Journal of Physics: Conference Series

PAPER • **OPEN ACCESS**

Effect of back-exercise on the level of pain and disability among hospital ward nurses with subacute and chronic nonspecific low back pain

To cite this article: J Fiter *et al* 2018 *J. Phys.: Conf. Ser.* **1073** 062027

Effect of back-exercise on the level of pain and disability among hospital ward nurses with subacute and chronic nonspecific low back pain

J Fiter[1], R A Werdhani[1*] and S Wahyuni[2]

[1]Department of Community Medicine, Faculty of Medicine, Universitas Indonesia, Jakarta, 10430, Indonesia
[2]Installation of Medical Rehabilitation of dr. H. Mohammad Rabain Hospital, Muara Enim, 31314, Indonesia

*E-mail: retno.asti@ui.ac.id

Abstract. Low back pain (LBP) in nurses decreases productivity due to disability. It also affects nurses' absenteeism and increases the prevalence of clinic visits. Strengthening the muscles of the lower back may reduce the level of pain and degree of disability. Thus, the purpose of this study was to investigate the effect of back-exercise on the level of pain and disability in subacute and chronic nonspecific LBP on hospital ward nurses. This quasi-experimental study included 20 participants who received a back-exercise intervention. Data were obtained by Visual Analog Scale (VAS) and Roland Morris Disability Questionnaire (RMDQ) before and after the back-exercise intervention. Other variables investigated were age, gender, body mass index, exercise habits, tendency of mental-emotional disorder, and years of working. Level of pain before the back-exercise intervention was 3.4 ± 0.8, while the level of pain after the back-exercise intervention was 0.5 (0–5.6, $p < 0.001$). The disability score before the back-exercise intervention was 6.8 ± 2.1, while disability score after the back-exercise intervention was 1.0 (0–6.0, $p < 0.05$). There was a significant relationship between the tendency of mental-emotional disorder to the change of disability score ($p < 0.05$). There was a significant difference in the level of pain and disability in subacute and chronic non specific LBP on hospital ward nurses following the back-exercise intervention. These data support the use of back-exercises for LBP.

1. Introduction

Lower back pain (LBP) is a prevalent musculoskeletal problem that occurs in all parts of the world and is one of the main causes of disability that limits work and negatively impacts the quality of life [1]. The economic burden due to LBP influences the workers, their families, companies, and even the government [2]. Many factors affect LBP, such as age, gender, level of education, body mass index (BMI), psychological aspects, and occupation type. Occupation plays perhaps the biggest role in the occurrence of LBP on workers that spend long periods of time standing, sitting, weightlifting, bending and twisting the body, and those exposed to whole-body vibration [3].

Relative to other occupations, nurses experience higher rates of LBP due to work-related accidents or musculoskeletal problems [4]. They often suffer back injury due to lifting and transferring patients, using non ergonomic hospital equipment, uneven work hours, high workload, and long durations of standing and walking [5]. Based on a study by Widiyanti, et al. in 2009, the prevalence of LBPin hospital nurses was 23% in Indonesia [6]. A pilot study that was conducted in RSUD showed that prevalence of LBP in nurses was 20%. Complaints about LBP is the most common reason for the absence of nurses and results in an increase in the other nursing staff's workload [7].

Recent reports suggest that back-exercise can reduce pain and disability in patients with LBP [8]. Back-exercise is a form of a simple exercise that is cheap, easily taught, and can be applied to the community of workers with multiple risk factors for LBP. Its primary aim is to improve spine curvature and strengthen lower back muscle to reduce symptoms of LBP in workers. This investigation examined the effect of back-exercise on the level of pain and disability among hospital ward nurses with subacute and chronic non specific LBP.

2. Methods

This research was a quasi-experimental study design and compared the subjects pre- and post-a four-week strength training intervention. The research was conducted in a hospital in November 2016. Research protocol was approved by Health Research Ethics Committe, Faculty of Medicine, Universitas Indonesia-Cipto Mangunkusumo Hospital. 20 hospital ward nurses who suffered from subacute and chronic non specific LBP participated in the present investigation.

Both male and female participants were included in the present study and were required to have at least one year of working time. Participants were required to undergo an examination using the VAS value and were included if they had a score of 1–5. Patients were excluded if they were on any type of analgesic therapy. All subjects participated voluntarily. Those who were pregnant, had severe hypertension, heart disease, or heart failure were excluded from the investigation. Subjects who failed to follow the exercise prescription were also excluded from the analysis.

The intervention consisted of back-exercise that utilized a combination of *pelvic tilting, double knee chest, bridging, prone plank, and side-lying abduction* movement. Independent variables like age, gender, body mass index (BMI), employment period, the tendency of mental disturbances emotional (GME), and the habit of regular exercise were also assessed. Dependent variables included the level of pain, value disability, changes in the level of pain, and changes in the value of disability.

Data collection was conducted using a screening questionnaire given to all the ward nurses in the hospital. The subjects that met the criteria for the research and agreed to participate in the research underwent a series of diagnosis examinations. One day prior to the back-exercise, research subjects completed the VAS questionnaire, RMDQ, and recording of risk factors. The intervention was administered in groups, twice a week, for 30 minutes, over the course of four weeks. At the end of the intervention, the subjects completed the same questionnaire and risk factor recording.

Data were collected and analyzed using the Statistical Package for Social Sciences (SPSS) program version 20 and arepresented descriptively and analytically. A Wilcox on signed-rank test was used to compare pre- and post-intervention values where appropriate. Statistical significance was set at $p < 0.05$.

3. Results

The socio demographic characteristics of the research subjects which were divided based on age, gender, BMI, employment period, the tendency of GME and exercise habit are displayed in Table 1. 75% of the included subjects were < 35 years and were all women. 85% of all subjects were non-obese, and most subjects had worked less than<8 years (55% of total subjects). Most of the research subjects did not experience the tendency to GME (65%). None of the subjects participated in regular structured exercise.

Table 2 shows the level of pain (VAS) before the intervention. There was a significant change in the level of pain before and after the exercise intervention, by 3.0 (−2.6–4.5). The value of disability (RMDQ) before the intervention was 6.8 ± 2.1, while after the intervention was 1.0 (0–6.0). Thus, changes in the value of disability were 5.4 ± 2.3. Table 3 shows the difference in pain level before and after the intervention. There was a significant difference in the level of pain suffered due tosubacute and chronic non specific LBP (from 3.4 to 0.5, $p < 0.001$).

Table 1. Sociodemographic characteristics of the research subjects

The characteristic	N	%
Age		
<35 years	15	75
≥35 years	5	25
Gender		
Male	0	0
Female	20	100
BMI		
Not Obese	17	85
Obesity	3	15
Working time*		
<8 years	11	55
≥8 years	9	45
The tendency of GME		
No	13	65
Yes	7	35
Regular exercise		
No	20	100
Yes	0	0

*Cut-off taken from the average value.

Table 2. The distribution in the level of pain and disability before and after the exercise intervention

	The level of pain (VAS)	The value of disability (RMDQ)
Before	3.4 ± 0.8	6.8 ± 2.1
After	0.5 (0–5.6)	1.0 (0–6.0)
Changes (margin)	3.0 (−2.6–4.5)	5.4 ± 2.3

Table 3. Wilcoxon tests on pain level before and after the exercise intervention

The level of pain	N	The middle value	Wilcoxon Test
			P
Before	20	3.4 ± 0.8	< 0.001*
After	20	0.5 (0–5.6)	

*p<0.05

Table 4. Wilcoxon test on disability value before and after the exercise intervention

The value of disability	N	The middle value	Wilcoxon Test
			P
Before	20	6.8 ± 2.1	< 0.001*
After	20	1.0 (0–6.0)	

*p<0.05

Table 4 shows the differences in disability before and after the intervention. The level of disability was significantly lower following the exercise intervention (from 6.8 to 1.0, $p < 0.001$). Table 5 shows the relationship between age, gender, BMI, exercise habit, and the tendency of GME to the changes in the level of pain and changes in the degree of disability. There were no significant relationships between age and BMI and the change in the degree of pain ($p > 0.05$) or in the changes in the value of disability ($p > 0.05$). The relationship between gender and the habit of exercise is negligible. There were no significant relationships between the tendency of GME to changes in the level of pain, but there was a significant relationship between the tendency of GME with changes in the value of disability ($p < 0.05$).

Table 5. The relationship of individual factors (age, gender, BMI, exercise habit, and the tendency of GME) to changes in the level of pain and changes in the value of disability

	Changes in the level of pain (margin VAS)	P a	Change the value of the difference in the RMDQ disability ()	P b
Age				
<35 years	2.8 (−2.6–4.5)	0.306	5.3 ± 2.4	0.833
≥35 years	3.2 (2.5–3.5)		5.6 ± 2.5	
Gender				
Male	0	N/A	0	N/A
Female	3.0 (−2.6–4.5)		5.4 ± 2.3	
BMI				
Not Obese	3.0 (−2.6–4.5)	0.616	5.4 ± 2.4	0.959
Obesity	2.5 (2.5–3.1)		5.3 ± 2.1	
Regular exercise				
No	3.0 (−2.6–4.5)	N/A	5.4 ± 2.3	N/A
Yes	0		0	
GME				
No	3.0 (−2.6–4.5)	0.588	4.5 ± 2.1	0.021
Yes	3.0 (1.3–3.8)		7.0 ± 1.9	

a: Mann Whitney *p<0.05
b: T-test independent

Table 6 shows the relationship between the work factors (working period) to changes in the level of pain and changes in the value of disability. There is no significant relationship between working period to changes in the level of pain ($p > 0.05$) or toward the changes in the value of disability ($p > 0.05$).

Table 6. Working time factor related to changes in the level of pain and the change in value disability

	Changes in the level of pain (margin VAS)	P	The change in value disability (Margin RMDQ)	P
Working Time				
<8 years	3.0 (0.4–4.5)	0.412	5.4 ± 2.8	0.912
Consecutive patients 8 years	2.8 (−2.6–3.5)		5.3 ± 1.9	

a: Mann Whitney
b: T-test independent

4. Discussion

This was the first investigation examining the impact of strength training on LBP in nurses aged <35 years. The results reported herein are in accordance with previous research hospital nurses which reported that a younger demographic is more susceptibleto LBP [9]. This situation LBP occurs early on during the career of hospital ward nurses and thus, earlyprevention is key to the long-term health of these patients. Also, this condition can also be caused by a young nurse who routinely carries out more physically demanding tasks.

The present investigation consisted of an all-female subject population. This is in line with the previous research on the population of nurses, which found that more women, compared to men, suffer from LBP [9].This discrepancyis likely caused because there are more female nurses than men and because of the anatomical and physiological differences across sexes. In this study, the subjects were mostly non-obese, which is similar to the study participants utilized in previous investigations, which also suggests that there is no significant relationship between BMI and the occurrence of LBP [6]. This suggests that obesity is not a major contributor to LBP in this population.

Another important aspect of the present investigation was that most of the participants had worked as a nurse for less than eight years. This suggests that LBP occurs early on within this population and calls for early preventive measures to be taken. Furthermore, the subjects studied herein did not show a tendency for GME. This indicates that the tendency of GME is not a risk factor for LBP in this population. Another pertinent finding of this investigation was that the majority of subjects did not participate in regular leisure-time physical activity. These findings further support the results of previous work that suggest that workers who do not exercise regularly are more at risk of experiencing LBP [10].

The ~85% lower LBP score following the exercise intervention is perhaps the most important finding of this investigation and is in accordance with previous research stating that back-exercise is useful to reduce the occurrence of pain in patients with chronic non specific LBP [11,12]. In this research, the disability rate decreased by 79% when measured after the intervention. This finding suggests that lower back-exercise attenuates the disability of nurses who suffer subacute and chronic non specific LBP, which is in accordance with results published previously [11,12].

There were no statistically significant relationships between the age factor and the changes in pain level. This result is in accordance with previous research that states that there is no significant relationship between the factor of life on the change of the level of pain. This may be caused by the small age range, which could have rendered the training response of PT hypoalgesia (EIH) undetectable. The relationship of gender factors to changes in the level of pain could not be analyzed because all the subjects were women and no male subjects were present for comparison.

BMI factor was not related to changes in the level of pain. This result is in accordance with previous research stating that there is no significant relationship between the obese group and non-obese group in decreasing the level of pain before and after the intervention of the back-exercise, where both groups equally experience significant lower levels of pain [13]. Considering that all the research participants studied herein did not participate in regular exercise training, it would not be appropriate to assess the correlation between exercise habits and LBP. The impact of leisure time physical activity on LBP should be the focus of future investigations.

There was also no tendency of GME to change the level of pain experienced by nurses who suffer subacute and chronic LBP. Low back pain patients who tend to experience GME or not to experience the tendency of GME have equally reduce the rate of pain. This relationship between GME and the changes in the level of pain has never been examined. Age was not associated with the change in disability scores. To our knowledge, there have been no investigations that describe the relationship between lifestyle factors with changes in disability. However, a mechanism that may occur in this research that the age range of the subject did not vary may cause EIH response that produced did not have the difference between the two age groups. In addition, the influence of gender on disability scores could not be analyzed because all the subjects of the present study were female.

BMI was also not significantly related to the change in disability rates. This finding is in accordance with recent reports, which suggest that there is no significant difference in lower disability index between obese and non-obese subjects following an exercise program [13]. The relationship between leisure-time physical activity and changes in the level of pain cannot be judged because none of the research subjects exercise dregularly. Thus, to assess this relationship, a more variable subject distribution is needed. Therewas a significant association between the tendency of GME and disability ratings in nurses who suffer subacute and chronic LBP. This research on the subject which tends GME have disability value before the intervention of higher compared with the subject that does not tend GME. The change in value greater disability on the subject which has the tendency of GME than the subject that does not tend GME.

IOP Conf. Series: Journal of Physics: Conf. Series **1073** (2018) 062027 doi:10.1088/1742-6596/1073/6/062027

Researchers believe that disabilityin groups that have the tendency to GME influenced by LBP and the tendency of GME (there are two things that contribute to the value of disability), while disability on the group does not have the tendency to GME only influenced by LBP only (only one thing that contributes to the value of disability) so the value of disability on the group that has the tendency of GME become greater than the group that does not have the tendency of GME. At the time of exercise, happened the secretion of endogenous opioid (beta secreting endorphins) that can reduce the level of pain and improve stress [14,15]. Changes the level of pain, also followed by the change in value disability with the improvement of stress than the value disability also improved [16]. Thus, on the group that tends GME also occur improvement disability by two mechanisms for the improvement of the disability caused LBP and repair disability caused by stress.

5. Conclusions

There is a significant relationship between the tendency for mental and emotional disturbances and changes in measures of disability and pain and disability before following a four-week back-exercise intervention in nurses suffering from non specific subacute LBP.

References

[1] Taimela S, Kujala U M, Salminen H H and Viljanen T 1997 The prevalence of low back pain among children and adolescents: a nationwide, cohort-based-administered questionnaire survey in Finland *Spine* **22** 1132–6.

[2] Andersson G B J 1997 The Epidemiology of Spinal Disorders. In Frymoyer J W (editor). *The Adult Spine: Principles and Practice.* Philadelphia: Lippincott-Raven pp. 93–141.

[3] Hoy D, Brooks P, Blyth F and Buchbinder R 2010 The epidemiology of low back pain *Best Pract. Res. Clin. Rheumatol.* **24** 169–81.

[4] Trinkoff A M, Lipscomb J A, Geiger-Brown J, Storr C L and Brady B A 2003 Perceived physical demands and reported musculoskeletal problems in registered nurses *Am. J. Prev. Med.* **24** 270–5.

[5] Trinkoff A M, Lipscomb J A, Geiger-Brown J and Brady B 2002 Musculoskeletal problems of the neck, shoulder, and back and functional consequences in nurses *Am. J. Ind. Med.* **200 2**41170–8.

[6] Widiyanti E C L, Basuki E and Jannis J 2009 The relationship the attitude of the body when lifting and moving patients on nurses women with lower back pain *Indon. Kedokt. Maj*. **59** 107–12.

[7] D'Errico A, Viotti S, Baratti A B, Barocelli Mottura A P, Tagna M, et al 2013 low back pain and the associated presenteeism among hospital nursing staff *J. Occup. Health* **55** 276–83.

[8] Dagenais S and Mayer J 2012 Adjustable lumbar support stabilitation exercise. In Dagenais S, Haldeman S (editor). *Evidence based management of low back pain.* The United States of America: Elsevier Mosby Inc pp. 91–103.

[9] Goni N T S, Khosama H and Tumboimbela M J 2016 Characteristics of the nurses in Irina F RSUP Prof. Dr. R. D. Kandou Manado is experiencing complaints lower back pain *J. e-Clinic*. **4**1–6.

[10] Basuki K J 2009 Risk factors of Genesis low back pain on the mining operator a nickel mining company in South Sulawesi *Promotion. Kesehat. Indones*.**4**115–21.

[11] You J H, Kim S Y, Oh D W and Chon S C 2014 The effect of a novel core stabilization namely with on managing variability with chronic low back pain: a, et al., experimenter-blinded study *Clin. Rehabil.* **28** 460–9.

[12] Wang X Q, et al. 2012 A meta-analysis of core stability exercise versus general exercise for chronic low back pain *Plos One* **7**1–7.

[13] Mangwani J, Giles C, Mullins M, Salih T and Natali C 2012 Obesity and recovery from low back pain : a prospective study to investigate the effect of body mass index on recovery from low back pain *Ann. R. Coll. Surg. Engl* **92** 23–6.

[14] Chatzitheodorou D, Kabitsis C, Malliou P and Mougios V 2007 A pilot study of the effects of high-intensity aerobic exercise versus passive intervention on pain, disability psychological

strain, and serum cortisol concentrations in people with chronic low back pain. *Physical Therapy* **87** 304–12.

[15] Mihardja H, Srilestari A, Budianto S A 2017 The effect of laserpuncture at the LI4 Hegu point on the plasma levels of β-endorphin in healthy subjects *J. Phys. Conf. Ser.* **884** 012065

[16] Siebenga J, Leferink V J M, Segers M J M, Elzinga M J, Bakker F C, Tan D H J, Rommens P M and Patka P 2008 A prospective cohort study comparing the VAS score and Roland-Morris spine disability-administered questionnaire in variability with a type A tbi thoracolumbar spinal fracture *Eur. Spine J.* **17** 1096–100.