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ORIGINAL RESEARCH

The Feasibility and Preliminary Effects of a Stress Process Model-Based Program in Dementia Caregiving (DeCare-SPM) for Family Caregivers: A Mixed-Methods Pilot Study

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Background: Dementia caregiving causes significant stress, making psychosocial interventions crucial. However, its success depends on effective implementation. This study aimed to evaluate the feasibility, acceptability, and preliminary effects of DeCare-SPM, a theory-driven program designed to enhance positive aspects of caregiving and reduce burden.

Methods: A single-group pre-post study without a control group, using an embedded mixed-methods design, was conducted from June to July 2023. The 1-month intervention included three face-to-face sessions and four weekly telephone-based consultations. The feasibility was evaluated through recruitment rate, adherence, and satisfaction. Focus group interviews with implementers and caregivers provided qualitative insights. Preliminary effects on positive aspects of caregiving (PAC), caregiver burden, sense of competence, social network, anxiety and depression, quality of life for caregivers, and neuropsychiatric symptoms and quality of life for individuals with dementia were measured at the end of the 1-month intervention period.

Results: 32 caregivers were recruited; no dropouts. 81.3% (26/32) attended all sessions, and 87.5% (28/32) completed telephonic interventions. Overall satisfaction a showed a median score of 4 (P25–P75: 3.25–5), with the highest ratings for the intervention team (median 4, P25–P75: 4–4). Participation demonstrated a median score of 4 (P25–P75: 3.25–4), with particularly high engagement in reading the provided materials (median 4.5, P25–P75: 4–5). The most frequently applied strategy was seeking support from family and friends (median 4, P25–P75: 4–4). (2) Qualitative findings revealed four themes: Perceived Benefit, Peer Support, Suggestions for Improvement, and Reasons for Low Application. Post-intervention improvements were seen in PAC (t=3.553, P=0.001, d=0.63), sense of competence (t=4.673, P<0.001), social network (t=3.645, P=0.001), and EQ-5D index (t=2.785, P=0.009). Burden (t=−3.083, P=0.004, d=0.55) and anxiety (t=−3.544, P=0.001) decreased significantly.

Conclusion: The DeCare-SPM was feasible and acceptable for family caregivers and showed preliminary effects on family caregivers.

Keywords: Alzheimer's disease, stress coping, family caregivers, psychosocial, feasibility

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Introduction

Dementia is a progressive, irreversible cognitive decline caused by diseases that damage nerve cells, leading to memory loss and functional impairment.[1] Over 55 million people worldwide have dementia, with projections reaching 139 million by 2050.[2] Despite extensive research efforts, dementia remains incurable, leading to healthcare and caregiving costs over three times higher than those of other conditions.[3] Informal caregivers, usually spouses or adult-children,[3] provide the majority of care for Individuals with dementia (IWD), averaging over 171 hours per week.[4] As the disease progresses, untrained family caregivers face increasing challenges, including managing behavioral changes alongside daily care

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duties.[5] These burdensome experiences may have harmful physical. (eg, elevated blood pressure, muscle strain), emotional (eg, anxiety, depression), and social[6] (eg, social isolation) impacts on the caregiver of IWD, thereby affecting the well-being of both caregivers and IWD.[6,7] Conclusively, caregivers of IWD face high stress, necessitating effective support programs.

Caregiving experiences are widely recognized as being fraught with stress and challenges.[8] Consequently, much of the existing study has predominantly focused on the stressors inherent in caregiving and their negative impacts, particularly the effects of caregiver burden on mental and physical health, such as subjective health indicators like depression and anxiety.[8] In parallel, studies have also examined burden factors, such as caregiving duration, intensity, care recipient dependence, personal resources, and coping strategies,[9] to mitigate these stressors to improve caregivers' overall health. For instance, the WHO has developed the "iSupport" program, which emphasizes problem-solving and skills training. In addition, evidence suggests that acceptance- and mindfulness-based interventions are effective in reducing psychological distress, caregiver burden, and depressive symptoms among informal caregivers of people with dementia.[10,11] Overall, existing evidence suggests that caregiver interventions can effectively reduce burden and depression, primarily by alleviating negative emotions and sources of stress. Overall, existing evidence[12] has demonstrated that interventions for caregivers effectively reduce burden and depression, mainly by alleviating negative emotions and sources of stress.

Existing intervention programs, including psychoeducation, counseling, psychotherapy, respite care, support groups, and integrated intervention models, primarily focus on alleviating caregiver burden and have shown certain effectiveness.[13] However, interventions often concentrate predominantly on reducing burden, with limited attention given to the PAC that may arise during caregiving. In fact, caregiving is an inherently complex process characterized by both positive and negative experiences,[14] where caregiver burden and PAC are not mutually exclusive or opposing constructs. For caregivers, caregiving is not merely a task; it is also a means of expressing love and fulfilling personal life meaning.[15] Simultaneously, caregiving experiences can foster personal growth, facilitate deeper spiritual development, thereby enhancing one's personal strength and enriching their spiritual life.[16] Evidence suggests that caregiving stress and positive cognitions jointly influence the well-being and life satisfaction of caregivers of IWD, with significant positive effects on caregivers themselves.[17] Moreover, PAC is influenced not only by caregiving burden,[18] but also by factors such as self-efficacy,[19] health status,[20] role strain,[21] and work-caregiver conflict.[22] Many caregivers face insufficient social support, with this sense of social isolation being more pronounced for those solely responsible for caregiving.[23] Studies indicate that caregivers with richer social support networks experience lower caregiving burden and report higher levels of PAC.[24,25] However, most interventions do not specifically focus on enhancing PAC, with only a few studies incorporating it as a secondary outcome measure, including psychoeducation,[26] gratitude education,[27] online positive emotion regulation,[28] positive journaling,[15] and various psychosocial interventions.[29] The effects of these interventions are inconsistent, and their positive impact on the PAC of caregivers remains insufficiently validated. Therefore, there is an urgent need to develop a comprehensive intervention program that prioritizes the enhancement of the PAC of caregivers while reducing caregiving burden.

We previously developed the stress process model-based program in dementia caregiving (DeCare-SPM) project,[9] which is based on the core constructs and logical relationships of the DeCare-SPM, formed through revised coping theories developed by Folkman et al[30] and the social convoy model.[31] The social convoy model conceptualizes social support as arising from networks of family, friends, and other social ties, and links these networks directly to individual health and subjective well-being. Additionally, it incorporates practical needs assessments (interviews with family caregivers), practical analysis (interviews with dementia care teams), and systematic evaluations of positive psychology interventions to create a comprehensive intervention project. The project highlights problem-focused coping, emotion-focused coping, meaning-focused coping, and social support as key intervention elements, aiming to enhance PAC and reduce their caregiver burden. We previously developed the stress process model-based program in dementia caregiving (DeCare-SPM) project,[9] grounded in revised coping theories developed by Folkman et al[30] and the social convoy model.[31] The social convoy model conceptualizes social support as arising from networks of family, friends, and other social ties that are directly linked to individual health and subjective well-being. The intervention was further informed by practical needs assessments with family caregivers, consultations with dementia care teams, and systematic evaluations of positive psychology interventions. Unlike structured caregiver programs such as the WHO "iSupport", which primarily consist of psychoeducation and skills-based modules focusing on burden reduction and caregiving competencies, DeCare-SPM is theory-driven and organized around a comprehensive coping framework. It integrates problem-focused, emotion-focused, and meaning-focused strategies together with social support enhancement. In addition to reducing caregiver burden, DeCare-SPM explicitly incorporates benefit-focused components aimed at enhancing the positive aspects of caregiving (PAC). Compared with structured caregiver programs such as the WHO "iSupport", which primarily consist of psychoeducation and skills-based modules focusing on burden reduction and caregiving competencies, DeCare-SPM is theory-driven and organized around a comprehensive coping framework. It integrates problem-focused, emotion-focused, and meaning-focused strategies together with social support enhancement. In addition to reducing caregiver burden, DeCare-SPM explicitly incorporates benefit-focused components aimed at enhancing PAC. Despite the theoretical advantages, the practical feasibility and effectiveness of the intervention remain unverified. The study therefore focuses on evaluating the feasibility and acceptability of DeCare-SPM, along with conducting a preliminary assessment of changes in PAC perception, caregiver burden, social support, anxiety, depression, and quality of life pre- and post-intervention. Additionally, shifts in the behavioral and psychological symptoms of IWD, as well as the quality of life, will be examined to inform the practical application of the intervention.

Method

Study Design

A nested mixed-methods design featuring a single-group pre-post measurement approach was employed in a study focusing on family caregivers of IWD within community settings in Chongqing, China. The study adhered to the Medical Research Council (MRC) framework for developing and evaluating complex interventions. Ethical approval was granted by the Ethics Committee of the First Affiliated Hospital of Chongqing Medical University (No. 2022–016).

Study Participants and Recruitment

Participants were recruited from a community in Shapingba District, Chongqing, between June and July 2023 using multiple recruitment approaches. The research team had established prior working relationships with local community healthcare providers. Potential participants were identified and initially contacted by the research team and community-based healthcare providers, including family doctors and community service center staff, via email, WeChat, telephone, or in-person visits. In addition, recruitment materials and poster links were distributed through community networks (eg, WeChat and email), allowing interested caregivers to proactively contact the study team All interested caregivers were provided with detailed study information, screened for eligibility, and enrolled after providing written informed consent. Eligible participants: 1) The care recipient must have a confirmed diagnosis of dementia (Alzheimer's or vascular type) from a medical institution. No restriction was placed on the duration since diagnosis. 2) Family caregivers must be 18 years or older. 3) IWDmust reside in the community and have no plans to relocate or enter an institution within the next year. 4) The primary family caregiver must provide an average of at least four hours of care per day. 5) Community-based care for the IWD must have been provided for at least three months. 6) Participation in the study must be voluntary. Exclusions: 1) Family caregivers with mental health disorders or other serious illnesses. 2) IWD or family caregivers currently participating in other care support programs or intervention trials. 3) IWD in the terminal phase or those with more than two unplanned hospital admissions in the past six months. 4) Individuals unable to participate due to the distance from the on-site care support training location. Given that this is a pilot study, calculating the sample size to assess the effectiveness of the intervention is not appropriate. However, methodological guidance for feasibility studies suggests that recruiting at least 30 participants per group is appropriate for estimating parameters for future sample size calculations.[32,33] Thus, 32 participants were recruited, meeting this recommendation.

Intervention

The DeCare-SPM intervention, guided by a comprehensive theoretical framework, is developed based on findings from needs assessments, practical analysis, and evidence synthesis. Aimed at supporting family caregivers of IWD and enhancing their PAC, the program addresses both primary and secondary stressors, fosters positive reappraisal, strengthens social support systems, and consists of four main modules:

Stressors (Becoming a Caregiver & Self-Care)

- The first module: Primary Stressors By enhancing knowledge and caregiving skills, caregivers can manage stressors that are problem-focused. The content covers understanding dementia, including an overview, underlying causes, and consequences, as well as daily caregiving tasks such as managing diet, bathing, and toileting. Additionally, strategies for addressing behavioral symptoms, including emotional and psychiatric manifestations, are provided.
- The second module: Secondary Stressors By employing emotion-focused coping strategies, negative feelings can be alleviated. The content includes relaxation techniques (eg, deep breathing and progressive muscle relaxation), mindfulness practices (such as self-acceptance and mindful living), and behavioral activation (including sleep therapy and engaging in enjoyable activities).

Evaluation and Coping (Exploring the Meaning of Caregiving)

- The third module: Focuses on enhancing positive emotions through meaning-centered coping strategies. The content covers self-management (eg, maintaining health, seeking support), meaning discovery (eg, identifying sources of meaning, drawing strength from role models), and positive reappraisal (eg, changing thought patterns, setting goals).

Mediating Factors (Supporting Caregivers & Sustaining Intervention Effects)

- The fourth module: Emphasizes enhancing social support through various channels. The content includes support groups (eg, information and resources), telephone coaching (eg, caregiving plans, solutions), and reinforcing intervention content to sustain its effectiveness.

The intervention primarily consisted of face-to-face group meetings and telephone coaching. The content of the first three modules was delivered through daily face-to-face group meetings, lasting 90 to 120 minutes each, with group sizes ranging from 20 to 30 participants. Specific intervention methods included warm-up activities, knowledge dissemination, and skill training. Comprehensive details regarding the intervention content are provided in Table 1. The fourth module comprised one-on-one telephone coaching sessions conducted once per week for four consecutive weeks as part of the intervention period. These sessions were designed to reinforce learned strategies and provide individualized guidance.

Quality Control

To ensure the rigor of the study and maintain intervention fidelity, multiple quality control measures were implemented. All intervention materials and slides were reviewed by the study team, and facilitators received systematic training to ensure a clear understanding of the intervention objectives, procedures, and content. Modules 1 and 3 were delivered by nurses or care workers with professional experience in dementia care, while Module 2 was conducted by a qualified psychological counselor. During group sessions, facilitators used plain and accessible language, attended to participants' responses, and encouraged interaction to enhance engagement. Telephone guidance followed a standardized interview protocol, and all facilitators underwent simulation training prior to practice. Weekly supervision and feedback meetings were held to review progress, identify issues, and provide ongoing support, thereby maintaining intervention fidelity. In addition, regular communication and reminders were delivered via WeChat as needed (approximately once per week) to promote participants' adherence and sustained engagement.

Feasibility Outcomes

The feasibility of the intervention were primarily assessed through a questionnaire that was independently designed and reviewed by experts to ensure its scientific rigor. The assessment included four aspects: (1) feasibility (Participant recruitment, enrollment, withdrawal reasons, completion, and attendance rates; Required resources, facilities, personnel, and time; implementation obstacles and challenges), (2) satisfaction, (3) engagement, (4) practical application, and (5)

Table 1 Content of the DeCare-SPM Intervention Program

The First Module	The Second Module	The Third Module	The Fourth Module
Problem-Focused Coping Strategies (Becoming a Caregiver)	**Emotion-Focused Coping Strategies (Taking Care of Yourself)**	**Meaning-Focused Coping Strategies (Exploring the Meaning of Care)**	**Seeking Social Support (Supporting the Caregiver)**
● Activity introduction and ice-breaking session to establish trust. ● Establishment of caregiver support groups to enhance engagement. ● Knowledge session: Basic overview of dementia. ● Knowledge session: Communication techniques with individuals with dementia. ● Scenario-based simulation: Practicing communication techniques with IWD. ● Knowledge session: Home safety management for IWD. ● Knowledge session Dietary care techniques for IWD. ● Knowledge session: Personal hygiene care techniques for IWD. ● Knowledge session: Behavioral and psychological symptoms of dementia (BPSD). ● Knowledge session: Identification and management of common BPSD. ● Case discussion: Strategies for managing common BPSD. ● Knowledge session: Techniques for handling emergencies in IWD. ● Experience sharing: Beneficial insights gained from the caregiving process.	● Knowledge Explanation: Appraisal and coping with caregiving stress events. ● Explanation of Breathing Exercises. ● Practice of Breathing Exercises. ● Explanation of Progressive Relaxation Training. ● Practice of Progressive Relaxation Training. ● Knowledge Explanation: Understanding Mindfulness, Accepting Oneself. ● Knowledge Explanation: Acknowledging Thoughts, Living in the Present. ● Mindfulness Practice: Mindful Breathing. ● Mindfulness Practice: Mindfulness Meditation. ● Knowledge Explanation: Sleep Behavior Methods. ● Practice of Sleep Behavior Methods. ● Explanation on Increasing Pleasurable Activities. ● Encouragement to develop a plan for participating in pleasurable activities. ● Practical Assignment: Practice of Relaxation Training.	● Knowledge Explanation: Self-Health Management ● Time Management and Setting Caregiving Priorities ● Introduction and Sharing of Social Support Resources ● Introducing Strategies for Seeking Social Support ● Explanation of Effective/Essential Caregiving Meaning ● Group Exchange and Sharing Positive Feelings in Caregiving ● The Power of Role Models, Choosing a Caregiver Perspective ● Explanation of Techniques for Identifying and Changing Assumptions/Beliefs ● Case Sharing and Practice on Changing Assumptions/Beliefs ● Knowledge Explanation: Resetting Goals ● Guiding Caregivers to Reset Their Caregiving and Personal Goals	● Resource Support: Sharing resources such as books, websites, manuals, etc. ● Telephone Coaching: Identifying the Needs of Family Caregivers ● Telephone Coaching: Personalized Care Support and Q&A ● Telephone Coaching: Encouraging the Use of Smart Control/Management Skills ● Telephone Coaching: Providing Emotional and Informational Resource Support ● Telephone Coaching: Suggestions for Personalized Care Plans ● Reinforcement Intervention: Review and reinforce content from the first three modules ● Continuous Follow-up: Addressing personalized issues proactively

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Conduct semi-structured interviews with participants and the implementation team, covering: experiences and perceptions of the intervention, facilitators and barriers during implementation, improvement suggestions, and reasons affecting usage frequency. For more details, refer to the Additional file 1.

Preliminary Effect Evaluation

All effectiveness evaluations were conducted using validated Chinese versions of questionnaires, administered on paper or online at baseline (T0) and immediately after completion of the 1-month (4-week) intervention period (T1).

Outcomes for IWD

The effects of the intervention on IWD were explored by assessing outcomes of interest, including activities of daily living (ADL), behavioral and psychological symptoms, and quality of life. ADL were evaluated using the Katz Index of Independence in ADL,[34] behavioral and psychological symptoms were assessed with the Neuropsychiatric Inventory Questionnaire (NPI-Q),[35] and quality of life was measured using the Quality of Life–Alzheimer's Disease scale (AD-QOL).[36] Detailed descriptions of these assessments are provided in Additional file 2.

Caregiver-Related Outcome

Caregiver-related outcomes were assessed using standardized instruments. Sense of benefit in caregiving was measured with the Positive Aspects of Caregiving Scale (PACS),[37] which evaluates caregivers' perceived positive experiences in providing care. Sense of competence was assessed using the Short Sense of Competence Questionnaire (SSCQ),[38] a 7-item short version of the 27-item Sense of Competence Questionnaire (SCQ),[38] designed to evaluate caregivers' perceived ability to care for IWD. Caregiving burden was measured with the Zarit Burden Interview (ZBI-6),[39] social support was assessed using the Lubben Social Network Scale (LSNS-6),[40] psychological well-being was evaluated with the Hospital Anxiety and Depression Scale (HADS),[41] and quality of life was measured using the European Quality of Life-5 Dimensions scale (EQ-5D).[42] Detailed descriptions of these assessments are provided in Additional file 2.

Quantitative Data Analysis

(1) Descriptive Analysis: For normally distributed continuous variables such as age and diagnosis time of IWD, data are presented as mean ± standard deviation (Mean±SD). Non-normally distributed continuous variables are described using median (P_{50}) and interquartile range (P_{25}, P_{75}). Categorical data are presented as frequency and percentage. Satisfaction, engagement, and the actual application frequency of the intervention content are described using Mean±SD.

(2) Preliminary effect: Paired t-tests are used to compare the outcomes of caregivers of IWD in terms of PAC, sense of competence, caregiver burden, social support network, anxiety, depression, and quality of life, as well as the behavioral symptoms and quality of life. $P<0.05$ is considered statistically significant. Given the pilot and feasibility nature of the study, these analyses were intended to provide preliminary effect estimates to inform future larger-scale trials.

Qualitative Data Analysis

The interview data were analyzed using inductive content analysis.[43] First, the data were read multiple times to gain an overall understanding. Next, keywords and phrases were identified, and initial codes were created. These codes were then categorized into broader themes based on shared characteristics. The themes were continually reviewed, refined, and named.

Result

Feasibility and Acceptability of the Intervention

Recruitment and Enrollment of Study Participants

Among the 46 caregivers who met the inclusion criteria (n=46), 32 participated in the study (n=32). Fourteen caregivers declined to participate, primarily due to scheduling conflicts—issues with timing (n=8), distance to the training site (n=4), and unspecified reasons (n=2).

Demographic Information of Study Participants

A total of 32 family caregivers of IWD were included, with no withdrawals or dropouts. The median age of the caregivers was 58.5 years, and 21 (65.63%) of them were adult-children caregivers. The mean age of IWD was 76.28 years (SD = 5.6), with 20 (62.50%) being female, and 19 (59.38%) diagnosed with Alzheimer's disease. The demographic information of the study participants is detailed in Table 2.

Actual Completion of the Intervention by Study Participants

A total of 26 caregivers fully participated in the 3-day face-to-face intervention, while 6 caregivers attended partially (either 2 or 1 day). Among the 32 caregivers, 28 completed all four scheduled telephone consultations; three missed one session, and one missed two sessions. The average duration per call was 12 minutes. Missed sessions were mainly due to scheduling conflicts or family obligations. The intervention was implemented smoothly, with no issues in resource availability or personnel coordination.

Satisfaction with the Intervention Program

The median overall satisfaction of family caregivers of IWD regarding the intervention was 4 (P25–P75: 3.25–5). The highest satisfaction was reported for the intervention team and the implementation method, both with median scores of 4 (P25–P75: 4–4). Willingness to recommend the intervention also showed a favorable rating (median 4, P25–P75: 3.25–4). All satisfaction items had median scores ≥3, indicating generally positive evaluations. In addition, 90.63% of caregivers indicated that they would participate in the intervention again if needed (Table 3).

Table 2 General Information of Participants

Variables	**N (%)/M±SD/ P_{50}(P_{25}, P_{75})**	**Variables**	**N (%)/M±SD/ P_{50}(P_{25}, P_{75})**
Family Caregivers		**IWD**	
Age (years)	58.5 (49, 67.5)	Age (years)	76.28±5.6
Relationship to IWD		Gender	
Spouse	8 (25.00)	Male	12 (37.50)
Child	21 (65.63)	Female	20 (62.50)
Son/Daughter-in-law	3 (9.38)	Marital Status	
Gender		Married with a spouse	17 (53.13)
Male	13 (40.63)	Divorced/Widowed/Single	15 (46.87)
Female	19 (59.38)	Education Level	
Education Level		Primary School or Below	4 (12.50)
Primary School or Below	9 (28.12)	Middle School	9 (28.13)
Middle School	5 (15.63)	High School/Vocational School	8 (25.00)
High School/Vocational School	3 (9.38)	College or Above	11 (34.38)
College or Above	15 (46.88)	Type of Dementia	
Marital Status		Alzheimer's Disease	19 (59.38)
Married	24 (75.00)	Vascular Dementia	13 (40.63)
Divorced/Widowed/Single	8 (25.00)	Severity of Dementia	
Per Capita Monthly Household Income (RMB, Yuan)		Mild Dementia	9 (28.13)
≤2000	3 (9.38)	Moderate Dementia	15 (46.88)
2001–3000	8 (25.00)	Severe Dementia	8 (25.00)
3001–4000	6 (18.75)	Level of Disability	
4001–5000	8 (25.00)	Independent	19 (59.38)
>5000	7 (21.88)	Mild Disability	6 (18.75)
Caregiving Duration (months)	29.5 (13, 42)	Moderate Disability	5 (15.63)
Weekly Caregiving Hours	35 (23, 70)	Severe Disability	2 (6.25)
Relationship Quality Score	6 (6, 8)	Number of Children	2 (2, 3)
		Time Since Diagnosis (months)	40.84±25.46

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Table 3 Satisfaction of Study Participants with the Intervention Program

Items	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied	P_{50} (P_{25}, P_{75})
1. Overall, are you satisfied with the intervention program we provided?	0 (0.00)	0 (0.00)	8 (25.00)	14 (43.75)	10 (31.25)	4 (3.25, 5)
2. Would you recommend our intervention program to friends or family?	0 (0.00)	1 (3.13)	7 (21.88)	18 (56.25)	6 (18.75)	4 (3.25, 4)
3. Did the intervention program meet your expectations?	0 (0.00)	2 (6.25)	14 (43.75)	13 (40.63)	3 (9.38)	3.5 (3, 4)
4. Do you find the intervention measures useful for you?	0 (0.00)	6 (18.75)	9 (28.13)	13 (40.63)	4 (12.50)	4 (3, 4)
5. Are you satisfied with our intervention team?	0 (0.00)	0 (0.00)	2 (6.25)	17 (53.13)	13 (40.63)	4 (4, 4)
6. Are you satisfied with the way the intervention measures were implemented?	0 (0.00)	1 (3.13)	3 (9.38)	25 (78.13)	3 (9.38)	4 (4, 4)
7. Would you participate in our intervention program again if needed?	0 (0.00)	0 (0.00)	3 (9.38)	22 (68.75)	7 (21.88)	4 (4, 4)
8. Do you feel that this program met your needs?	0 (0.00)	0 (0.00)	7 (21.88)	24 (75.00)	1 (3.13)	4 (4, 4)

Participation in the Intervention Program

Table 4 shows that the median scores for all engagement items exceeded 3. Overall participation in the intervention had a median score of 4 (P25–P75: 3.25–4), with the highest score for reading the provided materials (median 4.5, P25–P75: 4–5), followed by time and effort investment (median 4, P25–P75: 4–4).

Actual Application of the Intervention Content

The three most frequently applied intervention strategies were seeking support from family and friends (median 4, P25–P75: 4–4), applying personal hygiene care techniques (median 4, P25–P75: 3–4), and practicing progressive muscle relaxation (median 4, P25–P75: 3–5). The three least frequently applied strategies were mindfulness meditation (median 3, P25–P75: 2–3), resetting caregiving and personal goals (median 3, P25–P75: 2–3), and practicing mindful breathing (median 3, P25–P75: 2–3.75) (see Table 5).

Preliminary Effectiveness of the Intervention

Preliminary evaluation showed no significant improvement in BPSD and quality of life in IWD post-intervention (P>0.05). A preliminary evaluation of family caregivers of IWD showed significant improvements post-intervention in several areas: the total PAC score increased significantly (t=3.553, P=0.001, d= 0.63), with improvements in the self-affirmation and life outlook dimensions (P<0.05). Sense of competence significantly increased (P<0.001, d=0.83), and caregiver burden decreased (t=−3.083, P=0.004, d=0.55). The overall social support network score significantly improved (t=4.000, P<0.001, d=0.71), with notable gains in friend support (t=3.645, P=0.001), though the family support network showed no significant change (t=1.969, P=0.058). Anxiety and depression scores significantly decreased (P=0.010), and EQ-5D index improved (t=2.785, P=0.009), while no significant change was observed in EQ-VAS scores (t=2.005, P=0.054). Detailed results are presented in Table 6.

Qualitative Research Results

Characteristics of Qualitative Research Participants

At 1-month the intervention, 15 family caregivers were invited for a follow-up interview via phone, and 8 caregivers participated. Detailed information is provided in Additional file 3.

Table 4 Degree of Participation of Study Participants in the Intervention Program

Items	Never	Rarely	Sometimes	Often	Always	P_{50} (P_{25}, P_{75})
1. Overall, how would you rate your level of participation in this intervention program?	0 (0.00)	1 (3.13)	7 (21.88)	19 (59.38)	5 (15.63)	4 (3.25, 4)
2. Overall, do you feel that you invested sufficient time and effort during the training process?	0 (0.00)	2 (6.25)	4 (12.50)	21 (65.63)	5 (15.63)	4 (4, 4)
3. Did you actively participate in discussions and activities during the training?	0 (0.00)	3 (9.38)	13 (40.63)	12 (37.50)	4 (12.50)	3.5 (3, 4)
4. Did you complete the assigned tasks or practical activities after each training session?	0 (0.00)	4 (12.50)	11 (34.38)	15 (46.88)	2 (6.25)	4 (3, 4)
5. Did you thoroughly read all the materials and resources we provided?	0 (0.00)	0 (0.00)	5 (15.63)	11 (34.38)	16 (50.00)	4.5 (4, 5)
6. Did you seek our help or feedback when you encountered problems?	2 (6.25)	3 (9.38)	7 (21.88)	16 (50.00)	4 (12.50)	4 (3, 4)

Table 5 Frequency of Actual Application of Intervention Content by Study Participants

Items	Never	Rarely	Sometimes	Often	Always	P_{50} (P_{25}, P_{75})
1. Actively seek information about dementia	0 (0.00)	4 (12.50)	8 (25.00)	15 (46.88)	5 (15.63)	4 (3, 4)
2. Apply communication techniques with IWD	0 (0.00)	3 (9.38)	9 (28.13)	16 (50.00)	4 (12.50)	4 (3, 4)
3. Improve home environment arrangement and safety	2 (6.25)	3 (9.38)	18 (56.25)	9 (28.13)	0 (0.00)	3 (3, 4)
4. Apply dietary care techniques	0 (0.00)	3 (9.38)	11 (34.38)	14 (43.75)	4 (12.50)	4 (3, 4)
5. Apply personal hygiene care techniques	0 (0.00)	0 (0.00)	9 (28.13)	17 (53.13)	6 (18.75)	4 (3, 4)
6. Apply behavioral and psychological coping techniques	0 (0.00)	4 (12.50)	10 (31.25)	13 (40.63)	5 (15.63)	4 (3, 4)
7. Practice progressive muscle relaxation	0 (0.00)	1 (3.13)	11 (34.38)	11 (34.38)	9 (28.13)	4 (3, 5)
8. Practice mindfulness breathing	0 (0.00)	12 (37.50)	12 (37.50)	5 (15.63)	3 (9.38)	3 (2, 3.75)
9. Practice mindfulness meditation	4 (12.50)	9 (28.13)	13 (40.63)	6 (18.75)	0 (0.00)	3 (2, 3)
10. Practice sleep behavior techniques	1 (3.13)	3 (9.38)	12 (37.50)	11 (34.38)	5 (15.63)	3.5 (3, 4)
11. Record and share pleasant experiences	0 (0.00)	4 (12.50)	7 (21.88)	17 (53.13)	4 (12.50)	4 (3, 4)
12. Focus on personal health management	0 (0.00)	3 (9.38)	8 (25.00)	16 (50.00)	5 (15.63)	4 (3, 4)
13. Set caregiving priorities	0 (0.00)	2 (6.25)	18 (56.25)	8 (25.00)	4 (12.50)	3 (3, 4)
14. Share positive caregiving experiences	0 (0.00)	2 (6.25)	10 (31.25)	16 (50.00)	4 (12.50)	4 (3, 4)
15. Reset caregiving and personal goals	0 (0.00)	15 (46.88)	12 (37.50)	3 (9.38)	2 (6.25)	3 (2, 3)
16. Seek support from family and friends	0 (0.00)	0 (0.00)	5 (15.63)	24 (75.00)	3 (9.38)	4 (4, 4)

Table 6 Comparison of Outcome Measures Before and After Intervention

Variables	Before Intervention	After Intervention	Difference	Cohen'sd (95% CI)	t	P
Outcome measures for family caregivers						
PAC						
Self-affirmation	18.31±2.36	19.34±2.34	1.03±1.93	0.54 (0.16, 0.90)	3.029	0.005
Life outlook	9.69±1.79	10.28±1.80	0.59±1.13	0.52 (0.15, 0.89)	2.967	0.006
Total caregiving benefits score	28.00±3.39	29.63±3.45	1.63±2.59	0.63 (0.24, 1.00)	3.553	0.001
Caregiving Competence	19.97±1.67	21.19±2.22	1.22±1.48	0.83 (0.42, 1.22)	4.673	<0.001
Caregiving Burden	13.78±2.68	12.75±2.17	−1.03±1.89	0.55 (0.17, 0.91)	−3.083	0.004
Social Support Network						
Family support network	8.56±1.85	8.81±1.64	0.25±0.72	0.35 (−0.01, 0.70)	1.969	0.058
Friend support network	6.53±3.11	7.28±2.91	0.75±1.16	0.64 (0.26, 1.02)	3.645	0.001
Total social support network score	15.09±4.18	16.09±3.74	1.00±1.41	0.71 (0.31, 1.09)	4.000	<0.001
Anxiety and Depression						
Anxiety	7.78±3.38	6.94±3.03	−0.84±1.35	0.63 (0.24, 1.00)	−3.544	0.001
Depression	6.75±3.41	5.97±3.25	−0.78±2.24	0.35 (−0.01, 0.70)	−1.973	0.057
Total anxiety and depression score	14.53±6.17	12.91±5.52	−1.63±3.37	0.48 (0.11, 0.85)	−2.730	0.010
Quality of Life						
EQ-5D Index	0.91±0.09	0.94±0.07	0.03±0.06	0.49 (0.12, 0.86)	2.785	0.009
EQ-VAS	86.66±8.31	88.94±6.09	2.28±6.44	0.35 (−0.01, 0.71)	2.005	0.054
Outcome measures for IWD						
Behavioral and Psychological Symptoms	21.22±15.31	21.19±14.3	−0.03±2.09	0.01 (−0.33, 0.36)	−0.085	0.933
Quality of Life	27.75±5.44	27.97±4.22	0.22±7.26	0.03 (−0.32, 0.38)	0.170	0.866

Qualitative Interview Results

Qualitative interviews highlighted the multifaceted impact of DeCare-SPM on family caregivers of IWD, focusing on self-perception, social support, and factors influencing intervention implementation. Four main themes emerged: perceived benefit, peer support, suggestions for improvement, and barriers to application. Twelve secondary themes were identified, with summaries and examples provided in Additional file 4.

Focus group discussions revealed that support from community resources and social workers facilitated the intervention, while barriers included difficulties in implementing cognitive interventions and insufficient understanding of IWD-related medical information due to a lack of comprehensive assessments.

Discussion

The purpose of this pilot study was to evaluate the feasibility and preliminary effectiveness of DeCare-SPM. The results indicated that the intervention was feasible and acceptable for family caregivers of IWD. Pre- and post-intervention data showed significant improvements in caregivers' sense of benefit, caregiving competence, and social support, as well as reductions in caregiving burden and anxiety. However, the intervention showed limited effectiveness in improving BPSD and the quality of life of IWD. Qualitative interviews revealed caregivers' perceived benefits and the importance of peer support, while also identifying several factors for optimizing the intervention, including incorporating online learning, enhancing practical skills, and improving the application of learned techniques.

Feasibility of the Intervention

The recruitment outcomes of this study indicated that family caregivers showed strong interest in face-to-face training, reflecting their demand for and acceptance of such interventions. This is consistent with the findings of Waite et al,[44] which highlighted that the practicality of the program, trust-building, and participants' attitudes and expectations are key factors influencing the engagement of individuals with dementia and their caregivers in intervention programs The high level of recruitment enthusiasm observed in this study may be attributed to community support, assistance from social workers, and the pre-established trust and connection with individuals with dementia and their caregivers, as well as the availability of community resources and professional experience.

The majority of participants engaged in the face-to-face intervention throughout the study and achieved a high completion rate for the telephone guidance, further validating the acceptability and feasibility of the intervention. However, this study also has some limitations. A portion of participants were unable to fully engage in the intervention due to scheduling conflicts, caregiving responsibilities, geographical constraints, and weather conditions (such as the intense heat during July). These factors led to some gaps in the intervention, but overall, participants expressed a high level of satisfaction with both the content and format of the intervention. The feasibility evaluation results of this study are consistent with those of several previous studies on caregiver interventions for family caregivers of IWD.[45,46] The majority of participants indicated a willingness to participate again and found that the intervention content and methods met their specific needs.

The findings showed that caregivers exhibited strong engagement, actively participating in discussions and completing practical tasks, which may have contributed to the overall effectiveness of the intervention and to a positive learning experience. Caregivers generally held a positive attitude toward the materials and resources provided, although the frequency of help-seeking remained relatively low. When applying intervention strategies, caregivers often relied on family and friends for support. Although help-seeking behaviors were observed, the frequency of seeking professional guidance was relatively lower compared with other engagement items (Table 4), which may limit the full utilization of available professional resources.[47]

Personal hygiene care and progressive muscle relaxation techniques were widely adopted, indicating that caregivers preferred interventions that provided immediate and tangible benefits. In contrast, mindfulness meditation and breathing exercises were less frequently utilized, likely due to caregivers' unfamiliarity with these practices or difficulties integrating them into daily caregiving routines. Tahsin[48] reported that caregivers found mindfulness practices easy to learn and suitable for daily life, while another study[49] suggested that cognitive barriers and established family routines could hinder the application of mindfulness-based interventions.

The qualitative findings further revealed key challenges caregivers faced when implementing intervention strategies, including limited awareness, insufficient mastery of skills, and selective use based on individual needs. These challenges suggest that merely providing knowledge and skills may not be sufficient to meet practical demands. Future interventions should prioritize opportunities for practical application, promote flexible skill use, and provide individualized support, along with continuous guidance to enhance the real-world applicability of the intervention.

Preliminary Effectiveness of the Intervention

The results of the study demonstrate that the intervention significantly improved family caregivers of IWD in terms of PAC, sense of competence, social support network, and quality of life, while effectively reducing caregiver burden and anxiety levels. The findings are consistent with previous studies,[50,51] providing preliminary support for the potential effectiveness of psychosocial support interventions in enhancing the psychological well-being and caregiving efficacy of family caregivers of IWD, consistent with evidence from structured caregiver programs such as Partner in Balance.[52] Previous study has shown that single-component interventions, including psychoeducation,[50] cognitive behavioral therapy (CBT),[51] and support groups,[53] can improve the PAC and reduce caregiver burden. The observed improvements may be related to the multi-component design, which integrates psychoeducation, CBT, and social support. However, no significant improvements were observed in caregiver depression, certain quality-of-life indicators, or patient-related outcomes, which may warrant further investigation in studies with longer follow-up periods.

The qualitative findings support the quantitative results, indicating that the intervention enhanced PAC and expanded their friend support networks. The theme of "perceived benefit" emphasized the positive impact of the intervention on the self-efficacy and self-care abilities of caregivers. This may be related to the inclusion of self-care and positive evaluation components in the program, which helped caregivers reassess their caregiving roles. Additionally, the problem-focused coping module provided training in dementia care-related knowledge and skills, which may have helped caregivers better adapt to their roles and enhance caregiving abilities,[52] potentially contributing to positive shifts in caregivers' role identity. The qualitative results also support the idea that strengthening social support networks is an effective way to improve the mental health of caregivers and reduce stress. The theme of "peer support" indicated that meeting new friends, finding a sense of belonging, and sharing information through the intervention was key to the role of social support networks in promoting caregiver well-being. The study further confirmed that establishing peer connections and expanding social networks can indirectly provide emotional support and caregiving resources, easing caregiving stress.[54] Future research could explore developing peer support training programs for dementia caregivers, promoting social network interactions, and enhancing reciprocity and peer support.

Limitations

The study employed a single-group pre-post design without a control group, making it difficult to precisely determine whether the observed changes were due to the intervention itself or influenced by time effects, natural progression, or other external factors. Additionally, the sample size of 32 participants in the pilot study met the basic requirements for an initial feasibility evaluation. Although these limitations restrict the ability to make causal inferences about the effectiveness of the intervention, the primary objective was to assess the feasibility and acceptability of the intervention. The single-group pre-post design is a commonly used and appropriate choice. Therefore, while the study provided valuable insights for refining and improving the intervention, future studies should adopt a randomized controlled trial design with a larger sample size to formally evaluate the effectiveness of the intervention. In addition, future studies with larger sample sizes may employ multivariate statistical approaches to simultaneously examine multiple outcome variables and better control for potential confounding factors, while also evaluating the scalability and implementation of the intervention in routine community settings.

Conclusion

This study employed a single-group pre-post design within a mixed-methods approach to assess the feasibility of a benefit-focused intervention for family caregivers of IWD. Results indicate that the intervention is feasible in terms of recruitment and implementation, with caregivers generally expressing satisfaction and demonstrating moderate or higher levels of engagement. However, variability in the frequency of practical application was observed, with lower adoption rates of psychological techniques, which may be related to differences in awareness, skills, or individualized needs among caregivers. Thus, optimization of these aspects and the implementation process is recommended for formal deployment of the intervention. Preliminary findings suggest that the intervention enhances PAC, sense of competence, friend network and reduces caregiver burden and anxiety, though no significant effects were observed on caregivers' quality of life, depression, or the neuropsychiatric symptoms of IWD. Future study should include parallel controls to further evaluate the effectiveness of intervention.

Data Sharing Statement

This study was not preregistered. The raw data used to support the findings of this study are available from the corresponding author, Jun Wang, upon reasonable request.

Ethics Approval and Informed Consent

Ethics approval was granted by the Ethics Committee of the First Affiliated Hospital of Chongqing Medical University (No. 2022-016). All participants provided written informed consent prior to participation. The informed consent form included permission for the publication of anonymized responses and direct quotations.

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Disclosure

The authors report no conflicts of interest in this work.

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