Effects of Working Behavior Modification Program on Low Back Pain Prevention Behaviors and Back Muscle Endurance among Thai Farmers

Wisut Nochit, Thanee Kaewthummanukul, Wichit Srisuphan, Wilawan Senaratana

Abstract : Low back pain is an important health problem among workers. Thai farmers also suffer this debilitating condition. Having proper working postures and back muscle endurance can prevent back pain among farmers. This quasi-experimental study utilized a two group pretest-posttest design to examine the effects of the newly developed Working Behavior Modification Program for low back pain prevention behaviors and back muscle endurance among farmers. This consists of an education program and stabilization back exercise program. Multi-stage sampling was used to recruit farmers residing in one province in central Thailand. Two villages were randomly assigned as experimental and control groups and 40 participants were purposively selected into each group. The experimental group received the Program based on Protection Motivation Theory. The control group received information as usual. Data were collected using the Low Back Pain Prevention Behaviors Questionnaire and the Prone Double Straight-leg Raise Test at baseline as well as six weeks and nine weeks after completion of the program. Data were analyzed using descriptive statistics and two-way repeated measures ANOVA.

The findings were that the experimental group had significantly better LBP prevention behaviors and back muscle endurance at 6 and 9 weeks than the control group ($p < .01$). Results indicate that this Program can enhance low back pain prevention behaviors and back muscle endurance of Thai farmers. Nurses and health care personnel can use it as a guide for effectively preventing low back pain among farmers. However, it should be tested among more farmer populations.

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Introduction

Farmers are significantly vulnerable to develop low back pain (LBP) due to high manual physical stress in their work. Prevalence of LBP among farmers is over 50% across the world.[1] Although new machinery is utilized, Thai farmers still do farming practices by hand. In Thailand, during 2003 – 2010, the prevalence

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of LBP in Thai farmers increased dramatically by more than 90%.[2] LBP can lead to physical, mental and economic negative impacts on workers such as pain, discomfort, anxiety, depression, compensation and loss of productivity.[3,4] This reflects that there were the vast numbers of Thai farmers who have LBP and the negative impact of LBP affects Thai farmers much more than expected. Therefore, secondary prevention emphasizing LBP prevention program among Thai farmers should be a concern.

There are two possible causes of LBP among Thai farmers including physical stress and a lack of back muscle endurance (BME).[5] Physical stress in farmers directly results from improper working posture, particularly lifting, static and repetitive postures[4,5], contributing finally to LBP. Besides physical stress, lack of BME is another cause of LBP. Prior studies reported that poor BME was a predictor of first time occurrence and recurrence of LBP.[6] In Thailand, Thai farmers with chronic LBP had less BME than farmers without LBP.[5] The systematic review found that stabilization back exercise (SBE) and education interventions based on health behavior theory are recommended for preventing recurrence of LBP.[7] Although farmers cannot avoid exerting themselves and using their back due to the physical nature of their job, they could use a proper working posture and SBE for improving BME.

However, there has been only one study examining the effects of training for appropriate lifting among Thai farmers.[2] This intervention design focused on modification in lifting. It was training rather than exercise. Moreover, the limitations of this study included small sample size, no random sampling, and no control group. Therefore, the effectiveness of this intervention is questionable with no control group. Other studies outside Thailand showed the content of the programs consisted of providing proper working posture and SBE.[8-10] They focused on providing a proper lifting technique while, SBE focused on enhancing back muscle strength.[8-10] The use of SBE for enhancing BME in Thai workers has not been mentioned in the literature. Due to the causes of LBP, as well as the limitation of the earlier study about program for LBP prevention behaviors in Thai farmers mentioned above, the researcher was interested in developing a working behaviors modification program comprised of two main interventions: firstly an education intervention for enhancing knowledge and skills of LBP prevention behaviors, and secondly, an SBE intervention for enhancing BME among Thai farmers.

Teaching and skill training of proper working postures and SBE based on Protection Motivation Theory (PMT) and Self Efficacy, one component of PMT structure, increases knowledge of LBP prevention and back muscles capacity, and enhances LBP prevention behaviors.[8-10] The PMT addresses the relationship between belief, intentions, and behaviors. Thus, PMT was used as the conceptual framework in this study to develop the Working Behavior Modification Program (WBMP).

Review of Literature

There are multiple factors associated with LBP among workers that can be divided into three main groups: individual characteristics, psychological stress and physical stress.[11] Individual characteristics such as gender,[4] age,[4] education,[12] and body mass index (BMI)[13] are variables associated with an increased risk of LBP. Also, there are a number of psychological symptoms associated with LBP, including stress, anxiety, and depression.[4] However, the main factors associated with LBP among Thai farmers are physical stresses and lack of BME.[3,5] These stresses include heavy manual labor, whole body vibration, static working posture and improper working posture, especially bending forward lifting objects.[14] Moreover, 50% of Thai farmers lack knowledge of the proper posture for work.[2,3] Over 80% of farmers habitually bend forward to lift the objects putting them at risk for ligament damage, leading to back muscles' strain and LBP.[2,3]

When individuals bend forward to lift, their back muscles actually become totally inactive, and the ligaments of the spine have to bear the entire load of the upper body. This may decrease the ability of ligaments to appropriately support the spine and lead to decreased muscular functions.[13] In addition, laboratory studies show different pressures within the 3-4 disc space under various conditions of load. The lowest pressure occurs when lying down, the highest pressure occurs when bending forward.[14] Moreover, overloaded manual lifting, prolonged sitting and standing on a tractor result in LBP. They cause an increase in pressure on the disk leading to disk rupture and muscle fatigue.[4]

Regarding lack of BME, the term muscle endurance is the ability of a muscle group to execute repeated contractions over a period of time of sufficient duration to cause muscle fatigue.[15] Transversus abdominis (TrA) and multifidus muscles are the main muscles for preventing LBP. TrA maintains the balance of abdominal pressure while multifidus muscle shold the vertebrae in a direct line. Muscle endurance has proved to be a more significant predictor of new episode and recurrence LBP than back muscle strength and flexibility.[16,17] Lack of SBE caused LBP.[18] Regarding back muscle capacity among Thai farmers with LBP, a previous study showed they lacked static BME.[11] Moreover, about 90% of farmers lacked regular exercise and knowledge about SBE.[3] Back muscle consists of two muscle fibers – fast-twitch fibers and slow-twitch fibers. The fast-twitch fibers are the superficial muscle layer with large and long sizes to fix and support upper back structure whereas the latter is the deep muscle layer with small and short size to fix inner vertebrae, control rotation of vertebrae, and respond to changes of postures and extrinsic loads. Additionally, slow-twitch fibers is a part of TrA and multifidusmuscles,[19] and usually atrophies in people with chronic LBP.[20] Thus, a knowledge of both proper working and SBE for preventing LBP should be improved among Thai farmers.

As most farmers already have a history of LBP, the main risk factor is recurrence and chronic pain.[5] For example 40% of farmers have experienced LBP every day for a week or more in the past year[21] and LBP is a common recurrent condition among patients.[22] Therefore, in an effort to stop the progression of disease oriented-deterioration[23] a secondary prevention program, is likely to be appropriate for LBP prevention among farmers. Programs on occupational safety and health in agriculture should include working posture and environmental modification.[24] Moreover, the World Health Organization (WHO) suggests including in guidelines of working posture modification, the proper lifting of heavy objects. This is standing close to the object, bending at the knees, keeping the back straight during lifting, lifting the load with leg muscles, and with the object close to the body.[25] Laboratory studies have shown that this lifting object guideline could decrease prevalence of LBP in workers.[26] Educational intervention, comprised of modification of working posture and SBE based on behavioral theory, could improve LBP prevention behaviors and back muscle capacity among workers.[8-10]

Regarding factors associated with LBP prevention behaviors among Thai farmers, it was found that time barrier was an important variable for SBE.[3] However, SBE with a stretching technique and holding the back in a straight position for 8-10 seconds during exercise significantly promotes BME and protects the back from injury during exercise.[27,28] Also, recent systematic reviews concluded that an average SBE of 10 minutes per day has contributed to a significant improvement in primary outcome measures.[7] Furthermore, SBE of 6 minutes once daily, three and four times a week for 6 weeks, could improve BME by week 3.[16,29] Moreover, LBP prevention program in workers could strengthen back muscles at week 12.[8] However, there is no study investigating the effect of LBP prevention program on BME among informal workers. Thus, it is interesting to examine whether short-time SBE interventions can

enhance BME in farmers which would help solve issues regarding time barriers for farmers when dealing with manual labour.

Besides the time barrier, knowledge of LBP prevention and perceived severity are factors associated with LBP prevention behavior among farmers.[3] A systematic review has indicated that the development of a LBP prevention program should involve consideration of relevant variables based on health behavior theories[7] including Protection Motivation Theory (PMT). This is a theory of persuasive communication and consists of cognitive mediating processes; and was used to improve LBP prevention behavior in other workers. Cognitive mediating processes consist of the threat-appraisal process and the coping-appraisal process. The threat appraisal process includes four factors - intrinsic rewards, extrinsic rewards, perceived severity, and perceived vulnerability. The coping appraisal process includes three factors, self-efficacy, response efficacy and response costs. Assessments of threats and coping factors combine to form the behavioral intention in which, perceptions of severity and vulnerability should outweigh the rewards associated with maladaptive responses.[30] In addition, perception of response efficacy and self-efficacy should outweigh the response cost of the adaptive behavior. Therefore, protection motivation, which is typically equated with behavioral intention, is seen to direct and sustain protective behavior.[31] The variables of cognitive mediating process of PMT, which include perceived severity, perceived vulnerability; perceived self-efficacy and perceived cost, were used for developing WBMP among Thai farmers in this study. As reviewed, studies regarding behavior modification program based on application of PMT for LBP prevention showed that LBP prevention behaviors of participants improved at week 12 after completion of the program.[8] In addition, studies investigating the effects of LBP prevention program based on other behavioral theories among informal workers revealed that participants' LBP prevention behaviors improved at week 6,[32] and during weeks 9-12.[8-10, 32] It is, therefore, interesting to examine whether a LBP prevention program, based on application of PMT, would be able to improve LBP prevention behaviors within a short time and sustain the changes.

However, little is known about LBP prevention programs focusing on modification working posture and SBE for enhancing BME among Thai farmers. To address this gap of knowledge, it seemed reasonable to examine the effect of education LBP prevention programs, especially designed to modify working posture and enhance BME. PMT was selected as the conceptual framework in this study.

Conceptual Framework

LBP is a highly prevalent health problem among farmers. Two major causes of LBP in this population are improper working posture and lack of back muscle endurance. Knowledge of LBP, perceived severity of LBP, and time barrier to back exercise are key variables found to be associated with LBP prevention behaviors among farmers.[5] Such variables are the component of PMT. Theoretically, an individual with high perceived severity of LBP and perceived of probability that LBP will occur is more likely to be motivated to adopt the LBP prevention behaviors (threat-appraisal process). Also, an individual with high perceived ability of coping behaviors (LBP prevention behaviors) to remove the health threat (LBP) and perceived ability to carry out the coping behavior (LBP prevention behaviors) and low perceived cost is more likely to be motivated to adopt the LBP prevention behaviors as well (Coping-appraisal process). The final outcome of both processes (Threat-appraisal and Coping-appraisal) is LBP prevention behaviors attenuated from the intention. This study developed the WBMP among Thai farmers focusing on two sub-categories of secondary LBP prevention-education intervention and exercise intervention based on application of PMT. The WBMP was expected to enhance LBP prevention behaviors through increasing perceived vulnerability

to LBP, perceived severity of LBP, and perceived self-efficacy for LBP prevention behaviors particularly proper working postures, and decreasing perceived time barrier to SBE.

Regarding SBE intervention, its main purpose was to enhance BME through having their LBP prevention behaviors. SBE is an exercise program that is designed to help the performers improve BME and reduce pain including flexion exercise, extension exercise, and maintaining back straight during exercise.[28] However, both flexion and extension back exercises may cause back injury during exercise in some skeletal diseases because these exercises may increase the pressure within intervertebral discs of the lumbar spine and posterior annulus, respectively.[28] Therefore, to prevent injuries during exercise, short-time SBE with stretching technique and maintained back straight position was designed to improve back muscle endurance.

Thus, the following hypotheses (H) were posed:

H1. Farmers receiving WBMP have better LBP prevention behaviors and BME than the control group.

H2. After receiving WMBP, farmers have better LBP prevention behaviors and BME than prior to receiving this program.

Method

Design: A quasi-experimental, two group pretest-posttest design was used to test the effects of the WBMP on LBP prevention behaviors and BME among farmers at weeks 6 and 9 after completion of program.

Sample and Setting: The sample was equal numbers of male and female farmers,in one province in central Thailand and engaged in rice farming, undertaken by hand. Multi-stage sampling was used to obtain participants in two villages and these were randomly selected. Both villages had similarities in terms of being areas where rice farming was done for at least 2 cycles per year. Power analysis for estimating sample size with a significance level of 0.05, a power of 0.80, and an estimated effect size = .76 was obtained from a meta-analysis of behavioral type of LBP prevention behaviors education intervention among workers.[18] Thus, the minimum sample size was 32 per group. To address the possible loss of participants in this study, an extra eight participants were added (20% of minimal sample size). Therefore, the sample size for this study was a total of 80 participants, 40 per group. Samples were purposively selected and inclusion criteria were 1) having mild LBP and indicating normal working ability and without sciatica pain; 2) not receiving treatment for LBP from a doctor or other alternatives; 3) willing to participate in the program until study completion, and 4) not having a previous medical history of degenerative joint disease. Exclusion criteria were having severe illness or disabilities that made them unable to participate in this program. Participants were allocated into the experimental and control groups, 40 participants in each group. The experimental group received the WBMP while the control group received regular LBP prevention education.

Ethical Consideration: Study approval was received from the Research Ethics Review Committee of Faculty of Nursing, Chiang Mai University. The study's objectives, procedures, potential risks and benefits, protection of confidentiality and rights to withdraw were explained to all prospective participants. Prior to signing the consent form, they were assured about confidentiality and anonymity and had an opportunity to ask questions about the study. After receiving permission and conducting informed consent, the data collection procedure began.

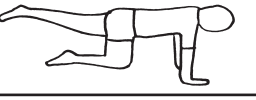
Data Collection:

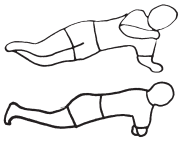
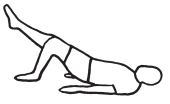
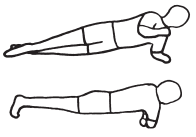
Instruments: The instruments in this study consisted of the WBMP and instruments for data collection.

The Intervention Program. The WBMP was developed by the first researcher based on PMT aiming to enhance LBP prevention behaviors and BME among the Thai farmers. The content validity of the program was examined by five experts (two rehabilitation physicians, one orthopedic surgeon, and two nurses with a specialty

of LBP prevention). All of experts recommended the sequence of each session be adjusted, and changes made to the learning activities so as to more easily understood, practiced and to fit within time frames. The final program (see **Table 1**) consisted of three sessions.

Table 1 Schedule and Content of the Modification Working Posture Program

Time Schedule		The Working Behaviors Modification Program
Week 1	Day 1	
	Enhancing perceived severity, vulnerability of LBP.	
	60 min	***Step 1:*** Giving education. Experimental group divided into four sub-groups (10 per group). Basic information about impact of LBP and sharing experiences between farmers by group discussion among those suffering from LBP.
	60 min	***Step 3:*** Discussion. Participants asked to share their knowledge and experience of the causes and impact of LBP.
	Day 2	
	Enhancing perceived self-efficacy of having proper working posture	
	45 min	Step 1: Education and group discussion about proper working posture training and technique for practicing.
	45 min	*Step 2*: Live modeling presentation was done by two farmers who had proper working posture, followed by group discussion.
	90 min	Step 3: A mastery experience also was done by participants. They practiced exercise and returned practice based on using authentic materials in daily life under the supervision by the researcher.
	Eliminating the time barrier to SBE	
	Day 3	**Training of short duration SBE**
	30 min	Step 1: The researcher demonstrated the four positions of basic level of SBE as the following exercises: 1. Curl-up Holding time 10 sec./ 10 repetitions  2. Static leg and back Holding time 10 sec./ 10 repetitions  3. Birddog Holding time 10 sec./ 8 repetitions 

Time Schedule	The Working Behaviors Modification Program
	4. Side-bridge Holding time 10 sec./ 10 repetitions 
60 min	*Step 3:* The participants practiced SBE under the supervision by the researcher.
30 min	*Step 4:* The participants were trained about practicing self-evaluation of BME progression by Prone Double Straight-leg Raise Test and recording data in a progress chart.
Week 2,3	**Self practice and group exercise once a week.**
Week 4	**Training of advanced SBE.**
	Step 1: Demonstration and return of four positions of advanced of SBE as the following exercises:
2 hours	1. Curl-up Holding time 10 sec./ 10 repetitions 
	2. Static leg and back Holding time 10 sec./ 10 repetitions 
	3. Birddog Holding time 8 sec./ 10 repetitions 
	4. Side bridge and plank Holding time 10 sec./ 10 repetitions 
Week 5-8	**Follow up through home visits 2 time a week**
Week 6,9	**Evaluation**

Each session was sequentially organized into three major components: a) enhancing perceived severity and vulnerability of LBP by way of giving information about risk and impact of LBP; b) enhancing perceived self-efficacy of having proper working posture and SBE by giving information by following the handbook about proper working posture-SBE training and techniques for practice and presenting a live modeling done by farmers who had proper working posture; c) eliminating the time barrier to SBE by providing short-time SBE practice.

Regular LBP prevention behavior education for the control group: Participants were given appointments to undergo health education including LBP disease, signs and symptoms, medication, proper working postures and exercise in the usual way by healthcare providers at the local health center.

Instruments

Three instruments were used:

The *Demographic Data Form,* developed by the researcher, was used to collect information on age, gender, marital status, BMI, education level, number of family members, family income, and health problems.

The *Lower Back Pain Prevention Behaviors Questionnaire* (LBP-PBQ) was developed by the researcher based on literature review.[8,9] Its reliability was tested among 30 farmers and Cronbach's alpha coefficient was 0.77. It measures the frequency of behaviors that the respondent performs including proper working posture and SBE. It is a 10-item questionnaire with 6 items of proper working posture (for example, 'While lifting, you keep the object close to your body' and 4 items of SBE (for example, 'You perform back muscle exercise 10 minutes per day, at least four times per week'). Item responses are given on a four-point Likert scale (never, sometimes, often, and always). Negative items are reverse-coded. Scores can range from 0-30. Scores >20 are considered high, between 10-20 are moderate, and <10 are low. Higher scores indicate more frequency to perform proper working posture and SBE.

The *Prone Double Straight-leg Raise Test* (PDSRT) was used to test low BME.[33] To apply this measure, participants were asked to lay in a prone position, leg extended, hands underneath the forehead, forearms perpendicular to the body, and to raise both legs until the knees cleared the floor. The examiner monitored knee clearance by sliding one hand under the thighs, and recorded the test duration in seconds. The test was terminated when the participant was no longer able to maintain knee clearance. Prior to use in this study, the PDSRT content validity was verified by five experts (two rehabilitation physicians, one orthopedic surgeon, and two nurses with a specialty of LBP prevention).Participants who had health problems with muscle pain in the arms, neck, back or legs were excluded from the study. Fifteen-min interval test-retest reliability was tested in a group of 15 farmers, and the calculation using Pearson's product moment correlation was 0.90.

Data analysis: Descriptive statistics were used to analyze the participants' demographic characteristics. Chi-square test and independent t-test were conducted to examine the difference of demographic data and dependent variables (LBP prevention behaviors and BME) between the participants in the experimental group and the control group at baseline. Prior to data analysis, the Kolmogorov-Smirnov test was used for testing normality distributed scores of LBP prevention behaviors and BME including Levene's test for homogeneity of variance. In this study, it was found that the scores of both variables were normally distributed. After that, two-way repeated measure ANOVA was used to test the difference between groups and change over time in each group of the score of LBP prevention behaviors and BME. Multiple pairwise comparisons between each group at each point of measurement were done using the Bonferroni test.

Results

In the analysis of demographic data, the majority of farmers, in the experimental and control groups, respectively: were of similar ages (mean age = 47.13; SD = 7.14 vs. mean age = 46.75; SD = 6.77); were male s (n=20; 50% vs. female = 20; 50%); primary school (n=35; 82.50%; vs. n = 34; 85.00%); and BMI (mean BMI = 25.01; SD = 3.88 vs. mean BMI = 24.71; SD = 3.51); and there was no statistical difference in any demographic characteristics of both groups ($p < .05$). Sample matching of extraneous variables including gender, age, education and BMI was done; same sex (male and female),same duration of age (not more than two-year difference),same education level (never studied, elementary school, secondary school, and tertiary school),and same BMI level (appropriate BMI, mild to moderate obesity, morbid obesity). Prior to receiving the intervention, there was no difference of LBP prevention behaviors

and BME between the experimental group and the control group, analyzed using independent t-test. This confirms that the changes of outcomes resulted from the WBMP.

Farmers who received the WBMP had higher mean scores of LBP prevention behaviors (F = 9665.54, p < .001) and BME (F = 248.641, p < .001) than the control group at 6 and 9 weeks. The results supported hypothesis 1 (H1)(see Tables 2 and 3, and Figures 1 and 2). After receiving the WBMP, there were significant differences of mean scores of LBP prevention behaviors and BME in the experimental group, at baseline, and 6 and 9 weeks. Multiple pairwise comparisons between each group at each point of measurement were done using the Bonferroni test. The results showed that LBP prevention behaviors and BME scores significantly increased from baseline to week 6, and from baseline to week 9 in the experimental group (p = .001). In the control group, LBP prevention behaviors scores slightly decreased, and BME scores slightly increased from week 6 to 9 (see Tables 4 and 5). This result supported hypothesis 2 (H2). In conclusion, LBP prevention behaviors and BME of farmers participating in the WBMP were improved.

Table 2 The difference in LBP prevention behaviors between each point of measurement

Variables	SS	df	MS	F^r	*p-value*
Within subject					
Group	6050.10	1	6050.10	553.80	.001**
Time x group	2647.51	2	1323.75	240.61	.001**
Error	555.83	78	7.13		
Between subject					
Group	142545.00	1	142545.00	9665.54	.001**
Error	575.16	39	14.75		

Note. ^{r} = Two-way repeated measure ANOVA. ** = p< .001.

Table 3 The difference in BME between the control and experimental groups

Variables	SS	df	MS	F^r	*p-value*
Within subject					
Group	49626.406	1	49626.406	76.325	.001**
Time x group	29133.006	1	29133.006	44.897	.001**
Error	50613.088	78	648.886		
Between subject					
Group	598900.504	1	598900.504	248.641	.001**
Error	187878.058	78	187878.058		

Note. ^{r} = Two-way repeated measure ANOVA. ** = p< .0001

Table 4 Multiple pairwise comparisons of LBP prevention behaviors scores between each point of measurement in the control and experimental groups

LBP prevention behaviors	Mean (SD)			*p-value*		
	Baseline (1)	Week 6 (2)	Week 9 (3)	(1) vs (2)	(1) vs (3)	(2) vs (3)
Control group (n = 40)	19.00 (3.37)	19.67 (3.01)	19.30 (2.56)	1.00	1.00	.001**
Experimental group (n = 40)	19.72 (2.86)	34.22 (2.93)	34.22 (2.88)	.001**	.001**	.001**

Note. Bonferroni test, ** = p<.001.

Table 5 Multiple pairwise comparisons of BME scores between each Point of measurement in the control and the experimental groups

BME	Mean (SD)			p-value		
	Baseline (1)	Week 6 (2)	Week 9 (3)	(1) vs (2)	(1) vs (3)	(2) vs (3)
Control group (n = 40)	29.25 (28.08)	30.60 (27.52)	37.45 (29.15)	1.00	1.00	.001**
Experimental group (n = 40)	29.32 (21.61)	81.60 (44.20)	91.50 (45.46)	.001**	.001**	.001**

Note. Bonferroni test, ** = p<.001.

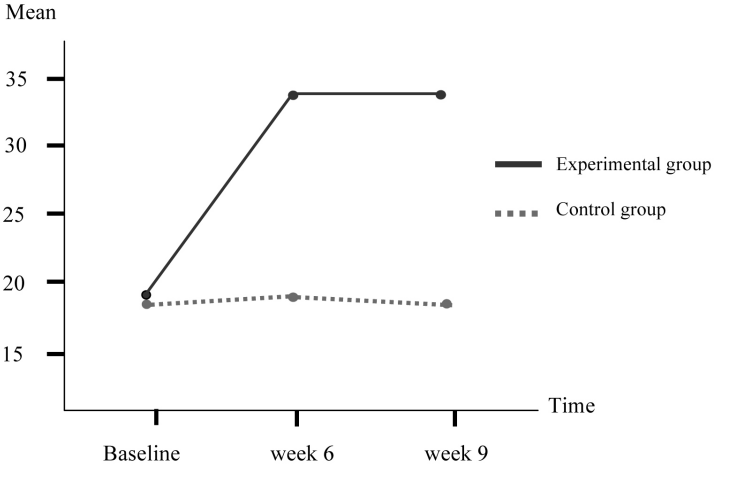


Figure 1 Changes in LBP prevention behaviors of control and experimental groups over time.

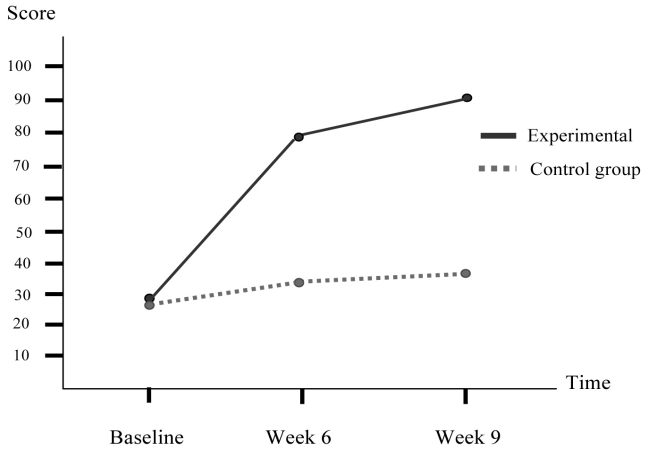


Figure 2 Changes in BME over time

Discussion

After completion of the WBMP, prevention behaviors and BME with short-term changes was positive over six weeks and the changes were sustained over the nine weeks of the follow-up period. For the control group who received the regular health education approach, the finding indicated no improvement of LBP prevention behaviors and slight improvement of BME. This can be explained that the regular approach usually focused on routine information and instruction and did not provide coaching for LBP behavioral change.[16] This finding indicates that changes of outcome among the experimental group resulted from the WBMP based on PMT.

According to the PMT, participants' motivation to protect themselves from LBP are enhanced by two mediating sub processes – the threat-appraisal process and the coping-appraisal process.[30] The finding showed that WBMP could increase the perceived severity, vulnerability, and self-efficacy and decreased perceived cost on lack of knowledge about LBP prevention behaviors and time barrier to SBE in first week after receiving WBMP. These processes resulted in the improvement of LBP prevention behaviors and BME at week 6 and week 9.

Regarding the threat-appraisal process, the findings indicated that providing knowledge of LBP and its risk factors, and offering information of the negative impact of LBP as well as sharing experience with other farmers who suffered from LBP could increase perceived severity of and vulnerability to LBP among the participants within a short time. Previous studies investigating the LBP prevention programs in other Thai workers found that participants' perception of LBP severity and vulnerability could increase in weeks 6-12.[8-10] The findings were consistent with other studies using LBP prevention behaviors strategies, such as providing information of the severity of chronic LBP and its risk factors could increase perceive severity of and vulnerability to LBP among the experimental group.[19] Moreover, the findings supported the meta-analysis studies which revealed an increase perceived severity of disease and vulnerability to disease could motivate the people to engage in disease prevention behaviors.[34,35]

The coping-appraisal process consisted of perceived self-efficacy to LBP prevention behaviors and perceived cost of LBP prevention behaviors. Perceived self-efficacy is a personal beliefs or confidence in one's capability of performing a specified task effectively.[36] The activities in the WBMP for

enhancing self-efficacy included mastery experiences which consisted of demonstration and returned demonstration of proper working posture and SBE, sharing and learning with live modeling presented by farmers who had proper working posture, and self SBE practice from a basic level to advanced levels could increase perceived ability of the participants to perform LBP prevention behaviors in the first week after receiving the program. In addition, verbal encouragement was given by the researcher on his home visits for the practice of LBP prevention help the farmers to continue good practices. This result supported the previous studies that taking direct behaviors after demonstration,[8-10] starting activities from easy to difficulty level,[37] and monitoring activities by group activity and home visits,[9,10] are strategies to enhance perceived self-efficacy of LBP prevention behaviors.

Perceived cost is a component influencing a person's intention to engage in the actual execution of the behavior. The perceived cost may be imagined or real. If the perceived cost is high, the action is unlikely to occur.[30] In this study, participants gained knowledge about the proper working posture and that they were required only to exercise ten minutes per day; this reduced the perceived costs and helped them undertake the required behaviors. Importantly, this program provided a handbook that included information about causes, treatment of LBP, impacts, proper posture and SBE for LBP prevention. This handbook helped the participants recall and reinforce what they had been taught by the researcher. Many studies reported that providing a handbook containing an explanation of LBP, treatment and prevention helped persons with LBP manage their problem.[8-10]

Regarding the effect of the program on BME, literature reviews found that TrA and multifidus muscles' fibers atrophy in people with chronic LBP.[20] However, SBE can rebuild muscular capacity, especially BME by exercise.[38] The findings in this study indicated that there were statistically significant differences in BME scores between the groups at weeks 6 and 9. The significant increase in specific skills regarding SBE of the experimental group may be a result of well-designed practices of the exercise program. In this study, SBE consisted of stretching and holding exercise which was designed to be easy, safe and taking little time (ten minutes a day) and at least four times a week. After completion of the program, participants indicated that this exercise program could increase BME in weeks 6 and 9. This finding supported the notion of "short and sharp" SBE which could enhance BME in LBP patients.[7] Similarly, prior studies showed that the BME of the experimental group significantly increased at week 3 to week 6.[16]

The SBE used in this study was effective for increasing the endurance of trunk muscles. It can be described that back exercise done properly and continuously can help the muscles construct muscle capacity, especially TrA and multifidus muscles. Effective exercises can rebuild muscular capacity, with the maintenance of improvement in endurance by exercise in the long term.[39]

However safety of back muscle exercise is important. The back muscle exercise with either over bending or over stretching postures might lead to injury of intervertebral discs. The postures of back muscle exercise used in the WBMP could prevent such injury because they emphasized straightening the back to keep the alignment of vertebrae.[38,40] Typically, participants had experienced LBP. When they did the SBE regularly, they indicated that these exercises made them become fit and greatly improved their low back muscles. They could also work every day and did not need to take medicine. In conclusion, this program helped them to regain normal life.

Limitations

This study controlled the extraneous variables such as geographic characteristics, life styles, age, gender, education, BMI, pain level and means scores of outcomes prior to intervention. However, there are other variables such as years of work, work position, and working hour/day, which probably affect the WBMP and were not controlled for.

Conclusion and Recommendation

The WBMP developed for this study is effective in improving LBP prevention behaviors and BME among Thai farmers with the short-term changes during six weeks, and the changes were sustained over the nine weeks of the follow-up period. Nurses and health care providers can apply this program as a guide for providing LBP prevention among farmers. Based on the findings, information about proper working posture and SBE should be given to other farmers for the prevention of LBP. Small group education, discussion, demonstration and return LBP prevention practice should be provided to help people change their behavior. However, it is suggested that studies determining the long-term effect of the WBMP, and investigating the effect of the WBMP on other outcomes (i.e. pain score) and in other workers should be further conducted. In addition, researchers should be aware of appropriate and correct exercise to prevent negative effects, for example, starting from easy to advanced level, holding time for each posture no more than eight seconds in order to prevent hypoxia.

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ผลของโปรแกรมการปรับพฤติกรรมการทำงานต่อพฤติกรรมการป้องกันอาการปวดหลังส่วนล่างและความทนทานของกล้ามเนื้อหลังของชาวนาไทย

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บทคัดย่อ : อาการปวดหลังส่วนล่างเป็นปัญหาสุขภาพที่สำคัญในกลุ่มแรงงานชาวนาเป็นกลุ่มอาชีพหนึ่งที่ต้องเผชิญกับปัญหาสุขภาพดังกล่าว การมีท่าทางการทำงานที่เหมาะสมและความทนทานของกล้ามเนื้อหลังจะสามารถช่วยป้องกันอาการปวดหลังในชาวนาได้ การวิจัยกึ่งทดลองแบบสองกลุ่มวัดก่อนและหลังการทดลองในครั้งนี้ มีวัตถุประสงค์เพื่อทดสอบผลของโปรแกรมการปรับพฤติกรรมการทำงานต่อพฤติกรรมการป้องกันอาการปวดหลังส่วนล่างและความทนทานของกล้ามเนื้อหลังของชาวนาซึ่งพัฒนาโดยผู้วิจัย กลุ่มตัวอย่างเป็นชาวนาในจังหวัดหนึ่งในภาคกลางของประเทศไทย การวิจัยนี้ใช้วิธีการสุ่มตัวอย่างแบบหลายขั้นตอนได้หมู่บ้านจำนวน 2 หมู่บ้านเป็นกลุ่มทดลองและกลุ่มควบคุม คัดเลือกกลุ่มตัวอย่างแบบเฉพาะเจาะจงตามเกณฑ์คัดเลือกกลุ่มตัวอย่างเข้ากลุ่มๆละ 40 ราย กลุ่มทดลองได้รับโปรแกรมการปรับเปลี่ยนพฤติกรรมการทำงานเพื่อป้องกันอาการปวดหลังโดยใช้ทฤษฎีแรงจูงใจเพื่อป้องกันโรค ประกอบด้วยโปรแกรมการให้ความรู้ และโปรแกรมการออกกำลังกายกล้ามเนื้อหลัง ในขณะที่กลุ่มควบคุมได้รับความรู้ตามปกติ รวบรวมข้อมูลก่อนและหลังการได้รับโปรแกรม 6 สัปดาห์และ 9 สัปดาห์โดยใช้แบบสอบถามพฤติกรรมการป้องกันอาการปวดหลังส่วนล่าง และวัดความทนทานของกล้ามเนื้อหลังโดยวิธี the Prone Double Straight-leg Raise Test วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนาและการวิเคราะห์ความแปรปรวนแบบวัดซ้ำสองทาง

ผลการวิจัยพบว่า ในกลุ่มทดลองมีพฤติกรรมการป้องกันอาการปวดหลังส่วนล่างและความทนทานของกล้ามเนื้อหลังดีกว่ากลุ่มควบคุมในสัปดาห์ที่ 6 และ 9 อย่างมีนัยสำคัญทางสถิติ ($p < .001$) ผลการวิจัยครั้งนี้แสดงให้เห็นว่าโปรแกรมการปรับพฤติกรรมการทำงานมีผลต่อพฤติกรรมการป้องกันอาการปวดหลังส่วนล่างและความทนทานของกล้ามเนื้อหลังของชาวนาไทย ซึ่งพยาบาลและบุคลากรด้านสุขภาพสามารถนำโปรแกรมนี้ไปเป็นแนวทางสำหรับการส่งเสริมชาวนาไทยในการป้องกันอาการปวดหลังส่วนล่างของชาวนาอย่างมีประสิทธิภาพได้

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