EFFECTS OF PAIN NEUROSCIENCE EDUCATION ON SELF-EFFICACY AND PAIN CATASTROPHIZING AMONG CHRONIC LOW BACK PAIN PATIENTS

Sonia Dua Dewan[1*], Rahul Krishnan Kutty [1] , Nelson Arputhraj John[1] and Angela Ngui Mee Ting[2]

[1]School of Physiotherapy, Faculty of Health Sciences, MAHSA University, Selangor, Malaysia.

[2]Research Scholar, Physiotherapist, Yuan Physiotherapy Centre, Kuala Lumpur. Malaysia.

****Corresponding Author, Email:** sonia@mahsa.edu.my*

ABSTRACT

Background: Chronic low back pain (CLBP), is a significant contributor to the disability with a prevalence rate of 12% in Malaysia. Pain Neuroscience Education (PNE) is an educational approach that re-conceptualizes pain suffering and is often recommended. The use of PNE in conjunction with other treatments to treat CLBP in Malaysia is limited.

Objective: To determine the effects of PNE on self-efficacy and pain catastrophizing among chronic low back pain (CLBP) patients.

Methods: Thirty subjects with chronic low back pain (CLBP) were recruited and allocated into the experimental group and control group. The experiment group received PNE with conventional therapy, while the control group received only conventional therapy. The baseline data was collected using Pain Self Efficacy Questionnaire (PSEQ) and Pain Catastrophizing Scale (PCS). Pre and Post design was utilized to measure the effects of PNE and paired sample t-test was used.

Results: The experimental group showed a reduction in pain catastrophization and increased self-efficacy ($p < 0.01$) in patients with CLBP. The effects of PNE were reported in self-efficacy and pain catastrophizing by a mean difference of 3.0 scores on PSEQ and 2.8 scores on the PCS, respectively.

Conclusions: Reduction in pain catastrophization is reported with the use of PNE in conjunction with other therapies. The PNE facilitates the patients to cope better with pain and clinically significantly reduces pain catastrophizing thereby optimizing the functional status.

Keywords: *Chronic low back pain; Pain catastrophizing; Pain neuroscience education, Self-efficacy*

INTRODUCTION

Chronic low back pain (CLBP) is a prevalent musculoskeletal is the leading cause of disability worldwide and in Malaysia, the reported prevalence rate among the elderly population (65 years) is anticipated to rise from 4% in 1998 to 9.8% in 2020. (Zahari, Justine and Dahlan, 2015). CLBP can be caused by factors such as age, gender, bad posture, and functional capacity, as pain limits activities and lowers the overall quality of life (Allegri et al., 2016). Due to the fact that CLBP is linked to a muscle imbalance between the abdominals and trunk extensor muscles (Kumar et al., 2015), core muscle training is indicated for CLBP treatment (França et al., 2010). Although there are numerous treatments available, no single intervention has been proven to be superior (Papuga et al., 2016). Lower recovery expectations (Gross and Battié, 2010), high initial pain levels (Carroll et al., 2008), sex (Walton, 2013), catastrophic thinking (Bunzli et al., 2015), fear of movement (Costal et al., 2011), and low self-efficacy are all possible moderators of these outcomes (Costal et al., 2011). Anxiety, despair, and fear-avoidance were found to be predictive of the transition from acute to chronic pain. The psychological variables contribute to anxiety & fear of movement, which leads to disuse and poor recovery (Alhowimel et al. 2018).

Self-efficacy describes a person's belief about their ability to execute the necessary actions to reduce the impact of pain on daily activities (Leung and Cheng, 2018). Recent literature has agreed that patients with higher levels of pain self-efficacy tend to have lower pain intensity and disability than patients with chronic pain (Costal et al., 2011; Van Liew et al., 2013). Conversely, CLBP patients with low confidence in their ability to accomplish regular activities have the potential to increase pain and fear. Pain catastrophizing describe as an exaggerated negative cognitive response to anticipated or actual pain experience and feel more helpless during or following a pain encounter Pain catastrophizing describe as an exaggerated negative cognitive response to anticipated or actual pain experience (Bunzli et al., 2015). Catastrophic thinking is found associated with poor coping strategies for pain resulting in physical deconditioning, depression, and disability from activities (Wertli et al., 2014; Linton and Shaw, 2011; Alhowimel et al. 2018; Leung and Cheng, 2018; Costal et al., 2011). Pain Neuroscience Education (PNE) is an educational approach that 'explains the pain' to patients (Traeger et al., 2014). PNE enables to change the pain beliefs in chronic pain patients (Rufa et.al, 2018) by redefining the pain as a protective action of the brain (Traeger et al., 2014) to achieve the goals of reducing pain, limiting disability, and improving tolerance to the movement (Moseley, 2015). Several studies have reported the moderate evidence for the

effect of PNE on reducing pain and disability, fear of movement (Beltran-Alacreu et al., 2015), anxiety and depression (Vibe Fersum et al., 2012), catastrophizing and self-efficacy (Moseley, 2004; Louw et al., 2011) in LBP. Most of the PNE trials investigated pain and disability (Moseley, 2002; Ryan et al., 2010; Van et al., 2013; Vibe Fersum et al., 2012; Louw et al., 2014; Pires, Cruz and Caeiro, 2014; Beltran-Alacreu et al., 2015). However, PNE studies focused on self-efficacy and pain catastrophizing in CLBP patients are limited. Although several studies determine the effectiveness of PNE in LBP patients in other countries, there is no research done on the Malaysian population. The difference in culture, environmental factors, and psychological factors in a different country thus may affect the intervention outcome. Therefore, this study is vital to find out the effect of PNE on self-efficacy in CLBP patients among Malaysian.

METHODOLOGY

Thirty males and females with CLBP volunteered to participate in the study from private health care centers in the Selangor area. The quasi-experimental design was undertaken to find the effects of PNE on the effect of PNE on self-efficacy and pain catastrophizing in CLBP patients non-probability convenience sampling was used. Besides, quasi-experimental research is more practical and feasible to conduct research because it often does not have the time and logistical constraints associated with many true experimental designs (Handley et al., 2018). The participants between 20-60 years with low back pain for more than 3 months and more than 4/10 on a numerical pain rating scale were included in the study. Previous spinal surgeries, spinal pathology, post-surgical pain, and pregnancy-related pain were excluded from the study. The sample size was calculated based on the 90% of confidence level and 15% of the confidence interval.

The subjects were equally divided into experimental (n=15) and control groups (n=15). The experimental group received four PNE sessions with strengthening exercises and the control group received only strengthening exercises for 4 weeks. Each PNE session lasted for 60 minutes (PowerPoint presentation, videos and booklet) and strengthening exercises were performed 10 repetitions, 3 sets per session, 4 times per week (Paolucci et al., 2018). The study was explained to the subjects and informed consent was obtained prior to enrollment in the study.

The Pain Self-efficacy Questionnaire (PSEQ) is a tool for assessing patients' confidence in their ability to function despite their pain. The PSEQ is made up of ten components with scores ranging from 0 to 6, for a total score of 60. The higher the scores, the more powerful the self-efficacy beliefs are. The patient is more focused on the pain if the score is less than 20 (severe). Patients with scores greater than 40 (minimum impairment) are more likely to respond effectively to an exercise regimen.

The pain catastrophizing scale (PCS) is a measure for assessing the mental condition of people who are in pain. It consists of 13 items with total scores ranging from 0 to 4 and a total score of 52. Catastrophizing with a score of more than 30 is related to a clinically relevant level of catastrophizing (Michael, 1995). Statistical Package for Social Sciences (SPSS) software version 26.0 was used to analyze all of the data and statistics, with a confidence interval (CI) of 95 percent and a significance level of 5%. (2019, IBM.com). There were no dropouts during the study period, as 30 samples followed the 4 weeks of intervention based on their group allocation.

Ethical considerations

This study was reviewed by the Faculty of Health Sciences Research Review Committee, MAHSA University (FRRC). All procedures and assessment tools used in this study have been approved by the FRRC

RESULTS

A total of 30 people volunteered to take part in this research (Table 1.0). There are 5 men and 10 females in the control group, with a proportion of 33.33 percent and 66.67 percent, respectively. The experimental group, on the other hand, was made up of 4 males and 11 females, with a percentage of 26.67 percent and 73.33 percent, respectively.

Table 1.0: Gender

	Control (n=15)		Experimental (n=15)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Male	5	33.33	4	26.67
Female	10	66.67	11	73.33

The mean and standard deviation of the subject's characteristics were tabulated and divided into two groups: control and experimental (Table 2.0).

Table 2.0: Subject's Demographic Data

	Control (n=15)		Experimental (n=15)	
	Mean	SD	Mean	SD
Age (years)	49.46	7.08	46.80	10.33
Weight (kg)	62.33	7.80	62.67	11.04
Duration of current pain (months)	27.87	13.08	24.47	9.63
NPRS	4.67	0.98	4.8	0.94

Table 3.0: Paired t-test for PSEQ

	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	T value	P value
Experimental	43.33 ± 3.87	46.33 ± 3.85	15.37	0.00

In the pre-test intervention, the mean value and standard deviation were 43.33 ± 3.87, and in the post-test intervention, they were 46.33 ± 3.85. The results of the outcomes were reported in Table 3.3, which demonstrated that the PNE had a statistically significant influence on CLBP patients' self-efficacy (P 0.001). The results of the study were presented in Table 3.0, which revealed that PNE had a statistically significant effect on pain catastrophizing in CLBP patients, with a P value less than 0.05.

Table 4.0: Paired t-test for PCS

	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	T value	P value
Experimental	24.80 ± 2.01	22.00 ± 2.20	19.34	0.00

In the pre-test intervention, the mean value and standard deviation were 24.80 ± 2.01, but in the post-test intervention, they were 22.00 ± 2.20. The PNE had a statistically significant effect on pain catastrophizing in CLBP patients (P 0.001), according to the results of the outcomes presented in Table 4.0.

Table 5.0: Unpaired t-test (within-group analysis)

	Control (Mean ± SD)	Experiment (Mean ± SD)	Mean difference ± SD	T value	P value
PSEQ	1.20 ± 0.56	3.00 ± 0.76	1.80 ± 0.20	7.41	0.00
PCS	-0.80 ± 0.68	-2.80 ± 0.56	-2.00 ± 0.12	8.82	0.00

Table 6.0: Mean difference ± SD of Control Group

Control	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Mean difference ± SD
PSEQ	41.67 ± 5.23	42.87 ± 5.25	1.2 ± 0.02
PCS	26.93 ± 3.61	26.13 ± 3.74	- 0.80 ± - 0.05

According to the results of the research in Table 5.0, conventional therapy slightly improved self-efficacy and pain catastrophizing in CLBP patients.

DISCUSSION

PNE had a statistically significant influence on self-efficacy and pain catastrophizing in CLBP patients, according to the findings of this study. The existing literature highlights that a patient's expectation of recovery can influence prognosis. Patients who expect their LBP to improve are more likely to return to work or everyday activities, with a better overall prognosis (Hayden et al., 2019). Therapy anticipation is linked to continuous treatment because patients believe that by undergoing interventions, they would be able to learn how to cope with pain and return to their normal activities. Lower recovery expectations, on the other hand, resulted in continued activity limitations and a longer recovery period (Smeets et al., 2009). Pain education using metaphors, video, or graphics encouraged patients to acquire an interest in learning about pain and gain a deeper understanding of pain and pain experienced as a whole, according to PNE research (Louw et al., 2019). According to Nijs et al. (2011), "explaining the pain" through face-to-face education in conjunction with written materials can assist patients to gain a better grasp of pain biology and reduce catastrophic thinking by modifying pain cognition Using plain language for health-related education allows for the development of the most effective interventions.

The effect of lumbar resistance training on pain catastrophizing or fear-avoidance belief among obese individuals with LBP was studied in a study by Vincent et al. (2014). The findings show that increasing resistance training reduces pain intensity and catastrophizing, resulting in increased tolerance and self-efficacy during activity performance. The relationship between pain severity and pain catastrophizing is proposed. Pain catastrophizing can be alleviated by reducing pain intensity (Cheng et al., 2018). As a result, minimizing catastrophic cognitive allows patients to reconsider the risk of suffering and feel empowered in their regular activities (Vincent et al., 2014). This may explain why strengthening exercise has a positive impact on self-efficacy and pain catastrophizing. Despite this, there is just a little amount of evidence to back up the possible idea.

PNE has been found to be useful in lowering pain catastrophizing in several studies. PNE has a considerable effect on reducing catastrophic thoughts in patients with persistent spinal pain, according to Malfliet et al. (2017; Smeets, 2009). Furthermore, when PNE was coupled with another intervention, it had a significant influence on pain catastrophic thinking than when it was delivered independently. PNE combined with knee mobilisation exhibited a superior effect in reducing pain catastrophizing in knee osteoarthritis (Lluch et al. 2017). As a result, integrating PNE with conventional therapy to remove barriers, raise expectations, and thus enhance its effect is recommended.

Pain catastrophizing has been characterized as a strong predictor of CLBP as individuals may make negative assertions about their level of disability. As a result, reducing pain catastrophizing is linked to greater improvements in pain and disability (Bunzli et al., 2015) as well as a better treatment outcome by reconceptualizing and redefining pain (Schmidt, 2017; Louw et al., 2016). By redefining pain as the nervous system's interpretation of the possibility of harm, Louw et al. (2011) anticipated that patients would be more likely to move, exercise, and put themselves into some discomfort, rather than providing an exact evaluation of how much their spine or tissue is damaged. They may also have the fortitude to confront catastrophic pain thoughts and foster positive thinking. All of these side effects may cause patients to pay less attention to their suffering.

CONCLUSION

The purpose of this study is to determine the effects of PNE on self-efficacy and pain catastrophizing in CLBP patients. PNE has a statistically significant influence on self-efficacy and pain catastrophizing in CLBP patients. Low self-efficacy and catastrophic pain-related thoughts are regarded to be a predictor of LBP persistence and influence LBP recovery and overall result; hence, PNE becomes an important aspect of CLBP care. It should also be recommended that it be used in conjunction with conventional therapy to improve the effect or outcome of the intervention (Tegner et al., 2018). Incorporating an understanding of pain neuroscience theories into CBPL management will contribute to better coping strategies. This study provides practitioners with critical information on the prognosis of PNE programme participants. The limitation of the study is a smaller sample size reduces the study's power and raises the margin of error, thus leading to higher variability which may lead to biases. Convenience sampling was used for this study which might lead to challenges to replication of results as data does not provide the representative results and researcher bias can affect the sampling techniques. The subjects were given to fill out the questionnaire which could have led to response bias which can be accidental and influence the results.

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