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The effect of aerobic exercise training on work ability of midwives working in health care centers

Zahra Abedian (MSc)[1], Minoo Safaei (MSc)[2]*, Seyed Reza Mazlum (MSc)[3], Seyed Reza Attarzadeh Hoseini (PhD)[4]

[1] Lecturer, Department of Midwifery, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
[2] Lecturer, Department of Midwifery, School of Nursing and Midwifery, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran
[3] Lecturer, Department of Medical-surgical Nursing, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
[4] Associate Professor, Department of Exercise Physiology, School of Physical Education and Sport Sciences, Ferdowsi University of Mashhad, Mashhad, Iran

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ABSTRACT

Background & aim: Maintaining and improving the work ability are important social goals, which challenge the health care and rehabilitation systems as well as health providers. The physical and mental health status affect the work ability. Regarding this, the current study aimed to investigate the effect of aerobic training on the work ability of the midwives in the health care centers of Mashhad, Iran in 2013.

Methods: This randomized clinical trial was conducted on 60 midwives working in the health centers of Mashhad, Iran, using purposeful sampling method. The health care centers were selected randomly, and then assigned into the intervention and control groups. Subsequently, the intervention group performed aerobic exercise for 24 sessions. Data collection was performed using the work ability index and the Bruce test (to compare the fitness of the participants at the pre- and post-intervention stages). For data analysis, the two-way ANOVA, Mann-Whitney U, and Chi-square tests as well as independent and paired sample t-tests were employed, using SPSS version 19. The P-value less than 0.05 was considered statistically significant.

Results: According to the results of the study, the mean score of work ability was significantly higher in the intervention group than that in the control group (40.5±4.9 vs. 36.4± 5.3, respectively; P=0.004). Furthermore, there was a significant difference between the two groups regarding the two variables including work ability compared with life time best (P<0.0001) and mental resources (P=0.036).

Conclusion: As the findings indicated, practicing aerobic exercise for eight weeks affected the mean work ability in the participants. Consequently, the managers are recommended to use such strategy in order to improve the work ability in the midwives in health care centers.

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Introduction

Work ability is defined as an individual's ability to manage job tasks. This concept is associated with individual factors such as physical and mental capacities, which is also influenced by out-work-life factors (1, 2). Nowadays, maintaining and improving the work ability are important social goals, which has received special attention in the national governmental program of several European countries (3). This subject is considered as a challenge for the health care and rehabilitation systems as well as health providers (4). Work ability as a multifactorial phenomenon depends on many factors that can be evaluated, using work ability index (5).

The work ability index is affected by both physical and mental aspects of work and health status including: diagnosed diseases by physicians, limitations caused in the work due to diseases, and the number of days of sick leave

* *Corresponding author:* Minoo Safaei, Department of Midwifery, School of Nursing and Midwifery, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran. Email: Safaeiminoo901@gmail.com

during the past 12 months. Regarding this, planning for the improvement of the work ability should involve the activities aimed to reduce work demands (e.g., time restrictions, employers' views, providing the facilities for the individual to control his/her work, and ergonomic factors) and enhance health status (e.g., improving the aerobic capacity in employees) (6, 7).

According to a study carried out by Kaleta et al., the job related factors and lifestyle should be considered in future programs to enhance the work ability (8). Today, the lifestyle of most people is going toward immobility and hypo mobility, a serious health problem in developed and developing countries (9-11). There are several prospective studies determining the predictor factors of work ability; however, the role of physical activity has not completely recognized yet (2). According to the professional health care principles, musculoskeletal difficulties are common problems among the personnel, leading to disability and off-works; therefore, the physical exercise can be effective in this regard (7).

Nurminen et al. reported that practicing physical exercise in the work environment once a week slightly improved the females' perceived work ability in difficult tasks (12). Consequently, it is necessary to determine an acceptable level of physical exercise to maintain and improve the work ability among the personnel (12). The nurses and midwives constitute the largest health care organization; accordingly, more than 80% of the patients receive direct services by this population (13). In many developing countries, the employment of the efficient midwives and nurses is considered as a priority of each health programs (14). With this background in mind, this clinical randomized trial was conducted to evaluate the effect of aerobic exercise on work ability. The purpose of this study is to improve the work ability through increasing the fitness level.

Materials and Methods

This clinical trial was conducted on the midwives working in the health care centers of Mashhad, Iran in 2013. First, the health care centers and sub-centers (No. 1, 2, and 3, urban centers) as well as the Samen health care centers and sub-centers (No. 1 and 3) were selected, using simple random sampling method. Subsequently, each center was randomly assigned into intervention and control groups. Then, the qualified midwives in these centers were selected based on the purposeful sampling method. Due to the lack of similar study, the sample size was calculated as a pilot sample, using the formula comparing means with safety coefficient of 95% and test power of 80%, which assigned 30 samples into each group (totally 60 cases).

The inclusion criteria were as follows: 1) the written consents to participate in the study, 2) Iranian nationality and Mashhad residency, 3) graduated midwifery degree, 4) no pregnancy, 5) non-menopause, 6) lack of psychological problems leading to admission to psychiatric hospitals, 7) not attending in any sport club and training sessions in the past three months, 8) lack of regular physical exercise, 9) lack of second shift work, 10) work history of one year or more, 11) body mass index of $\leq$ 30. On the other hand, the exclusion criteria included absence of more than five sessions from the exercise program and dealing with bankruptcy problem, divorce, and loss of family members in the past two months.

The data were collected using the demographic characteristics forms and work ability index questionnaire (WAIQ). The WAIQ was filled in before and after the aerobic exercise by the participants of both groups. First, all of the participants were tested by the researchers according to the Bruce test, using the treadmill (Technogym). Subsequently, the participants whose computed consumption oxygen was more than 10.5 mL/kg/min in the Bruce test (i.e., three folds more than the base) were entered in the study. The intervention group was required to perform aerobic exercise for eight weeks. The Bruce test was implemented to compare the fitness of the participants at the pre- and post-intervention stages. Finally, the work ability scores were compared in the two groups before and after aerobics exercise program. The present study was approved by the Ethics Committee of Mashhad University of Medical Sciences.

Work ability index

The work ability index consists of seven

dimensions including: 1) current work ability compared to life time best, 2) work ability in relation to physical and mental demands of the work, 3) number of current diagnosed diseases, 4) work impairment due to disease, 5) sick leave during the past year, 6) prognosis of work ability after two years, and 7) mental resources. The total score of this questionnaire has a range of 7-49 (i.e., low: 7-27, moderate: 28-36, good: 37-43, and excellent: 44-49) (15, 16). The reliability of this questionnaire was evaluated by Ehsanollah (2011), using the test-retest method. According to the test-retest results, the correlation coefficient between the items ranged from 0.74-0.88, which indicated an acceptable durability level (17). The reliability of this questionnaire was also calculated in the current study using internal homogeneity, which rendered the Cronbach's alpha coefficient of 082.

Physical exercise program

This exercise program, entailing 24 sessions (three sessions a week), was conducted outside normal working hours (i.e., from 6-6.45 p.m.) in the energy management club under the supervision of an exercise coach (MSc of physical education) and the researchers during July-October 2013. Every session lasted 45 min, which consisted of three stages including: warm-up stage (i.e., all types of walking, slow running, stretching exercises, and dancing for 15-25 min), aerobic exercise including slow walking and jogging (lasting 5 min in the first session and reaching to 20 min in the last session), and cooling-down stage (i.e., stretching exercises and walking for 10 min). Whereas the exercise time was fixed, the exercise load increased based on the exercise speed and severity (increasing the jogging distance). Furthermore, the activity duration was increased by reducing the resting time between the repeats or shortening the warm-up time. The maximum consumed oxygen increased from 30-60% over eight weeks.

Results

According to the results of the study, the mean age of the participants was 41.2±5.1 years (age range: 27-49 years). Furthermore, 86.7% and 86.7% of the participants in the intervention and control groups were married, respectively. Most of the samples in the control (86.7%) and intervention groups (86%) had the Bachelor of Science degree. In addition, 100% and 93.3% of the participants in the control and intervention groups had average economic level, respectively. Most of the subjects in the control and intervention groups were officially employed (76.7% and 80%, respectively).

The means of work history were 14.8±6.5 and 15.l7±5.3 years in the control and intervention groups, respectively. Additionally, 63.3% and 70.3% of the participants in the control and intervention groups were working in the Midwifery Department, respectively. Before the intervention, the means of maximum computed consumed oxygen levels according to the Bruce test were 23.4±6.8 and 24.5±7.4 mL/kg/min in the intervention and control groups, respectively.

Furthermore, the participants in the two groups were homogeneous in terms of such variables as age (P=0.290), marital status (P=1.000), literacy level (P=0.757), economic status (P=0.355), type of employment (P=0.974), work history (P=0.572), unit of service (P=0.584), and maximum consumed oxygen (P=0.691) at the pre-intervention stage. Before the intervention, the total means of the perceived work ability were 36.4±5.3 and 36.9±5.0 in the control and intervention groups, respectively. The results of the Mann-Whitney U test showed that there was no statistically significant difference between the two groups regarding the perceived work ability scores (P=0.722), indicating that the two group were homogenous in terms of the work ability.

However, the independent t-test revealed a statistically significant difference between the two groups regarding the increase of the work ability mean scores in the intervention group (P=0.004). Furthermore, the paired sample t-test indicated no statistically significant difference between the pre- and post-inter-vention work ability scores of the control group (P=0.963). Nevertheless, according to the Wilcoxon test, this value was found to be significantly different between the two stages in the intervention group, revealing an increase in the work ability after the intervention (P<0.0001; Table 1).

Table1. Descriptive statistics of work ability of the midwives working in the health care centers at the pre- and post-intervention stages

Variables	Groups Mean±S.D		P-value
Work ability Index (7-49)	Intervention	Control	
Pre-intervention	36.4±5.3	36.9±0.5	P=0.722
Post-intervention	40.5±4.9	36.9±5.1	P=0.004
P-value	<0.0001	0.963	

Table 2. Descriptive statistics of work ability sub-scales of midwives working in health care centers at the pre and post intervention stages

Sub-scales work ability		Groups Mean±SD		P-value
		Intervention	Control	
Work ability compared with life time best (0-10)	Pre-intervention	8.1±1.5	7.7±1.5	P=0.231
	Post-intervention	8.9±0.9	7.7±1.4	P<0.0001
Work ability in relation to physical and mental demands of the work (2-10)	Pre-intervention	7.9±1.4	8.4±1.3	P=0.287
	Post-intervention	8.8±1.1	8.3±1.1	P=0.138
Number of diagnosed diseases (1-7)	Pre-intervention	4.4±2.1	4.3±2.1	P=0.728
	Post-intervention	4.6±2.0	4.3±2.1	P=0.428
Work impairment due to disease (1-6)	Pre-intervention	4.9±0.9	5.0±1.1	P=0.596
	Post-intervention	5.1±1.1	4.9±1.1	P=0.500
Sickness absence in the past year (1-5)	Pre-intervention	3.9±1.1	4.2±0.8	P=0.307
	Post-intervention	4.2±0.9	4.2±0.8	P=0.748
Prognosis of work ability after 2 years (1, 4, 7)	Pre-intervention	5.2±1.7	5.6±1.5	P=0.412
	Post-intervention	5.9±1.5	5.6±1.5	P=0.436
Mental resources (1-4)	Pre-intervention	2.1±1.1	2.4±0.8	P=0.379
	Post-intervention	2.8±0.7	2.3±0.9	P=0.036

The mean of the seven sub-tests of the perceived work ability index was compared in the both groups before and after the intervention. Prior to the intervention, the two groups were homogenous in terms of all the sub-tests. However, following the intervention, the Mann-Whitney U test indicated a significant difference between the two groups in terms of two variables including work ability sub-test compared with best life time and mental resources (P<0.0001, P=0.036, respectively; Table 2).

Additionally, this test showed that at the end of the study, the maximum consumed oxygen levels were considerably higher in the intervention group than those in the control group (P=0.023). The two-way ANOVA was employed to determine the relationship between the work ability and the underlying and intervening variables after the intervention. As indicated, the work environment and the maximum consumed oxygen significantly affected the work ability both at the pre- and post-intervention stages, i.e., the participants' work ability in the Midwifery Department was 39.8±4.8; however, this value was 36.1±4.5 in the Maternal and Neonatal Unit. The participants having the maximum consumed oxygen range of 25.1-4.4 mL/kg had the highest work ability level before and after the intervention.

Discussion

As the findings of the current study demonstrated, the aerobic exercise, practiced for eight weeks, affected the mean work ability of the participants. According to the independent t-test, mean work ability scores at the end of the study was higher in the intervention group, compared to that in the control group (P=0.004). Similarly, the Wilcoxon test indicated that the mean work ability scores in the intervention group was higher at the post-intervention stage, compared to the pre-intervention one (P<0.0001), indicating the enhancement of the work ability level.

However, based on the paired sample t-test, there was no significant difference between the pre- and post-intervention work ability scores of the control group (P=0.963). At the end of the study, the two sub-tests including work ability comparing to best life time and mental

resources were more significantly increased in the intervention group than those in the control group. Ilmarian et al. (1996, 1997) demon-strated that performing physical exercise in the workplace once a week slowly increased the perceived work ability of the females working in the laborious enviro-nments. Accordingly, they reported that following the intervention, more people had a good or excellent work ability levels in the intervention group, compared to the control group. However, there was no difference in the work ability index of the intervention group at the end of the study (12).

In the present study, the mean work ability index was increased significantly (P=0.004), and the number of people with good and excellent work ability levels increased in the intervention group; nevertheless, the improvement was not statistically significant. The discrepancy between the findings of the current study and those of Ilmarian's can be due to the different occupational nature of the participants and physical exercise time scheduling. The physical exercise time scheduling in this study corresponded to holding three 45-min sessions a week, which was practiced outside normal working hours; however, in the Ilmarian's study, the program was conducted once a week within the working hours (each session lasted one h). In the present study, the study population consisted of midwives whose tasks were both physical and psychological; nevertheless, in Ilmarian's study, the study population was the laundrywomen whose job was mostly physical and led to more musculoskeletal diseases and problems.

Kettunen et al. (2002-2006) demon-strated that the practice of physical exercise intervention for 12 months (2-4 sessions a month) increased the work ability level of official employees and the employees with physical task both after the intervention and during the 12-month follow-up (18). The results of this study are consistent with those of Kettunen's since the both studies demonstrated the increase of the work ability.

Sjogren et al. (2001) reported that physical exercise in work environment did not increase the work ability immediately after ending the exercise period (P=0.237); however, it improved the work ability in the 12-month follow-up (P=0.000; 19). The findings of Sjogren's study are inconsistent with those of the present study. Our findings indicated that work ability was improved immediately after ending the aerobic physical exercise (P=0.004); nevertheless, the 12-month follow-up was not performed. This discrepancy can be ascribed to the physical exercise type as well as the duration and time of exercises. The physical exercise performed in the present study entailed holding three 45-min sessions a week for eight weeks (outside normal working hours). Nevertheless, in the Sjogren's study, the physical exercise program was practiced for 15 weeks in the work environment outside normal working hours. During the first five weeks, the exercises were performed once a week, and during the second and third weeks, they were seven or eight sessions a week. Furthermore, in the mentioned study, the participants exercised individually using sport instruments in workplace; however, the participants in the present study performed jogging as a group.

Additionally, Ilmarian et al. (1999) stated that the physical exercise might be a useful way to preserve and increase the work ability level through affecting the psychological aspects of the work (2). Similarly, our findings supported this point since the work ability increased after eight weeks of physical exercise, resulted from increase of the mental resources and work ability compared with best life time.

A long-term physical exercise improves physical readiness, which causes an individual to perform his/her job effectively and without tiredness and even save some energy to use at leisure time (20). These findings were supported by Sorensen et al., demonstrating that physical readiness index (i.e., maximum consumed oxygen) was significantly related to work ability (P=0.046). In the present study, the effect of aerobic exercise on fitness was determined by measuring the maximum consumed oxygen using the Bruce test.

As the findings of the present study indicated, there was a close relationship between work ability and maximum consumed oxygen, i.e., the work ability was greater in the participants with higher maximum consumed oxygen. In this study, fitness was introduced as a moderator variable between the aerobics exercise and work ability improvement.

Conclusion

According the findings of the current study, the aerobic exercise, which is a simple, low cost, easy, and low-risk jogging led to the improvement of work ability in the midwives. The findings of this study can be helpful in clinical programming to increase the midwives' work ability levels. The improvement of the physical and mental health of the midwives through aerobic exercise may enable them to do their duties more efficiently.

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Conflicts of Interest

There are no conflicts of interest.

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