

ORIGINAL ARTICLE

A survey of social cognitive determinants of physical activity among Iranian women using path analysis method

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Keywords

Physical activity • Self efficacy • Self-regulation • Social support • Women

Summary

Introduction. This cross-sectional study was carried out on 400 women selected from urban health centers in Isfahan through stratified sampling. The study was designed to evaluate the social cognitive theoretical model in explaining the determinants of physical activity among women using path analysis method.

Methods. In a hypothetical framework, the relationship between self-efficacy, outcome expectation, social support and self-regulation and physical activity were assessed using path analysis and indices of fitness. Furthermore, the predictive power of the model was evaluated.

Results. The social cognitive theoretical model had a good predictive power for physical activity. Confirmatory factor analysis revealed the suitability of the theoretical model; this model is able to cover 80% of the physical activity variance. Evaluation of the

social cognitive theoretical model using path analysis showed that self-regulation was the strongest determinant of physical activity. Social support and outcome expectation had very weak effects on physical activity; nonetheless, their effect was enhanced by the presence of self-regulation. Self-efficacy had a weak effect on physical activity; however, as an intermediate variable, it reinforced the impact of social support and outcome expectation on physical activity.

Conclusions. The use of the present hypothetical model is suggested as an appropriate framework in research related to physical activity among women as well as to strengthening self-regulation skills in designing and implementing programs promoting physical activities.

Introduction

Regular physical activity will be one of the most important indicators of health by 2020 [1]. Physical activity leads to a decrease in incidences of chronic diseases such as osteoporosis, type II diabetes, cardiovascular diseases, breast cancer, high blood pressure and cerebral stroke [2]. Despite the benefits of exercise for health, only 48% of women in high-income countries and 21% of women in low-income countries are involved in appropriate physical activities [3]. The national research findings of risk factors for non-communicable diseases showed that 48.6% of Iranian women had low physical activity levels [4]. Women's participation in physical activities is influenced by social cognitive factors. For this reason, several studies have been conducted to identify these factors [5, 6]. Researchers believe it is unlikely that age be correlated with physical activity and the appropriate social economic status (education, income level) may have a positive impact on physical activity [7-9]. Self-efficacy is one of the most important determinants of physical activity. Self-efficacy means one's confidence in his ability to perform a particular behavior [10, 11]. In most research studies, self-efficacy has been identified as one of the strongest predictors of physical activity that may affect physical activity directly or indirectly through other factors such as self-regulation or outcome

expectations [8, 9, 12]. Outcome expectations are the positive and negative beliefs of individuals in achieving results and values associated with carrying out a behavior [10, 11]. According to researches, outcome expectation is one of the weak determinants of physical activity. It is probable that outcome expectation impacts physical activity indirectly through other factors such as self-efficacy or self-regulation [7, 13]. Self-regulation means managing and modifying individual behaviors through the process of setting goals, observing behaviors and modifying them [10, 11]; one of the important factors affecting women's participation in sports activities. Self-regulation can affect physical activity either directly or indirectly through other perceptual factors such as Social support [14-16]. Social support means getting help by communicating with others [10, 11]. There are very few studies that have examined the relationship between social support and physical activity [8, 17]. According to Bandura's theory, social support has a direct impact on physical activity [18]; nevertheless, Anderson's research showed that social support, through self-efficacy and self-regulation, had a better indirect impact on physical activity [16]. Several studies have shown that these four constructs (i.e. Self-efficacy, Outcome expectation, Self-regulation, and Social support) play an important role in promoting physical activity [5, 16, 17, 19]. Social cognitive theory is an appropriate model for inves-

investigating the relationship between these factors with each other on the one hand and with physical activity on the other [17]. Challenges and vague points existed, however, in the studies conducted to survey determinants of physical activity using the social cognitive theoretical model; perhaps a review of these relationships within the framework of a theoretical model can answer some of these questions. The results of the study conducted by Resnick on 201 elderlies showed that outcome expectation and self-regulation had direct and indirect effects on physical activity; nonetheless, the role of self-efficacy was not investigated [20]. Rovniak, in a study on 277 students, stated that social support influenced physical activity through self-efficacy, self-efficacy influenced physical activity through self-regulation and self-regulation influenced physical activity directly. In this study, the role of outcome expectation had not been attended to [21]. In the study by Anderson conducted on a sample of 299 men and women, self-regulation was recognized as the strongest predictor of physical activity; in contrast, the effect of self-efficacy on physical activity was weak and the role of outcome expectation was not clear [16]. Ayotte, in a study on a sample of 116 middle-aged and married individuals, stated that self-efficacy affected physical activity directly and indirectly through outcome expectation and self-regulation. In this study, the role of social support had been neglected [22]. Considering the important role of social cognitive determinants as well as ambiguous results of the studies, the present study was carried out with the aim of investigating the relationship between these factors and their impact on physical activity using social cognitive theory on a group of women living in Isfahan city carrying out the path analysis method. Based on the relationships established in previous studies, the relationships between the variables of the theoretical framework of the present study are defined in Figure 1. As seen in the proposed framework, self-efficacy affects physical activity directly and indirectly through self-regulation. Social support indirectly influences physical activity through self-efficacy, outcome expectation and self-regulation. Self-efficacy is a mediating factor between outcome expectation and physical activity. Self-regulation is a key

factor that directly promotes physical activity. Moreover, these relationships are based on a review of the existing literature [16-18, 20-23] and the presuppositions of the present study. The present study, focusing on the role of outcome expectation, examines the following three hypotheses:

1. outcome expectation has a direct effect on physical activity;
2. outcome expectation influence physical activity indirectly through self-efficacy;
3. self-regulation is an intermediate variable between outcome expectation and physical activity.

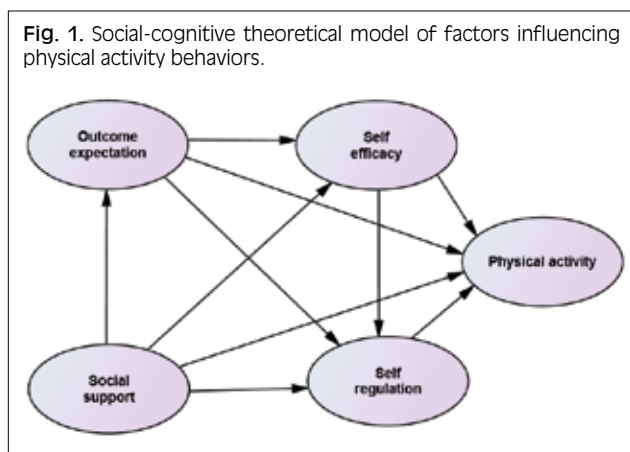
Methods

The present cross-sectional study was conducted in Isfahan, Iran, from May to September 2016. Taking into account the 0.95 confidence level (1.96), power of 80% (0.84) and given that the correlation coefficient of self-efficacy and physical activity equal to 0.15% [9] as well as 15% chance of loss, a total of 400 subjects were chosen as the sample. At first, urban health centers in Isfahan were selected randomly and then 10 centers were selected from among 25 centers through cluster sampling. Furthermore, the number of samples from each center was determined proportionally to the population covered by each center. After being acquainted with the participants, explaining to them the research objectives and how to fill out the questionnaire, they completed the informed consent and completed the questionnaires. The inclusion criteria for this study were informed consent and the ability to respond to the questions. The exclusion criteria were physical and mental disability and unwilling to complete the questionnaires.

The instrument for collecting information consisted of three sections:

1. Demographic factors questionnaire consisting of 10 questions about age, education, marital status, employment status, and income.
2. Social cognitive factors questionnaire: after extensive library studies and reviewing numerous works, a number of questionnaire items were collected to measure the determinants of physical activity. Subsequently, the items were translated into Persian and necessary corrections were made for the cultural and linguistic adaptation of the questionnaire by a committee of five bilingual experts. A number of items were removed due to inappropriate and vagueness [24]. The Initial development questionnaire consisted of 39 items and four constructs: self-efficacy, outcome expectation, self-regulation and social support. To determine Content Validity Index (CVI) and Content Validity Ratio (CVR), the questionnaires were evaluated by a panel of 20 health education professors. According to the Lawshe table and the number of specialist participants, the CVR approval criterion for each item was considered to be equal to 0.42 or higher. Moreover, the acceptance criterion for CVI was considered to be 0.79 [24]. At

Fig. 1. Social-cognitive theoretical model of factors influencing physical activity behaviors.



this stage, 19 items were deleted and 4 items were revised. Finally, 20 items were accepted of which five were considered for each construct. The score range was based on a 10-point Likert-type scaling (1 “strongly disagree” to 10 “strongly agree”). The lowest score was 20 and the highest was 200. Cronbach’s alpha reliability of the questionnaire was 0.91. Also, Cronbach’s alpha reliability of the questionnaire of self-efficacy was 0.94, 0.94 for outcome expectation, 0.93 for social support and 0.92 for self-regulation [25].

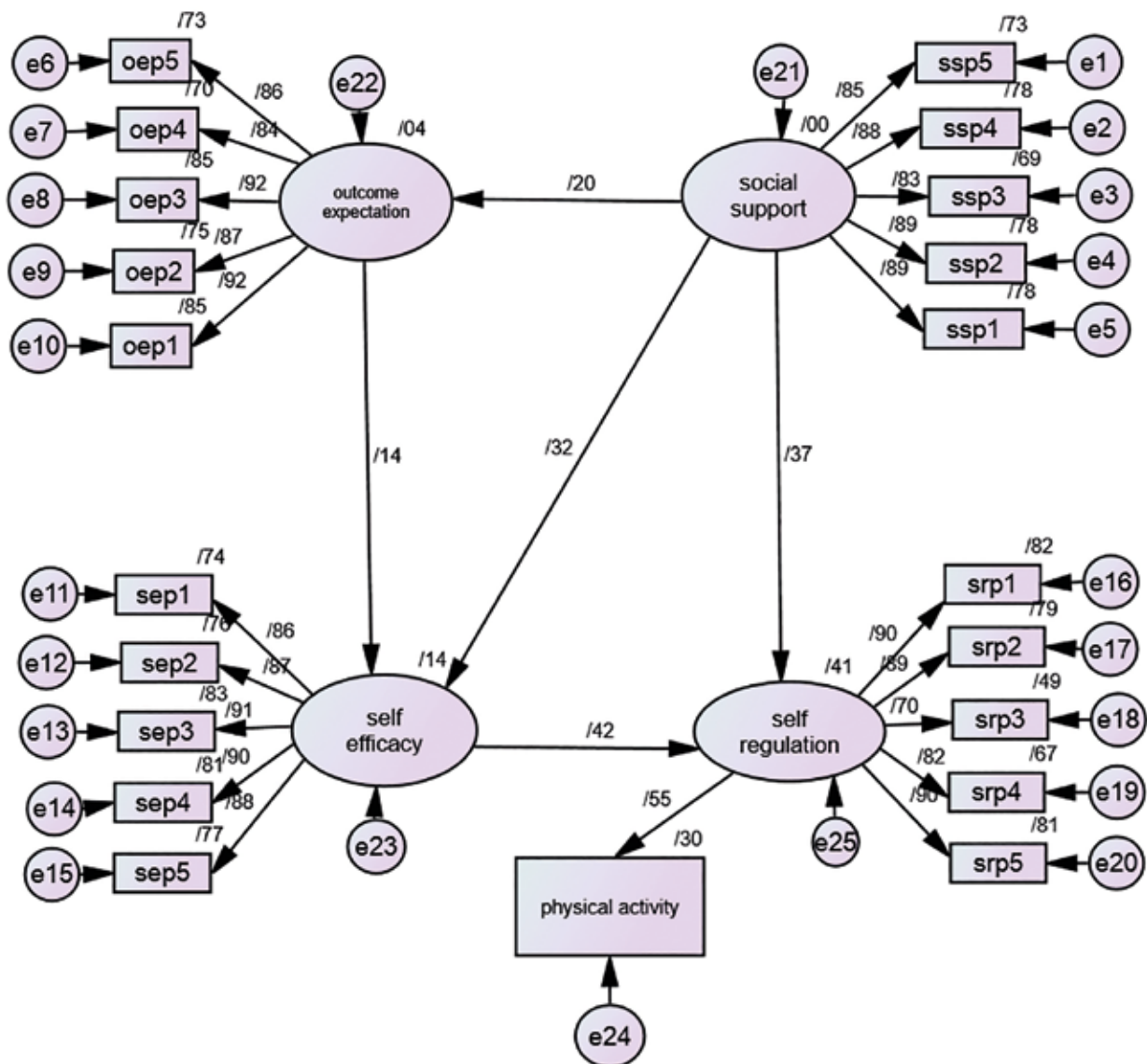
- Tools to assess physical activity: Standard questionnaire of physical activity was used in this regard. The international physical activity questionnaire (IPAQ) was used to determine appropriate levels of physical activity among adults aged 15 to 69 years [26], and its validity and reliability have been reported [27, 28]. According to its instruction, peo-

ple are classified into three groups in terms of physical activity: low activity (0-599 MET-min/week) of moderate activity (600-3000 MET-min/week) and intense activity (greater than 3000 MET-min/week) [26].

DATA ANALYSIS

Statistical tests were performed using SPSS and Amos Graphic software. In order to evaluate the predictive power of the main variables, multiple regression analysis was performed using the Enter method. Spearman’s correlation coefficient was used to analyze the relationship between predictor variables and physical activity with the significance level of less than 0.05. The predictive power of the social cognitive theoretic model was tested using the path analysis method (Fig. 2). Fitting indicators were selected to evaluate the social cognitive theoretical model from all three categories (absolute,

Fig. 2. Structural equation analysis of the final social-cognitive model of physical activity.



comparative and thrifty) and were calculated by using Confirmatory Factor Analysis (CFA). The CFA model, using the robust maximum likelihood, was used to estimate model parameters. The model was considered acceptable if Normed Chi-Square (CMIN/DF) was between 1 and 5, Comparative Fit Index (CFI) was greater than 0.8, Parsimonious Comparative Fit Index (PCFI) was more than 0.6, Tucker-Lewis Index (TLI) was more than 0.9, Root Mean Squared Error of Approximation (RMSEA) was < 0.05 good fit or between 0.05 and 0.08 adequate fit [29, 30].

Results

The number of participants in the study was 400 women, of which 40 were excluded from the study due to illness, disability or lack of willingness to complete the questionnaires. Finally, 360 participants remained. The mean of participants' age was 33.67 ($M = 33.67$, $SD = 8.35$). The lowest age was 14 and the highest was 50. The characteristics of the participants are presented in Table I. The results of the physical activity of participants (Mean = 934.33, $SD = 1051.598$) based on the IPAC questionnaire and MET min / week criterion are shown in Table II.

Multiple regression test results, presented in Table III, showed that this model is able to explain 29% of the physical activity variance (R Square = 0.29, F

Change = 36.42, p value < 0.001). The strongest predictor of physical activity was self-regulation ($Beta = 0.47$) and secondarily self-efficacy ($Beta = 0.11$). Social support and outcome expectations did not play a significant role in predicting physical activity.

The result of Spearman correlations showed that variables of the social cognitive theoretical model had a significant relationship with each other and with physical activity (Tab. IV). Furthermore, physical activity had the highest correlation with self-regulation. Therefore, we can examine the relationship between these factors in one theoretical model.

STRUCTURAL EQUATION MODEL

In order to evaluate the structural relations between the predictors of physical activity, a model was drawn by the presence of all the constructs of self-efficacy, outcome expectations, social support and self-regulation. Then, the paths with weak relationships were eliminated from the model and the final model was analyzed using the path analysis method (Fig. 2). The CFA model showed the suitability of the theoretical model; the model was able to predict 80% of the physical activity variance.

DIRECT, INDIRECT AND TOTAL EFFECTS

The evaluation of the social cognitive theoretical model using path analysis showed that self-regulation was the strongest determinant of physical activity ($\beta_{\text{Direct}} = 0.55$). The direct effect of social support on physical activity was very weak, but the indirect effect of social support on physical activity through outcome expectation, self-efficacy and self-regulation were 0.2, 0.32 and 0.37, respectively. Moreover, social support through these three variables affected physical activity, whose influence on physical activity through self-regulation was stronger than the others paths. The direct effect of the outcome expectation on the physical activity was very weak and outcome expectation had the greatest impact on physical activity through self-efficacy. The direct impact of self-efficacy of physical activity was very weak. Self-efficacy with an indirect effect on physical activity through self-regulation could affect physical activity, which has a meaningful effect. The strongest direct effect of physical activity was related to self-regulation and the strongest indirect effect on physical activity was related to self-efficacy and social support, which had the greatest impact on physical activity through self-regulation (Tab. V).

Discussion

The aim of this study was to investigate the correlation of social cognitive variables with physical activity in a group of women in Isfahan. For this purpose, the predictability power of social cognitive theory constructs was evaluated using path analysis method. The results are discussed based on the proposed framework and assumptions of the present study. The basic premise of this study was whether the proposed theoretical framework was able to explain the physical activity behavior. This

Tab. I. Characteristics of women who participated in study ($n = 360$).

Groups Variables	Frequency (n)	Percent (%)
Years of Education		
Illiterate	5	1.4
The ability to read and write	13	3.6
Primary school	36	10.0
Middle & high school	49	13.6
Diploma	145	40.3
Collegiate	112	31.1
Income Status		
Little	38	10.6
Moderate	205	56.9
Good	100	27.8
Excellent	17	4.7
Marriage Status		
Marriage	314	87.2
Single	36	10.0
Widow	6	1.7
Divorced	4	1.1
Job Status		
Employed status	68	18.9
Unemployed	292	81.1

Tab. II. The results of the physical activity of women who participated in study ($n = 360$).

Total physical activity	Frequency (n)	Percent (%)
Low	168	46.7
Intermediate	178	49.4
High	14	3.9

Tab. III. The results of multiple regression analysis of social cognitive variables in the prediction of physical activity.

Model	Beta	Std. Error	t	P _{value}
(Constant)	97.35	186.2	.52	.60
Self-efficacy	8.78	3.86	2.27	.024
Outcome expectation	-2.98	4.31	-.69	.48
Social support	1.31	3.99	.33	.74
Self-regulation	35.41	4.18	8.46	0.000

Tab. IV. Spearman's correlation coefficients between with the social cognitive factors and physical activity.

Structures	1	2	3	4	5
1. Self-efficacy	1				
2. Outcome expectation	0.19*	1			
3. Social support	0.33*	0.18*	1		
4. Self-regulation	0.49*	0.21*	0.46*	1	
5. Physical activity	0.34*	0.09*	0.27*	0.52*	1

Notes: *Correlation is significant at the 0.01 level (two-tailed).

Tab. V. Direct, indirect and total effects of variables in the social-cognitive model of physical activity.

Variable	Coefficients	Social support	Outcome expectation	Self-efficacy	Self-regulation	Physical Activity
Social support	Direct	-	0.2*	0.32*	0.37*	0
	Indirect	-	0	0.02	0.14	0.28
	Total	-	0.2	0.34	0.51	0.28
Outcome expectation	Direct	-	-	0.14	0	0
	Indirect	-	-	0	0.05	0.03
	Total	-	-	0.14	0.05	0.03
Self-efficacy	Direct	-	-	-	0.42*	0
	Indirect	-	-	-	0	0.23
	Total	-	-	-	0.42	0.23
Self-regulation	Direct	-	-	-	-	0.55*
	Indirect	-	-	-	-	0
	Total	-	-	-	-	0.55

Notes: * is significant at the $p < 0.001$.

assumption was evaluated using Amos software and path analysis, and the results showed that the proposed model has a proper predictive power and its fitting indicators are acceptable and the basic assumption of the present study is confirmed, which is similar to the result of the Ieverslandis & Rovniak studies [17, 21]. The analysis of structural equations showed that the social cognitive theoretical model can predict 80% of the variance of physical activity and in similar studies the obtained variance was 46 and 71% [16, 22]. It is possible that this theory can be used as a framework of reference for designing physical activity programs in women. In the following discussion of the results, we evaluate the relationships within the proposed theoretical framework approved by path analysis. One of the hypotheses in this study was whether self-efficacy is effective on physical activity. Based on the results of Ayotte 's study, Self-efficacy affects physical activity directly [22]; however, the results of this study showed that the direct effect of self-efficacy of physical activity is weak and self-efficacy with an indirect effect on physical activity through self-regulation can affect physical activity. Moreover, this finding is

similar to the result of the study performed by Rovniak that has introduced self-regulation as a mediator between self-efficacy and physical activity [21]. It is possible that self-regulation is an essential factor for physical activity in addition to self-efficacy. According to Bandura theory, although self-efficacy is a prerequisite factor for starting and maintaining physical activity, self-regulation is a key factor in achieving a healthy lifestyle [18, 23]. This can indicate the key role of self-regulation in promoting physical activity that should be considered as an important factor in interventions to promote physical activity. Another study investigated whether the self-regulation affects physical activity or not. The results of this study indicated that self-regulation is the strongest predictor of physical activity, which is similar to the results of Anderson and Wolfe's studies [16, 31]. Also, self-regulation is relevant to other structures in the social cognitive theoretical model, and other structures indirectly related to physical activity through self-regulation. In general, if one has the goal and proper planning, exercise leads to increased self-esteem. Furthermore, the individual looks at the positive results of exercise leading to im-

proved physical activity [23]. One of the hypotheses of the present study is that social support affects physical activity directly or indirectly (through influence on other variables such as outcome expectation, self-efficacy and self-regulation). According to the results of this study, social support has a very weak direct effect on physical activity, which is similar to the results of Wolfe and Anderson's studies [16, 31], but the result of Ieverslandis & Hsieh studies showed that social support affected physical activity [9, 17]. Also, the results of the present study showed that the effect of social support on physical activity through the variables of outcome expectation, self-efficacy and self-regulation are acceptable and significant, which can be confirmed by the results of studies conducted by Duncan and Rovniak [21, 32]. Based on the above results, it can be said that social support alone is insufficient for physical activity and other variables such as outcome expectation, self-efficacy and self-regulation are also necessary. Moreover, Bandura believes that a lack of social support is not a barrier to physical activity, but it can affect physical activity by affecting other variables [18, 23]. In this study, three hypotheses were proposed regarding the direct and indirect effects of outcome expectation on physical activity. The results showed that outcome expectation had no direct effect on physical activity, so the first proposed hypothesis of this study is not confirmed, which is similar to the results of the previous studies [21, 22, 31]. However, the second and third suggested hypotheses of the present study are confirmed with regard to the effect of outcome expectation on physical activity through self-efficacy and self-regulation, which is somewhat acceptable and appropriate. In explaining the results, it can be said that although the results related to exercise are quite obvious and proven; it alone does not lead to the participation of a person in physical activity and perhaps the presence of self-efficacy and self-regulation strengthen the effectiveness of outcome expectation on physical activity. The effect of outcome expectation on physical activity is more than the indirect effect. What is more, self-efficacy and self-regulation can enhance the impact of outcome expectation on physical activity, and it is recommended that more attention be paid to the effects of outcome expectation on physical activity through self-efficacy and self-regulation in interventions related to physical activity [18, 23]. As the results of this study showed, the proposed model has an appropriate predictive power for physical activity. Additionally, the internal assumptions of the model that are based on the relationships between variables, showed that their direct and indirect effects on physical activity are acceptable and the use of theoretical model is suggested as an appropriate framework for research on physical activity among women. The poor path of this model is related to the direct impact of self-efficacy, outcome expectation and social support on physical activity, which may be due to their incorrect position within the proposed framework. Also, in this study, the effect of self-efficacy on outcome expectation has not been investigated. Therefore, it is recommended that additional studies be carried out in this area in the

future. The strength of this study is the use of social cognitive theory to investigate the determinants of physical activity and using a theoretical model to prove the hypothesis. The present study had some limitations, including completion of questionnaires which was a form of self-report, the short duration of research and failure to examine the relationship between demographic variables in a social cognitive theoretical model, all of which indicate that the results of the present study should be used with caution.

Conclusions

The results of this study were indications of the importance of simultaneous examination of the structures of social cognitive theory in a theoretical model to explain the behavior of physical activity. It is suggested that more attention be paid to self-regulation in designing and implementing programs for the purpose of promoting physical activity. In addition, and physical activity in women should be increased with training and strengthening their self-regulation skills.

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Conflict of interest statement

None declared.

Authors' contributions

AE developed the original idea, statistical analysis, and early manuscript revising. MN collected data, analyzed them and wrote the initial manuscript.

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