

# Alexander Technique Training Coupled With an Integrative Model of Behavioral Prediction in Teachers With Low Back Pain

Tahereh Kamalikhah,<sup>1</sup> Mohammad Ali Morowatisharifabad,<sup>1,\*</sup> Farid Rezaei-Moghaddam,<sup>2</sup>

Mohammad Ghasemi,<sup>3</sup> Mohammad Gholami-Fesharaki,<sup>4</sup> and Salma Goklani<sup>5</sup>

<sup>1</sup>Department of Health Education, Shahid Sadoughi University of Medical Sciences, Yazd, IR Iran

<sup>2</sup>Physical Medicine and Rehabilitation, Army University of Medical Sciences, Tehran, IR Iran

<sup>3</sup>Health Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

<sup>4</sup>Department of Biostatistics, Tarbiat Modares University, Tehran, IR Iran

<sup>5</sup>Rehabilitation Faculty, Tehran University of Medical Sciences, Tehran, IR Iran

\*Corresponding author: Mohammad Ali Morowatisharifabad, Research Training Complex of Imam Reza, Behdasht Faculty, P.O. Box: 89165887, Yazd, IR Iran. Tel: +98-2536240691, Fax: +98-2536238555, E-mail: morowatisharif@yahoo.com

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## Abstract

**Background:** Individuals suffering from chronic low back pain (CLBP) experience major physical, social, and occupational disruptions. Strong evidence confirms the effectiveness of Alexander technique (AT) training for CLBP.

**Objectives:** The present study applied an integrative model (IM) of behavioral prediction for improvement of AT training.

**Methods:** This was a quasi-experimental study of female teachers with nonspecific LBP in southern Tehran in 2014. Group A contained 42 subjects and group B had 35 subjects. In group A, AT lessons were designed based on IM constructs, while in group B, AT lessons only were taught. The validity and reliability of the AT questionnaire were confirmed using content validity (CVR 0.91, CVI 0.96) and Cronbach's  $\alpha$  (0.80). The IM constructs of both groups were measured after the completion of training. Statistical analysis used independent and paired samples t-tests and the univariate generalized linear model (GLM).

**Results:** Significant differences were recorded before and after intervention ( $P < 0.001$ ) for the model constructs of intention, perceived risk, direct attitude, behavioral beliefs, and knowledge in both groups. Direct attitude and behavioral beliefs in group A were higher than in group B after the intervention ( $P < 0.03$ ).

**Conclusions:** The educational framework provided by IM for AT training improved attitude and behavioral beliefs that can facilitate the adoption of AT behavior and decreased CLBP.

**Keywords:** Alexander Technique, Educational Model, Low Back Pain

## 1. Background

Chronic low back pain (CLBP) is a public health problem in many countries. Individuals suffering from CLBP experience major physical, social, mental, and occupational disruptions. The effects of low back pain (LBP) include the loss of physical functions, deterioration of general health, and constant or episodic pain (1). 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 (2). Approximately 85% of LBP problems are nonspecific in that the pain is not attributable to a recognizable pathological cause, neurological problem, or anatomical defect (1).

Iran is similar to other countries in which LBP is considered to be a health and socioeconomic problem (3). It ranks third for cause of disability adjusted life-years in people aged 15 to 69 years (4). The general categories of risk

factors for LBP are individual (genetics, gender, age, height, weight, body mass index (BMI), physical activity, spinal mobility, and smoking); psychosocial (stress, anxiety, and depression); and occupational (heavy lifting, pushing and pulling, repetitive work, statistical posture and vibration, keeping the head in a forward position for long periods, awkward postures such as trunk flexion with or without rotation, combined trunk flexion, and manual lifting frequent trunk bending).

School teachers as an occupational group contain a high prevalence of musculoskeletal disorders (MSD) at between 40% and 95% (5, 6). Factors such as sex, age, work experience, awkward posture, repetitively holding one position for a long time, and a 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). In occupational settings, educational programs can ef-

fectively decrease the incidence of LBP (9). Because CLBP is a multifactorial phenomenon in terms of etiology, approaches considered for treatment include medication, injections, physical therapy, behavioral therapy, manipulation, biofeedback, electromyography, traction, transcutaneous electrical nerve stimulation, orthotics, acupuncture, and spa therapy (4, 10). Strong evidence indicates there is no single therapy that is effective for patients with CLBP; therefore, most patients with CLBP are managed using various interventions having uncertain scientific evidence of effectiveness (11).

The Alexander technique (AT) (12) is a self-care method to consciously alter habitual postural behavior and appears to be helpful for postural coordination (13). 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 (14).

A randomized controlled trial in 2008 revealed that AT courses have long-term benefits for LBP and are more effective than massage and exercise (15). The effectiveness of AT training for CLBP has been proven (16). This technique is non-pharmacologic and is a complimentary treatment prone to fewer adverse reactions than drug treatments (17). In health education, the provision of knowledge only is not sufficient to change behavior, thus, understanding potential intermediate factors that may lead to successful behavioral changes is also important (18). Theory-based interventions can motivate people to change their attitudes and behaviors (19).

Psychological factors such as perceived risk of prolonged problems, self-efficacy, and behavioral beliefs, which form part of the theory of reasoned action (TRA), are considered during the management of CLBP (20). The integrative model (IM) is a combination of the theory of planned behavior (TPB), TRA, and other existing models and theories that have been suggested by Fishbein (21). IM creates a framework for understanding, predicting, and changing a behavior. This model consists of constructs such as attitude, normative beliefs, 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, smoking cessation, and behaviors related to AIDS prevention (22-26). TPB has been applied to hand hygiene habits, heavy lifting, proper and safe posture (27, 28), diet, exercise (29), the use of an elevator to transport patients, and self-management of rheumatoid arthritis (18).

## 2. Objectives

Theory-based intervention can motivate people to change their attitudes and behaviors; however, AT training has not been associated with health education models thus far. The present study was designed and implemented to assess the effect of the design of AT lessons based on IM among female teachers in southern Tehran, Iran.

## 3. Methods

This was a quasi-experimental study of female elementary teachers with nonspecific LBP in two governmental educational districts in southern Tehran, Iran. The study was carried out from January to December 2014. The districts were selected randomly and were assigned to either group A (AT based on IM) or group B (AT only) by simple randomization. The eligible participants were initially selected by purposive sampling or case findings using specialist prepared checklists and visiting primary schools in the two districts, then referring to physical medicine and rehabilitation specialists for confirmation of the medical diagnosis.

Inclusion criteria were being female, experiencing non-specific CLBP persisting for more than 90 days or recurrent LBP, and an agreement to take part in the study. Exclusion criteria were having 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, and an inability to walk more than 100 meters. Further exclusion criteria were having confirmed rheumatoid arthritis, referring pain to the legs, numbness or pins and-needles feelings in the feet or toes, difficulty in walking on the toes and heel, positive straight leg rising (SLR) test in 70 angles, morning stiffness lasting more than 30 minutes, no pain reduction after resting, and pregnancy. Patients with a low back complaint that had persisted less than 90 days were also excluded. Initially, 86 subjects were determined to be eligible and recruited. Following their diagnosis in the final review, 42 subjects in group A and 35 in group B participated in the intervention program. Program drop-outs all cited conflicting class schedules; however, no subjects dropped out as a result of the intervention.

### 3.1. Sample Size

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

$$\begin{aligned}
 n &= \frac{\left(Z_{\frac{\alpha}{2}} + Z_{\beta}\right)^2}{d^2} \\
 &= \frac{10.49}{0.36} \\
 &= 29.13 \\
 &\sim 30
 \end{aligned}
 \tag{1}$$

$$\begin{aligned}
 d &= \frac{\mu_{1\text{diff}} - \mu_{2\text{diff}}}{\sigma_{\text{diff}1}^2 + \sigma_{\text{diff}2}^2} \\
 &= 0.6
 \end{aligned}
 \tag{2}$$

Considering a 15% drop up sample, we added five samples in the optimal sample size; thus, we considered 70 samples in total.

### 3.2. Study Instruments

An elicitation study was conducted to design the IM construct questionnaires about AT by preparing a semi-structural questionnaire based on a literature review (30). A total of 15 eligible teachers from the target group were interviewed about the pros and cons of applying AT, their attitudes toward AT, and environmental constraints. Content analysis was used to label the themes according to the IM constructs.

The design of the self-report AT questionnaire based on IM was prepared using the results of the elicitation study. They were confirmed by a content validity ratio (CVR), content validity index (CVI), face validity, and Cronbach's  $\alpha$ . To evaluate the CVR, 11 specialists reviewed the questionnaire and expressed their recommendations on the necessity of every item. The Lawshe table was used to determine a score of 0.96 after items with CVR values of less than 0.59 were eliminated.

Specialists evaluated each CVI item for relevancy, clarity, and simplicity. After eliminating items with CVI values of less than 0.79, the score was determined to be 0.91. To determine face validity, the opinions of 25 eligible teachers from the target group concerning the intelligibility and clarity of items were applied. The internal consistency of the questionnaire was evaluated using a Cronbach's  $\alpha$  of 0.80. The design and grading of the IM construct questions were consistent with the Fishbein approach (21, 31). The 41-item AT questionnaire included demographic data, generalized intention, knowledge, attitude, behavioral beliefs, perceived risk, and perceived environmental constraints.

The inquiries were rated on a 1 to 7 Likert scale (7 = "I strongly agree" to 1 = "I strongly disagree"), except for the questions about knowledge, which offered true-false or "do not know" responses. Table 1 shows the IM constructs and sample CVI, CVR, Cronbach's  $\alpha$ , and attributable range

for each construct. The validity and reliability of the Persian version of the Roland-Morris disability questionnaire has been confirmed (32). A visual analog scale questionnaire was also employed (33).

### 3.3. Educational Plan

Introduced AT books and DVDs 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 the inhibition and directions for rehearsals. These were provided to both groups. The group instructors were the researcher (a Ph.D. candidate in health education), a specialist in physical medicine and rehabilitation, and a physiotherapist. The intervention plan in group A was based on the IM constructs, intervention mapping book (34), and related references (29). Group A had five sessions (AT based on IM) and group B had three sessions (AT only) that were taught. The common educational program between the two groups included: AT origin, concepts and principles, introducing and rehearsing inhibition and direction, chair work, and the application of AT in daily activities. Box 1 shows the methods and techniques used for AT training in group A.

The Helsinki codes were observed and the Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran approved the survey. Oral consent was obtained in both groups. Educational authorities of Tehran city authorized us to visit schools and to hold AT sessions and also provided on-the-job training (OJT) certification for participants in both groups.

### 3.4. Statistical Analysis

All data were analyzed by the Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, IL, USA). Results for continuous variables are expressed as mean  $\pm$  SD. Categorical variables are shown as a frequency (percent). For statistical analysis, parametric (independent and paired-samples t-test, univariate generalized linear model [GLM] [ $\alpha = 0.05$ ]) analyses were used to compare response variables according to the two groups. Also, chi-square and Fisher's exact tests were used to compare proportions between the two groups.

## 4. Results

The 77 assessed teachers were divided into two groups. Group A (42 patients) attended AT training based on IM and group B (35 patients) attended AT training only. The mean age of the patients was  $42.15 \pm 6.19$  years (range: 27 - 58 years). Married patients (77.9%) formed the majority of the

**Table 1.** CVR, CVI, Cronbach's A, Sample IM Construct Questions, and Attributed Range

IM Constructs and Sample Questions	CVR	CVI	Cronbach's A	Attribute Range
<b>Generalized intention (4 questions): I intend to apply AT principles to daily activities.</b>	1	1	0.88	4 - 28
<b>Knowledge (11 questions): Position of the head on the spine plays no role in LBP.</b>	0.92	0.97	0.81	(-3.63) - 11
<b>Attitude (8 questions): Difficult ↔ Easy (bipolar adjectives).</b>	1	0.98	0.88	8 - 56
<b>Behavioral belief (7 questions): AT improves LBP without taking drugs.</b>	0.92	0.97	0.79	7 - 49
<b>Perceived risk (6 questions): LBP decreases work output.</b>	0.78	0.97	0.78	6 - 42
<b>Perceived environmental constraints (5 questions): No rules exist in the education ministry about standardized furniture.</b>	0.86	0.92	0.67	5 - 35
<b>TOTAL</b>	0.91	0.96	0.80	

**Box 1.** Intervention Plan for Group A

Techniques
<b>Techniques Used to Increase Perceived Risk</b>
Teaching methods: lectures. Equipment: photos, video projector. Fear arousal, anticipated regret, scenario-based risk information.
<b>Techniques Used to Increase Knowledge</b>
Teaching methods: lectures, demonstrations, questions and answers (Q and A). Equipment: photos, video projector, chair, desk, mirror, pillow, bed, model of the spine, book. Chunking (example): head forward and up, torso lengthened and widened, legs release away, shoulder out to the side, advance organizer, elaboration, create cues.
<b>Techniques Used to Shape or Change Attitudes</b>
Teaching methods: lecture, Q and A, group discussion, role playing. Equipment: photos, video projector, SMS. Direct experience: self-reevaluation. Persuasive communication: verbal encouragement, persuasive SMS, social comparison and modeling, repeated exposure (reminder SMS every week, installation of posters in the classroom and corridor of the institute, two reminders to install in the home), anticipated regret, one-sided messages (up to the third session), two-sided messages (after the third session).
<b>Techniques to Improve Perception of Environmental Constraints and Change Environment</b>
Teaching methods: lecture, Q and A. Equipment: photos, video projector. Advocacy, change system, training in problem solving.
<b>Techniques to Change Habitual Behavior</b>
Teaching methods: lecture, Q and A. Equipment: photos, video projector, posters, SMS. Implementation intentions, early commitment, modeling, stimulus control, environmental clues, attribution.

study population. It was found that 49.4% of teachers had taken action to cure their backaches before the beginning of the survey; 21.5% had visited a doctor for CLBP while duration of LBP was  $3.80 \pm 4.21$ . Table 2 shows the basic demographic characteristics and the status of LBP in the subjects, and Table 3 shows the other matching variables. The results for the t-tests and  $\chi^2$  tests showed no statistically significant differences between groups for baseline data ( $P > 0.05$ ). The mean scores of the IM constructs at the commencement of the study are shown in the first column of Table 4. The t-tests showed no baseline differences between groups with regard to these constructs.

Table 5 shows the views of all participants concerning the environmental constraints. As seen, 60% believed there were no regulations in the ministry of education for standardized furniture and equipment for teachers, and 52 subjects (65.8%) believed there were no standardized fur-

niture and equipment in schools. Furthermore, 16 subjects (20.3%) believed that nonstandard domestic equipment and furniture in their homes made back care more difficult.

The improvements in groups A and B immediately post-intervention were strongly significant for all constructs ( $P < 0.001$ ). In group A, the univariate GLM test revealed significant improvements for the constructs of direct attitude ( $P = 0.03$ ) and behavioral beliefs ( $P = 0.03$ ).

## 5. Discussion

This semi-experimental study investigated the effect of the design of AT lessons based on IM in teachers with LBP. The results show that, although improvements were seen in all IM constructs in both groups right after the interventions, the results for the constructs of direct attitude

Table 2. Demographic Characteristics of Attendees<sup>a</sup>

Matching Variables	Group A	Group B	P Value
Age	42.59 ± 5.85	41.62 ± 6.62	0.49
Work experience	19.30 ± 6.61	18.82 ± 6.49	0.75
BMI	27.79 ± 3.97	27.94 ± 3.71	0.87
Roland-Morris score	5.66 ± 4.1	7.06 ± 4.44	0.157
Pain score	5.25 ± 1.53	5.06 ± 1.53	0.57
Duration of LBP	3.21 ± 3.6	4.6 ± 4.8	0.16
Marital status			0.88
Married, No. (%)	34 (75.6)	28 (82.4)	
Single, No. (%)	11 (24.4)	6 (17.6)	
Education			0.48
AA degree, No. (%)	24 (54.5)	14 (43.8)	
High school diploma, No. (%)	16 (36.4)	16 (50.0)	
MS degree, No. (%)	4 (9.1)	2 (6.3)	

<sup>a</sup>Values are presented as mean ± SD unless otherwise indicated.

Table 3. Matching Variables<sup>a</sup>

Matching Variables	Group A		Group B		P Value
	Yes	No	Yes	No	
Any treatment	18 (42.9)	23 (54.8)	20 (57.1)	13 (37.1)	0.11
Going to doctor	7 (16.7)	35 (83.3)	9 (25.7)	26 (74.3)	0.224
Resting	4 (9.5)	38 (90.5)	3 (8.6)	32 (91.4)	0.634
Standard shoes	0 (0)	42 (100)	2 (5.7)	33 (94.3)	0.203
Diet	0 (0)	42 (100)	2 (5.7)	33 (94.3)	0.203
Pain relief pills	5 (11.9)	37 (88.1)	2 (5.7)	33 (94.3)	0.298
Swimming pool	3 (7.1)	39 (92.9)	3 (8.6)	32 (91.4)	0.571
Take care	1 (2.4)	41 (97.6)	3 (8.6)	32 (91.4)	0.224
Physiotherapy	2 (4.8)	40 (95.2)	0 (0)	35 (100)	0.294
Walking	1 (2.4)	41 (97.6)	1 (2.9)	34 (97.1)	0.706
Exercise	7 (16.7)	35 (83.3)	6 (17.1)	29 (82.9)	0.596
Increasing class focus	5 (11.9)	37 (88.1)	2 (5.7)	33 (94.3)	0.29
Meditation class	1 (2.4)	41 (97.6)	2 (5.7)	33 (94.3)	0.431
Time management	3 (7.1)	39 (92.9)	2 (5.7)	33 (94.3)	0.587
Yoga	2 (4.8)	40 (95.2)	2 (5.7)	33 (94.3)	0.620
Relaxation	2 (4.8)	40 (95.2)	2 (5.7)	33 (94.3)	0.620
Related classes	3 (7.1)	39 (92.9)	0 (0)	35 (100)	0.157

<sup>a</sup>Values are presented as No. (%).

and behavioral beliefs were greater for group A than for group B. The design of the AT training based on IM signifi-

cantly improved these two constructs over the results for AT alone; this indicates that the IM strengthened the AT

**Table 4.** The Mean Scores of the IM Constructs

Evaluated IM Constructs	Before, Mean $\pm$ SD	After, Mean $\pm$ SD	P Value	Between Groups
<b>Direct attitude</b>				0.03
Group A	34.37 $\pm$ 1.105	51.31 $\pm$ 1.05	< 0.001	
Group B	32.771 $\pm$ 0.547	47.87 $\pm$ 1.21	< 0.001	
P value	0.20	0.001		
<b>Behavioral beliefs</b>				0.03
Group A	30.13 $\pm$ 4.83	44.67 $\pm$ 0.81	< 0.001	
Group B	28.55 $\pm$ 2.27	41.89 $\pm$ 0.94	< 0.001	
P value	0.59	< 0.001		
<b>Intention</b>				0.41
Group A	17.666 $\pm$ 0.587	23.10 $\pm$ 0.35	< 0.001	
Group B	16.857 $\pm$ 0.487	22.65 $\pm$ 0.40	< 0.001	
P value	0.11	0.49		
<b>Knowledge</b>				0.48
Group A	1.320 $\pm$ 0.260	8.87 $\pm$ 0.339	< 0.001	
Group B	0.850 $\pm$ 0.213	8.50 $\pm$ 0.391	< 0.001	
P value	0.31	0.18		
<b>Perceived risk</b>				0.09
Group A	29.13 $\pm$ 1.198	36.82 $\pm$ 0.906	< 0.001	
Group B	28.50 $\pm$ 1.450	34.47 $\pm$ 1.042	< 0.001	
P value	0.92	0.49		
<b>Environmental constraints</b>				0.86
Group A	26.166 $\pm$ 0.911	26.52 $\pm$ 0.91	0.90	
Group B	26.000 $\pm$ 1.004	26.25 $\pm$ 1.11	0.85	
P value	0.90	0.85		

training. Yardley (30) found that at 3 months post intervention, attitude and perceived behavioral control for the 24-session AT group had improved and surpassed those for the 6-session group. In the present study, the possibility of improvement at 3 months post-intervention in scores for group A with IM constructs should be further investigated.

The importance of these findings is that group A participants showed more positive attitudes. This improvement in attitude and behavioral beliefs could relate to the different techniques used to improve attitude, such as verbal encouragement and persuasive SMSs. The techniques used to increase the other IM constructs might also have provided a new and interesting teaching method.

This is an important finding because a meaningful relationship has been found between attitudes and primary beliefs and intentions (26). Additionally, moderate to high changes in intentions have been found to result in mild to moderate changes in behavior (35). Bleakley (36) re-

vealed that attitude, normative beliefs, and self-efficacy predict 54% of intention variance and that attitude was the most important predictor. An increase in positive attitude has been found in response to AT over prescribed exercises (30), which is consistent with the results of the present study. Reddy (37) reported that participants reported greater skill, less pain, and better posture after six 45-minute AT training sessions.

The mean pain and disability for teachers was  $5.17 \pm 1.49$  and  $6.25 \pm 4.28$ , respectively. Only 49.4% of teachers had taken action to cure their backaches before the beginning of the survey, which indicates a general lack of focus on personal health. Moreover, just 21.5% had visited a doctor for CLBP. Mannion (38) found that not all people suffering from LBP sought medical care for their problem; this trend increases the probability of pain and disability and a consequent decline in work efficiency as well as high absenteeism. Undoubtedly, health authorities should focus

**Table 5.** Absolute and Relative Frequency of Environmental Constraints<sup>a</sup>

Environmental Constraints	Completely Disagree	Disagree	Disagree to Some Extent	No Idea	Agree to Some Extent	Agree	Completely Agree
Education ministry lacks rules for standardized furniture	1 (1.3)	1 (1.3)	1 (1.3)	10 (13)	1 (1.3)	4 (5.2)	59 (76.6)
Place available in school to lie down and rest back muscles during break time	35 (44.5)	2 (2.6)	4 (5.1)	8 (10.4)	7 (9.1)	1 (1.3)	20 (26)
Standardized furniture and footrests in school	51 (66.2)	2 (2.6)	7 (9.1)	3 (3.9)	3 (3.9)	2 (2.6)	12 (15.6)
Sufficient and standardized seats in transportation service	38 (46.8)	8 (10.4)	1 (1.3)	13 (16.9)	4 (5.2)	4 (5.2)	11 (14.3)
Lack of standardized domestic equipment and furniture	30 (39.0)	7 (9.1)	7 (9.1)	9 (11.7)	3 (3.9)	6 (7.8)	15 (19.5)

<sup>a</sup>Values are presented as No. (%).

on the health of the teachers in addition to that of the students in terms of MSD, especially for LBP.

It was found that 76.6% of teachers stated that there are no regulations for use of standardized furniture from the Ministry of Education. Moreover, 66.2% of teachers believed that there was no standardized furniture for teachers in schools. It appears that the main concerns of teachers focused on suitable and standard furniture. Janbozorgi (39) reported that the main disorder caused by muscle and spinal problems is backache and confirmed that the use of standardized equipment in schools decreased the incidence of spinal disorders, especially LBP. Van Niekerk (40) found that all subjects having different working positions experienced less back pain after the use of standardized chairs. Proper equipment and standardized chairs are considered important accompaniments for AT to improve upright posture (41).

More attention to this issue is recommended and investment in ergonomically-correct furniture could be facilitated by the sponsorship from corporations and charities. Studies have found that intention does not predict behavior unless it is accompanied by a supportive environment (26). To improve the effectiveness of AT principles, it is suggested that a supportive environment be taken into consideration in addition to familiarization with AT.

These results highlight the utility of IM-based intervention and the explicit use of the behavioral model to design AT sessions to promote the adoption of and adherence to AT; this will also improve the cost effectiveness of AT. Lessons for AT that are carried out in several sessions with an experienced teacher may not be economically fea-

sible in developing countries. However, our results suggest that IM-based intervention using printed materials about AT combined with methods to increase the knowledge, intention, attitude, and risk perception of participants can be useful in this situation. Hollinghurst explained that if AT training is accompanied by exercise, it is more cost effectiveness than AT training alone (42).

Although this data and analysis is useful in practice, it has limitations. First, the data is self-reported and subjective; thus, it may be less accurate. Second, the present study was performed on a small scale and more comprehensive research must be planned to evaluate both short-term and long-term benefits of incorporating IM into AT training. AT is an acceptable alternative in Iranian culture when the instructor is compatible with the class participants.

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## Footnotes

**Authors' Contribution:** Tahereh Kamalikhah performed the intervention, Mohammad Ali Morowatisharifabad supervised this project, Farid Rezaei-Moghaddam confirmed cases, Mohammad Ghasemi helped to write the content, Mohammad Gholami-Fesharaki analyzed the data, and Salma Goklani taught most of the lessons.

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