life: ePain effectiveness

In this study, no significant differences were found in the GEE analysis of between groups over time and between time points by group in the psychological outcomes. There was a decrease in the mean scores of the psychological outcomes, including the total score of depression, anxiety and stress (-1.49), depression (-1.25), and stress (-2.49) in the intervention group. The discrepancy in the total score of depression, anxiety and stress, and depression was narrowed. There were statistical differences in the baseline score of the total score of depression, anxiety and stress, and depression between the intervention group and the control group. The differences were diminished after the intervention.

It is inconsistent with other Internet-based pain interventions that psychological

health improved in the participants. The Peters et al. (2017) Internet-delivered positive psychology interventions increased happiness and decreased depression in patients with chronic musculoskeletal pain. A feasibility study by Müller et al. (2016), involving positive psychology with a computer-based tailored intervention, presented a decrease in depressive symptoms, pain intensity, and pain interference. The changes were maintained and reflected after 2.5 months in the follow-up assessment (Müller et al., 2016). The Buhrman et al. (2013) acceptance and commitment therapy interventions for chronic pain patients showed that levels of depression and anxiety decreased in the treatment group. The findings of ePain in inconsistent to this literature could possibly indicate that Internet-based pain programmes may be ineffective at improving the psychological health of chronic pain sufferers.

To improve chronic pain participants' pain severity and equip them with the skills to self-manage their pain, ePain focused on providing knowledge of pain and interventions for pain management. In the case of the existing literature, positive psychology, cognitive behavioural therapy, and acceptance and commitment therapy were adopted as the interventions to help chronic pain participants (Buhrman et al., 2013; Dear et al., 2013; Müller et al., 2016; Peters et al., 2017). In the above psychotherapies, outcomes were evaluated at seven weeks onwards, and their follow-

up assessments were done at 2.5 to six months (Buhrman et al., 2013; Müller et al., 2016; Peters et al., 2017). The ePain outcomes were evaluated in the sixth week (T2) which was a shorter period. The psychological outcome changes may not be obvious when compared to studies with a longer study period.

There was significant difference noted in the overall health and well-being when comparing the two groups over time from T0 to T2 ($p = 0.04$). When comparing the results between time points by group for overall health and well-being, statistical significances were found in the intervention group from T0 to T1 ($p = 0.02$) and the control group from T0 to T1 ($p = 0.003$) and from T0 to T2 ($p = 0.001$). There were no significant findings for overall quality of life, physical health domain, psychological domain, social relationship domain and environment domain in between group comparison and when comparing the results between time points in both groups.

Controversial results were found in that quality of life was increased in previous studies. The Lin et al. (2017) acceptance and commitment therapy for chronic pain patients showed that only mental health in health-related quality of life improved after nine weeks of intervention. The Rod (2016) study found that 35% of participants improved their ability to function or perform daily activities after six months of study,

but no scores were available to compare the pre- and post-intervention results. The Bennell et al. (2017) study demonstrated an improvement in participant quality of life, with participants receiving an Internet-delivered exercise and pain-coping skills training intervention after three months and nine months. In the main study, overall health and well-being in quality of life asked about a person's overall perceptions of their health (World Health Organization, 1996).

With improvements in pain severity, participants had more control over their pain situation, as they experienced less pain. Hence, their perceptions of their health condition improved. It is possible for participants to achieve a higher level of quality of life if they continue with ePain. However, the effects of ePain to quality of life was not obvious in the study. Studies showed a lower level of quality of life was associated with chronic pain (Dueñas et al., 2016; Paananen et al., 2011). The studies investigated the relationship between chronic pain and quality of life were observational studies and cross-sectional studies. The duration to develop a change to quality of life in chronic pain sufferers were not clear. Six weeks' study period may not be sufficient to lead to changes to the level of quality of life. Study duration examining the level of quality of life could be a reason that previous pain management studies presented changes in the level of quality of life.

8.7 Improvements in participant pain knowledge level

ePain improved the knowledge level of the intervention group participants. They engaged in ePain to learn about pain and gain pain-related knowledge. The number of pages viewed by the intervention group participants was high (n = 3127). The participants were interested in self-directed learning to gain pain knowledge. The highest frequency of page views included “Chapter 1 Introduction to pain” (n = 869, 28%) and “Chapter 2 Pain-related diseases and syndromes” (n = 788, 25%). The participants also sought self-management techniques to relieve their pain, as reflected in the pages viewed in “Chapter 6 The non-pharmacological management of pain” (n = 380, 12.2%) and “Chapter 7 Exercise for relieving pain” (n = 503, 16.1%).

Up to 96.2% of participants passed the quizzes. The high passing rate means that participants were able to acquire and master pain knowledge. In addition, the social relationships domain of quality of life demonstrated significant associations with the frequency of passing the quizzes ($p = 0.049$). It implied that with increased mastery of pain knowledge, participants can enhance their social relationships. Social relationships are comprised of personal relationships, social support, and sexual activity (World Health Organization, 1998). After joining ePain, participants gained a better

understanding, and self-control of, pain. They were willing to be involved in social activities, despite the presence of pain.

8.8 Positive participant feedback

ePain received positive comments and feedback from participants. ePain helped the intervention group participants increase their pain knowledge and relieve their pain. The intervention group participants viewed ePain's contents as clear and easy to understand. They enjoyed positive learning experiences and demonstrated satisfaction with ePain. The positive exposure to, and involvement in ePain contributed to participants' motivation to continue their pain management practice. Their pain situation would continue improving. Another possible reason for the positive experiences is that ePain met their expectations and needs. Participants suffered from chronic pain and looked for ways to alleviate their condition. ePain provides comprehensive pain-related content and fits their requirements.

8.9 Limitations

Limitations were identified in the study. They are discussed below: participants dropping out, intervention, and research method.

8.9.1 Participant dropout

Participants dropped out across different time points. Low response rate was found across time points. The response rate was 45.1% at T1 and 29.2% at T2 for all the participants. The reasons for participants dropping out of the study were collected. More than 50% of participants stated they had a busy schedule and were unable to continue with ePain.

The response rate in the study was compared to other Internet-based programmes. Similar and consistent results were found. The Barak and Grohol (2011) review discussed the current interventions and future trends of online mental health programmes. They identified the response rate in an online mental health programme was 37% (Barak & Grohol, 2011). The Leung et al. (2013) online self-help programme for people with eating disorder open trial had a response rate of 29%. The Rod (2016) observational study of an Internet-based patient self-management education and activities for chronic pain had a 39% response rate. The Ruehlman et al. (2012) randomized controlled trial of an Internet based chronic pain management programme had a response rate of 92% and they provided incentives to the participants. In the study, incentives were not provided to the participants. The main study had a response rate of

29.2% response rate. It was comparable to other online programmes without incentives.

Different methods were designed to improve the response rate and to retain the participants in the main study, such as providing suggestions on the contents related to participants' pain situations, and sending them reminders to continue with ePain.

The researchers can use information design to reduce the time spent reading content while pain education is delivered. Information design involves the use of visual communication, and readers can understand the content within a short period (Dur, 2014). Data visualisation by infographics can be used to illustrate complex scientific concepts and ideas (Otten et al., 2015). Although the main study already adopted short videos and diagrams to increase data visualisation, increasing the use of infographics, such as diagrams, animations, and short videos would be applicable in future studies.

Participants began ePain after they read the information sheet and instructions in ePain when they were randomized to the intervention group. Participants may have queries to the interventions and technical problems with ePain. To improve their experience with ePain and stay in the study, an introduction and demonstration of ePain session can be delivered and gather participants. Reminder messages were sent to

remind the participants to complete the questionnaire at evaluation time points. To enhance the response rate, weekly phone call or meeting can be arranged to reinforce the use of ePain and follow up with participants' progress. Incentives can be considered to improve the response rate.

The high dropout rate could affect the study's internal validity (Dumville et al., 2006). The baseline characteristics of the total number of participants retained in the study and the participants who dropped out were compared. It helps to ensure that no threats were created affecting the validity and attrition bias (Dumville et al., 2006; Moher et al., 2012). Similar baseline characteristics resulted, and the study adopted ITT to analyse the effects of ePain on the outcome variables.

Researchers should try to improve the response rate by considering the reasons for dropping out in this study, and designing solutions to fit their research. Focus group interview can be considered to collect qualitative data from retained participants for their user experiences and pain coping experience and dropped out participants for their reasons to discontinue ePain. Data analysis about attrition can be performed to further understand the characteristics of the dropped out participants and the pain situations. These data and results can help to retain the participants and design future plans for

further the study.

8.9.2 Research method

Self-administration questionnaires were adopted in the study to measure the outcomes at different time points. Reminders were sent to the participants to complete the questionnaires on time. It may result in social desirability bias. Participants may report their preferred answers, rather than their real conditions and feelings. Direct and indirect questioning can be used in future studies to reduce social desirability bias. An assessment can be done to examine the extent of the participants as socially desirability bias (Kwak et al., 2019).

There were missing data across time points because of participants dropped out. GEE estimates the results when there are missing data (Salazar et al., 2016). No imputation was conducted in the study. It is suggested if researchers perform other statistical tests other than GEE, imputing missing data is advised.

Completer analysis presents the treatment effects of the participants who completed the intervention (Elkin et al., 1989; Parker et al., 2008). It analysed those participants who completed the study only. In the study, it includes the participants who

completed all the evaluations from T0 to T2. Completer analysis invalidated the randomization and was used for sensitivity analysis. It compared with the study results in ITT and whether a similar conclusion could be drawn and support the findings (Gupta, 2011).

8.9.3 Intervention

Since the study focused on the working population, the generalisability of the study and the interventions may be limited. Members of the working population with a computer or mobile phone, and who were able to access the Internet and familiar with technology, participated in the study. Those without these devices, Internet access or unfamiliar with technology cannot join the study. The majority of the recruited participants were professionals and clerical staff. The effects of ePain in the blue collars might not be reflected. Also, other populations, for example, children and older adults, were not included. The results cannot be generalised to these populations. Future studies can use the design of ePain, with modified content, to meet the needs of the target populations.

ePain's content focused on physiological interventions to relieve participants' pain situations. The effects of pain on psychological aspects were covered. Psychological

support content for chronic pain participants was not emphasised in ePain. Psychotherapies of pain management, for example, acceptance and committee therapy and cognitive-behavioural therapy, were not covered in ePain. These types of psychological support elements should be developed in future studies.

8.10 Executive summary

The high prevalence of pain in the working population draws attention to and underscores the importance of managing this health problem. With a scarcity of existing pain services, it is difficult for the public health sector to accommodate large service needs. Currently in Hong Kong, ePain is the first online pain education and programme tailor-made for and targeting the working population.

ePain was designed and developed in a systematic and scientific way. Self-efficacy of behavioural change was used as the theoretical framework to guide the study. An online survey was conducted to provide evidence on the prevalence of pain, and the pain management preferences of the working population. An expert panel was formed to validate ePain. Chronic pain participants were recruited to conduct the usability test. Treatment fidelity was ensured throughout the study. ePain was conducted as a double-blinded randomised controlled trial in a technology setting.

Aspects of online learning, including self-paced learning, learner control, and self-directed learning, were integrated into ePain. Since ePain operates on the Internet, communication between participants and the research team was strengthened by using e-mail and instant messaging accounts. Also, participant progress was closely monitored by counting the page views and log records. Quizzes were set up to test participants' knowledge level and consolidate their learning.

The main study's findings suggest that ePain did not significantly improved pain severity, pain self-efficacy, pain interference, total score of depression, anxiety and stress, depression, anxiety, stress and quality of life when comparing the results between the intervention group and control group. The results are different from other online pain management studies which showed significant improvement in the pain situations of the participants.

A low response rate, the possibility of social desirability bias and generalisability are the limitations of the main study. Understanding these limitations would help future studies in developing and strengthening their interventions. The reasons for the limitations and suggestions are presented. Together with the results, these contribute to

the implications for practice, illustrated from the perspectives of chronic pain patients, healthcare professionals, and the community.

Chapter 9 Conclusion

9.1 Introduction

This chapter illustrates the study implications from the perspectives of patients, healthcare professionals, community, employers, and policy makers. The recommendations for future research are discussed.

9.2 Implications for practice

The implications of ePain for the current pain services offered in Hong Kong are discussed from the perspective of both patients and healthcare professionals.

9.2.1 From patients' perspectives

The existing pain service of Hong Kong is mainly provided by the Hospital Authority in the public healthcare sector, and is scarce. A limited number of pain specialists are available in the private sector, and the population may not be able to afford their consultation and treatment fees. The prevalence of chronic pain is high in the working population (Tang et al., 2020). The need for pain service is large. ePain can serve as an expansion of service for chronic pain patients who are waiting for public

pain service. ePain provides pain knowledge, as well as information about pharmacological and non-pharmacological interventions. Adults suffering from chronic pain can receive pain education through ePain. They understand how pain affects them and the treatments for pain. When patients are equipped with pain knowledge, it would facilitate communication between healthcare professionals and patients, for example, patients know how to report their pain using a numeric rating scale and how to describe their pain.

The main study demonstrated that participants improved their pain knowledge level as they passed the quizzes set out in the study. Also, pain self-efficacy can be developed by participating in ePain. The working population consists of adults who possess self-care and learning abilities. When they achieve a higher level of self-efficacy, they enjoy better control of their pain situation, are less affected by the adverse effects brought about by pain, and enhance their quality of life. Positive comments were received from the intervention group participants at the end of the study. ePain can provide continuous support to participants to develop their pain self-efficacy.

ePain is hosted on the Internet, and participants can log in and continue their learning at their convenience. It is not limited by venue and time. This facilitates chronic

pain participants in continuing to use ePain, especially when we target the working population. They may not be able to take a leave from work to attend classes. ePain can fulfil their need for pain education.

9.2.2 From healthcare professionals' perspectives

In terms of benefits to healthcare professionals, the time and resources to deliver pain education to chronic pain patients can be reduced. Healthcare team members involved in pain treatments and management are potential prescribers of ePain, for example, doctors, nurses, physiotherapists, and occupational therapists. ePain is an online programme that participants complete at their own pace. The healthcare team does not need to spare the time to organise the talks and conduct administrative work. They provide the ePain link or QR code to participants with simple instructions. Then, the participants can join ePain in their own free time. Healthcare professionals focus on providing technical support. Cost-effectiveness to deliver pain education can be achieved.

The participants can record their pain and related problems in ePain. The healthcare professionals can retrieve the records, trace the participants' progress and continuously monitor their pain situations. They identify the patients with high pain

severity, low pain self-efficacy, and other pain-related problems. They can arrange early follow-up for these patients. ePain acts as a pain database for both healthcare professionals and patients, who can retrieve their pain records. Furthermore, ePain can be implemented for the general public by hosting on websites of professional bodies, to increase their awareness of chronic pain and help them start early interventions when necessary.

9.2.3 From community perspectives

Due to the high prevalence of chronic pain in the working population, pain education and management should start as early as possible and at the community level. ePain is easily accessed by the population, as it is hosted on the Internet. Today, people have their own mobile phones and computers. The network covers large areas of the community and is available at home, in offices, and in public areas. The hardware and network coverage are ready in the community.

Also, the positive feedback from the participants illustrated that ePain is an acceptable intervention for pain education and management. As pain services are scarce, ePain is a feasible intervention to start pain education and management in the community. ePain can be merged with the present practice of pain services. In addition,

ePain can be implemented in the younger working population to increase public awareness of chronic pain.

9.2.4 From employers' perspectives

The employers can consider putting ePain as part of the staff health and well-being programme and host ePain on their human resource department website. The employees can learn about pain education through ePain. The working population would be possible to take less pain-related sick leave when they start pain management. Work loss and loss of workdays would decrease, and the productivity gains would increase. The cost of medical support for staff can be reduced as their pain situations improve. Employers may employ temporary staff when regular staff apply for pain-related sick leave. The cost of hiring temporary staff is no longer necessary.

9.2.5 From policymakers' perspectives

Pain service is scarce. The long wait times for specialist out-patient clinics is an important and unsolved issue in the public healthcare setting. ePain can serve as a buffer for chronic pain sufferers who are waiting for a pain service appointment. For chronic pain sufferers who have already attended a pain service appointment, physicians, nurses and allied health workers can prescribe ePain as an education tool. Policymakers should

consider adopting ePain as an education platform for pain service. In term of costs, the ePain website can be used by all members of the working population living with chronic pain. The human resources involved is to maintain the website and manage the data. Limited costs would be expected in the long run, but ePain results in a high return - enhancing the pain situations of the working population living with chronic pain.

9.3 Recommendations for future research

The main study demonstrated the implementation of an online pain management programme for the working population in Hong Kong. Future studies are still necessary to enhance ePain by handling the limitations and addressing the implications. As the ePain content is currently focused on the pain and pain management of the working population, other populations should also be covered, such as adolescents and older adults. With the population's improved education status, it is foreseen that older adults would be able to read and use information technology. Modifications may be required to fit a participant's specific lifespan, for example, larger font size and a read aloud function of the content. Different versions of ePain can be made to meet the needs of different occupations of the working population, for example, drivers and construction site workers.

Pain education can expand to patients of other ethnicities. Currently, ePain is delivered in Traditional Chinese. To meet the needs of the global population suffering from pain, ePain can be translated into other languages and developed as a multilingual platform. Researchers can conduct a validation and usability test of this version before they conduct a randomised controlled trial in their own countries. The experience of the main study can help researchers modify the ePain content, for example, with culturally specific pain management interventions.

The study duration can be extended in future studies. The participants suffered from chronic pain, persisting for three months or more. Extending the study duration and the post-intervention assessment would be beneficial to examine ePain's long-term effects on pain, psychological outcomes, and quality of life. It can evaluate the effectiveness of ePain over time.

Content about the psychological aspects of pain can be emphasised, and information about psychotherapy can be included in future research. The study focused on pain knowledge and self-management techniques. Psychological support for chronic pain participants is also important, as their emotions and moods would be affected by pain. Information about psychotherapies should be added to enrich ePain

to cover participant needs. Also, it allows comparison of ePain with other Internet-based pain management programmes using psychotherapy as the intervention.

The high dropout rate should be addressed in future research. Participants reported that the questionnaire was too long. The researchers may consider developing a shorter version of the questionnaire to reduce participants' unwillingness to complete it. Although the feedback from participants was good, researchers could think of creating mini games or including more videos and pictures, to integrate the content in an interesting way for learning.

The study collected participant feedback through a questionnaire. To gain a deeper understanding of the participants' experiences with ePain, focus group interviews are recommended to collect qualitative data. The ePain user experience can be taken into consideration when developing digital health interventions.

ePain demonstrates the integration of pain management with digital health. Researchers from the aspect of digital health would see how their work can relate to and benefit pain management. This serves as a direction for researchers to work on, to enhance human health and disease management. Also, healthcare researchers and

digital health researchers can consider collaborating with companies for professional computing service and technological support.

9.4 Conclusion

The high prevalence of chronic pain is an indicator that it is a common problem among the working population. Pain brings both physical disturbances and psychological distress, including depression, anxiety, and stress. Quality of life is affected. However, the scarcity of pain services cannot satisfy the huge demand. The working population is busy with work and as a result, finds it difficult to attend pain service appointments. Chronic pain sufferers tended to administer self-initiated treatments and perceived these treatments to be effective. Some chronic pain sufferers even attempted multiple self-initiated treatments. There is a concern as to whether self-initiated treatments were applied properly and effectively.

To accommodate the working population's need for pain management, the eHealth concept was adopted to design and develop ePain. The advancement of information technology allows people with access to the Internet to receive health education and promotion, without geographical or time limits. Evidence from the literature showed that Internet-based programmes enhance patients' disease knowledge and self-

management techniques. Systematic reviews of Internet-based pain management programmes demonstrated their effectiveness in reducing pain severity. However, pain self-efficacy, which is important for chronic pain sufferers to perform the activities of daily living or tasks required to manage their pain, was not studied. The self-efficacy theory of behavioural change was adopted as the study's theoretical framework.

Based on the online survey results, literature review, expert panel review and usability test, ePain was developed and launched in the main study. A double-blinded randomised controlled trial design was used. The intervention group participants accessed ePain, which contained content on self-directed learning of pain knowledge and self-management techniques. The control group participants read the pain pamphlet. Reminder messages were sent to the participants at the third, sixth, and twelfth weeks to conduct the evaluations for collecting the outcome measurement changes.

There was a total of 319 participants randomised into either the intervention group or the control group. There were no significant differences of the outcomes when comparing the results between groups over time and between time points by group from T0 to T2. When comparing the baseline data to the interim and post-intervention evaluations data, the intervention group participants experienced a slight improvement

in pain severity, pain self-efficacy, pain interference, and total score of depression, anxiety and stress, depression, stress and overall quality of life. The intervention group participants reported positive perceived usefulness and a positive user experience. Feedback from the participants who completed the study emerged into four categories, including enhancing pain knowledge and management, positive learning experience about pain management, positive user experience with the technical aspects of ePain, and suggestions for improving ePain.

To conclude, the study did not present positive findings in terms of pain situations, psychological health, and quality of life in the working population living with chronic pain. The participants showed their acceptance of ePain and the feasibility of using an Internet-based intervention for health education and promotion. It provides a better understanding on the development process of ePain as an Internet-based programme and explores the online programme has its feasibility for pain education and management.

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Appendix 1 Ethical approval of online survey

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

To	Tse Mun Yee Mimi (School of Nursing)		
From	CHIEN Wai Tong, Chair, Departmental Research Committee		
Email	hschien@	Date	15-Aug-2016

Application for Ethical Review for Teaching/Research Involving Human Subjects

I write to inform you that approval has been given to your application for human subjects ethics review of the following project for a period from 01-Sep-2016 to 31-Aug-2017:

Project Title:	Exploring prevalence of pain and the preference in using electronic pain management materials among working population in Hong Kong
Department:	School of Nursing
Principal Investigator:	Tse Mun Yee Mimi
Reference Number:	HSEARS20160804003

Please note that you will be held responsible for the ethical approval granted for the project and the ethical conduct of the personnel involved in the project. In the case of the Co-PI, if any, has also obtained ethical approval for the project, the Co-PI will also assume the responsibility in respect of the ethical approval (in relation to the areas of expertise of respective Co-PI in accordance with the stipulations given by the approving authority).

You are responsible for informing the Departmental Research Committee in advance of any changes in the proposal or procedures which may affect the validity of this ethical approval.

You will receive separate email notification should you be required to obtain fresh approval.

CHIEN Wai Tong

Chair

Departmental Research Committee

Appendix 2 Ethical approval of the main study

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

To	Tse Mun Yee Mimi (School of Nursing)		
From	Vaelimaeki Maritta Anneli, Chair, Departmental Research Committee		
Email	maritta.valimaki@	Date	10-Oct-2018

Application for Ethical Review for Teaching/Research Involving Human Subjects

I write to inform you that approval has been given to your application for human subjects ethics review of the following project for a period from 01-Nov-2018 to 01-Apr-2022:

Project Title:	The effectiveness of an electronic pain management programme (ePain) for working population with chronic pain: A randomized controlled trial
Department:	School of Nursing
Principal Investigator:	Tse Mun Yee Mimi
Project Start Date:	01-Nov-2018
Reference Number:	HSEARS20181009005

You will be held responsible for the ethical approval granted for the project and the ethical conduct of the personnel involved in the project. In case the Co-PI, if any, has also obtained ethical approval for the project, the Co-PI will also assume the responsibility in respect of the ethical approval (in relation to the areas of expertise of respective Co PI in accordance with the stipulations given by the approving authority).

You are responsible for informing the Human Subjects Ethics Sub-committee in advance of any changes in the proposal or procedures which may affect the validity of this ethical approval.

Vaelimaeki Maritta Anneli

Chair

Departmental Research Committee

Page 1 of 1

Appendix 3 Information sheet

THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

護理學院
School of Nursing

香港 九龍 紅磡
Hung Hom Kowloon Hong Kong

有關資料

（ 網上痛症自我效能提升課程對患有長期疼痛工作人口的影響 ）

誠邀閣下參加謝敏儀博士、梁秀芳博士及 Dr Theofanis Fotis 負責監督，鄧淑君負責執行的研究計劃，她是香港理工大學護理學院學生。

這項研究的目的是_研討網上痛症課程對長期疼痛的工作人口患者的自我效能、疼痛程度、抑鬱程度、焦慮、壓力和生活質素的影響， 方法是閣下需於網上課程開始前先完成問卷。在完成首次問卷後，閣下將被隨機分配到實驗組或對照組。實驗組的參加者可即時及於六星期內瀏覽並閱讀課程內容，而對照組的參加者可下載痛症健康教育單張。兩組的參加者均需於課程的第三星期、第七星期及第十二星期再次填寫問卷。對照組的參加者可於完成最後一次問卷後登入課程瀏覽。閣下需要花費的時間為十二星期、不會引起任何不適。

閣下享有充分的權利在研究開始之前或之後決定退出這項研究，而不會受到任何對閣下不正常的待遇或被追究責任。凡有關閣下的資料將會保密，一切資料的編碼只有研究人員得悉。

如果閣下對這項研究有任何的不滿，可隨時與香港理工大學人類實驗對象操守小組委員會秘書 莫小姐聯絡 (地址：香港理工大學研究事務處 轉交)。

如果閣下想獲得更多有關這項研究的資料，請與鄧淑君或聯絡她的導師謝敏儀博士、梁秀芳博士及 Dr Theofanis Fotis，電話 27666541

謝謝閣下有興趣參與這項研究。

主要研究員 (PI)

謝敏儀博士

Appendix 4 Demographic data form

個人背景

1. 電郵地址：
2. 電話號碼〔只作發出提示訊息〕：
3. 你的身體疼痛已持續
   □少於 3 個月
   □3 個月
   □4 個月
   □5 個月
   □6 個月
   □7 個月
   □8 個月
   □9 個月
   □10 個月
   □11 個月
   □12 個月
   □1 年或以上
4. 性別：
   □男 □女
5. 年齡：_____歲
6. 婚姻狀況：
   □未婚 □已婚 □離婚 □喪偶
7. 你的職業是：
   □經理及行政級人員
   □專業人員
   □輔助專業人員
   □文書支援人員
   □服務工作及銷售人員
   □工藝及有關人員
   □機台及機器操作員及裝配員
   □非技術工人
   □漁農業熟練工人及不能分類的職業
   □其他〔請註明〕：_____
8. 教育程度：
   □沒有接受教育 □小學 □中學 □大專/大學或以上
9. 你的家庭居住狀況是：
   □獨居 □與父母同住 □與配偶同住 □與配偶及子女同住 □與子女

同住

□與親戚或朋友同住

10. 你的每月入息是〔港元〕：

□6000 或以下

□6001 - 10000

□10001 - 20000

□20001 - 30000

□30001 - 40000

□40001 - 60000

□60001 或以上

11. 現有以下長期疾病〔可同時選擇多個答案〕：

□沒有任何長期疾病□高血壓　□糖尿病　□心臟病　□中風

□痛風　□氣管病□關節炎　□白內障

□其他〔請註明〕：_____

12. 有否長期服用或使用藥物：

□有

□沒有

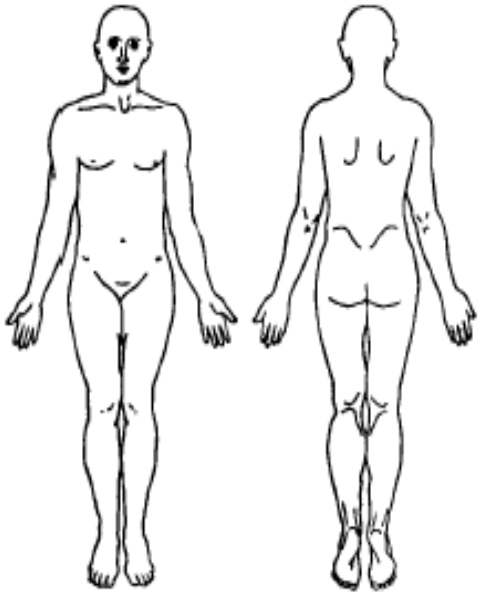
Appendix 5 Brief Pain Inventory

疼痛情況

簡易疼痛量表 Brief Pain Inventory

1. 在我們一生當中，大多數人都曾經體驗過輕微的頭痛、扭傷和牙痛，最近一週內您是否有其他不尋常的疼痛？
(1) □有(2) □沒有

2. 請您在下圖中用筆圈出您感到疼痛的部位，並<u>在最痛的部位</u>打" X "。



		不痛 ◄——► 痛極了										
3.	請圈出一個數字以表示您在最近一週內疼痛<u>最厲害</u>的程度	0	1	2	3	4	5	6	7	8	9	10
4.	請圈出一個數字以表示您在最近一週內疼痛<u>最輕微</u>的程度	0	1	2	3	4	5	6	7	8	9	10
5.	請圈出一個數字以表示您在最近一週內<u>平均疼痛</u>(大部份時間)的程度	0	1	2	3	4	5	6	7	8	9	10
6.	請圈出一個數字以表示您<u>現在疼痛</u>的程度	0	1	2	3	4	5	6	7	8	9	10

7. 您覺得哪些情況可以減輕您的疼痛？（如熱敷、服藥、休息）

_____

8. 您覺得哪些情況會加重您疼痛的程度？（如走路、站立、抬東西）

_____

9. 目前您正接受〝什麼藥物〞和〝什麼治療法〞來治療您的疼痛？

藥物方面: _____

治療方面: _____

10. 若有接受止痛藥物或治療，請圈出一個百分數，以表示您在最近一週內經治療或用藥後，疼痛減輕了多少？

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

沒減輕 *完全減除*

11. 如果您吃了止痛藥後，經幾個小時疼痛會再出現？

□ 止痛藥完全無效	□1 小時	□ 2 小時	□ 3 小時
□4 小時	□ 5-12 小時	□ 12 小時以上	□ 未曾吃過止痛藥

12. 我覺得我的疼痛原因是：（複選）

(1) □ 治療引起的（如 □化學藥物 □手術 □放射治療 □裝義肢 □其他）

(2) □ 我原來的疾病（即現在正接受診療的疾病）

(3) □ 與原來疾病無關的病（如關節炎）

(4) □其他：_____

13. 下列各個描述疼痛的詞，請您圈選出最恰當描述您疼痛的程度

	合適	**不合適**
(1) 持續而固定位置的	□	□
(2) 律動的	□	□
(3) 快速穿過的（觸電的）	□	□
(4) 刀割的	□	□
(5) 咬噬的	□	□
(6) 尖銳的	□	□
(7) 觸痛的（一觸即痛的）	□	□
(8) 灼的	□	□
(9) 精疲力竭的	□	□
(10) 累人的	□	□

(11) 貫穿的 □ □
(12) 煩人的（纏人的） □ □
(13) 麻痲的 □ □
(14) 可憐的 □ □
(15) 無法忍受的 □ □

14. 請圈出一個數字以表示您在最近一週內受疼痛影響的程度：

		不受影響 ◄——► 完全受影響										
1)	一般活動(吃、上廁所、洗澡)	0	1	2	3	4	5	6	7	8	9	10
2)	情緒	0	1	2	3	4	5	6	7	8	9	10
3)	行走能力	0	1	2	3	4	5	6	7	8	9	10
4)	正常工作(包括外出工作和做家事)	0	1	2	3	4	5	6	7	8	9	10
5)	與他人交往(如與親人、朋友的交往)	0	1	2	3	4	5	6	7	8	9	10
6)	睡眠	0	1	2	3	4	5	6	7	8	9	10
7)	生活樂趣	0	1	2	3	4	5	6	7	8	9	10
	總分:											

Appendix 6 Pain Self-Efficacy Questionnaire

疼痛自我功效問卷 (Pain Self-efficacy)

請根據你現時的狀況，在儘管有痛的情況下，評定你對於完成以下事情的信心程度。

請在每項的量度尺，圈出最適當的一個數字作答，0 分表示完全沒有信心，而 6 分則表示充滿信心。

例：　　0　1　2　3　4　5　6

完全沒有信心　　充滿信心

請注意，本問卷不是詢問閣下是否正在從事以下事情，而是想了解現時閣下於儘管有痛之情況下，對於完成以下事情有多大的信心。

1. 儘管有痛，我能享受不同的事情。

0　1　2　3　4　5　6

完全沒有信心　　充滿信心

2. 儘管有痛，我能夠完成大部份的家務。

0　1　2　3　4　5　6

完全沒有信心　　充滿信心

3. 儘管有痛，我能如常維持與家人或朋友的社交活動。

0　1　2　3　4　5　6

完全沒有信心　　充滿信心

4. 在大部份情況下，我能夠應付自己的痛楚。

0　1　2　3　4　5　6

完全沒有信心　　充滿信心

5. 儘管有痛，我能夠做某些形式的工作〔「工作」包括家務、受薪及非受薪之工作〕。

0　1　2　3　4　5　6

完全沒有信心　　充滿信心

6. 儘管有痛，我仍能夠享受很多活動，例如嗜好或休閒活動。

0　1　2　3　4　5　6

完全沒有信心　　充滿信心

7. 在沒有藥物的幫助下，我仍能應付自己的痛楚。

0 1 2 3 4 5 6

完全沒有信心　　充滿信心

8. 儘管有痛，我仍能達成我的大部份人生目標。

0 1 2 3 4 5 6

完全沒有信心　　充滿信心

9. 儘管有痛，我能夠維持正常的生活方式。

0 1 2 3 4 5 6

完全沒有信心　　充滿信心

10. 儘管有痛，我能逐漸變得更活躍。

0 1 2 3 4 5 6

完全沒有信心　　充滿信心

Appendix 7 Depression Anxiety Stress Scale (DASS-21)

情緒評估

請小心閱讀以下每一句子，並在其**右方圈上一數字**，表示「**過往一個星期**」如何適用於你。答案並無對錯之分。請不要花太多時間在某一句子上。

0 = 不適用　　1 = 頗適用，或間中適用

2 = 很適用，或經常適用　　3 = 最適用，或常常適用

	不適用	頗適用，或間中適用	很適用，或經常適用	最適用，或常常適用
1. 我覺得很難讓自己安靜下來	0	1	2	3
2. 我感到口乾	0	1	2	3
3. 我好像不能再有任何愉快、 舒暢的感覺	0	1	2	3
4. 我感到呼吸困難 (例如不是做運動時也感到氣促或透不過氣來)	0	1	2	3
5. 我感到很難自動去開始工作	0	1	2	3
6. 我對事情往往作出過敏反應	0	1	2	3
7. 我感到顫抖 (如手震)	0	1	2	3
8. 我覺得自己消耗很多精神	0	1	2	3
9. 我憂慮一些令自己恐慌或出醜的場合	0	1	2	3
10. 我覺得自己對將來沒有甚麼可盼望	0	1	2	3
11. 我感到忐忑不安	0	1	2	3
12. 我感到很難放鬆自己	0	1	2	3
13. 我感到憂鬱沮喪	0	1	2	3
14. 我無法容忍任何阻礙我繼續工作的事情	0	1	2	3
15. 我感到快要恐慌了	0	1	2	3
16. 我對任何事也不能熱衷	0	1	2	3
17. 我覺得自己不怎麼配做人	0	1	2	3
18. 我發覺自己很容易被觸怒	0	1	2	3

19. 我察覺自己在沒有明顯的體力勞動時，也感到心律不正	0	1	2	3
20. 我無緣無故地感到害怕	0	1	2	3
21. 我感到生命毫無意義	0	1	2	3

Appendix 8 The World Health Organization Quality of Life Instruments (WHOQOL-BREF)

世界衞生組織生活質素問卷 (WHOQOL-BREF)

以下問題涉及你的主觀生活質素。主觀生活質素指你對生活各方面的評價及睇法，包括自己的健康狀況、心情、能力、家庭、朋友、居住環境等。請您做出選擇。請選擇最適當的答案。

所有問題都請您揀出最可以反映你感受的形容詞。注意所有問題都是您**最近 2 周內**的情況。

1. 你的主觀生活質素好不好？ 【“主觀生活質素”係指你對自己健康狀況、心情、能力、家庭、朋友、居住環境等的感受】 ☐ 極不好 ☐ 不好 ☐ 無話好唔好 ☐ 好 ☐ 極好
2. 你滿唔滿意你的健康狀況？ ☐ 極不滿意 ☐不滿意 ☐無話滿唔滿意 ☐好滿意 ☐ 極滿意
3. 你覺唔覺得痛楚和唔舒服阻礙你做事？ 〔“痛楚和不舒服”包括關節僵硬、肌肉疼痛、長期或短期的痛、痕癢等不愉快感覺。“做事”係包括日常生活上所有的活動〕 ☐ 不阻礙 ☐ 少少阻礙 ☐ 某程度阻礙 ☐ 好大程度阻礙 ☐ 極阻礙
4. 你需唔需要靠醫療的幫助來應付日常生活？ 【“醫療的幫助”包括食藥、步行架或者其他醫療輔助工具】〔其他醫療輔助工具包括非藥物的療法，例如使用心臟起膊器、義肢等〕 ☐ 不需要 ☐ 少少需要 ☐ 某程度需要 ☐ 好大程度需要 ☐ 極需要
5. 你享唔享受生活？ 〔“享受生活”係指享受生活中美好事物的感受〕 ☐ 不享受 ☐ 少少享受 ☐ 某程度享受 ☐ 好大程度享受 ☐ 極享受
6. 你覺得自己的生活有沒有意義？

☐ 無意義 ☐ 少少意義 ☐ 某程度有意義 ☐好大程度有意義 ☐ 極有意義

7. 你可唔可以集中精神？

〔指集中精神思想或做事〕

☐ 不可以 ☐ 少少可以 ☐ 某程度可以 ☐ 好大程度可以 ☐ 極可以

8. 在日常生活中，你覺得安唔安全？

【包括政治安全、人身安全、環境上的安全】〔例如個人的安全有無受到威脅？有無受到政治迫害？對周圍的環境係唔係缺乏安全感？會唔會懷疑身邊的人會害自己？〕

☐ 不安全 ☐ 少少安全 ☐ 某程度安全 ☐ 好大程度安全 ☐ 極安全

9. 你覺得你居住的區域的環境健唔健康？

【你可以考慮環境的污染程度、氣候、噪音、景色、核電安全等。】

☐ 不健康 ☐ 少少健康 ☐ 某程度健康 ☐ 好大程度健康 ☐ 極健康

10. 你能唔能夠有足夠精神來應付日常生活？

☐ 不能夠 ☐ 少少能夠 ☐ 某程度能夠 ☐ 好能夠 ☐ 完全能夠

11. 你能唔能夠接受自己的外貌？

〔“自己的外貌”包括你自己的身形和外表〕

☐ 不能夠 ☐ 少少能夠 ☐ 某程度能夠 ☐ 好能夠 ☐ 完全能夠

12. 你能唔能夠有足夠的金錢應付需要？

☐ 不能夠 ☐ 少少能夠 ☐ 某程度能夠 ☐ 好能夠 ☐ 完全能夠

13. 你能唔能夠得到你日常所需要的資訊？

〔“資訊”指你需要知道的消息，每個人所需要的消息會唔同，例如有人需要知天氣、物價、新的事物、甚至八卦消息等〕

☐ 不能夠 ☐ 少少能夠 ☐ 某程度能夠 ☐ 好能夠 ☐ 完全能夠

14. 你能唔能夠有機會參加一些消遣活動？

〔“消遣活動”包括各種消閒、鬆弛身心的康樂活動，如散步、打麻雀、捉棋、睇電視、睇書、同家人、朋友共聚等〕

☐ 不能夠 ☐ 少少能夠 ☐ 某程度能夠 ☐ 好能夠 ☐ 完全能夠

15. 你能唔能夠自己四圍去？

〔“自己”指在無其他人的協助下。“四圍去”指由一個地方去另一個地，例如在屋企或工作地方走動、或上落交通工具等〕

☐ 不能夠 ☐ 少少能夠 ☐ 某程度能夠 ☐ 好能夠 ☐ 完全能夠

16. 你睡得好唔好，滿唔滿意？

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

17. 你滿唔滿意自己做日常的事的能力？

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

18. 你滿唔滿意自己的工作能力？

【“工作”包括賺錢的工作、義工、讀書、照顧小孩或做家務】

〔工作泛指賺錢的工作和義工。對學生來說，工作指讀書；對唔需要做工賺錢的人來說，工作可以是照顧小孩或做家務〕

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

19. 你滿唔滿意自己？

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

20. 你滿唔滿意自己的人際關係？

〔“人際關係”指人與人之間的關係，包括與親人、朋友及同事的關係〕

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

21. 你滿唔滿意自己的性生活？

【每個人都因年齡及身體狀況對自己性生活有不同的要求及期望，請根據你自己的期望講出你自己的感受】

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

22. 你滿唔滿意朋友給你支持？

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

23. 你滿唔滿意你現在居住的地方？

〔你可以考慮居住地方的擠迫程度、衛生情況、設施和建築質素等〕

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

24. 你滿唔滿意現在醫療衛生服務的方便程度？

【重點係問方便程度】

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

25. 你滿唔滿意你用的交通工具？

☐ 極不滿意 ☐ 不滿意 ☐ 無話滿唔滿意 ☐ 好滿意 ☐ 極滿意

26. 你有沒有時常覺得唔開心？

【“唔開心”指情緒低落、絕望、焦慮、憂心、抑鬱等。】

☐ 從來無 ☐ 好少有 ☐ 有時有 ☐ 好多時有 ☐ 不停有

27. 你覺得其他人接唔接受你？

〔例如其他人會唔會當你係朋友，或會唔會討厭你、排斥你〕

☐ 不接受 ☐少少接受 ☐ 某程度接受 ☐ 好大程度接受 ☐ 極接受

28. 你容唔容易食到你想食的食物？

☐ 不容易 ☐ 少少容易 ☐ 某程度容易 ☐ 好大程度容易 ☐ 極容易

Appendix 9 Pain-related sick leave form

因疼痛而引起的病假及休息

1. 你有沒有因爲疼痛無法上班申請病假？
   □有 □沒有

2. 請問因疼痛而請病假的日數爲：
   最少請假_____天
   最長請假_____天

3. 有否因疼痛出現而於工作的途中離開休息？
   □有 □沒有

4. 因疼痛出現而於工作的途中離開休息的時間爲：
   □_____分鐘
   □因疼痛而需於上班中途請假回家休息

5. 你認爲你的疼痛和工作有關嗎？
   □有關 □沒有關係

6. 有沒有接受過任何類型的疼痛管理教育？
   □有 □沒有

Appendix 10 Feedback collection form

意見調查

1. 你認爲這網上痛症處理計劃能夠令你增加對痛症的認識嗎？
   □能夠　□不能夠
2. 你認爲這網上痛症處理計劃哪個部份最貼合你處理痛症的需要？
   □第一課 疼痛介紹
   □第二課 與疼痛有關的疾病
   □第三課 與疼痛有關的職業病
   □第四課 如何面對自己的疼痛
   □第五課 藥物治療
   □第六課 非藥物治療
   □第七課 與疼痛相關的舒緩運動及預防
   □全部
3. 你認爲這網上痛症處理計劃能否協助你制定痛症處理計劃？
   □能夠　□不能夠
4. 你認爲這網上痛症處理計劃能否協助你減低痛楚？
   □能夠　□不能夠
5. 你認爲內容清楚易明嗎？

絕對不同意						非常同意
1	2	3	4	5	6	7

6. 你認爲網頁設計方便易用嗎？

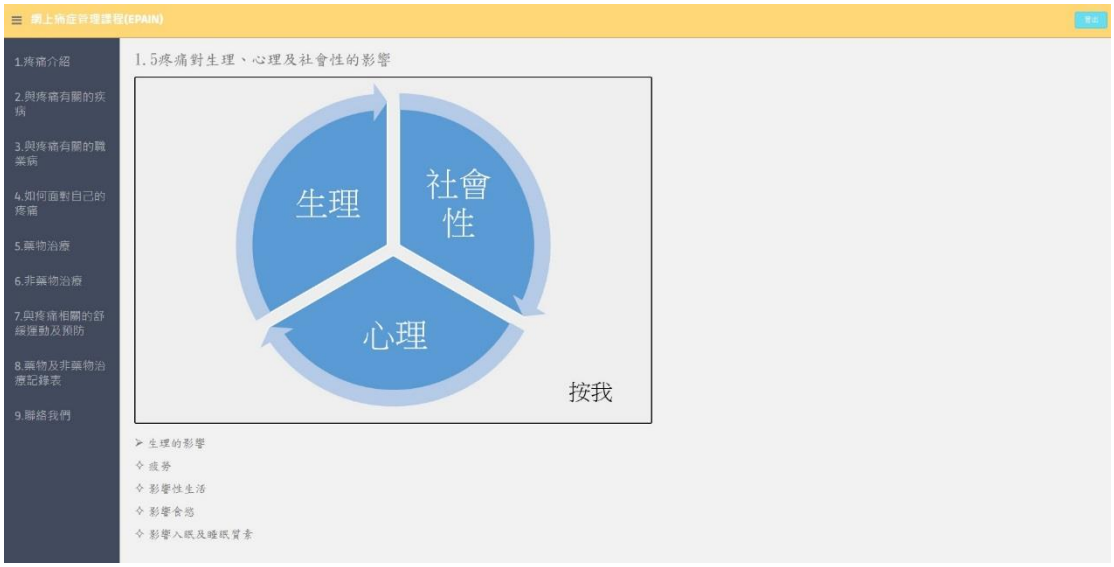
絕對不同意						非常同意
1	2	3	4	5	6	7

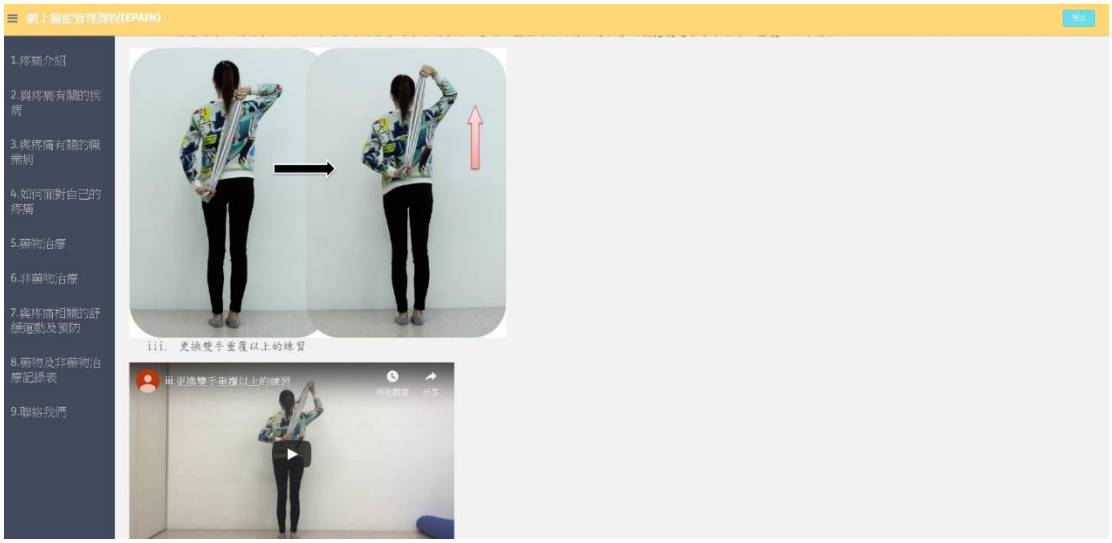
7. 整體而言，我很滿意這次的課程。

絕對不同意						非常同意
1	2	3	4	5	6	7

8. 你從哪裡得知本課程？〔可同時選擇多個答案〕
   □朋友推薦
   □社交媒體
   □網上搜尋
   □海報
   □講座
   □其他：_____
9. 使用本課程時有沒有遇上困難？
   _____
   _____
10. 歡迎提供其他意見：
    _____
    _____

Appendix 11 Screen captures of ePain from computer view




網上痛症管理課程(EPAIN)
登出
1.疼痛介紹
2.與疼痛有關的疾病
3.與疼痛有關的職業病
4.如何面對自己的疼痛
5.藥物治療
6.非藥物治療
7.與疼痛相關的舒緩運動及預防
8.藥物及非藥物治療記錄表
9.聯絡我們
iii. 更換雙手重覆以上的練習
iii.更換雙手重覆以上的練習
稍後觀看
分享


網上痛症管理課程(EPAIN)
登出
1.疼痛介紹
2.與疼痛有關的疾病
3.與疼痛有關的職業病
4.如何面對自己的疼痛
5.藥物治療
6.非藥物治療
7.與疼痛相關的舒緩運動及預防
8.藥物及非藥物治療記錄表
9.聯絡我們
7.15 小測試
請回答下列的問題，看你對本課內容了解多少！
1. 因為疼痛而限制運動會令疼痛情況減輕。
○對 ○不對
2. 進行運動時要留意周圍環境安全。
○對 ○不對
3. 應留意個人的疼痛情況來決定運動的次數。
○對 ○不對
4. 適當的運動可以有助預防疼痛。
○對 ○不對
5. 腕管綜合症患者進行「經暫休息練習」可有助減低對手腕的壓力和不適。
○對 ○不對
6. 伸展運動有助於訓練身體的協調力及減低受傷的機會。
○對 ○不對
對本節的意見
提交
請使用藥物及非藥物治療紀錄表記下你的治療歷程
前一頁
下一頁

Appendix 12 Screen captures of ePain from mobile phone view