

Reduced Mental Workload of Neonatal Intensive Care Unit Nurses through a Self-designed Education Class: A Randomized Controlled Trial

Abstract

Background: One of the factors affecting the behavior and performance of nurses is mental workload. Training programs can improve the attitude, knowledge, and performance of nurses. However, the impact of these programs on mental workload is not clear. Therefore, the study aimed to evaluate and compare the effect of two conventional and self-designed education classes on the mental workload of neonatal intensive care unit (NICU) nurses. **Materials and Methods:** This study was conducted on 68 nurses, divided into two intervention and control groups. Subjects of the intervention group attended a social awareness reinforcement class, in which one of the dimensions of emotional intelligence was introduced and covered. Research tool was the mental workload questionnaire of National Aeronautics and Space Administration Task Load Index (NASA-TLX). **Results:** In this research, results of the paired *t*-test were indicative of a significant decrease in the mean score of mental workload immediately after the intervention ($t = 1.48, p < 0.001$) and one month later ($t = 1.11, p = 0.007$). Moreover, a significant difference was observed in the mean score of mental workload of the intervention group between before and after the conventional education class, and before and 1 month after the self-designed class using repeated-measures analysis of variance ($F = 21.31, p < 0.001$). **Conclusions:** According to the results of the study, the conventional education class had no impact on the mental workload, whereas the self-designed class significantly decreased mental workload. Therefore, it is suggested that education programs be conducted for NICU nurses to improve their emotional intelligence, which leads to decreased level of mental workload.

Keywords: Education, emotional intelligence, Iran, nurses, workload

Introduction

In every job, a large number of sources are involved in the formation of mental workload,^[1] which is one of the factors affecting the behavior and performance of nurses in work settings. Mental workload is the attempt of mind at performing work duties.^[2] In jobs that demand significant mental workload, there is a reduction in efficiency due to boredom, as well as memory loss, irritability, and learning inefficiency.^[3] High mental workload and occupational stress are two factors that threaten the health of staff in all organizations.^[4] Assessment of mental workload is an effective technique to evaluate the organizational performance of operators.^[5] Not only mental workload has direct effects on nurses as operators but also it is indirectly involved in communication, decrease of job satisfaction, and burnout, which might affect patient safety.^[6]

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In a study by Alken from a referendum in the United States, Canada, England, and Scotland, it was demonstrated that the absence of qualified nurses increased mental workload of the staff.^[7] Meanwhile, according to a survey that polled nurses of the Massachusetts State (2011), the majority of the subjects (87%) expressed the negative impacts of high mental workload, including delayed medication prescription, increased complications of medications, and insufficient patient education.^[8] In a paper published by Cheung, there was a high mental workload in 60% of nurses' withdrawal after evaluating the relationship between the mental workload of these individuals and their level of withdrawal. Meanwhile, one of the main causes of high workload is communication between the staff in the workplace.^[9]

Using another similar term of "emotional labor," Hong and Lee believe that most

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nurses have emotional labor above average. Emotional labor is a major cause of occupational stress, burnout, and turnover in nursing occupation.^[10] However, nurses are obligated to acquire abilities in order to manage emotional events in working environments.^[11-14] Literature review revealed a negative relationship between emotional intelligence and emotional labor.^[10] Emotional intelligence has four dimensions: self-awareness, social awareness, self-management, and relationship management.^[15] In addition, emotional intelligence is related to the ability to understand the emotions of oneself and others, which affects various aspects of life.^[16] Success of people in health organizations highly depends on their emotional intelligence, which allows individuals to make better decisions in difficult situations and prevents feelings such as anger, anxiety, and fear. Moreover, emotional intelligence simply relaxes the minds of individuals and paves the way for self-insight and creative ideas.^[17]

Coladonato and Manning measured emotional intelligence in nurse leaders and managers in a hospital, recommending that emotional intelligence be regarded a necessity for nurse leaders in order to improve the management of their staff members.^[18] Meanwhile, results of several studies have shown that nurses at the level of students, staffs, and leaders have an average-to-low level of emotional intelligence.^[19] Furthermore, factors such as level of education,^[20] educational plans, and training strategies are related to the improvement of emotional intelligence.^[21] Results of another study by Mohamed and Nagy indicated a negative relationship between job stress and emotional intelligence among academic members of nursing school.^[22]

Therefore, one of the most important responsibilities of managers is helping people to develop and improve their vocational abilities.^[23] The survival of an organization greatly depends on the level of knowledge and various skills of its staff. The more on-time and better these backgrounds are, the more will be the capability of adaptation of the organization to the environment.^[24] Consistently, universities of medical sciences in Iran have started holding continuing education programs for staff.

While participation in continuing education courses improves the knowledge and performance level of nurses, its impact on mental workload is still unclear. On the contrary, extensive efforts are dedicated to developing the cognitive and technical abilities of nurses in nursing training courses. Nevertheless, few activities have been performed on the development of emotional intelligence in nursing continuing programs.^[25] One of the complex care environments in hospitals is neonatal intensive care unit (NICU). Caring for neonates, infants, and premature babies requires high dedication and accuracy and is usually accompanied by high accountability, which totally increases mental workload. With this background in mind, this study aimed to evaluate the effect of two conventional education

and self-designed education classes prepared to improve a part of emotional intelligence that affects the mental workload of the nurses in NICUs.

Materials and Methods

This randomized controlled trial (IRCT20180511039604N1) was conducted on nurses working in NICUs of two educational hospitals (Alzahra and Shahid Beheshti) of Isfahan University of Medical Sciences, Isfahan, Iran during May–July 2016. The number of nurses in Shahid Beheshti center was twice the number of the staff in the Alzahra Hospital. Sample size was estimated at 34 for each study group, and subjects were selected through simple sampling and were then randomly allocated to the control and intervention groups. For randomization, a number was assigned to each nurse at first, followed by the provision of separated vote labels for each number and putting all the numbers in a vase and randomly drawing them out one by one. If the selected number was even, the nurse would be placed in the control group and vice versa ($\alpha < 0.05$, $z_1 = 1.96$, $z_2 = 0.84$, $d = 0.7s$).

Lack of permission to hold classes for above 30 individuals led to holding two separate classes (17 nurses per class) with the same contents for the intervention group in Alzahra and Shahid Beheshti centers with a one-day interval. Therefore, there were nurses from both medical centers in each class. Contents of the self-designed education class included the definition of emotional intelligence and its dimensions, and strategies to improve social awareness, including personality identification and personality categories based on colors (e.g., orange or green personality). The self-designed education class was held for the intervention group 1 week after the conventional education class. Data were collected using a two-part questionnaire, the first and second parts of which included demographic characteristics and the National Aeronautics and Space Administration Task Load Index (NASA–TLX), respectively. The latter is a common scale for measuring mental workload.

Inclusion criteria were having at least a BSc. degree in nursing, having a minimum of 6 months working experience in NICUs, no recent suffering from anxiety and depression confirmed by self-report, and lack of consumption of antianxiety and antipsychotic medications. Exclusion criteria were unwillingness to continue the research, unexcused class absences, sudden death of the relatives, being divorced, and detection of chronic or untreatable diseases in the subjects or their relatives. After filling the demographic characteristics questionnaire, the NASA's mental workload survey was completed by both groups and their responses were evaluated. Following that, subjects of both groups participated in an education class according to the routine continuing educational schedule for NICU nurses, which is recognized as "conventional education class" entitled "respiration management in neonates" in the present study. At the end of this class,

NASA-TLX questionnaire was completed again by all participants and the effect of the conventional education class on the mental workload of nurses was evaluated. However, the subjects of the intervention group attended an additional class designed by the researcher after a week. Previous coordination was carried out with the supervisors of both hospitals to determine the schedule of the class.

During the class, an experienced psychology expert with the license of emotional intelligence training was present. As mentioned before, emotional intelligence is composed of four dimensions: self-awareness, self-management, social awareness, and relationship management. Given the limited time for data gathering and reporting in this project, only one aspect of emotional intelligence (social awareness) was selected for training after consulting with the expert. In addition, the nurses in the intervention group attended a 4-h self-designed education class entitled, “emotional intelligence with an emphasis on social awareness.” After the class, NASA-TLX questionnaire was completed by the nurses in the intervention group. The same process was repeated 1 month after the intervention to assess the effect of stability of training emotional intelligence in the intervention group.

It should be noted that the validity of NASA-TLX mental workload questionnaire was previously confirmed in different articles, including the research by Ghorbani (2013).^[26] Moreover, the reliability of the questionnaire was approved in various studies. In this regard, Mohammadi *et al.* reported the reliability of the questionnaire at the Cronbach’s alpha of 0.84.^[27] NASA-TLX evaluates six subscales, including “performance, attempt, hopelessness, as well as mental, physical and time requirements” by a visual scale within a range of 0–100 in the form of five units. The definition and the concept of each subscale have been determined in the questionnaire, which should be studied by respondents before filling the survey. In this scale, minimum and maximum scores of each subscale are 0 and 100, respectively. Respondents should determine the score of each subscale through marking on the visual scale. The mean score of subscales is reported as the degree of mental workload, which is the score within the range of 0–100. In this regard, a mean score below 50 is considered acceptable and the scores above 50 are considered high. Data analysis was performed in SPSS version 18 (SPSS Inc., Chicago, IL, USA) using paired and independent *t*-tests and repeated measure analysis of variance (ANOVA).

Ethical considerations

A written informed consent was obtained from all nurses prior to the research. In addition, the subjects were ensured of the confidentiality terms regarding their personal information. Furthermore, they were allowed to withdraw from the research at any time.

Results

In this study, all subjects were female. Mean (SD) ages of the subjects in the intervention and control group were 35.03 (5.7) and 32.8 (3) years, respectively. According to the results, the highest work experience of nurses was in the range of 5–10 years. Regarding marital status, 66.7% of the intervention group and 83.3% of the control group were married. In terms of level of education, 100 and 93.3% of the subjects had a BSc. degree in the intervention and control groups, respectively. The *t*-test results were indicative of no significant difference between demographic characteristics of the participants in the study groups [Table 1]. The results also showed that the mean (SD) score of mental workload in the control group before and after participation in the conventional education class was 85.7 (11.9) and 82.8 (7.9), respectively. This mean (SD) was estimated at 87.5 (7.6) and 85.1 (8.3) in the intervention group before and after participation in the conventional education class, respectively.

Nevertheless, no significant difference was observed between the control and intervention groups in terms of the mean score of mental workload before and after participation in the conventional education class ($p = 0.28$ and $p = 0.15$). According to the results, the mean (SD) score of mental workload before and after participating in the self-designed class was 85.1 (8.3) and 72.2 (9.04), respectively, in the intervention group. The results of ANOVA demonstrated a reduction in the mean score of mental workload in the intervention group after attending the self-designed class ($p < 0.001$). The mean scores of intervention group before and after participation in the conventional education class and self-designed class are shown in Table 2. In addition, the results of least square difference *post hoc* test in the intervention group are presented in Table 3.

Discussion

According to the results of the research, no significant relationship was observed between the evaluated variables, including age, marital status, employment status, level of education, and work experience of nurses in the NICU before and after intervention with the mean score of mental workload. Similarly, Malekpour *et al.* reported no significant relationship between demographic characteristics of high school teachers and their mental workload mean scores.^[28] In the present study, results showed that the mean score of mental workload before and after participation in the conventional educative class in both groups was not significant. In many studies, the positive effect of education as an independent variable on variant-dependent variables was recorded. In this regard, Nastiezaie *et al.* (2016) marked a significant difference between the control and intervention groups after the participation of intervention group in an educational course.

Table 1: Comparison of NICU nurse's characteristics according to study groups (n=64)

Characteristics	Intervention group	Control group	Statistical results	<i>p</i> *
Age, mean (SD)	35.03 (5.74)	32.80 (3)	<i>t</i> =1.57	0.12
Marital status, <i>n</i> (%)				
Married	22 (66.70)	27 (83.30)	$\chi^2=3.11$	0.08
Single	12 (33.30)	7 (16.70)		
Type of employment, <i>n</i> (%)				
Formal	6 (16.70)	3 (6.70)	$\chi^2=3.34$	0.34
Arbitrary	16 (50)	15 (46.70)		
Contract	10 (30)	11 (33.30)		
Probation	2 (3.30)	5 (13.30)		
Literacy status, <i>n</i> (%)				
Bachelor	34 (100)	30 (93.30)	<i>Z</i> =1.43	0.15
Master	0	4 (6.70)		
Work experience (years), <i>n</i> (%)				
<1	5 (13.30)	7 (17.20)	<i>Z</i> =0.52	0.60
<5	8 (23.30)	9 (27.60)		
<10	11 (33.40)	9 (27.60)		
>10	10 (30)	9 (27.60)		

**P*: Student's *t*-test (*t*), Chi-square test (χ^2), Mann-Whitney U test (*Z*). SD: Standard deviation

Table 2: Comparing the mean scores of mental workload in intervention group before and after intervention

Time	Mean score (SD) of mental workload		Repeated measure ANOVA		
	Intervention group	Control group	<i>F</i>	<i>df</i>	<i>p</i>
Before participating in the conventional education class	87.5 (7.6)	85.7 (11.9)	21.31	3	0.001
After participating in the conventional education class	85.1 (8.3)	82.8 (7.9)			
After participating in the self-designed class	72.2 (9.04)	-			
One month after participating in the self-designed class	82.3 (8.3)	-			

SD: Standard deviation

Table 3: Least significant differences *post hoc* test for comparing *p* value between six double times of intervention separately

Time	After conventional educative class	After self-designed class	One month after self-designed class
Before conventional education class	0.15	<0.001	<0.001
After conventional education class	-	<0.001	0.003
After self-designed class	-	-	0.007

management program regarding the effect of educating time management on exam anxiety.^[29]

In addition, Schwendimann *et al.* conducted a cross-sectional study to assess the factors associated with high job satisfaction among healthcare workers in Swiss nursing homes. In the mentioned research, the educational needs of nurses, who were responsible for taking care of the elderly, were significantly different from what was acquired during their undergraduate education. There were still issues in the working environment, which were not understandable for the nurses. These individuals lacked some skills, such as social

communication, teaching patient care, and pharmaceutical information.^[30] According to the results of the present study, education may not always be effective in learning. Our findings demonstrated that a routine educational subject (e.g., respiratory management) had no significant effect on decrease of mental workload. This means that mental workload is not just affected by education and the presented content plays an important role in this regard as well.

According to the results of the present study, the mean score of mental workload of the subjects in the intervention group significantly decreased after participating in the self-designed class, which had a new content adjusted to the emotional needs of the participants. Nurses undertake different roles and duties in healthcare teams and are obligated to pass various training courses during their career.^[31] A literature review revealed that no similar studies were conducted on the effect of emotional intelligence education programs and their dimensions on mental workload. However, some studies have reported the positive effect of emotional intelligence education programs and its dimensions on a sense of humor, social support, the safety of work setting, and other relevant variables.

In a study by Akhoondlotfali *et al.*, courses on emotional intelligence had a positive and significant effect on the

decrease of professional conflict of nurses.^[32] In addition, Gignac *et al.* conducted a study on 309 male and female students within the age range of 17–64 years in the University of Western in Australia to assess the relationship between emotional intelligence and sense of happiness. The tests were performed to evaluate the emotional intelligence, happiness, personality, and cognitive abilities of the subjects. According to the results, those with high emotional intelligence had a high self-confidence in terms of controlling their emotions and improving their wellbeing in order to be able to enjoy high levels of happiness in life.^[33]

Similarly, in a study carried out by Abualrub *et al.* on nurses in hospitals of Jordan, a significant and positive correlation was found between the safety of the workplace and teamwork. In addition, a moderate positive correlation was observed between workplace safety and job resistance.^[34] It seems that effective communication in working groups and social supports are considered important and the causes of remaining in the nurse profession. In the present study, the mean score of mental workload of the subjects in the intervention group was significantly higher one month after the intervention, compared to immediately after the intervention. However, the mean score of mental workload one month after the intervention was still significantly lower, compared to before the intervention. This might be due to the short duration of the intervention (only 4 h of class participation).

It seems that the mental workload score might decrease by increasing the time of the designed education class. According to the results, while the mean score of mental workload increased again a month later, it was still lower than mental workload score before the intervention. Social support training must be continued for nurses to maintain their effectiveness. Therefore, it is recommended that this type of educational classes, which are related to emotional intelligence, be held for NICU nurses monthly or over shorter intervals in order to maintain the decrease in the mental workload of these individuals. It should be pointed out that while the mean score of mental workload significantly decreased after the intervention, the mean score of mental workload in this study was near 70, which was higher than the acceptable level of mental workload (<50) as introduced by the NASA-TLS rating scale.

One of the major drawbacks of this research was assessing only one dimension of emotional intelligence due to a shortage of time and limited financial support for the research. In addition, the sample size was small and the classes' duration was significantly low (4 h). However, no sample loss was observed in the study and subjects in both groups were carefully matched. Moreover, standardized tools were obtained to collect the data. It is suggested that similar studies be conducted at a more extended level.

Conclusion

In recent years, the society and the government have criticized nurses because of the low quality of patient care, which can be related to the dissatisfaction and high mental workload of nurses. It is hoped that the results of this study could be applied to take a step toward reducing the mental workload of nurses and increasing the quality of patient care. The results of the current study will be provided for nursing principals and managers in order to be used in their future programming to improve human relationships and enhance the social skills and emotional intelligence of nurses in organizations. Therefore, in order to reinforce emotional intelligence in nurses, it is suggested that the abilities of emotional intelligence be specifically taken into account in these individuals and training workshops be held to provide the necessary training for reinforcement of emotional intelligence so that nurses could achieve professional success.

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Conflicts of interest

Nothing to declare.

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