

Kirkpatrick Evaluation of Theory-Based Educational Program for Low Back Pain Management in Teachers

Tahereh Kamalikhah,¹ Fatemeh Rahmaty Najarkolaei,^{2,*} Leila Sabzmakan,³ and Nooshin Rouhani Tonekaboni⁴

¹Department of Social Medicine, Semnan University of Medical Sciences, Semnan, IR Iran

²Health Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

³Department of Health Education, Alborz University of Medical Sciences, Karaj, IR Iran

⁴Department of Health Education, Gilan University of Medical Sciences, Rasht, IR Iran

*Corresponding author: Fatemeh Rahmaty Najarkolaei, Health Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran. Tel: +98-2182482469 Fax: +98-2188600062, E-mail: fatemeh_rahmaty@yahoo.com

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Abstract

Background: Low back pain (LBP) is the primary cause of disability for individuals under 45 years of age, the second most common reason for physician visits, and the third most common diagnosis for surgery. Evidence supports the effectiveness of the Alexander technique (AT) for chronic LBP. Health promotion programs must be evaluated to determine their sustainability and validity. The purpose of this study was to evaluate the theory-based AT program for the management of LBP in teachers according to the Kirkpatrick evaluation model.

Methods: This was a quasi-experimental study of female teachers with nonspecific LBP in southern Tehran in 2014. A group of AT training based on the integrative model (IM) of behavioral prediction contained 42 subjects and a group of AT training only contained 35 subjects. To evaluate the groups based on Kirkpatrick, a previously confirmed questionnaire was used for the reaction stage, and for the learning and behavior stage, a self-designed questionnaire was used that was confirmed for validity and reliability using content validity (CVR 0.94, CVI 0.90) and Cronbach's α (0.83). Skill was assessed using a checklist objectively. The data from before the intervention, right after, and 3 months later were assessed with an independent and one sample t-test, paired t-test, correlation, and univariate (GLM) through SPSS 19.

Results: Significant differences were not recorded between the two groups in terms of teaching methods ($P = 0.36$), class conditions ($P = 0.49$), and general assessment ($P = 0.11$). For teaching methods, the patients' satisfaction as reported in all items in both groups was higher than the number 4 ($P < 0.001$). In both groups, significant differences were recorded in knowledge, skills, and behavior before and after the intervention, but the AT training based on IM group was higher than the AT training only group in behavior and skills ($P < 0.001$).

Conclusions: Applying an educational framework such as IM to the design of AT lessons has positive effects on behavior and skills that can facilitate LBP management.

Keywords: Program Evaluations, Low Back Pain, Teachers, Educational Model

1. Background

Chronic low back pain (CLBP) is a chronic pain syndrome (recurrent or continuous) in the lower back region, lasting for at least three months (with or without radiculalgia) (1). Approximately 85% of low back pain (LBP) problems are non-specific in that pain is not attributable to a recognizable pathological cause, neurological problem, or anatomical defect (2). LBP is the primary cause of disability for individuals under 45 years of age, the second most common reason for physician visits, and the third most common diagnosis for surgery (3).

Iran is similar to other countries in which LBP is con-

sidered to be a health and socioeconomic problem (4). UK estimates place LBP as the biggest single cause of absence from work in 1988 - 89, when it was responsible for about 12.5% of all days of absence due to illness (1).

School teachers as an occupational group contain a high prevalence of musculoskeletal disorders (MSD) at between 40% and 95% (5, 6). Factors such as gender, age, work experience, awkward posture, repetitively holding one position for a long time, and head-down posture (as when reading, grading papers, and writing on a blackboard) are related to the high prevalence of MSD in teachers (7, 8). Strong evidence indicates that there is no single therapy

that is effective for patients with CLBP; therefore, most patients with CLBP are managed using different interventions that have uncertain scientific evidence of effectiveness (2).

The Alexander technique (AT) (9) is a self-care method that helps people to consciously alter habitual postural behavior and appears to be helpful for postural coordination (10). AT reduces unnecessary tension and elongates the spine in what has been referred to as the head-neck-back relationship using hand contact integrated with verbal explanation (11).

The effectiveness of AT training for CLBP has been proven (12). This technique is non-pharmacologic and is a complimentary treatment prone to fewer adverse reactions than drug treatments (13).

An integrative model (IM) of behavioral prediction is a combination of the theory of planned behavior (TPB), theory of reasoned action (TRA), and other existing models and theories; it was suggested by Fishbein (14). IM creates a framework for understanding, predicting, and changing a behavior. This model consists of constructs such as attitude, normative belief, perceived behavioral control, and behavioral intention. In addition, it recognizes that environmental constraints, skills, and abilities can moderate the intention-behavior relationship. This model has predicted behavioral intention for fruit and vegetable consumption, cancer self-examination, cancer screening, and cessation of smoking along with behaviors related to AIDS prevention (15-21).

Since there is no guarantee that health promotion (HP) programs will lead to what is expected or required, it is essential to obtain evidence that shows the effect of HP programs. Therefore, programs must be evaluated to ensure their sustainability and credibility (22, 23).

Downie and colleagues mentioned some reasons for HP evaluation: first, to ensure the achievement of the desired objectives, and second, to ensure the effectiveness of efficiency and its cost effectiveness. The other reasons are awareness of methodological development and ensuring ethical principles (24). On the other hand, evaluating educational programs (defined as the judgment process of aspects of learner behavior) is also an inseparable part of an educational system and includes a set of competencies that can be measured in such a way that it will be clear if the learner achieved the goals or not (25).

The Kirkpatrick model is one of those models that are based on the goal-oriented approach. This model is described as comprehensive, simple, and practical for most educational situations and it is considered by many experts to be a criterion in this scope. Kirkpatrick defined evaluation as an assessment of the effectiveness of an educational program and categorized it into four levels or

steps: Reaction, Learning, Behavior, and Results. Reaction is defined as a response that learners show to all of the effective factors during the implementation of the training period and information about it can be obtained through questionnaires or other common methods. Learning (Knowledge) is the determination of learning level, skills, techniques, and facts that have been learned by the participants and clarified to them during the training course and it can be discovered by evaluation before, during, and after the participation in the training course. Behavior, or the extent of the changes in the behavior of the participants because of the training course, can be measured by the continual assessment of the actual work environment. Results are the extent to which the fulfillment of the goals is linked directly to the organization. This level is difficult to measure, and evidence of results, such as cost reduction, duplication of displacement, accidents, and product quality enhancement and sales are checked (26-28).

Mazloomi et al. study mentioned that evaluation using the Kirkpatrick model has been done mainly on the levels of learning and reaction, and it also emphasized the importance of the need for evaluation of the levels of behavior and results. Additionally, AT training has not been evaluated in terms of reaction, learning, and behavior; only the degree of pain has been taken into consideration (29). Considering these factors, and since evaluation is often overlooked in HP programs, we conducted this project with the intention of evaluating the AT training course for female teachers of southern Tehran because of the prevalence of low back pain among them.

2. Methods

This was a quasi-experimental study of female elementary school teachers with nonspecific LBP in two governmental educational districts in southern Tehran. The study was carried out from January to December 2014. The subjects were randomly assigned to a group that did AT training based on IM or a group that did AT training only. The eligible participants were selected by purposive sampling of the case findings from the medical diagnoses by physical medicine and rehabilitation specialists.

The inclusion criteria were being female, experiencing non-specific CLBP persisting for more than 90 d or recurrent LBP, and agreeing to participate. The exclusion criteria were a history of malignancy, infection in the vertebral column, vertebral fractures, spinal surgery, confirmed osteoporosis, severe postural deformity, congenital abnormality of the spine, confirmed spondylolysis, inability to walk more than 100 m, confirmed rheumatoid arthritis, referring pain in the legs, numbness or pins-and-needles feelings in the feet or toes, difficulty in walking on toes and

heel, a positive straight leg rising (SLR) test in 70 angles, morning stiffness lasting more than 30 minutes, no reduction in pain after resting, and pregnancy. Patients with a low back complaint that had persisted less than 90 d were excluded. Initially, 86 subjects were determined to be eligible and recruited. In the final review, 42 subjects in the AT training based on IM group and 35 patients in the AT training only group participated in the intervention program. Program dropouts all cited conflicting class schedules; none dropped out as a result of the intervention.

2.1. Sample Size

The sample size was calculated as 30 subjects in each group considering $\alpha = 5\%$, the statistical power of 90% (Equation 1) (moderate effect size), and the Equation 2:

$$d = \frac{\mu_{1diff} - \mu_{2diff}}{\sigma_{diff1}^2 + \sigma_{diff2}^2} = 0.6 \quad (1)$$

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2}{d^2} = \frac{10.49}{0.36} = 29.1330 \quad (2)$$

Considering a 15% drop up sample, we added 5 samples to the optimal sample size, so we considered 70 samples in total.

2.2. Intervention

AT books and DVDs introduced by David Stuart Moore, director of the Australia AT school, were translated under the supervision of professors to produce a 90-page book in simple language (ISBN: 9786009434428) and a CD on inhibition and directions for rehearsals. These were provided to both groups. The group instructors were the researcher (PhD candidate in health education), a specialist in physical medicine and rehabilitation, and a physiotherapist. The intervention plan in one of the groups was based on the IM constructs, intervention mapping book (30), and related references (31). In the AT training based on IM group, five sessions were held in which the participants were divided into five groups of about seven teachers; in the AT training only group, three sessions were taught.

Teaching methods in both groups included lectures, demonstrations, and question and answer (Q and A), and the equipment consisted of photos, a video projector, chair, desk, mirror, pillow, bed, model of the spine, and a booklet. For class announcements, two methods were used: calling and texting each participant a week before, or texting just the night before the classes were held. In the AT training based on IM group, the purpose of each session and what was supposed to be done was explained.

The Helsinki codes were observed; the ethics committee of Shahid Sadoughi University of medical sciences,

Yazd, Iran approved the study. Oral consent was obtained before starting the classes. The educational authorities of Tehran city authorized the visits to the schools and the holding of the AT sessions. The participants in both groups were given on the job training (OJT) certification by the educational authorities of Tehran city.

2.3. Measures

The results of holding the classes were evaluated based on three levels of the Kirkpatrick evaluation model: reaction, learning, and behavior. A questionnaire was designed in advance for the reaction level (29) and a researcher created questionnaire was used for learning and behavior, and its validity and reliability were confirmed by Cronbach's $\alpha = 0.83$, CVR = 0.94, and CVI = 0.90.

The patients' reactions to the effective factors in the implementation of the training course were asked about by 10 questions on their evaluations of the teaching method and 11 questions on their evaluations of the conditions of holding the classes. The questions were rated on a 1 to 5 Likert scale (1 = bad to 5 = very good). The participants' general evaluations of attending the classes included 5 questions, and 4 questions investigated the amount of the inclination of the participants to apply the taught principles in daily life. These were rated on a 1 to 5 Likert scale (5 = I strongly agree to 1 = I strongly disagree). A skills assessment checklist of 18 items that recorded the two behaviors of getting up from and sitting down in a chair, which is one of the most fundamental AT lessons, and picking up light objects from the ground, was prepared and evaluated before and after the intervention by direct observation. In both groups, the reaction level was assessed immediately after the intervention, and the learning and behavior levels were examined after three months.

The data were analyzed using SPSS version 19 software and descriptive and analytic tests, such as the t-test (one sample and independent samples), paired t-test, Mann-Whitney, correlation, and covariance.

3. Results

In this study, 77 patients participated, 42 patients in the AT training based on IM group and 35 patients in the AT training only group. Their mean age was 6.27 ± 41.93 . Most were married (70, 88.6%) and the others were single. Another paper has reported (21) the demographic characteristics of the participants and the comparison of the differences in each of these characteristics as well as the other matching variables and IM constructs. No baseline differences were seen between the groups with regard to these constructs and variables (Figure 1).

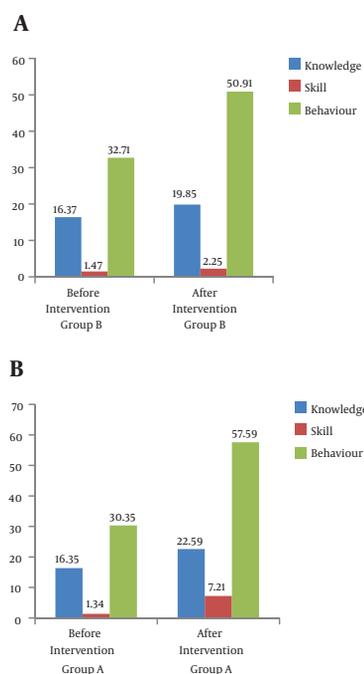


Figure 1. Group Means of Learning and Behavior Levels Before and After the Intervention

The mean of participant satisfaction with the teaching method in the classes in the AT training based on IM group and AT training only group was 48.57 ± 3.19 and 47.88 ± 3.38 (range 10-50 score), respectively; no significant statistical relationship was found between the groups ($p = 0.36$). Table 1 shows the mean scores for the evaluation of the reaction level. According to this both both groups in terms of class situation (score range 55 -11) and overall evaluation (score of 5-25) were not significantly different, $P = 0.49$ and $P = 0.11$, respectively.

Table 1. The Comparison of the Means of the Reaction Evaluation of Both Groups

Reaction Evaluation	Group	Mean \pm SD	P Value
Teaching technique	A ^a	48.57 \pm 3.19	0.36
	B ^b	47.88 \pm 3.36	
Class conditions	A	49.69 \pm 4.17	0.49
	B	50.91 \pm 10.58	
Overall assessment	A	20.85 \pm 1.50	0.11
	B	20.02 \pm 2.63	

^a AT training based on IM group.
^b AT training only group.

Table 2 shows the mean scores assigned to the items re-

lated to the teaching method (score range 1 - 5) by the participants. According to this the the satisfaction of the patients with all the items in this section was higher than the number 4 in both groups ($P < 0.001$). In both groups, the teachers' successfulness in transferring the content (eloquent and fluent expression) had the highest mean.

Table 3 shows the mean scores assigned to the items about the class conditions by the participants (score range 1 - 5). According to this the the satisfaction of the patients with all the items in this section was higher than the number 3 in both groups ($P < 0.001$). The timely announcements of the class in the control group and the announcements of topic and class goals in the AT training based on IM group had the highest means.

Table 4 shows the frequency of participant responses to the questions about items related to overall assessment. According to this the the options of attending the class in the AT training only group and satisfaction with the teaching method in the AT training based on IM group had the highest percentages. Using correlation analysis, the overall assessment of the classes in both groups in terms of the conditions of holding classes was statistically significant, but no significant relationship was observed between the satisfaction with teaching method and the overall assessment.

There were significant differences in the knowledge, skills, and behavior of the participants before and 3 m after applying the intervention. The analysis of the covariance showed that after the intervention, the participants in the AT training based on IM group had significant differences in skills and behavior compared to the AT training only group. A related table has been reported in another paper (21) (Table 5).

5. Discussion

This study aimed to evaluate AT classes based on Kirkpatrick's model by comparing an AT training based on IM group and an AT training only group. The results of the evaluation of the classes in the patients reaction section showed that the differences between the patients in the AT training based on IM group and the AT training only group in terms of satisfaction with the teaching methods, class conditions, and overall assessment were not statistically significant, which reflects the lack of difference in the patients' reactions to both types of training methods. However, the patients' satisfaction reported in all items about the teaching methods and class conditions was higher than average, indicating the success of holding the classes in both groups.

Considering that in both groups, the teacher's success in the transfer of content (eloquent and fluent expression)

Table 2. Mean of Scores Allocated by Participants to Items Related to Teaching Technique

Items Related to Teaching Technique	Group	Mean \pm SD	Score Range		One Sample T-Test With Test Value: 4
			Lower limit	Upper limit	
Communication skills (verbal communication such as pitch, expressive words, and normal speech rate; and non-verbal communication like facial expressions, hand movements, sitting posture, and walking status)	A ^a	4.90 \pm 0.297	4	5	< 0.001
	B ^b	4.82 \pm 0.38	4	5	< 0.001
The fitness of the training content with the topic and class goals	A	4.92 \pm 0.260	4	5	< 0.001
	B	4.82 \pm 0.51	3	5	< 0.001
The effectiveness of the teaching method used by the teacher in the skill development of AT application of participants	A	4.83 \pm 0.37	4	5	< 0.001
	B	4.65 \pm 0.48	4	5	< 0.001
The usage of teaching aid devices to facilitate learning	A	4.66 \pm 0.37	2	5	< 0.001
	B	4.60 \pm 0.77	2	5	< 0.001
Teacher success in transfer of contents (eloquent and fluent expression)	A	4.95 \pm 0.21	4	5	< 0.001
	B	4.91 \pm 0.28	4	5	< 0.001
Scientific expertise of the teacher	A	4.90 \pm 0.29	4	5	< 0.001
	B	4.88 \pm 0.32	4	5	< 0.001
Way of instructor's teaching in drawing participants' attention	A	4.85 \pm 0.41	3	5	< 0.001
	B	4.82 \pm 0.51	3	5	< 0.001
Logical and practical sequence of presented content	A	4.83 \pm 0.53	2	5	< 0.001
	B	4.88 \pm 0.32	4	5	< 0.001
Attraction of learners' participation by the teacher	A	4.88 \pm 0.53	3	5	< 0.001
	B	4.88 \pm 0.32	4	5	< 0.001
Pre- and post-test questions	A	4.80 \pm 0.45	3	5	< 0.001
	B	4.71 \pm 0.45	4	5	< 0.001

^aAT training based on IM group.^bAT training only group.

had the highest average, and in the class conditions, the timely announcements of the class in the control group and the announcements of the topic and objectives of the class in the AT training based on IM group had the highest averages, they can be considered as the strengths of this study. The teachers used quite eloquent and fluent expressions and avoided jargon, therefore, using this method and the announcement method (which are described in the method section) is highly recommended and researchers can benefit from these items in future studies. In the study by Mazloomi et al. people were also relatively satisfied with the teaching methods and class conditions (29). In this study, in the class conditions in both groups, the lowest level of satisfaction was related to the layout of the seats in terms of convenience, access, and teacher observation.

This can be attributed to the practical nature of AT training, which needs the demonstration method of teaching and an adequate place to observe the teacher's explanation, and because this location was provided to the re-

searchers by the educational system, the researchers had no control over it. Hence, it is recommended that in future studies of teaching AT, more attention will be paid to the place and location. In contrast to this study, Mazloomi et al.'s study reported that information had the lowest levels of satisfaction (29).

The assessment of the participants' amount of learning in both groups, which was evaluated with the two items on amount of knowledge and skills, showed that 3 months after the intervention, knowledge and skills in both groups rose meaningfully. Several studies have emphasized the effectiveness of educational programs on the knowledge enhancement and skills of the participants. Hadavandi's study investigated the evaluation of the effectiveness of a crisis management workshop in Kerman that was taught with the Kirkpatrick method and found that the training course was effective in the knowledge enhancement and knowledge of the target group in the field of crisis management (32). Another study that eval-

Table 3. Mean Scores Assigned by Participants to Items Related to the Class Conditions

Relevant Items of Class Conditions	Group	Mean \pm SD	Score Range		One Sample T-Test With Test Value: 4
			Lower limit	Upper limit	
Chair arrangement in terms of comfortable sitting, access, and viewing the lecturer	A ^a	3.40 \pm 1.01	1	5	< 0.001
	B ^b	3.60 \pm 1.01	1	5	< 0.001
Noise control in the training implementation place	A	4.28 \pm 0.74	4	5	< 0.001
	B	4.31 \pm 0.78	3	5	< 0.001
Amount of brightness (light) in education place	A	4.52 \pm 0.59	3	5	< 0.001
	B	4.40 \pm 0.65	3	5	< 0.001
The ratio of training space to the number of attendees	A	4.47 \pm 1.03	1	5	< 0.001
	B	3.97 \pm 0.89	2	5	< 0.001
The opportunity to participate in discussions	A	4.59 \pm 0.62	3	5	< 0.001
	B	4.51 \pm 0.56	3	5	< 0.001
Notification Status of the Classes in Each of the Following cases					
Timely notification	A	4.92 \pm 0.62	4	5	< 0.001
	B	4.94 \pm 0.23	4	5	< 0.001
Declaration of class subject and objectives	A	4.95 \pm 0.26	4	5	< 0.001
	B	4.88 \pm 0.32	4	5	< 0.001
Scheduling of classes	A	4.76 \pm 0.48	3	5	< 0.001
	B	4.71 \pm 0.51	4	5	< 0.001
Doing class management and discipline	A	4.80 \pm 0.39	4	5	< 0.001
	B	4.74 \pm 0.44	4	5	< 0.001
How to use the educational tools in the class	A	4.54 \pm 0.55	3	5	< 0.001
	B	4.62 \pm 0.59	3	5	< 0.001
Presentation of new scientific content in class	A	4.83 \pm 0.37	4	5	< 0.001
	B	4.80 \pm 0.53	3	5	< 0.001

^aAT training based on IM group.^bAT training only group.**Table 4.** The Frequency of the Participants' Responses to the Items Related to Overall Assessment

Items Relevant to Overall Assessment	Group	Completely Agree	Agree	No Idea	Disagree	Completely Disagree
Attendance in this class resulted in good usage of my time.	A ^a	40 (95.2)	2 (4.8)	0	0	0
	B ^b	33 (94.3)	1 (2.9)	1 (2.9)	0	0
Class welfare conditions (reception, heat, cold, etc.) were acceptable.	A	9 (21.4)	2 (4.8)	27 (64.3)	2 (4.8)	2 (4.8)
	B	10 (28.6)	1 (2.9)	20 (57.1)	1 (2.9)	3 (8.6)
I was satisfied with the teaching method in the class.	A	41 (97.6)	1 (2.4)	0	0	0
	B	26 (74.3)	8 (22.9)	1 (2.9)	0	0
Class time duration regarding the volume of content.	A	2 (4.8)	1 (2.4)	30 (71.4)	7 (16.7)	2 (4.8)
	B	2 (5.7)	5 (3.14)	13 (37.1)	8 (22.9)	7 (20)
I can apply the content presented in the class.	A	35 (83.3)	4 (9.5)	2 (4.8)	0	1 (2.4)
	B	22 (62.9)	6 (17.1)	5 (14.3)	0	2 (4.8)

^aAT training based on IM group.^bAT training only group.

uated a training course that used the Kirkpatrick method for nurses working with DC shock showed similar results (33).

In this study, 3 months after the intervention, the par-

ticipants in the AT training based on IM group had higher skills and behavior that can be attributed to the AT teaching based on IM. Since these participants had no differences in their reactions to and knowledge of the Kirk-

Table 5. The Correlation Between Overall Assessment and Other Intervention Conditions and Patients' Learning

Items	Groups	Overall Assessment	Satisfaction with Teaching Method	Satisfaction with Class Condition	Patients' Learning
Overall assessment	A ^a	1			
	B ^b	1			
Teaching method	A	0.189	1		
	B	0.060	1		
Class conditions	A	0.376 ^c	0.597 ^d	1	
	B	0.412 ^c	0.220	1	
Patients' learning	A	0.456 ^d	0.053	0.063	1
	B	-0.275	-0.502 ^d	-0.435 ^d	1

^aAT training based on IM group.^bAT training only group.^cCorrelation is significant at the 0.05 level (2-tailed).^dCorrelation is significant at the 0.01 level (2-tailed).

patrick evaluation model, but 3 months after the intervention they had differences in skills and behavior, this study indicates the importance of the measurement of all levels of the Kirkpatrick evaluation model and reveals that proper reactions and class satisfaction are not predictive of people's behavior. On the other hand, Gielen and colleagues' study stated that IM is an innovative approach and much effort is needed to design, test, and evaluate interventions based on models like IM for the preventive behavior of damage (34).

In Reddy and colleagues' study, the participants showed a better level of skill, lesser pain, and better posture after 6 sessions of 45 minutes of AT training and exercising for 15-20 minutes (35). According to the results of this study, the accompanying AT training course with health educational and promotion models and designing interventions based on these models can develop people's skills in doing this technique and performing better behavior. According to Hollinghurst's study, if AT training is accompanied by exercise, it has higher cost effectiveness in comparison with AT training alone (36).

The overall evaluation of the participants had a positive and meaningful statistical relationship with the class conditions and had no relationship with the teaching method and learning level, which indicates the importance of paying attention to the class conditions. The present study, which focused on three levels of the Kirkpatrick evaluation model, suggests that AT training based on IM has more effect on the improvement of behavior and skills as variables that measure the knowledge level of the Kirkpatrick evaluation model than AT training alone. Although in contrast to other studies conducted in Iran that have only focused on two levels of the Kirkpatrick evalua-

tion model, this study evaluated three levels of the Kirkpatrick evaluation model but did not evaluate the results level of the Kirkpatrick evaluation model due to the length of time needed to evaluate this level; this is a limitation of this study and it is highly recommended that evaluating the results level is considered in future studies. Other limitations of this study were that all the participants were female teachers, which resulted in low external validity, and also, the sample size was small.

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Footnote

Authors' Contribution: Tahereh Kamalikhah conducted this study. Fatemeh Rahmaty Najarkolaei designed part of the study. Leila Sabzmakan designed part of the study. Nooshin Rouhani Tonekaboni contributed to the article.

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