

PART 1: OVERVIEW

*Mechanisms of Actions in
Behavioral Interventions for
Dementia Family Caregivers*

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Mechanisms of Actions in Behavioral Interventions for Dementia Family Caregivers

PURPOSE

This guidance document is designed for researchers developing, testing, or refining behavioral interventions for family caregivers of persons living with dementia. It describes mechanisms of action (MoAs) – or the processes through which interventions produce change – and offers guidance on aligning intervention components, outcomes, and measures to mechanisms.

WHAT IS A MECHANISM?

Mechanisms explain how and why an intervention works or is effective. Understanding and specifying mechanisms of action is essential for advancing caregiver intervention science, enabling researchers to:

- Strengthen theoretical rigor and reproducibility
- Improve intervention precision by identifying active ingredients
- Support optimization, adaptation, and scaling for real-world implementation
- Meet expectations of funding agencies (NIH, PCORI) and implementation science frameworks more broadly
- Facilitate translation from efficacy to effectiveness research
- Refine interventions to maximize benefit and adapt them for diverse populations
- Train interventionists effectively
- Implement programs with fidelity

INTERVENTION COMPONENT	MECHANISM	PROXIMAL OUTCOMES	DISTAL OUTCOMES
What the intervention does	Why and how it works	Immediate observable change	Longer term intended benefit

CORE MECHANISMS OF ACTION

Based on a review of the literature, the following mechanisms are most commonly targeted and empirically supported in intervention research with family caregivers. Examples of theories guiding mechanism selection are included in Appendix A. Examples measures for mechanisms are included in Appendix B.

MECHANISM & DESCRIPTION	COMMON TARGETS	EXAMPLE INTERVENTION COMPONENTS	PROXIMAL OUTCOMES	DISTAL OUTCOMES
Knowledge and Illness Appraisal Increases understanding of dementia and reframes symptoms as disease-related rather than intentional, reducing misattributions and caregiver blame.	<ul style="list-style-type: none"> • Dementia knowledge • Symptom attribution • Caregiver expectations 	<ul style="list-style-type: none"> • Disease education • Anticipatory guidance • Symptom explanation 	<ul style="list-style-type: none"> • Accurate understanding of symptoms, progression, and prognosis • Realistic expectations 	<ul style="list-style-type: none"> • Reduced frustration and distress • Lower caregiver burden
Skills Acquisition and Behavioral Competence Builds caregivers' ability to manage care challenges effectively, enhancing task mastery and reducing care-related stress.	<ul style="list-style-type: none"> • Problem-solving • Communication • Behavioral management 	<ul style="list-style-type: none"> • Skills training • Modeling and role-play • Practice with feedback 	<ul style="list-style-type: none"> • Task mastery • Successful management of care challenges 	<ul style="list-style-type: none"> • Reduced problem frequency/intensity • Lower caregiver upset and burden
Self-Efficacy and Mastery Strengthens caregivers' belief in their ability to manage caregiving demands; mediates reductions in depression and supports sustained behavior change.	<ul style="list-style-type: none"> • Care confidence • Perceived control • Mastery 	<ul style="list-style-type: none"> • Guided practice • Goal attainment • Positive reinforcement 	<ul style="list-style-type: none"> • Increased confidence in managing caregiving • Greater use of effective strategies 	<ul style="list-style-type: none"> • Reduced burden and distress • Sustained behavior change

continued

MECHANISM & DESCRIPTION	COMMON TARGETS	EXAMPLE INTERVENTION COMPONENTS	PROXIMAL OUTCOMES	DISTAL OUTCOMES
<p>Cognitive and Emotional Regulation</p> <p>Modifies maladaptive thoughts and emotional responses to caregiving stressors, reducing anxiety, depression, and emotional reactivity.</p>	<ul style="list-style-type: none"> • Negative appraisals • Catastrophizing • Emotional distress 	<ul style="list-style-type: none"> • Cognitive reframing • Stress management • Mindfulness / acceptance-based strategies 	<ul style="list-style-type: none"> • Reduced emotional reactivity • Better ability to respond calmly • Improved caregiver mental health 	<ul style="list-style-type: none"> • Improved caregiver mental health • Enhanced interactions with care recipient
<p>Behavioral Activation and Engagement</p> <p>Increases engagement in meaningful, rewarding, or restorative activities for caregivers and care recipients, countering withdrawal and depressive symptoms.</p>	<ul style="list-style-type: none"> • Activity balance • Pleasant events • Dyadic engagement 	<ul style="list-style-type: none"> • Activity planning • Values-based goal setting • Structured routines 	<ul style="list-style-type: none"> • Increased engagement in enjoyable/meaningful activities • Positive mood and reinforcement 	<ul style="list-style-type: none"> • Reduced depression • Improved quality of life
<p>Environmental Modification and Task Simplification</p> <p>Reduces cognitive, physical, and emotional demands by improving person-environment fit, lowering behavioral symptom frequency and caregiver effort.</p>	<ul style="list-style-type: none"> • Home safety • Sensory overload • Task complexity 	<ul style="list-style-type: none"> • Environmental assessments • Adaptive equipment • Cueing strategies 	<ul style="list-style-type: none"> • Better care recipient functioning • Fewer behavioral triggers 	<ul style="list-style-type: none"> • Reduced behavioral symptoms • Lower caregiver burden
<p>Social Support and Resource Mobilization</p> <p>Increases perceived and actual support from formal and informal networks, buffering stress and reducing isolation.</p>	<ul style="list-style-type: none"> • Support utilization • Provider communication • Service navigation 	<ul style="list-style-type: none"> • Support mapping • Referral facilitation • Peer support groups 	<ul style="list-style-type: none"> • Receipt of instrumental/emotional support • Reduced isolation 	<ul style="list-style-type: none"> • Enhanced coping resources • Improved caregiver well-being
<p>Dyadic Relationship Processes</p> <p>Improves interaction patterns, mutual understanding, and shared meaning within the caregiving dyad, enhancing relationship quality and reducing conflict.</p>	<ul style="list-style-type: none"> • Communication quality • Empathy • Shared problem-solving 	<ul style="list-style-type: none"> • Dyadic coaching • Communication strategies • Values clarification 	<ul style="list-style-type: none"> • Enhanced mutual understanding • Better dyadic coping 	<ul style="list-style-type: none"> • Improved relationship quality • Benefit for both caregiver and care recipient

Note: CG = caregiver; CR = care recipient. Mechanisms may operate simultaneously and interact across individual, dyadic, and contextual/environmental levels.

MEASUREMENT CONSIDERATIONS:

When testing mechanisms, select measures that match your hypothesized mechanism(s) and are sensitive to change.

Key Principles:

- Use proximal, mechanism-specific measures rather than relying only on global outcomes
- Establish temporal ordering—mechanism change should precede outcome change
- Test mediation or moderated mediation where feasible
- Use validated measures with demonstrated sensitivity to change in caregiver populations
- Match measurement level (individual, dyadic, environmental) to the hypothesized mechanism

See Appendix B for validated measures organized by mechanism.

DESIGN AND REPORTING GUIDANCE

Study Design

- Explicitly state hypothesized mechanisms in protocol and manuscripts
- Align each intervention component with at least one mechanism
- Minimize components that do not map to a clear mechanism
- Report null mechanisms to advance the field
- Consider optimization designs (e.g., MOST, SMART)

MANUSCRIPT REPORTING CHECKLIST

What to Report

Introduction	Methods	Results	Discussion
<ul style="list-style-type: none"><input type="checkbox"/> State theoretical framework<input type="checkbox"/> Define hypothesized mechanisms<input type="checkbox"/> Specify expected mediators and moderators<input type="checkbox"/> Present a causal pathway diagram	<ul style="list-style-type: none"><input type="checkbox"/> Map intervention components to mechanisms<input type="checkbox"/> Describe measures for each mechanism<input type="checkbox"/> Report timing of assessments<input type="checkbox"/> Describe fidelity assessment procedures<input type="checkbox"/> Specify planned mediation/moderation analyses	<ul style="list-style-type: none"><input type="checkbox"/> Report fidelity (delivery, receipt, enactment)<input type="checkbox"/> Test all pathways in the mediation mode<input type="checkbox"/> Report indirect effects with confidence intervals<input type="checkbox"/> Test moderated mediation if hypothesized<input type="checkbox"/> Include null findings	<ul style="list-style-type: none"><input type="checkbox"/> Interpret mechanism findings in the context of theory<input type="checkbox"/> Discuss clinical/practical significance<input type="checkbox"/> Address alternative explanation<input type="checkbox"/> Acknowledge limitations for causal inference<input type="checkbox"/> Suggest implications for optimization and adaptation



Key Takeaway

Effective dementia caregiver interventions work through multiple, interacting mechanisms. Clearly specifying and testing these mechanisms strengthens scientific impact, facilitates translation, and accelerates progress toward scalable, person- and family-centered dementia care.

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FREQUENTLY ASKED QUESTIONS



1. Can you have more than one mechanism?

Yes. This is particularly the case in multi-component and multi-level interventions in which each component and/or level may map to a different mechanism by which it is effective.

Also, different mechanisms may account for effectiveness of an intervention for different subgroups of caregivers.

2. At what NIH stage should mechanisms be tested?

Mechanisms can be examined at any NIH stage:

Stage 0: identify mechanism(s) and the feasibility and acceptability of their measurement

Stage 1: identify mechanisms, their measurement and relationship to intervention;

Stage 2: formally evaluate relationship of mechanism in mediation models

Stage 3: formally evaluate relationship of mechanisms in mediation and moderation models

Stage 4: evaluate implementation processes/outcomes and relationship to mechanisms

3. What is the main mechanism of technology based (e.g., Web Applications)

See guidance document on mechanisms and technology – Part 2 in this series.

4. What is the relationship of mechanisms and fidelity?

See guidance document on mechanisms and fidelity – Part 3 in this series.

5. What is the relationship of mechanisms and tailoring?

See guidance document on mechanisms and tailoring – Part 4 in this series.

6. Is it necessary to discuss mechanisms in NIH grant applications?

Yes - even if not formally testing a mechanism, it is important to include a conceptual model and propose hypothetically the presumed mechanism.

7. Are mechanisms reported in main trial outcome publications?

Yes – it is important to state the hypothesized mechanism even if not formally tested in the main trial outcome.

APPENDIX A. CONCEPTUAL FRAMEWORKS COMMONLY USED IN DEMENTIA CAREGIVER INTERVENTIONS

Behavioral caregiver interventions typically draw on multiple theoretical frameworks. Understanding when to apply each framework strengthens the specification of mechanisms. Mechanisms may operate at individual, dyadic, and contextual/environmental levels simultaneously.

FRAMEWORK	WHEN TO USE / KEY USES	CORE MECHANISM PATHWAY
Stress Process Model (Pearlin et al., 1990)	Targeting burden, distress, or depression; examining the role of primary stressors (CR symptoms, functional decline); testing how resources buffer stress effects <i>EXAMPLE: The START trial (Livingston et al., 2020) used stress process theory to understand how teaching coping strategies reduces caregiver depression over 6 years by improving appraisal and enhancing personal resources.</i>	Primary stressors → Appraisal → Secondary strains → Psychosocial resources (mediators) → Caregiver outcomes
Social Cognitive Theory (Bandura, 1997)	Teaching skills or behavior management techniques; building confidence in managing care challenges; addressing learned helplessness <i>EXAMPLE: Interventions that teach behavioral management techniques increase caregiver confidence in handling challenging situations, thereby reducing reactivity and distress.</i>	Skill acquisition → Mastery experiences → Enhanced self-efficacy → Increased use of effective strategies → Improved outcomes
Cognitive Behavioral Theory	Targeting negative thought patterns, teaching cognitive reframing, and addressing depression or anxiety through thought-behavior-emotion connections	Identify automatic thoughts → Challenge cognitive distortions → Develop balanced thinking → Behavioral activation → Improved mood
Personal Control Theory (Shultz et al., 1994)	Caregivers experiencing loss of control over daily life; maintaining agency despite progressive disease; teaching compensatory strategies <i>EXAMPLE: “Caregivers may be motivated to learn and use new care techniques in order to maintain direct personal control over important life domains” (Gitlin et al., 2002).</i>	Threat to control → Motivation to learn adaptive strategies → Successful strategy use → Restored sense of mastery → Reduced distress
Competence—Environmental Press Frameworks	Modifying physical/social environment to support CR function; reducing behavioral symptoms through environmental adaptation; addressing person-environment misfit	Environmental demands exceed CR abilities → Excess disability and problem behaviors → Environmental modifications reduce press → Improved CR functioning and fewer symptoms → Decreased caregiver burden
Dyadic Care Models	Targeting caregiver-care recipient interaction patterns, examining bidirectional effects, and focusing on relationship quality as a mechanism	Improve communication → Enhanced mutual understanding → Better dyadic coping → Improved relationship quality → Both members benefit
Transtheoretical Model of Change (Prochaska & DiClemente, 1983)	Caregivers at different levels of readiness for change; tailoring intervention intensity to readiness; addressing resistance or ambivalence <i>EXAMPLE: Memphis REACH classified caregivers by readiness stage and found that intervention benefits varied by stage, with those in preparation/action stages showing greater gains.</i>	Precontemplation: awareness building → Contemplation: motivational interviewing → Preparation: planning and resource identification → Action: skills training and support → Maintenance: relapse prevention

APPENDIX B: COMMONLY USED VALIDATED MEASURES FOR SELECT MECHANISMS

Choose measures that match your hypothesized mechanism and are sensitive to change in caregiver populations.

MECHANISM	PRIMARY TARGETS	VALIDATED MEASURES
1. Knowledge and Illness Appraisal	Dementia understanding, symptom attribution, expectations	<ul style="list-style-type: none"> • Dementia Knowledge Assessment Scale (DKAS) • Alzheimer's Disease Knowledge Scale (ADKS) • Revised Memory and Behavior Problems Checklist – Reaction Subscale (RMBPC-R) • Illness Perception Questionnaire (adapted versions)
2. Skills Acquisition and Behavioral Competence	Perceived control, caregiving confidence, and task management	<ul style="list-style-type: none"> • Task Management Strategy Index (TMSI) • Caregiver Assessment of Management Problems (CAMP) • Observational or intervention-specific skills checklists • Goal Attainment Scaling (GAS)
3. Self-Efficacy and Mastery	Perceived control, caregiving confidence	<ul style="list-style-type: none"> • Revised Scale for Caregiving Self-Efficacy (RSCSE) • Caregiver Self-Efficacy Scale • Pearlin Mastery Scale (adapted)
4. Cognitive and Emotional Regulation	Appraisal, emotional distress, coping	<ul style="list-style-type: none"> • Center for Epidemiologic Studies Depression Scale (CES-D) • Patient Health Questionnaire (PHQ-9) • Generalized Anxiety Disorder Scale (GAD-7) • Cognitive Emotion Regulation Questionnaire (CERQ) • Perceived Stress Scale (PSS)
5. Behavioral Activation and Engagement	Activity level, positive affect, engagement	<ul style="list-style-type: none"> • Pleasant Events Schedule (PES / PES-AD) • Behavioral Activation for Depression Scale (BADS) • Activity logs or ecological momentary assessment (EMA)
6. Environmental Modification and Task Simplification	Environmental fit, task demands, safety	<ul style="list-style-type: none"> • Home Environmental Assessment Protocol (HEAP) • Environmental Skill-Building Program (ESP) environmental ratings • Functional Independence Measure (selected items) • Observational environmental audits
7. Social Support and Resource Mobilization	Perceived and enacted support, service use	<ul style="list-style-type: none"> • Medical Outcomes Study Social Support Survey (MOS-SSS) • Interpersonal Support Evaluation List (ISEL) • Service utilization inventories • Caregiver Resource Utilization measures
8. Dyadic Relationship Processes	Communication, relationship quality, mutuality	<ul style="list-style-type: none"> • Dyadic Relationship Scale (DRS) • Mutuality Scale • Quality of the Caregiver-Care Recipient Relationship Scale • Dyadic coping or communication scales (adapted)

Note: Instrument selection should be guided by the hypothesized mechanism, the measure's sensitivity to change in caregiver populations, and the level of analysis (individual, dyadic, or environmental).

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