

Comparison of the Effectiveness of Values-Based Behavioral Activation and Mindfulness in Reducing Health Anxiety in Patients with Diabetes

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ABSTRACT

The present study aimed to compare the effectiveness of values-based behavioral activation and mindfulness in reducing health anxiety among patients with diabetes. This study employed a quasi-experimental design with pretest, posttest, and follow-up assessments and a control group. The statistical population comprised all women with diabetes who attended healthcare centers in Mianeh County during 2024–2025. Among them, 45 participants who met the study inclusion criteria were selected through purposive sampling and randomly assigned to three groups of 15 participants each: the first experimental group (values-based behavioral activation), the second experimental group (mindfulness), and the control group. The interventions were administered three sessions per week over a one-month period. The research instrument included the Health Anxiety Questionnaire. Data were analyzed using mixed-design analysis of variance and the Bonferroni post hoc test. The results indicated that, compared with the control group, both interventions significantly increased the use of problem-focused coping mechanisms and decreased emotion-focused and avoidant coping mechanisms. Furthermore, both approaches significantly reduced health anxiety and increased overall health-promoting behaviors, including the subscales of nutrition, physical activity, health responsibility, stress management, interpersonal support, and self-actualization. The effects of both interventions were maintained at the two-month follow-up. For most variables, no significant difference was observed between the effectiveness of the two interventions; however, for certain dimensions of health-promoting behaviors, including the total score and nutrition, values-based behavioral activation demonstrated greater effectiveness than mindfulness. Based on these findings, it can be concluded that both values-based behavioral activation and mindfulness are effective interventions for improving the psychological and health-related functioning of patients with diabetes. By improving coping styles, reducing health-related concerns, and promoting healthy behaviors, these interventions may be used as beneficial adjunctive treatments alongside the medical management of diabetes.

Keywords: values-based behavioral activation, mindfulness, health anxiety, patients with diabetes

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Introduction

Diabetes mellitus is one of the most important chronic metabolic diseases worldwide and is associated not only with glycemic dysregulation but also with a substantial burden of physical, psychological, behavioral, and social complications. The chronic nature of diabetes requires continuous self-management, medication adherence, dietary regulation, physical activity, glucose monitoring, and repeated encounters with healthcare services, all of which may impose a persistent psychological burden on patients. Long-term exposure to these demands is particularly important because diabetes is associated with a range of vascular, neurological, renal, ophthalmological, and cardiovascular complications, and the possibility of severe adverse outcomes may intensify patients' concerns about their present and future health (1). More recent epidemiological evidence has also highlighted the association between diabetes and serious cardiovascular outcomes, including an elevated risk of sudden cardiac death, further emphasizing the objectively threatening medical context within which patients must manage the disease (2). Consequently, diabetes management cannot be reduced to pharmacological treatment alone, because psychological adjustment, emotional regulation, health-related beliefs, and adaptive behavior substantially influence how patients respond to the illness and engage in self-care. Diabetes-specific distress and emotional problems may interfere with treatment adherence and self-management, while the ways in which patients cope with illness-related demands can influence both psychological outcomes and diabetes self-care behavior (3). For this reason, contemporary approaches to diabetes care increasingly emphasize integrated interventions that address both medical and psychological dimensions of the disease. Diabetes self-management education, for example, has been shown to benefit self-acceptance and self-care, underscoring the value of behavioral and psychological support alongside conventional medical management (4). Systematic evidence further indicates that psychological interventions can influence stress, physical health, and self-care behaviors among individuals with diabetes, supporting the inclusion of structured psychological treatment within comprehensive diabetes care (5).

One psychological difficulty of particular relevance in chronic disease is health anxiety. Health anxiety refers to excessive concern, fear, vigilance, or preoccupation regarding the possibility of having, developing, or worsening a serious medical condition. Although a certain degree of concern about bodily symptoms may be adaptive in people with established chronic illnesses, excessive health-related anxiety may lead to persistent monitoring of physical sensations, catastrophic interpretation of benign or expected symptoms, repeated reassurance seeking, avoidance of illness-related information or activities, and heightened emotional distress. The contemporary conceptualization of health anxiety has increasingly moved beyond the older and more restrictive concept of hypochondriasis toward a dimensional understanding of illness-related fear and preoccupation (6). From a broader anxiety perspective, responses to threat may involve both relatively enduring dispositional characteristics and context-dependent states, and medically threatening circumstances can intensify anxiety even in individuals without generalized psychopathology (7). In patients with diabetes, this issue is especially salient because many bodily sensations may plausibly be linked to fluctuations in blood glucose, medication effects, disease complications, or unrelated physiological processes. This ambiguity may encourage hypervigilance and catastrophic appraisal in susceptible individuals. Health anxiety has also been examined in populations with other serious medical conditions, with findings suggesting that illness context may substantially shape the intensity and meaning of health-

related concern (8). During periods of heightened health threat, such as the COVID-19 pandemic, interventions integrating cognitive-behavioral and mindfulness components have produced reductions in health anxiety and related maladaptive cognitions among medically vulnerable individuals (9). Positive mindfulness training has similarly been associated with improvements in health anxiety and psychological adjustment among healthcare workers exposed to persistent illness-related threat (10). These findings suggest that health anxiety is not merely a secondary emotional reaction to disease but a clinically meaningful target that may be modified through interventions addressing attention, avoidance, cognitive appraisal, and behavioral patterns.

Among the psychological approaches relevant to such mechanisms, behavioral activation has received considerable attention as a structured, action-oriented intervention that focuses on increasing engagement in adaptive, rewarding, meaningful, and goal-directed activities while reducing avoidance and withdrawal. Behavioral activation is grounded in the premise that emotional distress is often maintained through cycles of reduced activity, avoidance, diminished environmental reinforcement, and increasing disengagement from valued areas of life. By systematically monitoring behavior, identifying patterns of avoidance, scheduling meaningful activities, solving practical barriers, and increasing contact with positive reinforcement, behavioral activation seeks to alter the environmental and behavioral processes that sustain psychological distress (11). The approach has been developed extensively for clinical populations, and structured behavioral activation protocols emphasize activity monitoring, functional analysis, goal-directed behavior, gradual engagement, and the systematic reduction of avoidance (12). Evidence from systematic review and meta-analytic research supports behavioral activation as an effective intervention for emotional disorders, particularly depression, and indicates that its relatively straightforward behavioral procedures may be clinically useful across diverse populations (13). Behavioral activation has also been applied beyond conventional depressive disorders. For example, it has demonstrated beneficial effects on anxiety and psychological difficulties in patients with chronic dermatological conditions when compared with metacognitive approaches (14), and it has been compared with relaxation-based approaches in individuals experiencing elevated social anxiety, with findings supporting its effects on maladaptive beliefs and social problem-solving processes (15). Such findings are theoretically relevant to health anxiety because behavioral avoidance, excessive symptom monitoring, restriction of activity, and reduced engagement in meaningful life domains may all contribute to maintaining illness-focused distress.

A values-based form of behavioral activation may be particularly relevant for individuals living with a long-term medical condition. Values-based behavioral activation extends behavioral scheduling beyond the pursuit of immediate pleasure by linking daily actions to personally meaningful life directions, such as family relationships, health, autonomy, social participation, spirituality, responsibility, and self-development. This emphasis may increase treatment relevance for patients with diabetes, who are often required to sustain difficult health behaviors over long periods despite fatigue, uncertainty, or fear. Values-guided activity can shift attention from symptom control alone toward active participation in a meaningful life, potentially reducing avoidance and increasing persistence with adaptive behavior. Related behavioral models emphasizing meaningful goals and personally significant action have been used in health behavior interventions, including models designed to regulate eating behavior and strengthen adaptive self-management (16). Behavioral activation has also been incorporated into diabetes-specific interventions. A

home-based diabetes-modified behavioral activation treatment has been developed for older adults with type 2 diabetes, reflecting growing interest in adapting behavioral activation to the functional and self-management demands of chronic metabolic illness (17). In a randomized clinical trial, collaborative goal setting combined with behavioral activation was associated with clinically meaningful benefits among adults with uncontrolled diabetes and depression, demonstrating that behavioral activation principles can be integrated with diabetes care and delivered through accessible treatment formats (18). More recently, behavioral activation therapy has been directly compared with acceptance and commitment therapy in patients with type 2 diabetes, with findings supporting improvements in quality of life and self-care behavior (19). Comparative research among women with type 2 diabetes has likewise indicated that behavioral activation can reduce psychological distress, supporting its potential utility for emotionally vulnerable patients with chronic metabolic disease (20). Together, these studies provide a basis for examining whether a values-based behavioral activation model may also reduce excessive illness-related anxiety among patients with diabetes.

Mindfulness represents another prominent intervention approach with direct relevance to health anxiety and chronic disease management. Mindfulness generally involves deliberate, present-centered, and nonjudgmental awareness of ongoing internal and external experiences. Through repeated attention to breathing, bodily sensations, thoughts, emotions, and environmental stimuli, individuals learn to observe experiences without automatically reacting to them through avoidance, suppression, catastrophic interpretation, or rumination. This mechanism is especially relevant to health anxiety, in which bodily sensations and illness-related thoughts can rapidly trigger threat appraisals and maladaptive behavioral responses. Mindfulness-based approaches may reduce this reactivity by encouraging patients to notice bodily sensations and health-related thoughts as transient experiences rather than immediate evidence of danger. Research conducted across psychological and healthcare settings suggests that mindfulness interventions can improve emotional regulation, stress management, psychological flexibility, and well-being. Mindfulness-based programs have been shown to improve psychological flexibility and mental health in populations exposed to persistent occupational stress (21), while mindfulness meditation has demonstrated beneficial effects on mental health during periods of acute societal stress (22). Qualitative syntheses of mindfulness training have also emphasized improvements in awareness, emotional regulation, self-care, and coping among healthcare professionals (23). Mindfulness-based approaches were further proposed as useful strategies for mitigating psychological distress during the COVID-19 crisis because of their potential to reduce automatic emotional reactions and promote adaptive coping (24). In addition, mindfulness-based cognitive therapy has been examined in clinical and nonclinical populations and has demonstrated benefits for resilience, emotional reactivity, and adjustment to distressing health-related experiences (25). Meta-analytic evidence on third-wave mindfulness-based cognitive-behavioral treatments has similarly supported their usefulness in older adults, a population in which chronic health conditions and concerns regarding illness may be particularly salient (26).

Mindfulness has increasingly been investigated specifically in diabetes care. The growth of this literature is reflected in bibliometric evidence showing a substantial expansion of research on mindfulness interventions for diabetes, with increasing attention to both psychological and metabolic outcomes (27). Systematic reviews and meta-analyses suggest that mindfulness-based interventions can improve

psychological health in people with diabetes and may also produce beneficial changes in disease-related outcomes. A meta-analysis of randomized controlled trials found that mindfulness-based stress reduction was associated with improvements in mental health, mindfulness, and glycemic indicators among patients with diabetes (28). Reviews focused specifically on glycemic control have likewise concluded that mindfulness may have a potentially useful adjunctive role in diabetes management, although effects may vary according to intervention characteristics and patient populations (29). A more recent systematic review and meta-analysis of mindfulness-based interventions for adults with type 2 diabetes further supports the clinical relevance of mindfulness as an adjunctive intervention for this population (30). Intervention research has also moved toward integrating mindfulness with daily diabetes self-management. A blended mindfulness-based stress reduction program was found to improve diabetes self-management, with evidence suggesting that psychological processes may mediate the relationship between mindfulness training and behavioral outcomes (31). A mindfulness-based healthy lifestyle program has also been evaluated among older adults with type 2 diabetes, reflecting an increasing emphasis on combining mindfulness practice with health-promoting behavioral change (32). Similarly, user-centered digital mindfulness programs are now being developed to integrate psychological support directly into diabetes self-management contexts, including gestational diabetes care (33). These developments indicate that mindfulness is increasingly regarded not merely as a stress-reduction technique but as a potentially important component of comprehensive behavioral diabetes management.

The mechanisms through which mindfulness may benefit patients with diabetes extend beyond reductions in generalized distress. Mindfulness may strengthen psychological flexibility, self-efficacy, acceptance of internal experiences, and the ability to maintain adaptive behavior in the presence of discomfort. Research in chronic pain populations has demonstrated associations among mindfulness, psychological flexibility, self-efficacy, and functional outcomes, highlighting mechanisms that are potentially transferable to other chronic health conditions (34). Mindfulness-based cognitive interventions have also been shown to improve health-promoting behaviors in individuals experiencing health-related psychological difficulties (35). Among patients with type 2 diabetes, interventions that combine cognitive-behavioral strategies with mindfulness have been found to improve health-promoting lifestyles, suggesting that mindful awareness may support healthier decision-making and sustained behavioral engagement (36). The potential utility of mindfulness is also strengthened by evidence from other clinical intervention contexts in which mindfulness-based stress reduction compares favorably with established psychological interventions in terms of functional and economic outcomes (37). More broadly, protocols evaluating mindfulness-based cognitive therapy and cognitive-behavioral stress-management approaches among healthcare staff demonstrate that mindfulness can be examined using rigorous randomized designs and may provide a structured framework for modifying stress-related psychological outcomes (38). These findings collectively suggest that mindfulness may reduce health anxiety by decreasing cognitive fusion with threat-related thoughts, moderating reactivity to bodily sensations, improving emotion regulation, and increasing adaptive engagement with health-related behaviors.

Although values-based behavioral activation and mindfulness share several therapeutic targets, they approach them through somewhat different pathways. Behavioral activation primarily emphasizes overt behavior, activity scheduling, reduction of avoidance, problem solving, and re-engagement with personally

meaningful goals. Mindfulness, in contrast, primarily emphasizes attentional regulation, acceptance, nonjudgmental awareness, and modification of the individual's relationship with thoughts, feelings, and bodily sensations. Both approaches may ultimately reduce health anxiety, but the mechanisms by which they do so may differ. Behavioral activation may decrease health anxiety by reducing inactivity, withdrawal, symptom-focused behavior, and avoidance while increasing value-consistent engagement. Mindfulness may reduce the same outcome by attenuating catastrophic interpretation, excessive cognitive elaboration, physiological reactivity, and rigid responses to illness-related sensations. Evidence supporting behavioral, cognitive, spiritual, and mindfulness-oriented interventions across chronic illness populations suggests that psychological treatment can facilitate adaptation to serious health conditions and improve emotional functioning (39). Similarly, intervention studies in hypertension have demonstrated that mindfulness-based therapy can reduce anxiety in patients with chronic medical conditions, providing additional support for its use in populations facing continuing health threats (40). The broader behavioral literature indicates that active coping and self-management are closely related to psychological adjustment in diabetes (3), while intervention studies suggest that structured behavioral and mindfulness-based treatments can each improve outcomes relevant to chronic disease management (19, 20). However, direct comparisons between values-based behavioral activation and mindfulness for health anxiety in patients with diabetes remain limited.

This comparative gap is clinically important because identifying interventions with similar or differential effectiveness can guide treatment selection in healthcare settings where psychological resources are limited. Values-based behavioral activation may be relatively concrete, action-oriented, and easy to integrate with behavioral self-management goals, whereas mindfulness may be particularly suitable for patients who experience intense cognitive and physiological reactivity to health-related thoughts and sensations. Previous research has established the therapeutic relevance of behavioral activation, mindfulness, cognitive-behavioral strategies, and combined health-promotion approaches, but much of this evidence has focused on depression, general anxiety, psychological distress, self-care behavior, glycemic control, resilience, or quality of life rather than health anxiety as a primary outcome (5, 11, 28). Moreover, comparative evidence is especially sparse among women with diabetes, despite the importance of psychological and behavioral adaptation in this population. Studies comparing behavioral activation and mindfulness-based cognitive therapy in women with type 2 diabetes have shown that both approaches can reduce psychological distress, but further research is needed to determine whether comparable effects are observed for more specific constructs such as health anxiety (20). Similarly, recent developments in mindfulness-based diabetes interventions and behavioral activation treatments suggest increasing support for both approaches, yet their relative efficacy for reducing excessive health-related fear has not been sufficiently clarified (17, 30, 31). Accordingly, the present study aimed to compare the effectiveness of values-based behavioral activation and mindfulness in reducing health anxiety among women with diabetes.

Methods and Materials

Study Design and Participants

The present study was an applied, quasi-experimental investigation employing a pretest–posttest–follow-up design with two experimental groups and one control group. Participants in all three groups were assessed at three measurement occasions. The first assessment was conducted at baseline before implementation of

the independent variables, the second assessment was conducted immediately after completion of the interventions, and the third assessment was performed at the two-month follow-up. Before initiation of the interventions, participants assigned to the first experimental group, the second experimental group, and the control group completed the pretest measures, and their baseline scores were recorded. Subsequently, the first experimental group received the values-based behavioral activation intervention and the second experimental group received the mindfulness intervention, whereas the control group received no psychological intervention during the study period. The intervention sessions were delivered in group format at a frequency of three sessions per week, and the overall intervention period lasted approximately one month. Following completion of the intervention period, participants in all three groups completed the posttest assessment. A two-month follow-up assessment was subsequently conducted to evaluate the maintenance of treatment effects, consistent with the follow-up periods used in recent intervention studies (Rabipour et al., 2022; Alikhah et al., 2023; Rezapour et al., 2023). Scores obtained at the pretest, posttest, and follow-up stages were then compared to determine within-group changes over time and between-group differences in intervention effects.

The statistical population consisted of all women with physician-diagnosed diabetes who were receiving pharmacological treatment and attending healthcare centers in Mianeh County during 2024–2025. In experimental research, a sample size of approximately 15 participants per group has been suggested as adequate for intervention studies under comparable conditions (Delavar, 2017). In addition, an a priori sample-size estimation was conducted using G*Power software. Assuming an effect size of $F = 0.35$, a statistical power of 0.95, and a type I error rate of $\alpha = 0.05$, the minimum required total sample size for detecting differences across the three comparable groups was estimated to be 45 participants. Accordingly, potentially eligible women with diabetes, based on a physician's diagnosis, were invited to participate in the study. Initially, 100 women completed the study questionnaires. From this pool, 45 individuals who demonstrated the most unfavorable scores on the study measures and met all eligibility criteria were selected as the final sample. They were then randomly allocated to three groups of equal size: the values-based behavioral activation group ($n = 15$), the mindfulness group ($n = 15$), and the control group ($n = 15$). The inclusion criteria were a confirmed diagnosis of diabetes by a physician, current use of diabetes-specific oral medication, diagnosis of diabetes at the age of 35 years or older, at least three years having elapsed since the initial diagnosis, an age between 45 and 60 years, a minimum educational level of a high-school diploma sufficient to ensure reading and writing ability, absence of other chronic physical diseases, and absence of diagnosed psychological disorders. The exclusion criteria were absence from more than two intervention sessions, unwillingness to continue participation at any stage of the study, receipt of psychological interventions during the preceding six months, and a history of substance or alcohol misuse.

Ethical principles governing research involving human participants were observed throughout the study. Before enrollment, participants received a clear and accurate explanation of the objectives, procedures, voluntary nature, and general requirements of the study, after which written informed consent was obtained. During implementation of the study, efforts were made to establish effective and supportive communication with participants and to minimize potential psychological discomfort associated with completing the assessments or participating in the interventions, including test-related anxiety, concerns regarding self-esteem or self-confidence, and apprehension about the possible implications of study results. Confidentiality

and privacy of all participant information were maintained by the researchers, and research data were used exclusively for scientific purposes. Participants assigned to the control group were informed that, after completion of the study, they would be offered access to the intervention or provided with relevant educational materials. The study protocol was approved by the appropriate institutional ethics committee under ethics code IR.IAU.TNB.REC.1405.123.

Data Collection Tools

Short Health Anxiety Inventory. Health anxiety was assessed using the short form of the Health Anxiety Inventory developed by Salkovskis and Warwick (2002). The Short Health Anxiety Inventory is an 18-item self-report measure designed to assess excessive concern, apprehension, and maladaptive cognitions related to health and illness. Each item consists of four statements representing progressively increasing levels of health-related concern or dysfunction, and respondents are instructed to select the statement that most accurately describes their current experience. Each item is scored from 0 to 3, with the first response option scored 0, the second scored 1, the third scored 2, and the fourth scored 3; consequently, higher total scores indicate greater levels of health anxiety and more pronounced health-related concerns. The instrument assesses major dimensions of health anxiety, including concerns about illness, perceived likelihood or consequences of becoming ill, and maladaptive responses to perceived health threats. Salkovskis and Warwick (2002) reported a test–retest reliability coefficient of 0.90, while Cronbach's alpha coefficients reported for the measure ranged from 0.70 to 0.82. They also examined its construct-related validity through associations with measures of illness-related beliefs. Subsequent psychometric research has further supported the reliability and validity of the instrument. Abramowitz et al. (2007), for example, reported satisfactory reliability indices for the Health Anxiety Inventory, with reliability estimates ranging from 0.63 in some analyses to approximately 0.94 for internal consistency. In the present study, the internal consistency of the instrument, assessed using Cronbach's alpha, was 0.81, indicating acceptable reliability for the study sample.

Intervention

Values-Based Behavioral Activation Protocol. The values-based behavioral activation intervention was delivered in a group format across eight sessions. The researcher-developed protocol was prepared with reference to behavioral activation principles described by McCauley, Schloedt, Gudmundsen, Martell, and Dimidjian (2016) and the values-oriented behavioral framework associated with Hayes and Masuda (2006). In the first session, the structure and rules of treatment were introduced, and participants were familiarized with the behavioral activation model through the sequence of event, feeling, response or behavior, and consequence. Everyday life examples were used to illustrate behavioral cycles, and participants were introduced to an activity-monitoring form. A sample activity record was completed during the session, and participants were assigned the completion of the monitoring form as homework. In the second session, homework was reviewed and barriers to completion were discussed. Participants identified important people and meaningful activities in their lives and were introduced to a worksheet distinguishing activities associated with feeling better from those associated with feeling worse. The relationship among situations, behavioral responses, and emotional experiences was explained, and participants learned to record their

emotional states on the activity-monitoring sheet and rate their intensity as low, moderate, or high. In the third session, previous homework was reviewed, and the distinction between mood-dependent behavior and goal-directed behavior was introduced using visual material illustrating the relationship between activity and emotional state. Participants completed an experiential exercise in which they first rated their mood from 1 to 10, engaged in a brief pleasurable activity, such as drawing with their eyes closed, and then rated their mood again. This exercise was used to demonstrate the association between behavioral engagement and subsequent emotional improvement. Participants were also taught to record pleasure associated with activities and rate its intensity on their activity-monitoring forms. In the fourth session of the values-based behavioral activation program, homework was reviewed and participants were assisted in identifying activities that tended to improve or worsen their emotional state. An imagery-based exercise was conducted in which participants first rated their current mood, recalled a period during which they had felt particularly happy while engaging in a preferred activity, described the details of that experience, and focused on the associated positive emotional state for several minutes before rating their mood again. The exercise was used to further clarify the relationship between behavior and mood. A pleasant-activities worksheet was then introduced, and individualized activity scheduling was initiated on the basis of each participant's interests and preferred activities. The day, time, location, and other relevant details of planned activities were specified, possible barriers to their completion were identified, and practical strategies were taught to facilitate adherence and prevent participants from forgetting planned activities. From the fifth session onward, behavioral activation and systematic review of related homework constituted the central treatment focus. During the fifth session, activity scheduling was expanded by increasing the frequency of previously selected activities or adding new activities, adherence to planned activities was reviewed, and barriers to behavioral activation were identified and addressed. Participants were instructed to complete scheduled activities between sessions and record them on activity-planning forms, while continuing activity monitoring when required. In the sixth session, activity scheduling and barrier management were continued, and a four-stage problem-solving skill was taught using simple language and illustrative examples. The stages consisted of remaining calm, brainstorming possible solutions, implementing the selected solution, and evaluating its effectiveness. Participants again completed and recorded scheduled activities as homework. During the seventh session of the values-based behavioral activation intervention, homework and engagement with planned activities were reviewed, and participants continued to increase the frequency and diversity of meaningful activities. Particular attention was given to strategies for reducing avoidance and overcoming practical or psychological barriers interfering with behavioral activation. These strategies were taught using simple examples and visual materials to maximize comprehensibility, and participants were again instructed to carry out their scheduled activities and document them between sessions. The eighth and final session focused on reviewing homework, consolidating the skills acquired during treatment, and providing an integrated review of the concepts introduced throughout the program. Participants were shown their mood-related or activity-related records so that they could observe positive changes occurring across the treatment period. The importance of continued behavioral activation was emphasized, and participants were encouraged to maintain systematic activity planning and active engagement in meaningful behaviors after termination of the formal sessions. The final component specifically addressed clarification of personally important values, formulation of behavioral goals consistent with those values, strengthening commitment

to value-congruent action, and preparation for continued independent application of the treatment strategies. The session concluded with a summary of the intervention and review of strategies for maintaining therapeutic gains.

Mindfulness Protocol. The mindfulness intervention was developed on the basis of the mindfulness-based approach described by Kabat-Zinn et al. (1992) and was administered in a group format across eight sessions. The first session was devoted to administration of the baseline assessment, establishment of therapeutic rapport, conceptualization of participants' difficulties, and introduction to mindfulness. Approximately the first 30 minutes were allocated to pretest completion, after which the principles of mindfulness training and its potential roles in psychological health and well-being were explained with reference to relevant research evidence. In the second session, after a brief review of the previous material, participants were introduced to relaxation training, including the distinction between muscular tension and relaxation, appropriate sitting posture, and the muscle groups involved in progressive relaxation. With participants' eyes closed, relaxation exercises were conducted across 14 muscle groups, including the forearms for approximately 5 minutes, upper arms for 5 minutes, lower-leg and calf muscles for 10 minutes, thighs for 5 minutes, abdominal and chest muscles for 10 minutes, shoulders and neck for 10 minutes, lips and jaw for 10 minutes, and the muscles around the eyes and upper and lower forehead for approximately 10 minutes. In the third session, following a brief review, relaxation practice was consolidated into six broader muscle groups. With eyes closed, participants practiced relaxation of the hands and arms for approximately 10 minutes, legs and thighs for 10 minutes, abdomen and chest for 10 minutes, neck and shoulders for 10 minutes, jaw and lips for 10 minutes, and forehead and eye muscles for approximately 10 minutes. The fourth mindfulness session focused on mindful awareness of breathing. Following review of the previous session, participants were trained to observe inhalation and exhalation without becoming involved in unrelated thoughts and to coordinate breathing with a state of relaxation. The exercise began with approximately 10 minutes of learning to sit comfortably while maintaining an upright spinal posture. Participants then practiced ordinary breathing interspersed with somewhat deeper inhalations and exhalations for approximately 15 minutes. This was followed by about 15 minutes of attending closely to the passage of air during inhalation and exhalation and observing movements of the chest and abdomen. During the final approximately 15 minutes, participants silently repeated calming phrases during breathing, such as statements emphasizing effortless breathing and bodily relaxation. The fifth session introduced body-scan practice. After a brief review, participants first attended to abdominal and thoracic movements during breathing for approximately 15 minutes. They then spent approximately 20 minutes deliberately directing awareness to different parts of the body, including the hands, feet, eyes, mouth, ears, and skin. Auditory awareness was subsequently practiced for approximately 15 minutes by attending to surrounding sounds, the instructor's footsteps or finger-produced sounds, and the sound of one's own breathing without deliberately shifting attention to unrelated stimuli. The session concluded with approximately 10 minutes devoted to mindful exploration of olfactory and gustatory sensations through smelling and tasting a sweet food item. The sixth mindfulness session focused on mindfulness of thoughts. After reviewing previous exercises, participants initially practiced approximately 15 minutes of attentional focusing by directing awareness toward a mental focal point or a visual fixation point, such as a cross marked on a sheet of paper, while refraining from deliberate engagement with unrelated thoughts. The next stage involved

approximately 30 minutes of guided practice with negative self-referential thoughts. Participants were asked to imagine themselves experiencing difficulty or inability in several ordinary personal activities, such as walking, running, or eating, and to observe the resulting thought repeatedly without judging, suppressing, or deeply elaborating upon it. Under the instructor's guidance, attention was brought to the thought and subsequently disengaged from it, with emphasis on acknowledging its presence without evaluative judgment. This was followed by approximately 30 minutes of guided practice involving positive self-referential thoughts, during which participants imagined themselves competently performing everyday activities, such as walking or completing a routine purchase. These thoughts were repeatedly brought into awareness and then allowed to pass, with participants instructed to observe positive cognitions and images without judgment or excessive elaboration. The seventh session integrated the principal mindfulness skills acquired in the fourth, fifth, and sixth sessions. Mindful breathing, body-scan practice, and mindfulness of thoughts were each repeated for approximately 20 to 30 minutes to facilitate integration into a more comprehensive mindfulness practice. During the eighth and final session, the principal techniques taught throughout the program were reviewed and consolidated. Participants were encouraged to incorporate mindfulness practices into their everyday lives and to use these skills regularly to support psychological and physical health. The posttest assessment was administered at the conclusion of the intervention, and participants were encouraged to continue independent mindfulness practice during the subsequent follow-up period.

Data Analysis

Data obtained at the pretest, posttest, and two-month follow-up assessments were analyzed using IBM SPSS Statistics. Descriptive statistics were first calculated to summarize participant characteristics and the distribution of the study variables. To evaluate changes in health anxiety over time and to compare the effectiveness of values-based behavioral activation, mindfulness, and the control condition, a mixed-design analysis of variance was conducted, with measurement time representing the within-subject factor and treatment group representing the between-subject factor. This analytical strategy permitted simultaneous examination of the main effect of time, the main effect of group, and the group-by-time interaction, with the interaction effect providing the principal test of differential changes across the three study conditions. Before performing inferential analyses, the relevant statistical assumptions for mixed-design analysis of variance were examined, including the distributional properties of the dependent variable, homogeneity of variances, and assumptions concerning the covariance structure of repeated measurements. When statistically significant omnibus effects were identified, Bonferroni-adjusted post hoc comparisons were used to determine the specific differences between measurement occasions and treatment groups while controlling for inflation of the familywise type I error rate. Statistical significance was evaluated at $\alpha = 0.05$.

Findings and Results

The final sample consisted of 45 women with diabetes who were equally allocated to the values-based behavioral activation group, the mindfulness group, and the control group, with 15 participants in each group. The participants had a mean age of 51.933 years ($SD = 4.096$). Regarding educational attainment, 14 participants (31.1%) held a high-school diploma, 22 participants (48.9%) held a bachelor's degree, 6 participants (13.3%) held a master's degree, and 3 participants (6.7%) held a doctoral degree. Thus, the

largest proportion of participants had a bachelor's degree, whereas those with a doctoral degree constituted the smallest educational subgroup. Descriptive statistics for health anxiety across the three measurement occasions and study groups are presented in Table 1.

Table 1. Descriptive Statistics for Health Anxiety Across the Study Groups and Measurement Occasions

Variable	Group	Pretest M	Pretest SE	Posttest M	Posttest SE	Follow-up M	Follow-up SE
Health anxiety	Values-based behavioral activation	32.466	2.011	17.066	1.541	17.000	1.756
Health anxiety	Mindfulness	32.266	2.066	15.666	1.252	15.600	1.369
Health anxiety	Control	32.400	2.085	32.266	2.114	32.533	2.296

As shown in Table 1, the three groups had highly comparable mean health anxiety scores at pretest, with mean scores of 32.466 in the values-based behavioral activation group, 32.266 in the mindfulness group, and 32.400 in the control group. Following the interventions, marked reductions in health anxiety were observed in both experimental groups. The mean score decreased to 17.066 in the values-based behavioral activation group and to 15.666 in the mindfulness group, whereas the control group's mean score remained essentially unchanged at 32.266. A similar pattern was observed at the two-month follow-up, with mean health anxiety scores of 17.000 and 15.600 in the values-based behavioral activation and mindfulness groups, respectively, compared with 32.533 in the control group. The relative stability of the posttest and follow-up means in both intervention groups suggested that the reductions in health anxiety achieved after treatment were maintained during the follow-up period.

Before conducting the mixed-design analysis of variance, the relevant statistical assumptions were examined. Mauchly's test of sphericity was nonsignificant for health anxiety, $W = 0.899$, $\chi^2 = 4.372$, $df = 2$, $p = .112$, indicating that the assumption of sphericity was satisfied. Therefore, no correction to the degrees of freedom was required for interpretation of the within-subject effects. The nonsignificant Mauchly test supported the use of the standard univariate estimates for examining changes in health anxiety across the three measurement occasions. The multivariate tests also demonstrated a statistically significant overall group-related effect on health anxiety, with Pillai's trace = 0.891, Wilks' $\lambda = 0.109$, Hotelling's trace = 8.206, and Roy's largest root = 8.206; all corresponding tests were statistically significant, $F(2, 41) = 168.220$, $p < .001$. These results indicated that health anxiety differed significantly as a function of study condition and measurement occasion, thereby justifying further examination of the between-group and within-subject effects.

Table 2. Mixed-Design Analysis of Variance for Health Anxiety

Effect	SS / Multivariate Value	df	MS	F	p	Effect Size
Between-subjects: Group	3471.481	2	1735.741	12.480	< .001	0.373
Between-subjects: Error	5841.289	42	139.078	—	—	—
Within-subjects: Time	2560.000	1	2560.000	222.886	< .001	—
Within-subjects: Time $\times$ Group	1317.600	2	658.800	57.358	< .001	—
Multivariate: Pillai's trace	0.891	2, 41	—	168.220	< .001	0.891
Multivariate: Wilks' lambda	0.109	2, 41	—	168.220	< .001	0.891
Multivariate: Hotelling's trace	8.206	2, 41	—	168.220	< .001	0.891
Multivariate: Roy's largest root	8.206	2, 41	—	168.220	< .001	0.891

The results of the mixed-design analysis of variance presented in Table 2 indicated a statistically significant main effect of group on health anxiety, $F(2, 42) = 12.480$, $p < .001$, with an effect size of 0.373. This finding demonstrated that the three groups differed significantly in their overall health anxiety scores. The main effect of time was also statistically significant, $F = 222.886$, $p < .001$, indicating that health anxiety changed significantly across the pretest, posttest, and follow-up assessments. More importantly, the time $\times$ group interaction was statistically significant, $F = 57.358$, $p < .001$, demonstrating that the pattern of change in health anxiety over time differed across the three study groups. Examination of the descriptive means showed that this interaction resulted primarily from substantial reductions in health anxiety in the two intervention groups following treatment, whereas health anxiety remained relatively stable in the control group. The maintenance of comparatively low health anxiety scores at follow-up in both experimental groups further indicated that the therapeutic effects of values-based behavioral activation and mindfulness persisted over the two-month follow-up period.

Table 3. Bonferroni Post Hoc Comparisons of Health Anxiety Across Measurement Occasions and Study Groups

Comparison Type	Comparison	Mean Difference	SE	p	95 % CI
Time	Pretest vs. Posttest	10.711	0.591	< .001	—
Time	Pretest vs. Follow-up	10.667	0.714	< .001	—
Time	Posttest vs. Follow-up	-0.044	0.554	1.000	—
Group	Values-based behavioral activation vs. Mindfulness	1.000	2.486	1.000	-5.199 to 7.199
Group	Values-based behavioral activation vs. Control	-10.222	2.486	< .001	-16.422 to -4.022
Group	Mindfulness vs. Control	-11.222	2.486	< .001	-17.422 to -5.022

The Bonferroni-adjusted pairwise comparisons presented in Table 3 showed that health anxiety scores were significantly lower at posttest than at pretest, with a mean difference of 10.711, $SE = 0.591$, $p < .001$. Health anxiety at follow-up was also significantly lower than at pretest, with a mean difference of 10.667, $SE = 0.714$, $p < .001$. In contrast, the difference between posttest and follow-up was not statistically significant, mean difference = -0.044, $SE = 0.554$, $p = 1.000$, indicating that the reduction in health anxiety observed immediately after the interventions remained stable during the two-month follow-up period. The between-group comparisons further demonstrated that there was no statistically significant difference between the values-based behavioral activation and mindfulness groups, mean difference = 1.000, $SE = 2.486$, $p = 1.000$, 95% CI [-5.199, 7.199]. Thus, the two interventions demonstrated comparable effectiveness in reducing health anxiety. However, the values-based behavioral activation group differed significantly from the control group, mean difference = -10.222, $SE = 2.486$, $p < .001$, 95% CI [-16.422, -4.022], and the mindfulness group also differed significantly from the control group, mean difference = -11.222, $SE = 2.486$, $p < .001$, 95% CI [-17.422, -5.022]. Taken together, these findings indicate that both values-based behavioral activation and mindfulness produced significant and sustained reductions in health anxiety among women with diabetes, while neither intervention demonstrated statistically superior effectiveness relative to the other.

Discussion and Conclusion

The present study aimed to compare the effectiveness of values-based behavioral activation and mindfulness in reducing health anxiety among women with diabetes. The findings demonstrated that both interventions produced significant reductions in health anxiety compared with the control condition.

Participants in the values-based behavioral activation group and the mindfulness group showed substantial decreases in health anxiety from pretest to posttest, whereas the control group demonstrated little change across the same period. Moreover, the significant time $\times$ group interaction indicated that changes in health anxiety over time depended on treatment condition and that the observed improvements were specifically associated with participation in the psychological interventions. Importantly, the reductions achieved after treatment were maintained at the two-month follow-up, as no significant deterioration was observed between posttest and follow-up. The Bonferroni comparisons further indicated that the two active interventions did not differ significantly from one another, suggesting that values-based behavioral activation and mindfulness were comparably effective in reducing health anxiety in this sample. These findings support the broader proposition that psychological interventions targeting behavioral avoidance, maladaptive attentional processes, emotional reactivity, and ineffective coping can play an important adjunctive role in the management of psychological distress among individuals living with diabetes.

The effectiveness of values-based behavioral activation in reducing health anxiety is consistent with previous evidence indicating that behavioral activation can improve psychological functioning across both psychiatric and chronic medical populations. Behavioral activation is based on the assumption that distress is maintained partly through behavioral withdrawal, avoidance, inactivity, and diminished access to reinforcing and meaningful experiences (11, 12). In patients with diabetes, health-related fear may promote excessive monitoring of bodily sensations, avoidance of activities perceived as dangerous, repeated reassurance seeking, and progressive restriction of ordinary life activities. Such behavioral patterns may temporarily reduce anxiety but ultimately reinforce threat perceptions and maintain preoccupation with disease. Values-based behavioral activation attempts to interrupt this cycle by increasing engagement in purposeful, rewarding, and personally meaningful activities and by decreasing behavior controlled primarily by fear or transient mood states. This interpretation is consistent with findings showing that behavioral activation can reduce anxiety, depression, and maladaptive concerns in individuals with chronic physical conditions (14). It also aligns with evidence demonstrating beneficial effects of behavioral activation on maladaptive beliefs and social problem-solving processes among individuals with elevated anxiety (15). In the present study, participants were repeatedly encouraged to monitor the relationship between activity and mood, identify avoidance patterns, schedule meaningful behaviors, solve barriers to action, and commit to behavior congruent with personal values. These procedures may have reduced the amount of attention devoted to bodily threat and illness-related concerns while simultaneously increasing perceived competence, environmental reinforcement, and engagement with life outside the illness context.

The present findings are also supported by studies specifically applying behavioral activation principles to diabetes management. Behavioral activation has been incorporated into interventions designed for individuals with type 2 diabetes because behavioral withdrawal, depressive symptoms, low motivation, and poor engagement in self-care may interact in ways that worsen both psychological and physical outcomes. The development of diabetes-modified behavioral activation approaches for older adults illustrates the increasing recognition that behavioral activation can be adapted to disease-management demands (17). Similarly, collaborative goal setting combined with behavioral activation has shown favorable effects among adults with uncontrolled diabetes, emphasizing the usefulness of linking concrete goals with systematic behavioral engagement (18). More recent comparative work has also demonstrated that behavioral activation

therapy can improve quality of life and self-care behavior in individuals with type 2 diabetes (19). The present results extend these findings by suggesting that behavioral activation may also influence a more specific cognitive-affective outcome, namely health anxiety. This effect may occur because increased behavioral engagement provides corrective experiences. When patients participate in valued and scheduled activities without the feared consequences occurring, beliefs about physical vulnerability may gradually weaken. Moreover, successfully completing planned behaviors may increase perceived self-efficacy and reduce helplessness regarding illness management.

The value-oriented component of the intervention may have further strengthened its effects. In chronic disease, patients are frequently required to pursue meaningful activities despite uncertainty, fluctuating symptoms, and awareness of possible long-term complications. When behavior is organized solely around symptom reduction, patients may become trapped in continuous attempts to control, avoid, or monitor internal experiences. In contrast, values-based behavioral activation redirects attention toward living in accordance with personally meaningful life directions. This shift can reduce the centrality of illness in the person's identity and encourage sustained engagement even when health-related concerns are present. The integration of meaningful goals with behavioral change has also been emphasized in health-related behavioral models concerned with eating and self-regulation (16). For women with diabetes, whose daily routines may already involve extensive disease-management demands, reconnecting treatment behavior with personally important domains such as family, autonomy, social participation, and self-care may increase motivation and weaken avoidance. Thus, the observed reduction in health anxiety may reflect not only increased activity but also a change in the functional role of behavior, from fear-driven restriction toward deliberate and value-consistent engagement.

The effectiveness of mindfulness in reducing health anxiety is likewise consistent with previous research. Health anxiety often involves selective attention to bodily sensations, catastrophic misinterpretation of normal or ambiguous physiological experiences, repetitive worry, and difficulty disengaging from perceived signs of illness. Mindfulness directly targets these processes by training individuals to observe thoughts, emotions, and bodily sensations without immediate judgment, elaboration, or avoidance. Instead of treating each sensation as evidence of danger, individuals learn to notice internal experiences as transient events. Previous studies have shown that mindfulness-based interventions can reduce health anxiety and improve adaptation in medically and psychologically stressed populations. Positive mindfulness training has been associated with reductions in health anxiety and improved adjustment (10), while mindfulness-based cognitive interventions have demonstrated benefits for resilience and emotional reactivity among patients with physical health problems (25). Integrative cognitive-behavioral and mindfulness approaches have also been effective in reducing health anxiety in individuals exposed to intense illness-related threat (9). The present findings are compatible with these studies and suggest that mindfulness may help patients with diabetes relate differently to illness-related thoughts and bodily signals rather than automatically responding to them as threatening.

The mindfulness protocol used in the present study included relaxation, mindful breathing, body scanning, sensory awareness, and mindfulness of both negative and positive thoughts. These components may have influenced health anxiety through several complementary mechanisms. Relaxation may have reduced physiological arousal that could otherwise be misinterpreted as evidence of medical deterioration.

Mindful breathing and body scanning may have increased awareness of somatic experiences while reducing evaluative responses to them. Mindfulness of thoughts may have helped participants recognize that negative health-related cognitions do not necessarily represent objective facts and need not automatically control behavior. This explanation corresponds with evidence showing that mindfulness can improve psychological flexibility, emotional functioning, and self-efficacy in chronic illness populations (34). It is also consistent with findings that mindfulness-based programs improve psychological flexibility and mental well-being more broadly (21). By increasing tolerance of uncomfortable internal experiences, mindfulness may reduce the urgency to seek reassurance, avoid activity, or repeatedly monitor symptoms, thereby weakening the behavioral cycle that sustains health anxiety.

The present mindfulness findings are especially congruent with the growing literature on mindfulness interventions in diabetes. Bibliometric research has documented increasing scientific attention to mindfulness as an adjunctive strategy in diabetes care (27). Systematic review and meta-analytic evidence indicates that mindfulness-based stress reduction can improve psychological health among patients with diabetes and may also contribute to better glycemic outcomes (28). Reviews of the relationship between mindfulness and glycemic control similarly suggest that mindfulness may be clinically valuable in diabetes management, although intervention effects can vary according to design and population characteristics (29). A recent systematic review and meta-analysis also supports the usefulness of mindfulness-based interventions for adults with type 2 diabetes (30). Furthermore, mindfulness-based lifestyle interventions have been applied successfully among older adults with type 2 diabetes (32), while blended mindfulness-based stress reduction programs have been associated with improved diabetes self-management (31). These findings reinforce the present results by suggesting that mindfulness is relevant not only to general psychological distress but also to the everyday self-regulatory demands of chronic diabetes care.

The significant maintenance of treatment effects at the two-month follow-up is another important finding. The absence of a significant difference between posttest and follow-up suggests that participants retained the psychological benefits of both interventions after the structured sessions ended. In the behavioral activation condition, this maintenance may be explained by the practical and repeatable nature of the learned strategies. Activity monitoring, scheduling, problem solving, and value-guided goal setting can be continued independently after treatment, allowing participants to maintain behavioral patterns that reduce avoidance and increase reinforcement. Similarly, mindfulness exercises such as attention to breathing, body awareness, and nonjudgmental observation of thoughts can be incorporated into daily routines without specialized equipment or extensive professional supervision. Evidence from other mindfulness intervention contexts has indicated that learned mindfulness practices may continue to influence emotional regulation, coping, and self-care after formal training has ended (23, 24). The persistence of effects in the current study is also consistent with the broader literature on third-wave interventions, which emphasizes the acquisition of skills that can be generalized beyond treatment sessions (26). From a clinical perspective, this durability is particularly relevant in diabetes because effective psychological management requires strategies that patients can use repeatedly in response to ongoing illness-related stress.

The finding that values-based behavioral activation and mindfulness did not differ significantly in effectiveness is also theoretically meaningful. Although these approaches emphasize different proximal mechanisms, they may ultimately influence overlapping processes. Behavioral activation changes the

person's relationship with distress by encouraging action despite difficult emotions, whereas mindfulness changes the person's relationship with internal experience by encouraging observation without automatic reaction. Both can reduce experiential avoidance. Both can increase intentional behavior. Both can weaken the dominance of threat-focused cognition. Both may also increase self-efficacy by providing patients with concrete methods for responding to distress. This convergence may explain why neither intervention emerged as superior. Comparative studies in women with type 2 diabetes have similarly found that behavioral activation and mindfulness-based cognitive approaches can both reduce psychological distress (20). Other comparative and integrative research also suggests that diverse psychological approaches may produce beneficial effects through partly shared mechanisms, including improved coping, emotional regulation, behavioral engagement, and reduced cognitive reactivity (5, 36). The equivalence observed in the present study therefore does not imply that the two therapies are identical; rather, it suggests that different therapeutic pathways may lead to comparable reductions in health anxiety.

The results can also be understood in the context of coping with diabetes as a chronic stressor. Diabetes requires continuous behavioral adaptation, and psychological distress may arise not only from actual complications but also from uncertainty about the future, treatment burden, and perceived inability to control disease progression. Research indicates that coping strategies are closely associated with diabetes-specific distress, depression, and self-care behaviors (3). Interventions that promote more flexible engagement with stress may therefore reduce health anxiety indirectly by strengthening adaptive coping. Mindfulness may facilitate acceptance and present-focused attention, whereas behavioral activation may promote active problem solving and approach-oriented coping. Diabetes self-management interventions that strengthen self-acceptance and self-care similarly demonstrate that behavioral and psychological processes are important components of effective disease management (4). The present findings therefore support a biopsychosocial understanding of diabetes in which mental health interventions complement medical treatment rather than functioning as unrelated ancillary services.

The clinical relevance of reducing health anxiety in diabetes should also be considered against the objective medical risks associated with the disease. Diabetes is associated with numerous chronic complications and increased cardiovascular risk (1), and recent population-level evidence has also demonstrated an elevated risk of sudden cardiac death among individuals with diabetes (2). Therefore, the therapeutic goal should not be to eliminate appropriate concern or reduce necessary attention to genuine symptoms. Rather, psychological intervention should help patients distinguish adaptive vigilance from excessive and functionally impairing anxiety. Both values-based behavioral activation and mindfulness appear suitable for this purpose because neither requires denying medical risk. Behavioral activation encourages patients to continue meaningful and health-promoting activity despite uncertainty, whereas mindfulness encourages accurate observation of internal experience without escalating automatically into catastrophic interpretation. In this sense, both interventions may reduce maladaptive health anxiety while preserving appropriate medical self-care.

Several limitations should be considered when interpreting the findings. First, the sample was relatively small and consisted exclusively of women with diabetes attending healthcare centers in one geographic area, which limits the generalizability of the findings to men, patients from different cultural or socioeconomic backgrounds, individuals with different types or severity levels of diabetes, and patients receiving care in

other healthcare systems. Second, participants were selected purposively after an initial screening process, and those with relatively unfavorable questionnaire scores were recruited into the final sample; therefore, the findings may not represent patients with low or subclinical levels of health anxiety. Third, health anxiety was assessed primarily through a self-report questionnaire, making the results potentially susceptible to response bias, social desirability, and participants' awareness of treatment assignment. Fourth, the follow-up period was limited to two months, which allows evaluation of short-term maintenance but not longer-term durability of the interventions. Fifth, the study did not include objective indicators of diabetes management, such as HbA1c, medication adherence, glucose-monitoring behavior, or documented healthcare utilization, and therefore it was not possible to determine whether reductions in health anxiety were accompanied by improvements in medical outcomes. Finally, the relatively modest sample size may have limited statistical power for detecting small differences between the two active interventions.

Future studies should replicate the present investigation with larger and more heterogeneous samples and should include both women and men across different age groups, educational levels, socioeconomic backgrounds, and diabetes subtypes. Multicenter randomized controlled trials would provide stronger evidence regarding the comparative efficacy of values-based behavioral activation and mindfulness. Future research should also employ longer follow-up periods, such as six months or one year, to determine whether treatment gains remain stable over time. Incorporating objective clinical indicators, including HbA1c, fasting blood glucose, medication adherence, physical activity, healthcare utilization, and frequency of reassurance-seeking medical visits, would provide a more comprehensive understanding of intervention effects. Researchers could also examine potential mediators and moderators of treatment response, such as experiential avoidance, psychological flexibility, intolerance of uncertainty, illness perception, coping style, self-efficacy, baseline health anxiety severity, and adherence to homework. Direct examination of these mechanisms may clarify whether values-based behavioral activation and mindfulness achieve similar outcomes through different therapeutic pathways. Future work may also compare face-to-face, digital, blended, and brief versions of these interventions to identify formats that maximize accessibility and cost-effectiveness.

The findings suggest that healthcare professionals working with patients with diabetes should consider routine assessment of excessive health-related anxiety as part of comprehensive diabetes care, particularly when patients demonstrate persistent worry about complications, repeated reassurance seeking, excessive symptom monitoring, avoidance of daily activities, or significant emotional distress. Values-based behavioral activation may be particularly useful for patients whose anxiety is accompanied by inactivity, behavioral withdrawal, loss of meaningful routines, and avoidance of valued activities, while mindfulness may be especially suitable for individuals characterized by heightened reactivity to bodily sensations, repetitive health-related thoughts, and difficulty disengaging from worry. Because both interventions were effective and neither demonstrated clear superiority, treatment selection may reasonably be guided by patient preference, therapist expertise, feasibility, and the dominant maintaining processes observed clinically. Brief group-based versions of these interventions could be integrated into diabetes clinics, primary care settings, counseling centers, and multidisciplinary chronic disease programs. Training patients to continue activity scheduling, value-guided action, mindful breathing, body awareness, and nonjudgmental

observation after formal treatment may also help preserve therapeutic gains and support long-term psychological adaptation to diabetes.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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