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The Role of Supportive Groups in Enhancing Adherence to Physical Activity among Diabetic Patients in Khuzestan Province

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Abstract

Objective: This study aims to assess the effectiveness of support groups to enhance physical activity adherence of patients with diabetes in the Khuzestan Province of Iran to improve diabetes management and help reduce complications from the disease.

Materials and Methods: The study used a mixed methods approach. The qualitative phase included the analysis of twenty-three diabetic patients, a professor from a university, and sporting federation personnel in semi-structured interviews. This phase and advanced a theoretical structure with four primary types and 19 placeholders of exercise adherence. The quantitative phase employed a 59-item highly reliable questionnaire (Chronbach's alpha= 0.923) to diabetic patients. A sample of 384 respondents was obtained using a random sampling technique. Data were analyzed using the software SPSS and Smart PLS. Exploratory and confirmatory factor analysis were used.

Results: Support was personal (self-efficacy and other digital support tools 11.92 percent), family (joint activities 42.09 percent), friends (helps in alleviating social loneliness, 7.03%), and public (enhanced policies and infrastructure, 9.73%). 70.78 percent of support was exercised to help with adherence to physical activity. Conclusion: Support groups are critical to increasing physical activity adherence among diabetes patients.

Conclusion: By removing obstacles through improved self-efficacy, family involvement, peer connections, and public resources, support groups dramatically increase diabetic patients' adherence to physical activity. It is crucial to incorporate culturally sensitive methods, educational initiatives, and digital platforms. Long-term efficacy, underlying mechanisms, and cultural influences on the uptake of social support should all be investigated in future research.

Keywords: Diabetes, Exercise adherence, Supper groups, Khuzestan

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Introduction

Diabetes is a chronic and complicated disease that dysregulate glucose and insulin metabolism, profoundly affecting patients' quality of life. According to the World Health Organization, the global prevalence of diabetes continues to rise (1). Effective diabetes management requires a comprehensive approach that includes lifestyle modifications such as regular physical activity (2). Numerous studies have demonstrated that a balanced diet combined with consistent exercise can significantly regulate the blood glucose levels (3,4).

Adherence to physical activity is a crucial component of diabetes management and is vital for preventing diabetes complications. Despite this, many individuals with diabetes face substantial barriers to maintaining regular exercise routines (5). A considerable number fail to meet recommended levels of physical activity, which can result in poor glycemic control, increased risk of obesity, cardiovascular complications, and overall disease progression (6).

Research has identified a wide range of barriers that hinder physical activity among diabetic patients. These include personal and environmental factors such as lack of self-awareness, inadequate education, ineffective healthcare management, cultural attitudes, insufficient support systems, time constraints, and financial limitations (7); lack of awareness, time constraints, low self-confidence, and media influence (8); as well as insufficient social or emotional support, including lack of support from spouses, friends, partners, and family (9-13).

Support groups have emerged as a promising mechanism for fostering exercise adherence in this population (14). By offering emotional support, shared experiences, and informational resources, these groups can play a critical role in promoting positive health behaviors and supporting diabetes self-management (15). Participation in support groups has been shown to enhance physical activity levels, alleviate diabetes-related stress and anxiety, and improve overall quality of life (9). Social support has consistently been identified as a key determinant of adherence to physical activity, with positive implications for disease management and health outcomes (16). Social support is recognized as a positive predictor of self-care activities in diabetic patients, highlighting the importance of supportive networks to enhance physical activity adherence (17). Furthermore, structured interventions such as regular group sessions can create supportive and motivational environments, which are essential for maintaining long-term physical activity habits (13). Such support groups may help overcome common barriers to exercise-including lack of awareness and motivation-by fostering a sense of accountability and belonging among participants (18,19). Such groups may reduce common barriers to exercise, such as lack of awareness and motivation, among diabetic patients (20). Family support, in particular, has been recognized as a pivotal factor in promoting physical activity among individuals with diabetes (21). Studies highlight that emotional engagement and active participation by family members, when coupled with education on diabetes management, can significantly improve adherence to exercise programs (22,23). Home-based exercise initiatives that involve family members have also been shown to enhance physical functioning, blood glucose control, and lipid profiles in diabetic patients (24).

In recent years, the role of peer support-especially from friends-has received growing attention. Social support from friends can serve as a source of motivation, encouragement, and companionship, all of which contribute to increased physical activity levels. Evidence suggests that individuals with type 2 diabetes who receive support from friends are more likely to meet physical activity recommendations than those without such support (25). Interventions involving friends in

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physical activity programs have shown promising results in improving exercise adherence. For example, a quasi-experimental study demonstrated that multimedia messaging services designed to enhance social support from friends could increase physical activity levels in diabetic patients (26). Additionally, the influence of friends on exercise adherence becomes particularly evident during periods of social isolation, as observed during the COVID-19 pandemic, where the lack of social interaction negatively impacted physical activity levels in diabetic patients (27).

Despite growing recognition of their potential, further research is warranted to fully assess the benefits of support groups in enhancing physical activity among diabetic patients. Future studies should explore the mechanisms through which support groups exert their influence, evaluate their long-term effectiveness, and examine how cultural and contextual factors shape their impact. This study, therefore, seeks to investigate the role of support groups in facilitating physical activity among individuals with diabetes and to propose evidence-based strategies for enhancing exercise adherence within this population.

Material and methods

This study employs a mixed-methods approach, incorporating both qualitative and quantitative components with practical objectives.

Qualitative section

The target population comprised approximately 2,000 elementary and middle school students in Shahroud. Participants were selected based on the World Health Organization's (WHO) percentile chart for childhood and adolescent obesity, focusing on those above the 90th percentile. Participants In the qualitative phase of the study, purposeful sampling and snowball sampling techniques were employed. The phase began with a thorough review of the theoretical framework and relevant literature by consulting online databases, academic books, journals, and scholarly articles. This phase involved in-depth, semi-structured interviews conducted with 23 diabetic patients from Khuzestan province, along with university professors and experts from the Sports Federation for Special Patients. All interviews were conducted in person, lasting 35-45 minutes each, and were recorded and transcribed with participants' full consent. The interview process enabled comprehensive exploration of factors influencing adherence to physical activity among diabetic patients, while also allowing for follow-up on briefly mentioned topics during the discussions.

(Professors and informed experts: 8 people ، Diabetic patients: 13 people ،Head of the Special Patients Sports Board and Public Relations Officer: 2 people). These interviews enabled an in-depth exploration of the factors influencing adherence to physical activity among individuals with diabetes and allowed for clarification and elaboration on topics that were only briefly mentioned by participants. The interviews were conducted until data saturation was reached, ensuring a comprehensive understanding of diabetic patients' perspectives on physical activity adherence. Data were analyzed using content analysis, a systematic technique for interpreting textual data obtained from interviews. Each interview was transcribed verbatim and then subjected to coding and categorization using the constant comparative method. During the open coding process, transcripts were examined line by line, and data segments-whether words, lines, or paragraphs-were labeled as discrete "events." These events represented meaningful units of information, each corresponding to a specific idea or observation. Multiple related events were grouped to form broader concepts, with some concepts emerging from a combination of events, and others from a single significant point. In the selective coding phase, these concepts were compared continuously to refine and synthesize them into subthemes and overarching core themes. This iterative process facilitated the identification of key patterns and relationships within the data, offering a

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nuanced understanding of the motivational and contextual factors that influence physical activity adherence among diabetic patients.

Quantitative Section

In the quantitative phase, the statistical population comprised diabetic patients residing in Khuzestan Province. Based on Morgan's sampling table, a sample size of 384 participants was determined. Random sampling was carried out among diabetic patients attending hospitals and medical clinics, as well as through the distribution of online questionnaires. Drawing on findings from the qualitative interviews, a researcher-developed questionnaire was constructed to collect relevant data. This instrument was designed to reflect the themes and insights identified in the interview phase. To ensure face and content validity, the questionnaire was reviewed by 10 leading professors and experts in the field of sports management. Their feedback-pertaining to the wording of items, response formats, number of questions, and alignment with the research objectives-was incorporated into the revised version. Following distribution and data collection, additional refinements were made based on their suggestions, resulting in a finalized questionnaire containing 59 items measured on a 5-point Likert scale (ranging from 1= Very Low to 5= Very High).

To assess the reliability of the instrument, a pilot study involving 30 participants from the target population was conducted. This yielded a Cronbach's alpha coefficient of 0.921. The reliability of the final questionnaire was also confirmed, with a Cronbach's alpha of 0.923, indicating high internal consistency.

The questionnaire consisted of two sections. The first section gathered demographic and personal information, including gender, age, education level, marital status, duration of illness, medical history, and occupation. The second section included 59 items addressing the role of support groups in promoting adherence to physical activity among diabetic patients. These items reflected four main support factors: personal support, family support, peer (friend) support, and public (general) support. Respondents expressed their perspectives and experiences with each support type. Items with mean scores below 3 were interpreted as indicating a lower perceived impact on adherence to physical activity.

Statistical analysis

For data analysis, information was obtained using descriptive statistics indicators. Subsequently, to address the research hypotheses, the inferential statistical method ANOVA was employed to examine the effect of support type (personal, family, friends, and public groups) on diabetic patients' adherence to exercise programs. Data analysis was conducted using SPSS version 26 and Smart PLS version 3 software.

Ethical considerations

In this study, the first step involved obtaining approval from the Research Ethics Committee of Shahid Chamran University of Ahvaz (ethical code: IR.SCU.REC.1403.121). The research adhered to ethical principles, and informed consent was obtained from all participants to ensure confidentiality of their information and respect for their rights. The research process included conducting interviews and distributing questionnaires among participants.

Results

In the qualitative phase, to address the primary objective of the study, a review of relevant literature and prior research was conducted. In-depth interviews were held with 23 diabetic patients, expert university faculty members, and the head of the Sports Federation for Patients with Special Conditions in Khuzestan Province, and the federation's public relations officer.

In the quantitative phase, questionnaires were administered to a sample of 384 participants, selected based on accessibility within the statistical population. Data collection was conducted through random sampling, both in person-by visiting medical centers across

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various counties in Khuzestan Province-and online. The demographic characteristics of the participants are summarized in Table 1.

As presented in Table 2, a total of 260 initial codes were extracted upon completion of the interviews. Some of these codes were repetitive or semantically similar. During the open coding phase, overlapping codes were consolidated, resulting in 66 distinct primary concepts or initial open codes. Given the large number of concepts, they were subsequently organized into subcategories based on conceptual and semantic similarities. This process led to the formation of 19 subcategories, which were then synthesized into four overarching categories: personal support, family support, peer (friends') support, and public (general) support.

To analyze the 59 items in the initial questionnaire, Principal Component Analysis (PCA) with varimax rotation was employed. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was calculated at 0.831, indicating that the sample was sufficiently adequate for factor analysis. The KMO statistic ranges from 0 to 1, with values above 0.5 considered acceptable for conducting factor analysis. Additionally, Bartlett's test of sphericity was statistically significant ($P< 0.001$), confirming that the correlation matrix was appropriate for factor extraction.

As indicated in Table 3, four main factors were identified through exploratory factor analysis (EFA) with varimax rotation. These four factors collectively explain 70.784% of the variance in exercise adherence. Both Cronbach's alpha coefficients and composite reliability (CR) were confirmed to be within acceptable ranges. To perform confirmatory factor analysis, the four-factor model was tested based on the questionnaire items. For assessing the measurement model fit using the Partial Least Squares (PLS) method, the reliability of the instrument is first evaluated through three criteria: 1) Cronbach's alpha, 2) Composite Reliability (CR), and 3) Factor loading coefficients.

Table 1. Frequency distribution of demographic characteristics of qualitative and quantitative samples

Variable	Qualitative Sample	N	%		
Age	25-35	6	26.09%		
	36-45	13	56.52%		
	45-55	4	17.39%		
Interviewees	Professors and informed experts	8	34.78%		
	Diabetic patients	13	56.52%		
	Head of the Special Patients Sports Board and Public Relations Officer	2	8.70%		
Education	Diploma	3	13.04%		
	Associate degree	3	13.04%		
	Bachelor's	5	21.74%		
	Master's	4	17.39%		
	PhD	8	34.78%		
Variable	**Quantitative Sample**	**N**	**%**	**mean**	**Std. Deviation**
gender	Men	209	54.42%		
	women	175	45.48%		
Age	-	-	-	45.22	5.349
Education	Diploma	96	25.00%		
	Associate degree	52	13.54%		
	Bachelor's	147	28.38%		
	Master's	44	11.46%		
	PhD	8	2.08%		
	Others	37	9.64%		
Marital Status	Married	246	64.06%		
	Single	138	35.04%		
Employment	Full-time	44	11.46%		
	Part-time	51	13.28%		
	Self-employed	155	40.36%		
	Student	28	7.29%		
	Homemaker	97	25.26%		
	Others	9	2.35%		

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Table 2. Open, axial, and selective coding of adherence to exercise in diabetic patients in khuzestan province

Main Categories	Subcategories	Frequency	% to all the interviews	Concepts	Frequency	% to Subcategories
Personal support	Awareness and knowledge	14	5.38%	Awareness of exercise benefits	6	42.85%
				Adjusting diet plan	3	21.43%
				Stress management	3	21.43%
				Progress evaluation	2	14.29%
	Motivation and commitment	19	7.31%	Creating motivation	5	26.31%
				Engaging exercise methods	2	10.53%
				Exercise planning	3	15.79%
				Adherence to exercise plans	5	26.31%
				Group activity participation	2	10.53%
	Health management and monitoring	15	5.77%	Flexibility in planning	2	10.53%
				Health status monitoring	4	26.67%
				Fatigue management	4	26.67%
				Rest and recovery	3	20%
				Medication/supplement management	4	26.67%
	Quality of life improvement	21	8.07%	Improving sleep quality	2	9.52%
				Mental health	6	28.57%
				Daily activities	3	14.29%
				Social planning	4	19.05%
				Social status improvement	4	19.05%
				Using exercise counselors	2	9.52%
	Emotional encouragement/support	4	1.54%	Motivation boosting	4	100%
	Active participation in exercise	6	2.31%	Spectating during exercise	3	50%
				Exercise activity planning	3	50%
Family support	Diabetes awareness	11	4.23%	Awareness of diabetes/exercise	5	45.45%
				Awareness of special needs	2	18.19%
				Dietary counseling	4	36.36%
	Social situational support	12	4.62%	Support in social gatherings	5	41.67%
				Support in social events	3	25%
				Support in sports events	4	33.33%
	Financial/temporal support	12	4.62%	Funding for exercise/treatment	4	33.33%
				Purchasing diabetic-friendly food	3	25%
				Allocating time for exercise	5	41.67%
	Encouraging learning/development	9	3.46%	Enrolling in sports/educational classes	4	44.45%
				Providing educational resources	2	22.22%
				Encouraging new exercise techniques	3	33.33%
	Monitoring/evaluating progress	8	3.08%	Tracking exercise progress	4	50%
				Assistance in health/diabetes monitoring	4	50%
Friends' support	Emotional encouragement/support	17	6.54%	Friends' support during hardships	7	41.18%
				Motivation during exercise lapses	5	29.41%
				Encouraging effort in exercise	5	29.41%
	Awareness/resources	7	2.69%	Introducing quality resources	3	42.86%
				Sharing diabetes/exercise info	4	57.14%
	Shared experiences	8	3.08%	Sharing diabetes/exercise experiences	2	25%
				Encouraging new sports	4	50%
				Innovative exercise improvements	2	25%
	Protection and companionship	24	9.23%	Motivation during hardships	6	25%
				Support for diabetes management success	4	16.67%
				Support for exercise efforts	6	25%
				Togetherness in emergencies	2	8.33%
				Support during stress	2	8.33%
				Assistance in blood sugar tracking	4	16.67%

Continuous

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Main Categories	Subcategories	Frequency	% to all the interviews	Concepts	Frequency	% to Subcategories
Friends' support	Learning and growth	8	3.07%	Updates on diabetes improvements	3	37.5%
				Recommending educational classes	2	25%
				Learning exercise techniques	3	37.5%
	Positive/supportive environment	6	2.31%	Connecting with other patients	2	33.33%
				Providing positive exercise spaces	4	66.66%
Public support	Resource accessibility	28	10.77%	Insurance-provided exercise facilities	2	7.14%
				Health organizations promoting exercise	4	14.29%
				Building diabetes-friendly facilities	4	14.29%
				Government attention to diabetic needs	4	14.29%
				Sufficient educational programs	5	17.85%
				Appropriate health/sports policies	4	14.29%
				Access to suitable facilities	5	17.85%
	Policy-making and planning	31	11.92%	Inter-organizational collaboration	5	16.14%
				Sports-medical expert collaboration	2	6.45%
				Financial aid for diabetic exercise	2	6.45%
				Continuous evaluation of services	4	12.90%
				Dedicated diabetic sports centers	4	12.90%
				Government's role in diabetic support	4	12.90%
				Media awareness of exercise benefits	3	9.68%
				NGO effectiveness for diabetics	2	6.45%
				Diabetic-specific sports events	3	9.68%
				Educational resources/cost coverage	2	6.45%

Table 3. Determining the number of main factors and explaining the relevant variance

Dimensions	Total	Percentage of variance	The cumulative percentage	Total	Percentage of variance	Total	Percentage of variance	The cumulative percentage
family support	24.836	42.094	42.094	24.836	42.094	11.770	19.949	19.949
Personal support	7.035	11.923	54.017	7.035	11.923	11.137	18.877	38.826
public support	5.745	9.737	63.754	5.745	9.737	9.502	16.106	54.931
Friends' support	4.147	7.030	70.784	4.147	7.030	9.353	15.852	70.784

Next, convergent and divergent validity are examined. Cronbach's alpha is a classical measure of reliability and a suitable metric for evaluating internal consistency. For variables with a small number of items, Moss et al. (1998) proposed 0.6 as the threshold for the Cronbach's alpha coefficient (28). A more modern criterion used in PLS for reliability assessment is Composite Reliability (CR), which calculates the reliability of constructs not in absolute terms but based on their correlations with one another. If the CR value for each construct exceeds 0.7, it indicates adequate internal consistency for the measurement model.

According to Table 4, the Cronbach's alpha coefficients and Composite Reliability (CR) values fall within acceptable ranges. The third criterion for evaluating the fit of the measurement model is discriminant validity. This was assessed using the Fornell-Larcker criterion, which compares the correlation of each construct with its own indicators to its correlations with other constructs. In this method, the square root of the Average Variance Extracted (AVE) for each construct is placed along the main diagonal of the Fornell-Larcker matrix. To establish discriminant validity, the square root of the AVE must be greater than the correlations between that construct and all other constructs. As shown in Table 5, the square root of the AVE for each construct exceeds its correlations with other constructs, confirming adequate discriminant validity and indicating a good fit for the measurement model.

Discussion

This study was conducted to investigate the role of support groups in promoting exercise adherence among patients with diabetes. Based on interviews and literature reviews, the support groups were categorized into four types: 1. the individual (self), 2. friends, 3. family, and 4. general/public support. These four groups were identified as the supportive

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entities. These categories served as a key research finding, consistent with the study's title, and the discussion was developed accordingly. The results indicated that each group, in its own way, plays a significant role in encouraging and motivating patients to engage in regular physical activity.

Improving self-efficacy and giving diabetic patients access to useful self-management resources are two aspects of personal support. The creation of intelligent digital platforms that tailor physical activity recommendations according to personal health indicators like body weight, medical history, and HbA1c levels is an example of an innovative approach. By providing personalized exercise program recommendations and real-time feedback, these platforms may increase patients' motivation for consistent exercise. An application might, for instance, combine data from blood glucose monitoring with activity tracking to provide notifications about the best times to exercise or when insulin adjustments are required. Additionally, patients can talk about personal struggles and get helpful advice through interactive webinars with dietitians and fitness experts. This method promotes greater accountability in addition to raising patient awareness. Including "serious games" in workout routines is another new approach. These games make working out more interesting and pleasurable by fusing entertainment components with physical activity, such as virtual challenges and reward systems. For instance, patients may compete virtually with peers or receive rewards for finishing particular exercises, which increases intrinsic motivation and encourages long-term adherence to physical activity. These findings are consistent with recent studies by Bleicher et al. (2024), Regufe (2024), the American Diabetes Association (2023), Kolberg et al. (2016), Maghsoud et al. (2024), and Tripathi et al. (2023). (2-4,8,15,16).

Families can significantly increase the physical activity of diabetic patients by fostering a supportive environment and actively engaging in group exercise. One effective tactic is to design family-based exercise programmes that are tailored to the unique health conditions of each member. Yoga sessions, nighttime walks, or simple resistance training at home can all be included into daily routines. These shared activities strengthen family bonds and increase the patient's compliance with exercise. Teaching families the value of exercise in diabetes management is equally vital. Hands-on seminars that teach safe exercise skills, like how to adjust exercise intensity to avoid hypoglycemia, can enhance confidence and lessen anxiety.Furthermore, providing low-income families with financial assistance in the form of low-interest loans or coupons for savings on essential exercise equipment (such as balancing balls and resistance bands) ensures that the tools they need are accessible. By enabling these families to participate in physical activities, this access can enhance their general health and wellbeing. Additionally, neighbourhood fitness activities or group exercise programmes can create a positive atmosphere that motivates everyone to join.These findings are consistent with previous studies by Ledgaard et al. (2016), Che et al.

Table 4. Study of reliability coefficients of the 4-factor model of exercise adherence in diabetic patients

Four factors	Average extracted variance (AVE) < 0.5	Composite reliability < 0.7 (CR)	Cronbach's alpha coefficient >/6(a)
Family Support	0.690	0.968	0.964
Personal Support	0.572	0.952	0.945
Public Support	0.689	0.971	0.967
Friends Support	0.746	0.978	0.975

Table 5. Assessment of model convergent validity using the Fornell and Larcker method

Value	Family Support	Personal Support	Public Support	Friends Support
Family Support	0.831	-	-	-
Personal Support	0.523	0.756	-	-
Public Support	0.570	0.331	0.830	-
Friends Support	0.653	0.464	0.476	0.863

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(2022), Al-Zahrani et al. (2019), Zou et al. (2022), Miccio et al. (2022), Vanden Bosch et al. (2021), and Bleicher et al. (9,11,12,14,15,18,24).

Conclusion

Diabetes management cannot be deemed effective if social support and physical activity are not addressed. Support groups, especially those that include family and friends, are crucial for helping patients get beyond barriers to exercise and improve disease management. There are still several significant study gaps regarding these groups' long-term effectiveness, underlying processes of influence, and cultural variations in the acceptance of social support, even if the evidence now available emphasises their positive effects. Translating these ideas into practical therapies requires interdisciplinary collaboration between health officials, psychologists, and medical practitioners. Comparative and longitudinal study methods should be used in future studies to assess the effectiveness of support groups across a range of populations. Integrating digital technologies, such fitness software, into support interventions can also improve access to educational and motivating resources. Additionally, culturally sensitive approaches may improve the quality of life for diabetics. Access to instructional and motivating resources can also be enhanced by integrating digital technologies, such as fitness software, into support interventions. The quality of life for people with diabetes may potentially be further enhanced by culturally sensitive methods.

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Conflict of Interest

The authors declare no conflicts of interest regarding this study or its publication.

Authors' contributions

T.A: Conceptualization, review, data collection, validation, formal analysis, writing - main draft. E.V: Conceptualization, supervision, methodology, review and editing, formal analysis, software. A.P: Conceptualization, review, validation, formal analysis, review and editing. All the authors critically revised the manuscript, agree to be fully accountable for the integrity and accuracy of the study, and read and approved the final manuscript.

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