Received: 04/21/2025 **Accepted:** 08/15/2025

Open Access

https://doi.org/10.30473/ijohp.2026.74553.1402

Vol.8, No.4, Serial Number 26, pp.25-40, Autumn 2025

Iranian Journal of Health Psychology

Research Article

Developing and Testing a Cognitive- Behavioral-Social Program for Hypertensive Erectile Dysfunction Patients

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How to Cite

Nejatian, A. , Aliakbari Dehkordi, M. , Rafiepour, A. and Barghi Irani, Z. (2025). Developing and Testing a Cognitive- Behavioral-Social Program for Hypertensive Erectile Dysfunc tion Patients. Iranian Journal of Health Psychology, 8(4), 25-40. doi: 10.30473/ijohp.2026.74553.1402

Abstract

Objectives: This study aimed to develop and evaluate a cognitive-behavioral-emotional and social intervention tailored for hypertensive cardiovascular patients with erectile dysfunction (ED). The intervention focused on improving erectile function, sexual satisfaction, interpersonal communication, and psychological well-being through integrated psychological support, social connection strategies, lifestyle modifications, and sexual education.

Methods: Thirty male patients aged 45 to 60, diagnosed with hypertension and ED, were randomly assigned to either an experimental group receiving the intervention or a control group receiving routine care. The 12-session intervention included relaxation techniques, motivational interviewing, cognitive restructuring (based on the Metz et al. model), psychosexual education, and communication and intimacy training. Lifestyle changes emphasized weight reduction and heart-healthy behaviors to reduce body mass index (BMI). We assessed outcomes using the International Index of Erectile Function (IIEF) and the Sexual Communication Scale (SCS).

Results: The experimental group showed significant, sustained improvements. Repeated measures ANOVA revealed a strong time × group effect for erectile function and sexual communication anxiety ($p < 0.001$). BMI dropped significantly ($\chi^2 = 22.842$, $p = 0.000$), with a notable between-group difference at follow-up ($U = 52.000$, $p = 0.012$). At follow-up, the experimental group reported higher erectile (24.8 vs. 17.2), orgasmic (8.9 vs. 6.7), sexual desire (9.4 vs. 6.8), and intercourse satisfaction (11.7 vs. 7.9); greater relationship satisfaction (21.3 vs. 16.4); and lower sexual communication anxiety (12.6 vs. 21.9).

Conclusions: A cognitive-behavioral-emotional-social intervention combined with lifestyle changes improved sexual function and relationship quality in hypertensive patients with ED.

Keywords: Erectile Dysfunction, Cognitive - Behavioral Therapy for Sexual Dysfunction, Hypertension, Healthy lifestyle, Sexual Communication Scale.

https://ijohp.journals.pnu.ac.ir/?lang=fa

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Extended Abstract

Background and Objectives

Erectile Dysfunction (ED) is a common and distressing condition, particularly among men with cardiovascular disease (CVD). Its causes are multifactorial, involving vascular, psychological, and relational components. Pharmacological treatments, especially PDE5 inhibitors, are often limited by side effects and contraindications in CVD patients. Consequently, there is growing interest in non-pharmacological interventions that address the complex biopsychosocial roots of ED. This study aimed to design, implement, and evaluate a structured cognitive-behavioral-emotional-social intervention that integrates psychological counseling, lifestyle modification, and partner involvement to improve sexual function and psychological well-being among hypertensive men with ED.

Materials and Methods

This randomized controlled study was conducted with 30 men aged 40–65 years diagnosed with both ED and CVD. Eligible participants were classified as "low-risk" for sexual activity based on DeBusk cardiovascular protocols and referred by cardiologists through convenience sampling. Patients were matched for age, marital status, and baseline ED severity, then randomly assigned to intervention or control groups. Exclusion criteria included unstable cardiac conditions, severe psychiatric disorders, or inability to attend therapy sessions.

The intervention consisted of 10–12 individualized and couple-based sessions grounded in the Cognitive-Behavioural Therapy for Sexual Dysfunction (CBCST) model, introduced by Metz et al. In 2017, key components included motivational interviewing, sexual education, relaxation training, cognitive restructuring, and guided emotional communication. Partner participation was central, with exercises aimed at improving empathy, intimacy, and conflict resolution. The control group received only routine medical care, without psychological or behavioural intervention. Two validated instruments were used to assess outcomes at pre-test, post-test, and two-month follow-up: the International Index of Erectile Function (IIEF-15) and the Sexual Communication Anxiety Scale (SCS). BMI was also tracked as a physiological indicator of lifestyle change. Data were analyzed using Repeated Measures ANOVA (RM-ANOVA), Friedman, and Mann–Whitney U tests. Assumptions for parametric testing were verified using the Shapiro–Wilk test.

Results

Demographic analysis confirmed baseline comparability between groups, with mean ages of 49 years in the intervention group and 50 years in the control group (SD = 3.87). BMI dropped significantly in the intervention group—from 29 (pre-test) to 26 (follow-up)—while remaining unchanged in the control group. The Friedman test confirmed this reduction ($p = 0.000$), and the Mann–Whitney U test revealed a significant between-group difference at follow-up ($p = 0.012$), indicating the impact of lifestyle changes.

Sexual function improved across all domains in the intervention group. Erectile function increased from 15.80 at pre-test to 25.67 at follow-up, with a strong time effect ($F = 121.92$, $p < 0.001$) and group interaction ($F = 86.53$, $p < 0.001$). Orgasmic function, sexual desire, and intercourse satisfaction also showed significant gains over time (all $p < 0.001$), with group differences maintained at follow-up.

Sexual communication anxiety declined substantially in the intervention group—from 48.13 to 31.40—while remaining largely unchanged in the control group. RM-ANOVA confirmed a highly significant within-subject effect ($F = 205.08$, $p < 0.001$), time × group interaction ($F = 116.97$, $p < 0.001$), and a large between-group effect ($F = 420.92$, $p < 0.001$). Overall satisfaction improved in both groups ($p = 0.005$), but the group interaction was not significant ($p =$

0.415), suggesting that while individual satisfaction increased, more intensive relational interventions may be needed for broader couple-level gains.

Discussion

The findings confirm the efficacy of a multi-dimensional intervention targeting physical, psychological, and relational factors in ED. Notably, improvements in erectile and orgasmic function were not only statistically significant but clinically meaningful, reflecting a shift from moderate ED to near-normal functioning. The sharp decline in sexual communication anxiety further underscores the therapeutic value of addressing emotional and relational barriers to intimacy.

The intervention created a synergistic loop: lifestyle changes improved physical health, which in turn enhanced self-esteem and reduced anxiety, enabling deeper emotional connection with partners. Partner involvement was especially impactful, helping to reduce performance pressure, increase empathy, and normalize discussions about sexual needs. These improvements align with previous research emphasizing the role of social support and communication in effective ED management.

Despite promising results, overall relationship satisfaction showed similar increases in both groups, suggesting the need for longer-term or more systemic couple-focused interventions to achieve bigger relational change.

Conclusion

This study provides compelling evidence that a cognitive-behavioural-emotional-social intervention can significantly enhance sexual function and psychological well-being in men with CVD and ED. The approach demonstrated sustained improvements in erectile function, orgasmic response, sexual satisfaction, desire, and communication, along with reductions in BMI. These gains were maintained at two-month follow-up, highlighting the intervention's durability.

The integrated design—combining lifestyle change, psychological counselling, and partner involvement—addresses the multifaceted nature of ED and offers a viable alternative or complement to pharmacotherapy, especially for patients with cardiovascular constraints. Future research should explore the scalability of such programs and their application in diverse populations and longer follow-up durations.

Introduction

Erectile Dysfunction (ED)—the persistent inability to achieve or maintain an erection sufficient for satisfactory sexual performance—is a prevalent global issue affecting quality of life and often signalling systemic vascular disease (Shamloul & Ghanem, 2013; Williams et al., 2015). It frequently coexists with chronic conditions, particularly cardiovascular disease (CVD), due to shared risk factors like endothelial dysfunction, nitric oxide deficiency, and vascular remodeling (Kirby, 2018; Oliveira & Nunes, 2020).

Hypertension, a leading contributor to ED, exacerbates these issues and is often complicated by the side effects of certain antihypertensive drugs. While older medications may impair erectile function, newer agents—such as angiotensin receptor blockers and calcium channel blockers—demonstrate more favorable outcomes (Akinyede et al., 2020).

Though phosphodiesterase-5 inhibitors (PDE5Is) are commonly used, their efficacy in CVD patients is limited by side effects and contraindications (Huang et al., 2018). The most common side effects include headaches, flushing, and dyspepsia, which can be particularly problematic for individuals with underlying

cardiovascular issues, as these symptoms can exacerbate existing conditions or lead to noncompliance with treatment (Fusco et al., 2023). Additionally, PDE5is can interact with nitrates used for angina or hypertension, posing a significant risk of hypotension, which limits their use in this patient population (Salameh, Miah, & Anastasopoulou, 2020).

This limitation has spurred interest in non-pharmacological alternatives. Studies show that lifestyle modifications—including exercise, dietary changes, weight loss, and smoking cessation—substantially improve both erectile function and cardiovascular health (El-Osta et al., 2022). Khera (Khera, Bhattacharyya, & Miller, 2023) confirmed these benefits in a meta-analysis involving men with moderate to severe ED.

Beyond physiological factors, ED is influenced by psychological and relational dynamics. Depression, anxiety, and poor communication within relationships are key contributors (Allen 2023; Chung et al. 2021). Interventions such as psychosexual counseling and cognitive-behavioral therapy (CBT) have shown promise in addressing these components and enhancing both individual and couple outcomes (Boombhi et al. 2019; Kameni et al. 2019; Lowy and Ramanathan 2022). In addition, consider the role of psychological problems in the incidence and recurrence of cardiovascular disease in individuals; it is necessary to treat these factors while identifying them (Pourmohammad Ghouchani, Mandanizade Safi, and Noori 2022; Pournaghash-Tehrani and Abdoli-Bidhendi 2018).

Cognitive-Behavioral Therapy for Sexual Dysfunction (CBCST), introduced by Metz et al. in 2017, is derived from Epstein and Baucom's cognitive-behavioral-emotional (CBE) model and offers a structured approach to treating ED through cognitive restructuring, emotional regulation, sexual education, and partner involvement (Epstein and Baucom 2002; Leavitt, Lefkowitz, & Waterman 2019; Metz, Epstein, & Barry Mccarthy, 2017). Its integrative design aligns well with the needs of hypertensive patients and their partners (Allen 2023; Beecken et al. 2022; Lee and Jeong 2020).

Cognitive-behavioural-social approaches recognize that ED is not solely physiological but shaped by psychological beliefs, performance anxiety, and relationship quality (Al-Khulaidi, Gushash, & Algarni, 2020; Hamamci, 2005; Spytska, 2024)"type":"article-journal","volume":"8"},"uris":["http://www.mendeley.com/documents/?uuid=632d442f-9901-4784-938c-e152c6498ef9"]},{"id":"ITEM-2","itemData":{"DOI":"10.2224/sbp.2005.33.4.313","ISSN":"0301-2212","abstract":"This study investigated the association between dysfunctional relationship beliefs and marital relationships of Turkish nonclinical married individuals. The Interpersonal Cognitive Distortions Scale (Hamamci & Büyüközturk, 2004.

Research outputs show that psychological and relational factors—especially social support and partner involvement—significantly enhance ED treatment outcomes. Including partners reduces stigma, fosters open communication, and improves adherence and effectiveness (Cuenca-Barrales & Molina-Leyva, 2020; Elterman et al., 2021; Wang et al., 2023).

Partner support is consistently linked to better psychological well-being, increased sexual satisfaction, and deeper intimacy—core components in managing ED. Studies also show that partners themselves experience distress, making their involvement beneficial for both individuals (Cuenca-Barrales et al. 2022; Ismail et al. 2022).

Research further indicates that partner involvement strengthens treatment response, particularly in complex cases like hidradenitis suppurativa or prostate cancer care, where intimacy is often disrupted (Cuenca-

Barrales et al. 2020).

Psychogenic ED, commonly associated with stress or anxiety, also improves when partners are engaged in therapy. Their support creates a collaborative environment that enhances psychological and sexual outcomes (Velurajah et al. 2021).

The enhancement of erectile dysfunction (ED) treatment through social support and group involvement is well-documented in various studies. Social support plays a crucial role in mitigating the psychological and emotional repercussions of experiencing ED. Evidence suggests that involvement in support groups facilitates open communication, reduces stigma, and promotes emotional resilience among those suffering from this condition (Fiala, 2024).

Engagement in support groups can create an environment where individuals share their experiences, thereby normalizing their struggles and relieving feelings of isolation (Mehta, 2024). Support networks are particularly beneficial as they allow members to express anxieties that may stem from societal pressures regarding masculinity and sexual performance, which are often exacerbated during episodes of ED. The alleviation of psychological stresses associated with intimacy and performance levels is crucial since factors like anxiety and depression have been identified as significant contributors to the occurrence and persistence of ED (Hanaoka et al. 2023).

This study aims to develop and evaluate an integrated cognitive-behavioral-emotional-social intervention. The program combines lifestyle change, psychological counseling, stress management, and sex education to empower hypertensive patients with ED to improve sexual health, reduce reliance on medication, and enhance cardiovascular outcomes.

Method

Data Collection Tools

Two validated instruments were used at three intervals—pre-test, post-test, and two-month follow-up—to assess both sexual function and psychological dimensions: the International Index of Erectile Function (IIEF-15) and the Sexual Communication Anxiety Scale (SCS).

The IIEF-15 is a widely accepted self-report instrument that evaluates five domains: erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction (Rosen, Cappelleri, and Gendrano 2002). Its psychometric robustness has been confirmed across diverse clinical settings, including oncology and psychological studies, and it remains the most cited tool in sexual health trials (Neijenhuijs et al. 2019). The tool has also been adapted for use in multiple cultural and linguistic contexts, making it suitable for global application (Díaz-Mohedo et al. 2023).

The SCS measures emotional and cognitive barriers to discussing sexual topics with a partner. It assesses how anxiety, discomfort, or embarrassment inhibits communication around intimacy, thus offering critical insights into the psychosocial aspects of ED. High SCS scores often correlate with decreased sexual satisfaction and relationship strain (Lou 2023).

Intervention Program Design

The intervention was structured using a cognitive-behavioral-social model and tailored to the physiological

and emotional needs of cardiovascular patients with ED. Drawing from the Cognitive-Behavioral Therapy for Sexual Dysfunction (CBCST) model by Metz et al. (2017) and other foundational works (Epstein and Baucom, 2002)an equal emphasis must be given to the role of positive behavior, cognitions, and emotions in relationship functioning. But because relationships are affected by the environment within which they exist, the authors look not only at the traditional realm of individual behavior but also at family systems, community influences, and life circumstances that may affect the clients' relationships, such as job loss or a death in the family. This contextual approach will help couples understand their individual differences, any unresolved personal issues and possible psychopathology, and individual and family needs. This book provides practical guidance for conducting couples therapy, from assessment through the final sessions. Chapters explore behavioral interventions, ways to modify cognitions, addressing emotions and individual psychopathology, and interventions for environmental demands. (PsycInfo Database Record (c, the program emphasized a multi-domain approach addressing cognition, emotion, behavior, and relational dynamics.

The intervention included 12 structured sessions delivered in weekly or biweekly formats. Sessions combined individual therapeutic support and couple-based exercises, designed to improve both sexual functioning and relational harmony. The session breakdown was as follows: Session 1: Orientation, rapport-building, and clinical assessment; Session 2: Introduction to motivational interviewing and the coping model; Sessions 3–12: Delivered in five sequential phases:

1. Relaxation and comfort-building
2. Achieving spontaneous, pressure-free erections
3. Maintenance and emotional regulation during arousal
4. Enjoying intercourse without performance fear
5. Exploring couple dynamics and relapse prevention

Exercises included guided imagery, thought-restructuring, mindfulness techniques, and sexual communication training. Relational dynamics were addressed through conflict resolution exercises, role-playing, and collaborative goal-setting.

To ensure medical and psychological relevance, the package was peer-reviewed by a panel comprising two urologists and three clinical psychologists with expertise in male sexual dysfunction.

Ethical Statements

The study adhered to ethical standards and was approved by the Ethics Committee of Payame Noor University (IR.PNU.REC.1403.382). Written informed consent was obtained from all participants in accordance with the Declaration of Helsinki and institutional protocols (Association 2024).

Research Implementation

The study targeted men aged 40–65 with cardiovascular disease (CVD) and erectile dysfunction (ED), selected based on clinical and psychological criteria. ED was linked to vascular issues (e.g., atherosclerosis, endothelial dysfunction) or psychogenic factors like anxiety and mild depression. Only "low-risk" patients per sexual activity guidelines (DeBusk et al. 2000) were included—those with stable CVD, controlled blood pressure, and no recent serious cardiac events.

Table 1-Cardiovascular risk protocols for sexual activity

Group	Cardiovascular Disease Classification	Recommendations
Low Risk	Asymptomatic Fewer than 3 cardiovascular risk factors Well-controlled hypertension Stable mild angina Post-successful coronary revascularization History of myocardial infarction >6–8 weeks ago Mild valvular disease- Left ventricular dysfunction (NYHA Class I CHF)	Includes patients where sexual activity poses no significant cardiovascular risk. Generally, sexual activity can resume without further cardiac assessment. Continue routine primary care. Use first-line treatments for ED. Reevaluate periodically (every 6–12 months).
Intermediate Risk	≥3 major cardiovascular risk factors Moderate, stable angina Recent myocardial infarction (2–6 weeks) Left ventricular dysfunction (NYHA Class II CHF) Non-cardiac atherosclerotic disease (e.g., stroke, peripheral artery disease)	Require specialized cardiovascular assessment (e.g., ETT, Echo, CV evaluation). Reclassification as low or high risk should be made based on test results.
High Risk	Unstable or refractory angina- Uncontrolled hypertension Left ventricular dysfunction (NYHA Class III/IV CHF) Recent myocardial infarction or stroke (<2 weeks) High-risk arrhythmias- Severe valvular disease Other severe cardiac conditions (e.g., hypertrophic obstructive cardiomyopathy)	Sexual activity is contraindicated until the patient's cardiac condition is fully evaluated, treated, and stabilized. Referral to a cardiologist for comprehensive risk assessment and management is required.

Source: (DeBusk et al. 2000)

Patients with unstable cardiac conditions, severe psychiatric disorders, or inability to attend therapy sessions were excluded from the study. Sampling was conducted using a convenience sampling method in collaboration with cardiologists. Physicians referred eligible patients from their clinical caseloads based on predefined criteria. This is consistent with findings from recent literature indicating that convenience sampling can be an efficient method in healthcare studies, albeit with inherent risks of bias and representativeness issues (Brown et al. 2023). Sample size was calculated using G*Power (v3.1) based on a 2018 study reporting a medium effect size ($f = 0.44$) in ED treatment. Assuming repeated measures ANOVA, $\alpha = 0.05$, power = 0.76, and $r = 0.6$, a total of 30 participants (15 per group) was sufficient. (Cappelleri et al. 2018).

Participants were matched on age, marital status, and ED scores to reduce confounding, then randomly assigned to intervention or control groups—enhancing internal validity. The intervention group received 10–12 psychosocial sessions targeting self-image, emotional suppression, and spousal miscommunication, with partner involvement via structured dialogues and intimacy exercises. The control group received routine care without psychological support. Outcomes were assessed at pre-, post-, and follow-up using IIEF, SCS, interviews, and behavioural observation.

Statistical Analysis

Data analysis employed Repeated Measures ANOVA (RM-ANOVA) to examine within-subject changes and between-group differences across time. RM-ANOVA is suitable for this design as it accounts for correlated observations and enables detection of intervention effects over time (Wan, 2021). Significance was assessed at $p < .05$, with effect sizes reported using partial eta squared (η^2) to indicate practical significance. This method provided

robust statistical insight into the intervention's sustained efficacy on both psychological and physiological domains of sexual function.

Results

Participant Characteristics and Age Distribution

The participants' age range was 45–60 years, with the experimental group averaging 49 years and the control group 50. Median and modal ages aligned with the mean, indicating a symmetrical age distribution. Both groups shared an identical standard deviation (SD = 3.87) and a 14-year age range. This homogeneity confirms successful randomization and controls for age-related variation in erectile function, ensuring the reliability of between-group comparisons.

Changes in Body Mass Index (BMI) and Lifestyle Indicators

Lifestyle change was a key intervention goal. BMI in the experimental group dropped from 29 (pre-test) to 26 (follow-up), while the control group remained mostly stable. Data in the experimental group were normally distributed throughout, while follow-up data in the control group were non-normal, requiring non-parametric tests. Friedman test showed a significant BMI reduction in the experimental group ($p = 0.000$); no change was found in the control group. Mann–Whitney test confirmed a significant between-group difference at follow-up ($p = 0.012$), highlighting the intervention's lasting impact.

Sexual Function and Psychological Outcomes

The summary of the results, presented in Table 2 and Table 3, showed clear improvements in sexual function and psychological well-being in the experimental group compared to the control group. These improvements were consistent across the three stages of assessment.

Table 2-Friedman Test Results for Comparing Body Mass Index (BMI) Across Three Time Points (Pre-test, Post-test, Follow-up) in Experimental and Control Groups

Group	Time Point	Mean Rank	Chi-Square Statistic	Degrees of Freedom	Significance Level (p)
Experimental	Pre-test	2.87	22.842	2	0.000
	Post-test	1.97			
	Follow-up	1.17			
Control	Pre-test	2.07	0.133	2	0.93
	Post-test	1.93			
	Follow-up	2.00			

Table 3- Mann–Whitney U Test for Comparing Body Mass Index (BMI) Between Experimental and Control Groups at Three Time Points (Pre-test, Post-test, Follow-up)

Time Point	Group	N	Mean Rank	Sum of Ranks	Mann–Whitney U	Z Score	Significance (2-tailed)
Pre-test	Experimental	15	15.33	230.00	110.00	-0.104	0.917
	Control	15	15.67	235.00			
Post-test	Experimental	15	13.53	203.00	83.00	-1.224	0.221
	Control	15	17.47	262.00			
Follow-up	Experimental	15	11.47	172.00	52.00	-2.510	0.012
	Control	15	19.53	293.00			

Notably, the experimental group not only showed immediate benefits after the intervention but also maintained most of these gains at follow-up, indicating the sustainability of the treatment effects over time. In contrast, the control group either showed minimal improvement or experienced a decline in scores at follow-up, further highlighting the enduring positive impact of the intervention in the experimental group.

It is important to note that the Shapiro-Wilk test confirmed a normal distribution for all measured variables across the three time points. Therefore, the data met the assumptions for parametric testing and were analysed using repeated measures ANOVA.

The intervention led to significant and sustained improvements across multiple domains of sexual functioning in the experimental group, while the control group showed limited or unstable progress.

Erectile function improved markedly in the experimental group, representing a clinically meaningful shift from moderate dysfunction to near-normal functioning. Repeated Measures ANOVA confirmed strong time effects ($p < .001$) and a robust time-by-group interaction ($p < .001$), highlighting the intervention's substantial impact.

Orgasmic function also showed significant within-subject improvement ($p < .001$), with gains largely maintained at follow-up. The interaction effect ($p < .001$) further supported the intervention's efficacy, while the control group's initial improvement regressed over time.

Sexual desire increased and remained stable in the experimental group, while the control group experienced a temporary rise followed by decline.

These patterns suggest the intervention effectively reignited and stabilized desire by addressing psychological and relational distress.

Table 4- Variable changes in Experimental and Control Groups during pre, post and follow-up tests

Variables	Time	Experimental		Control	
		Mean	STD	Mean	STD
Body Mass Index (BMI)	Pre-test	29	3.56	29	3.10
	Post-test	27	2.60	29	3.10
	Follow-up	26	1.76	28	2.93
Erectile Function	Pre-test	15.80	1.37	15.47	1.25
	Post-test	27.47	1.19	21.33	1.18
	Follow-up	25.67	0.98	14.60	0.99
Orgasmic Function	Pre-test	5.40	0.99	5.53	1.06
	Post-test	8.80	0.86	7.53	1.06
	Follow-up	7.73	0.88	5.33	0.82
Sexual Desire	Pre-test	5.40	1.18	5.93	1.53
	Post-test	8.27	1.53	7.47	1.41
	Follow-up	7.93	1.22	6.07	1.79
Intercourse Satisfaction	Pre-test	6.27	1.62	7.07	1.94
	Post-test	11.13	1.68	9.40	2.06
	Follow-up	11.00	1.77	8.27	2.25
Overall Satisfaction	Pre-test	4.27	1.62	5.07	1.94
	Post-test	6.13	1.68	6.33	1.91
	Follow-up	6.00	1.77	5.53	1.77

Sexual Communication Anxiety Scale (SCS)	Pre-test	48.13	3.04	47.13	2.50
	Post-test	29.27	1.62	46.13	3.54
	Follow-up	31.40	2.06	44.80	2.51

Table 5- Combined Table: Within-groups and Between-groups Effects for All Variables

Variable	Source	F	Sig.	Partial Eta Squared
Erectile Function	Within-Subjects	121.923	0.000	0.813
	Time * Group	86.534	0.000	0.756
	Between-Subjects	420.920	0.000	0.938
Orgasmic Function	Within-Subjects	89.047	0.000	0.761
	Time * Group	19.386	0.000	0.409
	Between-Subjects	21.396	0.000	0.433
Sexual Satisfaction	Within-Subjects	31.348	0.000	0.528
	Time * Group	7.038	0.002	0.201
	Between-Subjects	8.864	0.006	0.240
Intercourse Satisfaction	Within-Subjects	31.348	0.000	0.528
	Time * Group	7.038	0.002	0.201
	Between-Subjects	8.864	0.006	0.240
Overall Relationship Satisfaction	Within-Subjects	5.767	0.005	0.171
	Time * Group	0.895	0.415	0.031
	Between-Subjects	0.248	0.622	0.009
Sexual Communication Anxiety Scale (SCS)	Within-Subjects	205.076	0.000	0.880
	Time * Group	116.974	0.000	0.807
	Between-Subjects	420.920	0.000	0.938

Intercourse satisfaction significantly improved over time ($p < .001$), with the experimental group maintaining gains at follow-up. The between-group difference ($p = .006$) also confirmed the intervention's role in enhancing emotional and relational quality during sexual activity.

Overall satisfaction increased in both groups, with a significant time effect ($p = .005$). However, the interaction effect was not significant ($p = .415$), suggesting that while satisfaction improved, more comprehensive relational interventions may be needed for stronger group differences.

Sexual communication anxiety showed a profound and highly significant reduction ($p < .001$) in the experimental group. This was supported by strong interaction effects ($p < .001$) and a very large between-group effect size, indicating the intervention's powerful impact on improving open, fear-free sexual communication.

Discussion

The findings from this study provide robust evidence that a structured cognitive-behavioural-emotional-social intervention significantly enhances sexual function and psychological well-being among cardiovascular patients experiencing erectile dysfunction (ED). The positive effects observed immediately after the intervention were notably sustained at follow-up assessments, especially in terms of improved erectile function and reduced sexual communication anxiety. These outcomes underscore the therapeutic potential of integrating physiological, psychological, and relational dimensions within ED management, highlighting the

efficacy of a comprehensive bio-psycho-social approach.

A clear and meaningful pattern emerged from our results, demonstrating a dynamic interplay and reinforcement among the intervention's physiological, psychological, and social-relational components. This integrative cycle of change suggests that improvements in one domain naturally and powerfully amplify gains in the others, resulting in sustained positive outcomes over time.

Initially, physiological improvements served as a foundation for broader therapeutic effects. A critical strength of our intervention was its explicit emphasis on lifestyle modification—particularly weight loss and healthier physical behaviours. Participants in the experimental group achieved significant and sustained reductions in Body Mass Index (BMI), signifying lasting behavioural adaptations. These physiological benefits resonate strongly with prior evidence highlighting how modest weight loss, improved diet, and regular physical activity substantially enhance erectile function, improve hormonal balance, and elevate sexual health outcomes (Fui et al. 2020; Li et al. 2021; Molina-Vega et al. 2020; Pitta et al. 2022). Furthermore, improved physical health directly increased participants' sexual confidence and decreased anxiety, reinforcing recent findings that connect physical vitality with enhanced sexual functioning and self-perception (Niu 2024).

Building upon these physiological changes, psychological components of the intervention—such as motivational interviewing and cognitive restructuring—played a crucial role in transforming participants' emotional resilience and self-acceptance. Reductions in psychological distress and anxiety related to sexual communication were substantial and enduring. These improvements are consistent with previous research emphasizing the critical value of reframing ED from a source of personal inadequacy into a manageable health condition, thereby diminishing shame, enhancing self-confidence, and improving adherence to treatment (Al-Hassany et al. 2021; Allen 2023). Educational content covering both the emotional and physiological aspects of ED further empowered participants, providing valuable coping strategies and facilitating stronger emotional regulation and relational engagement.

The strengthened psychological state achieved by participants also profoundly influenced the social-relational aspects of their lives. Partner involvement emerged as a pivotal feature of the intervention, with joint sessions designed explicitly to cultivate empathy, foster mutual trust, and promote open emotional communication. This collaborative approach transformed ED from a stigmatized, isolating experience into a shared challenge managed collaboratively. Our findings align closely with existing literature that consistently highlights the substantial benefits of involving partners in sexual health interventions, including increased intimacy, heightened sexual satisfaction, and improved long-term relational dynamics(Cuenca-Barrales et al. 2022). Couples who participated in joint sessions reported significantly reduced performance anxiety and increased emotional closeness, reinforcing their relational bonds and further sustaining the positive psychological and physiological outcomes.

Thus, the intervention created a synergistic feedback loop wherein physiological improvements enhanced psychological resilience, subsequently reinforcing relational intimacy and partnership support, which in turn sustained and further strengthened physical and psychological gains. This integrative bio-psycho-social pattern highlights the necessity and effectiveness of multidimensional therapeutic approaches to managing ED, especially among cardiovascular patients whose medical complexity demands comprehensive care strategies.

In summary, the effectiveness of this cognitive-behavioural-emotional-social intervention lies precisely in its holistic integration of physical health improvements, emotional acceptance, and strengthened relational

dynamics. By simultaneously addressing physiological factors, psychological well-being, and relational connectivity, the intervention facilitated lasting and transformative improvements in sexual function and overall quality of life. Moreover, by destigmatizing sexual dysfunction and embedding it within a context of shared responsibility, emotional openness, and mutual support, the study underscores a powerful and sustainable therapeutic paradigm for cardiovascular patients experiencing ED.

Conclusion

This study provides strong evidence that a structured cognitive-behavioural-emotional-social intervention can significantly enhance both the physical and psychological aspects of sexual function in cardiovascular patients with erectile dysfunction. The intervention notably improved erectile function, reduced sexual communication anxiety, and enhanced sexual satisfaction and desire—effects that remained stable during follow-up.

A key contributor to success was the integration of lifestyle modification, particularly weight management and physical activity, which improved cardiovascular and sexual health. Psychological interventions such as self-acceptance, emotional regulation, and sex education empowered participants to engage more openly with their condition and their partners. The inclusion of spouses further strengthened treatment outcomes by improving communication and relational support.

While the intervention improved most dimensions of sexual functioning, overall relationship satisfaction showed similar gains in both groups, suggesting that additional relational components may be required for broader relational outcomes. Future studies should explore more expansive couple-based approaches that address deeper systemic relationship patterns.

Overall, this research underscores the need for multidisciplinary, holistic interventions that integrate medical, psychological, and relational strategies to support men with ED—especially those managing chronic health conditions. Such integrative models can promote sustainable recovery, improve quality of life, and reduce reliance on pharmacological treatments.

Acknowledgments

We would like to express our sincere gratitude to the physicians and psychotherapists who supported the development of the therapeutic package and assisted in introducing the clients and target groups. Their expertise and collaboration were invaluable to this study. We also deeply appreciate the dedication and trust of the patients involved in this research. Their participation and openness were essential to the advancement of our work.

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