

Original Article



Effects of Social Support and Self-regulation on Changes in Exercise Behavior Among Infertile Women: A Cross-sectional Study for Comparison of External and Internal Factors

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Abstract

Background: Exercise behavior (EB) has a significant impact on infertility, but the magnitude of the effect is not easily determined. This study aimed to assess the effect of social support and self-regulation, as external and internal factors, on changes in EB among infertile women.

Methods: This cross-sectional study was conducted on 483 infertile women in Sanandaj (Iran) in 2020. Samples were recruited from 35 comprehensive healthcare centers by convenience sampling. Standardized face-to-face interviews were conducted using valid and reliable instruments for the assessment of EB, social support, and self-regulation. The association between EB, social support, and self-regulation was evaluated by logistic regression models.

Results: The majority of the participants (56.7%) had secondary infertility, while 70.8% of them did not perform any exercise. Self-regulation and social support were significantly higher in women with secondary infertility than in those with primary infertility ($P < 0.01$). Self-regulation was significantly lower in women whose height was below 160 centimeters ($P < 0.05$). Social support was significantly higher among participants aged ≥ 35 years and weighing ≥ 60 kg ($P < 0.01$). The odds of EB adoption increased with self-regulation and social support (odds ratio [OR] = 1.05, 95% CI = 1.02-1.09, $P < 0.01$; OR = 1.06, 95% CI = 1.02-1.11, $P < 0.01$).

Conclusion: Social support and self-regulation almost equally influenced EB in infertile women. In future research, designing support and consultation programs can be considered to encourage infertile women to exercise.

Keywords: Social support, Regulation, Infertility, Women, Exercise, Cross-sectional study



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Introduction

Infertility is one of the most important health issues in many countries (1). The lives of infertile couples, and notably the lives of women, are significantly negatively impacted by infertility at the social level. Women are more likely to face domestic abuse, divorce, social stigma, emotional stress, despair, anxiety, and low self-esteem (2,3). According to the results, the total worldwide prevalence of infertility and primary infertility was 46.25%

and 51.5%, respectively (4). The prevalence of infertility has been reported to be 17–28% in underdeveloped countries (5) and 20% in Iran (6).

Lifestyle, especially exercise behavior (EB), which is defined as physical activity units of thirty minutes each, 5 days a week, is a crucial factor in women's general health and in fertility (7,8). Regular EB reduces the risk of cardiovascular disease, stroke, hypertension, diabetes, cancer, osteoporosis, and depression and plays



an important role in life expectancy, quality of life, self-efficacy (9,10), and fertility outcomes (7). Balanced exercise combined with weight loss was reported to be effective methods of fertility treatment in obese women. Exercise has the potential to influence the reproductive system and plays a fundamental role in maintaining energy balance. Reducing insulin resistance and achieving hormonal changes induced by exercise are believed to support the reproductive capacity of women (8). Despite evidence of the positive impact of physical activity on infertility, infertile women tend to be less active than their fertile counterparts (7,11). The majority of infertile women were reported to perform less vigorous exercises than fertile women (11-13). In fact, vigorous EB was observed in a mere 14–19% of infertile women (12,,13).

Several factors significantly contribute to vigorous exercise, including perceived barriers and benefits, self-efficacy, self-regulation, and social support. The relationship between self-regulation and social support has not been addressed in previous studies and may be an important predictor of vigorous exercise (5,14).

Social support refers to having access to a network of family members, friends, and other people who could provide help in times of need. Social support improves health-related behaviors (15), health-enhancing behaviors (16), and healthy behaviors (17). The lack of social support may have adverse consequences, such as increased mortality rates, a higher risk of cardiovascular disease, reduced mental health (18), and failure to form healthy habits (19). Smith reported that social support in the form of verbal encouragement increased EB (20).

Self-regulation also plays an essential role in the improvement of mental health. Bandura maintains that it is an internal mechanism determining what behavior should be practiced. Self-regulation guides us toward our goals and encourages us to modify our behaviors in order to achieve certain behavioral standards (21). Self-regulation is also related to goal-setting, which involves coping with obstacles hindering the achievement of one's goals (22). Bai et al found self-regulation to be an important factor in EB (23). In the study by Kim et al, self-regulation increased EB in pregnant women; those who practiced self-regulation had higher levels of physical activity (22).

Although women's physical activity has been addressed in a number of studies, such as the role of physical activity in fertility and infertility among men and women (7,24,25), the effects of social support as an external factor and self-regulation as an internal factor on changes in EB among infertile women have not been examined yet.

The stages of change model describe the stages of change in an individual's behavior. The five stages of change are pre-contemplation, contemplation, preparation, action, and maintenance (26). Regarding internal factors)the individual factor has a fundamental role(, we can refer to motivation (27) and perceived self-efficacy (5). In addition, with regard to external factors (others play an

essential role), we can refer to cues to action (5).

This study sought to determine how the stages of EB progress among infertile women and how well the EB of infertile women is predicted by self-regulation and social support. According to the search of the research team, no study has investigated this issue, especially in the city of Sanandaj with different economic, social, and cultural conditions. The authors believe the present report could help in designing behavioral interventions on social support and self-regulation to enhance EB among infertile women.

Materials and Methods

Study Design

This cross-sectional study was performed among infertile women in Sanandaj, Iran.

Study Population and Data Collection

Using convenience sampling, we consecutively recruited women with primary and secondary infertility (n=483) from 35 comprehensive healthcare centers (infertile women were registered in the systems at these centers) and the sole fertility center in Sanandaj in Western Iran (a facility providing infertility treatment) in 2020. Based on the inclusion criteria, the women were required to be married, for more than one year, be in the age range of 20-45 years, and be willing to participate in the study. According to the World Health Organization, primary infertility is characterized by the inability of a woman who has never been pregnant to conceive, while secondary infertility refers to the inability to conceive after having successfully conceived at least once in the past (28). The standardized questionnaires comprised questions on demographic characteristics, EB, social support, and self-regulation. The objectives and steps of the study were explained to the participants, and written informed consent was obtained from them. Interviews were conducted face-to-face in a quiet location. The questionnaires took 15 minutes to fill out and were completed by all of the participants.

Questionnaire

Data were collected using a four-part standardized questionnaire that encompassed demographics, social support, self-regulation(independent variables), and changes in EB (dependent variable).

The initial part of the study included demographic characteristics such as age, weight, height, employment status, income, education level, and the type and duration of infertility. The second section comprised a 12-item questionnaire addressing social support, such as having friends and other persons, including family, colleagues, and social networks that provided a buffer against adverse life events. Items in this section were scored on a 6-point Likert-type scale with one entirely disagree case and six fully agree cases. The reliability of the questionnaire had been determined previously (29). The range of scores and the cut-off point were from 12 to 72 and 42, respectively.

The third section comprised a 12-item questionnaire concerning self-regulation, including the ability to control and maintain EB, pursue long-term goals, and persevere in performing exercises. Participants were asked to rate all items on a scale of 1-4, indicating “always” and “never”, respectively. The lowest and lowest possible scores on the instrument were 12 and 48, respectively. A score of 30 or more was considered a cut-off point. The reliability of the questionnaire had been previously evaluated in the Iranian population (30). The range of scores was from 12 to 48, and the average score was 30.

Stages of Change in Exercise Behavior

EB was defined as physical activity units of thirty minutes each, 5 days a week. Self-reported engagement in EB was determined by the responses to questions about the stages of EB change in the questionnaire, which was designed based on the trans-theoretical model of behavior change. The reliability of the questionnaire had been ascertained previously in the Iranian population (0.78) (31). The self-reported EB questionnaire includes a question addressing the stages of change in EB. The questionnaire included pre-contemplation, contemplation, preparation, action, and maintenance stages. Pre-contemplation refers to when a person has no intention of taking action in the near future, while contemplation means a person intends to start the behavior within the next six months. Preparation indicates that a person is ready to take action within the next 30 days, while action implies that the person has recently changed their behavior, within the last six months. Maintenance represents that the person has sustained the behavior change for an extended period, exceeding six months. The first three stages (pre-contemplation, contemplation, and preparation) suggest a lack of engagement in EB, while the action and maintenance stages indicate that EB has been adopted. Using these five stages, the researchers created a binary outcome for self-reported EB (yes/no) specific to each participant, indicating whether they had adopted EB (in the action or maintenance stage) or not (in the first three stages).

Covariates

Covariates included demographic data such as age (<35 years / ≥35 years), weight (<60 kg / ≥60 kg), height (<160 / ≥160 centimeters (cm)), job status (homemaker/employed), income (<\$300 / ≥\$300 per month), educational attainment (less than high school diploma or high school diploma or more), duration of infertility (less than 6 years or 6 years or more), and type of infertility (primary or secondary). The questions in the survey were presented in a dichotomous format, meaning that participants were asked to choose between two options for each question.

Statistical Analysis

All data were entered in the statistical software program IBM SPSS Statistics for Windows, version 21.0 (IBM Corp.

2012, Armonk, NY: IBM Corp). The baseline characteristics of the participants were described by the frequency and percentage of categorical variables, as well as the mean and standard deviation (SD) of quantitative variables. The chi-square test and the independent *t* test were used to assess group differences. Pearson's correlations were employed to determine associations between social support and self-regulation. Logistic regression models were applied to evaluate the association between EB and social support and self-regulation. Estimates were adjusted for age, job status, income, education, weight, height, and the duration and type of infertility. The results were reported as estimated logits and odds ratios (ORs) with corresponding 95% confidence intervals (CIs), and a significance level of ≤0.05 was considered statistically significant.

Results

The study recruited 483 women who were experiencing infertility, and their average age was 34.88 ± 7.81 years. Almost all the women had secondary infertility. Of the 438 women who provided information on EB, one-third (141) reported engaging in exercise. Of those who reported EB, 22.8%, 29.6%, 18.4%, 16.6%, and 12.6% were in the pre-contemplation, contemplation, preparation, action, and maintenance stages of engagement in EB, respectively.

The univariate analysis revealed statistically significant differences in EB between employed women and homemakers. More specifically, EB was more prevalent among employed infertile women ($P=0.01$). The relationship between demographic characteristics and EB is summarized in [Table 1](#).

The results demonstrated a statistically significant difference in the mean values of self-regulation and social support between women who reported engaging in EB and those who did not. [Table 2](#) provides an overview of the means and SDs for self-regulation and social support. The means and SDs of self-regulation and social support by covariates are presented in [Table 3](#). Self-regulation and social support were significantly higher in women with secondary infertility ($P=0.001$). Self-regulation was significantly lower in women whose height was less than 160 cm ($P=0.04$). Social support was significantly higher among those aged ≥35 years and weighing ≥60 kg ($P=0.001$).

A logistic regression analysis was performed to examine the relationship between engagement in EB and several variables, including age, job status, income, education, weight, height, and the duration and type of infertility. It was shown that employed women with a higher education level than a high school diploma had substantially higher odds of adopting EB compared to other women (OR=1.61, 95% CI: 1.04 - 2.49, $P=0.03$, OR=1.79, 95% CI: 1.12 - 2.87, $P=0.04$, [Table 4](#)). Moreover, the odds of EB adoption increased with self-regulation and social support (OR=1.05, 95% CI: 1.02-1.09, $P=0.001$, OR=1.06, 95% CI: 1.02-1.11, $P=0.001$). The remaining covariates (age,

Table 1. Demographic Characteristics of Participants and Their Exercise Behavior

Exercise Behavior Demographic Variables	Doing No Exercises No. (%)	Doing Exercises No. (%)	P Value ^a	
Age (y)	<35	154 (74.4)	53 (25.6)	0.133
	≥35	188 (68.1)	88 (31.9)	
Weight (kg)	<60	123 (74.5)	42 (25.5)	0.193
	≥60	219 (68.9)	99 (31.1)	
Height (cm)	<160	172 (73.5)	62 (26.5)	0.206
	≥160	170 (68.3)	79 (31.7)	
Education	<High school diploma	213 (74.5)	73 (25.5)	0.335
	≥High school diploma	129 (65.5)	68 (34.5)	
Job status	Home-maker	244 (74.2)	85 (25.8)	0.018
	Employed	98 (63.6)	56 (36.4)	
Income	Less than 300 dollars	198 (70.5)	83 (29.5)	0.843
	More than 300 dollars	144 (71.3)	58 (28.7)	
Type of infertility	Primary	157 (75.1)	52 (24.9)	0.069
	Secondary	185 (67.5)	89 (32.5)	
Duration of infertility (y)	<6	297 (72.1)	115 (27.9)	0.136
	≥6	45 (63.4)	26 (36.6)	

^a χ^2 test.

Table 2. Comparison of Self-regulation and Social Support Between Groups

Variable	Doing No Exercises	Doing Exercises	P Value ^a	
Self-regulation	Min.- Max.	13-48	18 - 54	<0.001
	Mean±SD	29.67±0.34	32.52±0.61	
Social support	Min.- Max.	16 - 45	21- 44	<0.001
	Mean±SD	31.63±0.32	34.06±0.43	

Note. SD: Standard deviation; Min.: Minimum; Max.: Maximum; ^aIndependent samples t-test.

weight, height, income, type of infertility, and duration of infertility) were not statistically significant. The results of the multiple logistic regression analysis of EB are summarized in Table 4.

Discussion

This study aimed to determine the effects of self-regulation and social support on the stages of change in EB among infertile women in Iran. The findings of the study indicated that EB was more prevalent among employed infertile women. Consistent with these results, Allahqoli et al (5) reported that employed women did exercise than other women. Meeting the physical activity requirements in the workplace may be a reason that increases EB among employees.

The results revealed the absence of regular EB in the majority of infertile women. Saremi et al found no EB or low levels of EB in 75% of infertile women in Iran. The authors observed that fertile women were more active than their infertile counterparts and emphasized the importance of motivating infertile women to be more active and exercise to gain normal weight and achieve

Table 3. The Mean and Standard Deviation of Self-regulation and Social Support by Demographic Characteristics

Demographic Variables	Means of Determinant		
	Self-Regulation Mean (±SD)	Social Support Mean (±SD)	
Age (y)	<35	30.09 (±6.93)	30.99 (±5.75)
	≥35	30.81 (±6.62)	33.35 (±5.66)
	P value ^a	0.251	0.001
Weight (kg)	<60	30.14 (±7.14)	31.36 (±6.26)
	≥60	30.69 (±6.55)	32.84 (±5.51)
	P value ^a	0.401	0.001
Height (cm)	<160	29.60 (±6.87)	32.34 (±5.64)
	≥160	31.35 (±6.55)	32.34 (±5.98)
	P value ^a	0.042	0.995
Education	<High-school diploma	30.77 (±6.59)	32.36 (±5.65)
	≥High-school diploma	30.10 (±6.99)	32.31 (±6.05)
	P value ^a	0.283	0.922
Job status	Home-maker	30.49 (±6.93)	32.39 (±5.63)
	Employed	30.52 (±6.38)	32.23 (±6.20)
	P value ^a	0.968	0.772
Income	Less than 300 dollars	30.29 (±6.80)	32.21 (±5.26)
	More than 300 dollars	30.80 (±6.70)	32.51 (±6.51)
	P value ^a	0.348	0.366
Type of fertility	Primary	29.18 (±6.30)	30.61 (±4.53)
	Secondary	31.51 (±6.92)	33.66 (±6.32)
	P value ^a	0.001	0.001
Duration of infertility (y)	<6	30.39 (±6.78)	32.21 (±5.78)
	≥6	31.16 (±6.63)	33.08 (±6.03)
	P value ^a	0.374	0.242

Note. SD: Standard deviation. ^aIndependent samples t test.

healthy fertility (7). Sadeghi et al concluded that the level of physical activity among infertile Iranian women was 2.2-fold lower than that of their fertile counterparts, and exercise may have a role both in preventing and treating infertility (11). Allahqoli et al found that 75% of infertile women were in the passive stages of engagement in EB, including pre-contemplation, contemplation, and preparation, indicating that they did not engage in regular exercise (5). The results of the present study and previous investigations indicated that infertile women have poor levels of exercise. According to the theoretical framework of the social psychological health behavior change model, poor EB may be attributed to a poor understanding of the advantages of physical activity, including its role in preventing physical and mental disorders. Several barriers can prevent individuals from being physically active, including a lack of interest and motivation, low self-efficacy, and a lack of social support, particularly emotional support (32). Low levels of EB among participants of the present study may also be explained by their poor mental health, limited comprehension of the advantages of physical exercise, and the absence of systematic healthcare

Table 4. Binary Logistic Regression of the Effects of Self-regulation and Social Support on Exercise Behavior

Predictors	B	SE	Odds Ratio	95% CI	Wald	P Value
Model						
Age						
<35 years	-0.005	0.23	0.99	0.62-1.57	0.00	0.082
≥35 years						
Weight						
<60 kg	0.21	0.23	1.23	0.78-1.93	0.85	0.121
≥60 kg						
Height						
<160 cm	0.19	0.21	1.21	0.79-1.85	0.80	0.235
≥160 cm						
Education						
<High-school diploma	0.48	0.22	1.61	1.04-2.49	4.72	0.032
≥High-school diploma						
Job status						
Home-maker	0.58	0.24	1.79	1.12-2.87	5.97	0.045
Employed						
Income						
Less than 300 dollars	-0.26	0.22	0.76	0.49-1.18	1.42	0.328
More than 300 dollars						
Type of infertility						
Primary	-0.05	0.24	0.94	0.58-1.52	0.05	0.429
Secondary						
Duration of infertility						
<6 years	0.52	0.29	1.68	0.94-2.99	3.14	0.132
≥6 years						
Self-regulation	0.05	0.01	1.05	1.02-1.09	11.94	0.001
Social support	0.06	0.02	1.06	1.02-1.11	10.81	0.001

Note. SE, standard error; CI: confidence interval; df: degrees of freedom; Percentage correctly classified = 70.8%; Dependent variable: Exercise behavior; Model (Likelihood ratio); Chi-square = 46.41, *df* = 10, *P* < 0.01.

programs to encourage physical activity.

The findings of the present study revealed that social support significantly predicted EB in infertile women. Similarly, Smith et al found that social support in the form of verbal encouragement improved physical activity in adults with a physical disability (20). Sikka et al reported that the presence of a sports instructor significantly increased the level of physical activity in patients (33). Laird et al also showed that social support influenced EB. The findings demonstrated that social support was not a significant predictor of physical activity in adolescent girls, but parents and friends may play a role in promoting EB (34). Allahqoli et al concluded that although the rate of EB in infertile women is low, social support from their partners may enhance EB. They emphasized on promoting EB in infertile women, and reducing barriers such as lack of social support (5). According to social psychological health behavior change model, EB is influenced by one's access to guidance on external behavior, such as support from a family member or a friend (35). The social support theory considers the family an important source of support, which includes material assistance (instrumental support) and access to information. Notably, informational support may influence EB (36). According to the results of this study, people who have social support may experience higher levels of self-esteem and motivation for doing their health behavior.

In the present study, infertile women had low scores for social support. This may be attributed to the social stigma

related to infertility, the attempt to conceal infertility from others, pressure from family and friends to have children, lack of trust in others, and fear of talking about infertility with others. These factors may reduce the level of social support available to infertile women. The absence of social support (verbal or nonverbal) may impose significant pressure on infertile women and have detrimental effects on their sense of identity and self-efficacy. Hopelessness, depression, and low self-confidence make infertile women vulnerable to psychological disorders. Therefore, infertile women must have access to a high level of social support. The latter would help them to cope with the stress of infertility and the related social stigma. On the other hand, belief in having access to social support is more important than actual support. Possibly, such belief was not strong among the women investigated in the present study and hindered the improvement of their EB. Considering the importance of social support for infertile women, it will be essential to enhance their level of support and improve their comprehension of the same.

Self-regulation also predicted EB in infertile women and was higher among those with secondary infertility. In the present study, social support and self-regulation almost equally influenced the level of EB in infertile women. In contrast, Kim et al found that self-regulation increased physical activity in pregnant women; those who practiced self-regulation had higher levels of physical activity (22). Sas-Nowosielski and Szopa reported that persons with high self-regulation abilities are not only

able to perform and maintain their EB but also regulate their health behaviors purposefully. They concluded that self-regulation strategies may be effective tools in keep going exercise; however, their use is moderate (37). Goal-setting, self-rewarding, and self-monitoring are important aspects of self-regulation; they motivate pregnant women to become more active and improve their self-efficacy. Training programs focused on self-regulation for infertile women could improve their EB.

The current study had several limitations, including the use of a self-reported questionnaire, which may be influenced by bias, a cross-sectional design that limited the ability to establish causality, the exclusion of infertile women from rural areas, and the lack of a follow-up assessment. Despite its weaknesses, the strengths of our study are the recruitment of infertile women and the investigation of social support and self-regulation among them.

Conclusion

Although previous studies have not investigated the effects of social support and self-regulation on EB, the findings of the present study revealed social support and self-regulation could almost equally influence EB in infertile women. Infertile women had low levels of social support for practicing EB. Self-regulation, an internal factor influencing physical activity in infertile women, should be improved. Support and consultation programs serve as external factors and should be designed to improve EB in infertile women, especially those with primary infertility. The findings of this study could be beneficial in providing insights for health experts, families, women, health authorities, policy-makers, managers, designers of health education programs, and the media to promote EB. It is suggested that future studies should address the effect of self-regulation training on improving EB in infertile women, examine the association between different sources of social support and physical activity in infertile women, and explore the reasons for physical inactivity and facilitators of physical activity from the perspective of infertile women based on qualitative methods. In addition, researchers and authors can use the results of this study to design educational programs based on social support and self-regulation to improve EB among infertile women.

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Competing Interests

There are no competing interests to declare.

Ethical Approval

The study was conducted with the approval of Kurdistan University of Medical Sciences, Kurdistan, Iran (ethical code: IR.MUK.REC.1397.043) and the relevant authorities at the comprehensive healthcare centers. Prior to data collection, the participants were informed of the study's objectives and provided with written consent. Participants had the right to withdraw from the study at any time, and the confidentiality of their information was guaranteed throughout all stages of the research.

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