

# The effectiveness of core stability exercises on nurse fatigue

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## Abstract

**Context:** Despite reporting a high prevalence of fatigue among nurses, few studies have been examined the impact of measures to reduce their fatigue.

**Aims:** The present study aims to examine the impact of core stability exercises on nurses' fatigue.

**Settings and Design:** The present study is a field trial study. The study population has been included all nurses who are employing in Shahid Rajaie hospital of Gachsaran.

**Materials and Methods:** A total of 46 eligible nurses were selected through convenience sampling but allocated between experimental and control groups based on block randomization. Nurses in the experimental group did a core stability exercise based on the protocol as three times a week for 6 weeks. The impact of exercise was evaluated using multidimensional fatigue inventory before and after the intervention.

**Statistical Analysis Used:** The collected data were analyzed using SPSS software through descriptive and analytical statistics such as the Chi-square test and *t*-test, taking into account the 95% confidence intervals.

**Results:** No statistically significant difference was observed in the mean score of total fatigue and its dimensions between two groups on precore stability exercises ( $P > 0.05$ ). However, the statistical significant difference was observed in mean scores of total fatigue and physical and mental subscales between the two groups after core stability exercises ( $P < 0.05$ ). Within-group comparison in the experimental group also showed the statistically significant difference by total fatigue, physical, and mental fatigues after core stability exercises compared to before one ( $P < 0.05$ ).

**Conclusions:** Core stability exercises were able to reduce nurses' fatigue, particularly mental and physical fatigues.

**Keywords:** Core stability exercises, Fatigue, Nurse

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**Received:** 24 May 2018; **Accepted:** 25 July 2018; **Published:** 08 October 2018.

## INTRODUCTION

Fatigue is a common problem among nurses,<sup>[1]</sup> and about 82% of emergency nurses have been experienced moderate-to-severe physical fatigue.<sup>[2]</sup> Fatigue varies from tiredness to exhaustion that may interfere with nurse's physical and cognitive performance. It is also a multidimensional concept including physical, psychological, and emotional aspects.<sup>[3]</sup>

Fatigue is not only dangerous to nurses themselves but also for the patients.<sup>[4]</sup> Recent studies reported a reduction of cognitive, mental, and motor skills<sup>[5]</sup> as well as nursing errors<sup>[6]</sup> following fatigue. Furthermore, Scott *et al.* have concluded that fatigue was associated with reduced quality of nursing care.<sup>[7,8]</sup> Therefore, the emphasis has been treated with the prevention of fatigue to improve the quality of nursing cares.<sup>[9]</sup>

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**How to cite this article:** Afrasiabifar A, Mosavi A, Mohammadian-Behbahani M, Hoseinichenar N. The effectiveness of core stability exercises on nurse fatigue. *J Nurs Midwifery Sci* 2018;5:9-14.

Access this article online	
Quick Response Code:	Website: www.jnmsjournal.org
	DOI: 10.4103/JNMS.JNMS_12_18

The review of the existing literature shows that fatigue among nurses has been interested to researchers in recent years,<sup>[2,10]</sup> and studies have generally emphasized on the necessity of prevention nursing fatigue. However, few studies have been examined the effect of different measures including mindfulness,<sup>[11]</sup> systematic relaxation,<sup>[12]</sup> and remedial exercises at work<sup>[13]</sup> for nurses' burnout, anxiety, stress, flexibility, fatigue, and musculoskeletal pains.<sup>[10]</sup>

The weakness of the central muscles of the body is a common cause of early fatigue. Core stability exercises are proposed for strengthening these muscles. In fact, the center of the body can be likened to a muscular box, in the front, back, top, and bottom that there are abdominal, paravertebral and gluteal, diaphragm, and pelvic girdle muscles, respectively. Twenty-nine muscles contribute to the stability of the vertebrae, pelvis, and kinetic chain during body movements. Core stability is defined as the body's ability to control the situation and motion of the central part of the body. Exercises of muscles responsible for core stability help them to maximize motor performance and prevention of injury.<sup>[14]</sup>

Core stability exercises improve body movements through maintaining the body postural and preventing unsuitable patterns of movement<sup>[15]</sup> The literature review indicates the positive effects of core stability exercises on balance of elderly women,<sup>[16]</sup> postural control ability and respiratory function in stroke patients,<sup>[17]</sup> physical, mental, and social status of the elderly,<sup>[12]</sup> and in women with knee osteoarthritis.<sup>[18]</sup> However, the impact of such exercises on individuals who are working in different jobs including nurses, whose core body muscles tolerate huge pressures during performing their duties, has not been reported yet. On the other hand, the different body positioning of nurses during their duties<sup>[19]</sup> and the high skeletomuscular complaints among them<sup>[20]</sup> may be followed by weakness in the shoulder and core body muscles and finally cause fatigue. Therefore, the main question was whether core stability exercises could modify fatigue in nurses. Hence, the present study aims to examine the impact of core stability exercises on nurses' fatigue.

## MATERIALS AND METHODS

The present research is a field trial study. The study population included all nurses working in different wards of Shahid Rajaie hospital of Gachsaran, 2014. The following formula was used to calculate sample

size:  $n = \frac{2 \left[ \left( \bar{x}_{1-\alpha} + \bar{x}_{1-\beta} \right)^2 \right] s^2}{d^2}$  Eligible nurses were selected as convenience sampling due to the limited study

population but those met, the inclusion criteria were randomly assigned to the intervention and control groups based on nonmatched blocked randomization. Based on the factorial rule ( $4! = 4 \times 3 \times 2 \times 1 = 24$ ), we created 24 blocks, namely ABCD, ABDC, ACBD, ACDB, ADCB, ADBC, BACD, BADC, BCAD, BCAD, BDAC, BDCA, CABD, CADB, CBAD, CBDA, CDAB, CDBA, DABC, DACB, DBCA, DBAC, DCAB, and DCBA. There were four participants – two participants for the test group and two participants for the control group – in each block. However, their arrangement varied. Subsequently, we selected blocks from these blocks. Capital letters of A and D were labeled for nurses in test Group and B and C for nurses in control group.

The inclusion criteria were employing in different wards of mentioned hospital, willingness to participate in the study, having a rotating working shift, lack of simultaneous participation in other exercise programs, noninvolvement in another profession other than nursing, nonemploying in nursing in other hospitals, having a minimum work experience of 1 year, no known history of heart and musculoskeletal diseases, and obtaining a score of 50 or higher based on multidimensional fatigue inventory (MFI) before the intervention. The exclusion criteria were incomplete questionnaire before or after the intervention, absence in some sessions of exercises, and unwillingness to continue the exercises. This study was approved by the Ethics Committee of Yasuj University of Medical Sciences. Informed consent was obtained from all nurses and they were assured that their information would be kept confidential and they can freely withdraw from the study at any stage.

## Procedure

Exercise sessions were scheduled a way that does not interfere with the working duties of nurses. All exercises were performed in a room of 3 m × 4 m which locating in mentioned hospital at 1 h before working shifts and under the direct supervision of the second author.

## Intervention

According to the protocol of core stability exercises, nurses in the intervention group did core stability exercises about 45 min as three times for 6 weeks [Table 1]. Its protocol includes three levels named; 1–3 that gradually progressed to Level 3. Level 1 was done in a stable condition and consisted of static contraction training. Level 2 was also done in a stable condition but consisting of dynamic training. Level 3 should be done in an unstable condition using Swiss balls. This level includes dynamic and resistance training.<sup>[21]</sup> We did not do the third level

**Table 1: Core stability exercise program**

Session	Type of exercises	Position	Sets and repetitions
1 <sup>st</sup> and 2 <sup>nd</sup> week	Holding the abdomen in	Supine	3 sets and 20 reps in each set
	Holding the abdomen in	Prone	3 sets and 20 reps in each set
	Holding the abdomen in	Squatting	3 sets and 20 reps in each set
3 <sup>rd</sup> week	Holding the abdomen in, with one leg in the abdomen	Supine	3 sets and 20 reps in each set
	Holding the abdomen in, with one leg in the abdomen	Prone	3 sets and 20 reps in each set
4 <sup>th</sup> week	Side lying bridge	Lateral	6 reps for each side of body with 10 s pause
	Side-lying bridge	Lateral	6 reps with 10 s pause for each side of body
	Holding the abdomen in, with limbs up and keep hands and feet close together	Supine	3 sets and 20 reps in each set
5 <sup>th</sup> week	Raising one leg out of the back	Squatting	3 sets for each leg and 20 reps in each set
	Doing long in a 45° inclined direction to the left or right	-	3 sets and 15 reps in each set
	Bringing up the arms and legs simultaneously	Prone	3 sets and 10 reps for each set
6 <sup>th</sup> week	Side-lying bridge with bringing up the leg	Lateral	6 reps for each side of body with 10 s pause
	Rotating the trunk		3 sets for each part of body and 20 reps for each set
	Raising the opposite arm and leg	Squatting	3 sets and 20 reps for each set
	Side-lying bridge with bringing up the leg	Lateral	6 reps for each side of body with 10 s pause

because this is done in people with imbalance disorders. Hence, the number of exercise sessions was reduced from 8 weeks to 6 weeks. Nurses were also continued exercises at least one time in their homes. Techniques and the correct form of doing exercises were shown in one session before starting the exercise program. Exercises are practiced in three different positions of supine, prone, and squatting and at the first and second levels that consisted of static and dynamic training. Nurses in the control group did not have any exercises.

### Measures

To collect data, the MFI was used. It consists of twenty items based on a 5-point Likert scale in five subscales of general fatigue, physical fatigue, mental fatigue, reduced activity, and reduced motivation. Each subscale has four items, and its score ranges between 4 and 20. The total score, as the sum of all its subscales score, ranges between 20 and 100. This questionnaire is commonly used for the measurement of chronic fatigue that its validity and reliability has been approved in the Persian version.<sup>[22]</sup> Nurses of both groups were asked to complete it a week before and after the completion of core stability exercises in the intervention group.

### Statistical analysis

Collected data were analyzed using descriptive and inferential statistics through SPSS version 21 (SPSS Inc., Chicago, IL, USA) software with a confidence level of 95% and statistical significance level  $P < 0.05$ . Parametric tests were used for data analysis since the distribution of fatigue scores has normal distribution. In addition, the simple Bootstrap technique was used to increase the accuracy of estimates and reliability of comparisons by selecting parameters of a confidence level of 95% and number of samples as 1000 in data analysis. Data collector and analyzer were blind related to participated nurses in groups.

## RESULTS

Forty-six female nurses with a mean age of  $29.4 \pm 3.9$  years old (range: 23–38) participated in the present study that 37% (17 nurses) were single and rests of them were married. The average work experience of nurses was 5.5 years or  $65.8 \pm 59.8$  months. Demographic variables of both groups have been shown in Table 2, and no significant differences were observed between the intervention and control groups. There was no significant difference between the two groups by a total mean score of fatigue and its subscales ( $P > 0.05$ ) before the intervention.

After the intervention, independent *t*-sample test indicated significant differences by a total mean score of fatigue and subscales of mental and physical fatigues between two groups. The mean difference of total fatigue, mental, and physical fatigue of two groups were 4.6 ( $P = 0.01$ ), 2.9 ( $P = 0.001$ ), and 3 ( $P = 0.001$ ) scores, respectively [Table 3].

Paired *t*-test to compare mean differences on postcore stability exercise compared to before one showed a significant difference in total fatigue and mental and physical fatigues ( $P < 0.05$ ) for nurses in intervention group, but no significant changes was observed for nurses in control group.

## DISCUSSION

This study was designed to examine nurses' fatigue following core stability exercises. The results showed that, although core stability exercises are unable to modify some aspects of nurses' fatigue, it could totally improve their physical and mental fatigue to some extent. Review of available literatures indicates that core stability exercises had been more investigated in ill persons than in healthy individuals. Furthermore, although the results of our study may be somewhat matching with the reported findings

as reduced fatigue of nurses following aerobic stretching exercises,<sup>[23]</sup> reduced emotional exhaustion of nurses after physical exercises,<sup>[24]</sup> and improving muscle strength following core stability exercises,<sup>[25]</sup> but the mentioned studies are different from our study in terms of some aspects such as sample size, exercise type, and duration of exercises.

The findings of other studies also demonstrated the usefulness of core stability exercises on symptoms such as fatigue and pain relieving. The positive impact of core stability exercises, for example, on fatigue in patients with cancer was reported.<sup>[26]</sup> Cho *et al.* also have stated that core stability exercises lead to an increased range of motion in patients with chronic low back pain.<sup>[27]</sup> Improved balance of educable mentally disabled students<sup>[28]</sup> and reduction of fatigue in women with breast cancer under radiotherapy<sup>[29]</sup> following core stability exercises have been also reported.

**Table 2: Demographic variables of two groups of nurses**

Variable	Group		Total (n=46)	P
	Intervention (n=23)	Control (n=23)		
Age (mean±SD)	30±3.7	28.9±4.2	29.4±4	0.3
Marital status, n (%)				
Single	9 (39.1)	8 (34.8)	17 (37)	0.5
Married	14 (60.9)	15 (65.2)	29 (63)	
Education level, n (%)				
AD of nursing	3 (13.1)	1 (4.4)	4 (8.7)	0.5
BSc/MSc of nursing	20 (86.9)	22 (95.6)	42 (91.3)	
Ward, n (%)				
Medical/surgical wards	6 (26.1)	9 (39.2)	15 (32.6)	0.3
Intensive wards	12 (52.2)	7 (30.4)	19 (41.3)	
Pediatric/gynecology	5 (21.7)	7 (30.4)	12 (26.1)	

SD: Standard deviation

The results of our study showed that core stability exercises were able to reduce physical and mental fatigues of nurses but unable to modify other dimensions of fatigue including motivation and general fatigue. Given the prevalence of skeletal muscular complaints such as low back pain among nurses which may be a sign of weakness in the core muscles including shoulder, paravertebral, and pelvic ones<sup>[30]</sup> which core stability exercises may increase the strength of these muscles. This is may be consistent with the effect of core stability exercises on lumbar vertebra instability in individuals with chronic low back pain<sup>[31]</sup> and variation in acceleration of trunk movement, pain, and disability in people with nonspecific low back pain.<sup>[32]</sup> Moreover, this finding can be also attributed to the nature of these dimensions and the causing factors. It seems that some types of fatigue such as reduced motivation are mostly resulted from professional and organizational backgrounds. Therefore, appropriate approaches to them should be taken into account.

Despite observed benefits following core stability exercises in reducing fatigues of nurses, the present study has some limitations that should be considered to the generalization of findings. One of the limitations was the nature of the studied variable. Fatigue is a subjective experience that great efforts have been made to both conceptualize it as well as to differentiate normal fatigue from abnormal or pathologic types. Hence, in addition to the phenomenology of normal and abnormal types of fatigue, epidemiology and etiology of fatigue should be also considered to investigate about fatigue in a different population.<sup>[33]</sup> Second, MFI was primarily developed to measure fatigue in cancer patients

**Table 3: Between-group comparison of mean scores of total sores of fatigue and its subscales**

Subscales	Group						Independent t-sample test		P
	Intervention			Control			95% CI of difference		
	Mean±SD	95% CI		Mean±SD	95% CI		Lower	Upper	
		Lower	Upper		Lower	Upper			
Total score									
Pre	57.7±4.7	55.6	59.5	57.9±8.4	54.8	61.8	-4.3	3.8	0.8
Post	53.8±5.2	51.7	55.9	58.4±6.6	55.9	61.1	-8.1	-1.1	0.01
General fatigue									
Pre	11.2±2.6	10.1	12.3	11.8±2.7	10.7	12.3	-2.2	0.8	0.3
Post	11.8±2.2	10.9	12.7	11.5±2.5	10.5	12.7	-1.1	1.6	0.6
Physical fatigue									
Pre	12.6±1.3	12	13.1	12.3±1.2	11.7	12.8	-0.4	1.1	0.3
Post	9.3±0.8	8.9	9.6	12.2±1.1	11.8	12.6	-3.5	-2.4	0.001*
Mental fatigue									
Pre	12.8±0.8	12.4	13.1	12.1±1.6	11.5	12.7	-1	1.4	0.09
Post	9.4±1.2	8.9	10	12.4±1.4	11.7	12.9	-3.6	-2.1	0.001*
Reduced activity									
Pre	11.3±2	10.5	12.1	11.2±2.1	9.9	12.5	-1.4	1.6	0.8
Post	12.2±2.1	11.7	13.1	11.3±2.5	10.3	12.4	-0.5	2.2	0.2
Reduced motivation									
Pre	11.1±2.2	10.2	11.9	10.4±3.1	9.3	11.7	-1.4	1.6	0.2
Post	10.3±2.1	9.9	10.6	10.9±2.3	10	11.9	-0.5	2.3	0.6

\*Significant differences. SD: Standard deviation, CI: Confidence interval



and has been also developed for other patients,<sup>[34,35]</sup> as well as its validity and reliability was reported good, but it is a self-report scale which the gathered information depends on the questions being asked based on the scale developer's conceptualization of fatigue and the respondent's answers based on his or her own interpretation. A number of issues should be considered while choosing a specific scale of fatigue for research such as aspects of fatigue are to be assessed, choosing a one-dimensional or multidimensional scale, and the suitability of scale for using in the target population.<sup>[33]</sup> Further studies are suggested to evaluate the efficacy of core stability exercises on fatigue through the selection of specific scales known as a visual analog scale for fatigue or visual analog rating of physical energy and mental energy to better clinical judgments. We concluded that core stability exercises were useful for reducing fatigue in nurses who participated in 6-week program of exercises. They were completely satisfied by performing this kind of exercise, especially since these types of exercises are very simple and they could continue and practice them in their homes.

## CONCLUSIONS

The finding of our study showed that core stability exercises were useful for reducing fatigue in nurses who participated in six weeks program of core stability exercises. They were completely satisfied from performing this kind of exercise especially since these types of exercises are very simple and nontime consuming and they could continue and practice them in their homes. It is also necessary to more investigate about the effects of core stability exercises on fatigue of nurses by using other tools particularly the specific questionnaire.

## Conflicts of interest

There are no conflicts of interest.

## Authors' contributors

Afrasiabifar A: Designing the study, analysis of data, and compiling the article. Mohammadian Behbahani M: Designing the study, sampling, performing and supervising core stability exercises, and compiling the article. Mosavi A: obtaining informed consent, collecting data, and compiling the article. Hosseinichenar N: obtaining informed consent, collecting data, and compiling the article.

## Financial support and sponsorship

Nil.

## Acknowledgment

We express thank to all nurses who participated in this study.

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