

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

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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. Group one AT training based on the integrative model (IM) of behavioral prediction contained 42 subjects and group 2 AT training alone 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  $\alpha$  (0.83). Skill was assessed using a checklist objectively. The data from before the intervention, after, and 3 months later were assessed with an independent and one sample t-test, paired t-test, correlation, and univariate (GLM) assessment via 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 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 radiculargia) (1). Approximately 85% of low back pain (LBP) problems are non-specific and 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 considered to be a health and socioeconomic problem (4). UK estimates 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 have a high prevalence of musculoskeletal disorders (MSD) ranging from 40% to 95% (5, 6). Factors such as gender, age, work experience, bad posture, remaining in one position for a long time, and head-down posture (as when reading, grading papers, and writing on a blackboard) are causes of high prevalence of MSD in teachers (7, 8). Strong evidence indicates that there is no single therapy effective for patients with CLBP; therefore, most patients with CLBP are managed using different interventions (2).

The Alexander technique (AT) (9) is a self-care method that helps people to consciously alter habitual postural be-

havior 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 be successful, it is essential to obtain evidence that shows the effect of HP programs. Programs must be evaluated to ensure their sustainability and credibility (22, 23).

Downie and colleagues mentioned several reasons for HP evaluation: first, to ensure the achievement of the desired objectives, and second, to ensure the effectiveness of efficiency as well as its cost effectiveness. Other reasons are awareness of methodological development and ensuring ethical principles (24, 25).

The Kirkpatrick model is a model based on the goal-oriented approach. 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. 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, dupli-

cation 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). We sought to assess AT training course for female teachers of southern Tehran with low back pain.

## 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. 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. In the final review, 42 subjects in the AT training based on IM group and 35 patients in the AT training group participated in the intervention program.

### 2.1. Sample Size

The sample size was calculated as 30 subjects in each group considering  $\alpha = 5\%$ , the statistical power of 90%.

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 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. In the AT training based on IM group, the purpose of each session and what was supposed to be done was explained.

### 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 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  $6.27 \pm 41.93$ . Most were married (70, 88.6%). No baseline differences were seen between the groups with regard to these constructs and variables (Figure 1).

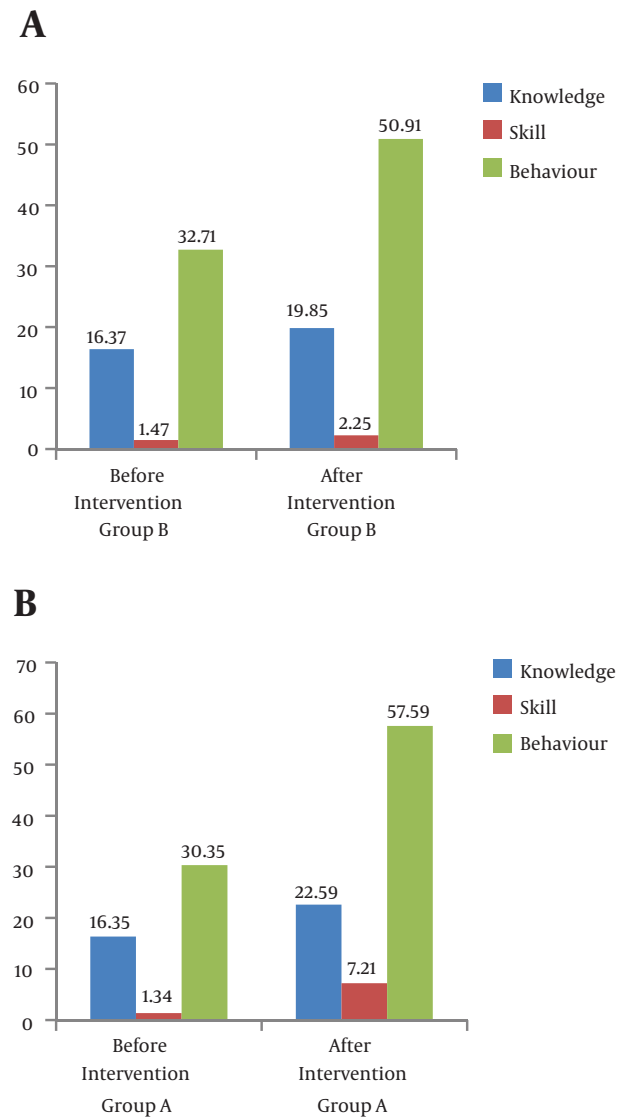


Figure 1. Group Means of Learning and Behavior Levels Before and After the Intervention

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  $48.57 \pm 3.19$  and  $47.88 \pm 3.38$  (range 10-50 score), respectively; no significant statis-

tical 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 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 <sup>a</sup>	48.57 $\pm$ 3.19	0.36
	B <sup>b</sup>	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	

<sup>a</sup> AT training based on IM group.

<sup>b</sup> AT training only group.

Table 2 shows the mean scores assigned to the items related to the teaching method (score range 1 - 5) by the participants. According to this 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 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 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 differ-

ences 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) 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. 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.

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

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

**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 <sup>a</sup>	4.90 $\pm$ 0.297	4	5	< 0.001
	B <sup>b</sup>	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

<sup>a</sup>AT training based on IM group.

<sup>b</sup>AT training only group.

exercising for 15 - 20 minutes (34). 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 (35).

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.

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## Footnote

**Authors' Contribution:** Tahereh Kamalikhah conducted this study. Fatemeh Rahmati- Najarkolaei designed part of the study and advisor of it. Leila Sabzmakan designed part of the study. Nooshin Rouhani Tonekaboni contributed to the article.

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

Relevant Items of Class Conditions	Group	Mean ± 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 <sup>a</sup>	3.40 ± 1.01	1	5	< 0.001
	B <sup>b</sup>	3.60 ± 1.01	1	5	< 0.001
Noise control in the training implementation place	A	4.28 ± 0.74	4	5	< 0.001
	B	4.31 ± 0.78	3	5	< 0.001
Amount of brightness (light) in education place	A	4.52 ± 0.59	3	5	< 0.001
	B	4.40 ± 0.65	3	5	< 0.001
The ratio of training space to the number of attendees	A	4.47 ± 1.03	1	5	< 0.001
	B	3.97 ± 0.89	2	5	< 0.001
The opportunity to participate in discussions	A	4.59 ± 0.62	3	5	< 0.001
	B	4.51 ± 0.56	3	5	< 0.001
<b>Notification Status of the Classes in Each of the Following cAses</b>					
Timely notification	A	4.92 ± 0.62	4	5	< 0.001
	B	4.94 ± 0.23	4	5	< 0.001
Declaration of class subject and objectives	A	4.95 ± 0.26	4	5	< 0.001
	B	4.88 ± 0.32	4	5	< 0.001
Scheduling of classes	A	4.76 ± 0.48	3	5	< 0.001
	B	4.71 ± 0.51	4	5	< 0.001
Doing class management and discipline	A	4.80 ± 0.39	4	5	< 0.001
	B	4.74 ± 0.44	4	5	< 0.001
How to use the educational tools in the class	A	4.54 ± 0.55	3	5	< 0.001
	B	4.62 ± 0.59	3	5	< 0.001
Presentation of new scientific content in class	A	4.83 ± 0.37	4	5	< 0.001
	B	4.80 ± 0.53	3	5	< 0.001

<sup>a</sup>AT training based on IM group.<sup>b</sup>AT training only group.

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**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 <sup>a</sup>	40 (95.2)	2 (4.8)	0	0	0
	B <sup>b</sup>	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)

<sup>a</sup>AT training based on IM group.<sup>b</sup>AT training only group.**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 <sup>a</sup>	1			
	B <sup>b</sup>	1			
Teaching method	A	0.189	1		
	B	0.060	1		
Class conditions	A	0.376 <sup>c</sup>	0.597 <sup>d</sup>	1	
	B	0.412 <sup>c</sup>	0.220	1	
Patients' learning	A	0.456 <sup>d</sup>	0.053	0.063	1
	B	-0.275	-0.502 <sup>d</sup>	-0.435 <sup>d</sup>	1

<sup>a</sup>AT training based on IM group.<sup>b</sup>AT training only group.<sup>c</sup>Correlation is significant at the 0.05 level (2-tailed).<sup>d</sup>Correlation is significant at the 0.01 level (2-tailed).

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