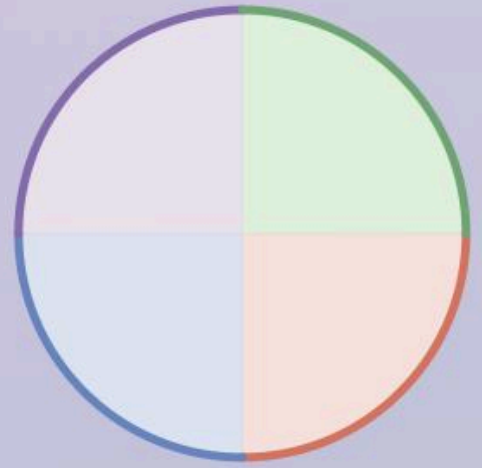




Mira.

Designing for disruption, a framework for
routine recovery and autonomy-preserving
AI in elder care.

Sapna Bajaj

MDES PROJECT · SAN JOSÉ STATE UNIVERSITY

VOICE · AMBIENT · CARE

ACKNOWLEDGING

MY COMMITTEE

ABOUT ME



After a decade in design roles across industries, I joined the Masters of Design program at San Jose State University to refocus my practice toward meaningful social change. This project emerged from a personal and professional curiosity, how might we support older adults who are navigating emotional transitions, independence, and the evolving role of technology? I see this as an opportunity to apply design to a deeply human challenge.

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Five sections, one quiet argument.



22 SLIDES · 1920 × 1080

View in order, or by section.

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Abstract

Statement

Tomorrow's healthcare systems must adapt to an unprecedented demographic shift. Today's older adults are determined to age in place, and the technology designed for them must reflect their dignity, not just their physical fragility. MIRA provides a practical framework for autonomy-preserving AI, shifting the design focus from rigid task compliance to routine recovery. This ensures the next generation of elder-care technology supports true independence without compromising privacy.

Abstract

Older adults increasingly seek aging-in-place solutions that prioritize dignity and emotional agency. Yet, a profound disconnect exists between their desire for independence and current assistive technologies. Because modern elder-care tech leans heavily toward caregiver surveillance, rigid alarms, and task compliance, it leaves users feeling monitored rather than supported. This dynamic drives massive technology abandonment—a gap that families and the healthcare industry can no longer afford.

To build cognitive resilience into the home, designers must understand the reality of transitioning back after a major health event. The first phase of this research explored how daily routines fracture under cognitive friction. Methods included an extensive literature review across clinical gerontology and technology acceptance models; an analysis of current market solutions; and in-depth interviews with 14 community-dwelling older adults and 4 caregivers. This data revealed that assistive tech is abandoned for three primary reasons: it assumes perfect cognitive continuity, it patronizes users with synthetic empathy (“Elderspeak”), and it prioritizes caregiver surveillance over privacy, triggering a fear of institutionalization.

This research was synthesized into three foundational frameworks. First, the 7-Domain Cognitive Disruption Model maps the specific neuropsychological fracture points—like prospective memory decay—that occur when a routine is interrupted. Second, the Autonomy-Preserving Matrix defines three core voice-interaction heuristics: Action-Oriented Scaffolding, Non-Reflective Pragmatism, and Threshold Lowering. Finally, the principle of Information Asymmetry establishes an ethical data boundary, defining what a system must intentionally hide to protect an elder's dignity while providing caregivers with sustainable reassurance.

These frameworks informed the development of MIRA: a formative design artifact and voice-first, ambient AI system. MIRA introduces a new interaction loop—Detect, Stabilize, Scaffold, and Resume—allowing the technology to absorb the cognitive friction of a disrupted moment. Rather than sounding loud alarms, MIRA guides the user through small, actionable steps based on physical cues. This enables the system to act as a quiet collaborator without overhauling an elder's existing habits. MIRA's framework and conversational scripts were refined through iterative Wizard of Oz testing with caregivers and older adults. With continued evaluative testing, this framework has the potential to cultivate a new generation of elder-care systems that are respectful, pragmatic, and capable of restoring true independence.



A NOTE BEFORE YOU BEGIN

Independence is not the ability to execute every task perfectly. It is the ability to *recover when things break.*

We must stop designing digital wardens that demand compliance, and start designing ambient collaborators that scaffold recovery. MIRA is one attempt to draw that line, quietly, and on the elder's side of it.

Background & Context

The Demographic Imperative

By 2030, 1 in 6 people globally will be aged 60 or older. In the United States, the entire Baby Boomer generation will cross the 65-year threshold. Simultaneously, the global worker-to-retiree ratio is shrinking from 4:1 to 2:1, causing an unprecedented, compounding shortage of both professional nurses and unpaid family caregivers.

The Transition Home

As populations age and more older adults choose to remain in their homes, the burden of managing everyday routines increasingly shifts toward self-managed recovery. While many older adults remain physically capable, interruptions, stress, recovery from health events, cognitive fatigue, and fragmented support systems can destabilize continuity in everyday life.

This thesis investigates how routine disruptions affect independence during aging and recovery. Existing systems largely focus on reminders, compliance, and monitoring, but often fail to support moments where continuity breaks. Through interviews with older adults and caregivers, this research identified recurring experiences of hesitation, overwhelm, confusion, and difficulty resuming routines after interruption.

MIRA was developed as a continuity recovery framework that explores how contextual, voice-first AI interactions can scaffold recovery during these disrupted moments while preserving dignity, confidence, and autonomy.

Manifesto



The Problem -

Where we are today

Elder-care technology has built digital wardens, not assistants. Driven by caregiver anxiety, the current market operates on a paradigm of surveillance and rigid task compliance. We bombard older adults with loud alarms, track their daily mistakes, and monitor them as dependent patients. This approach strips away dignity, triggers a fear of institutionalization, and ultimately leads to massive technology abandonment.



What We're Missing -

The Insight

We fundamentally misunderstand how independence is lost. We assume aging in place is purely a physical challenge, but daily life actually fractures at the cognitive level. When an interruption occurs—a ringing phone, a moment of fatigue—it triggers cognitive overload and prospective memory decay. True independence is not the ability to execute every task flawlessly; it is the cognitive resilience to recover when a routine breaks.



The Proposition -

New Possibility

We must shift our design objective from monitoring compliance to enabling routine recovery. By creating Autonomy-Preserving AI, we can build ambient collaborators that offer proactive cognitive scaffolding, dynamically lower barriers, and enforce strict data boundaries to protect user privacy. It is time to design technology that trusts older adults as capable individuals, rather than treating them as burdens to be watched.



ABSTRACT

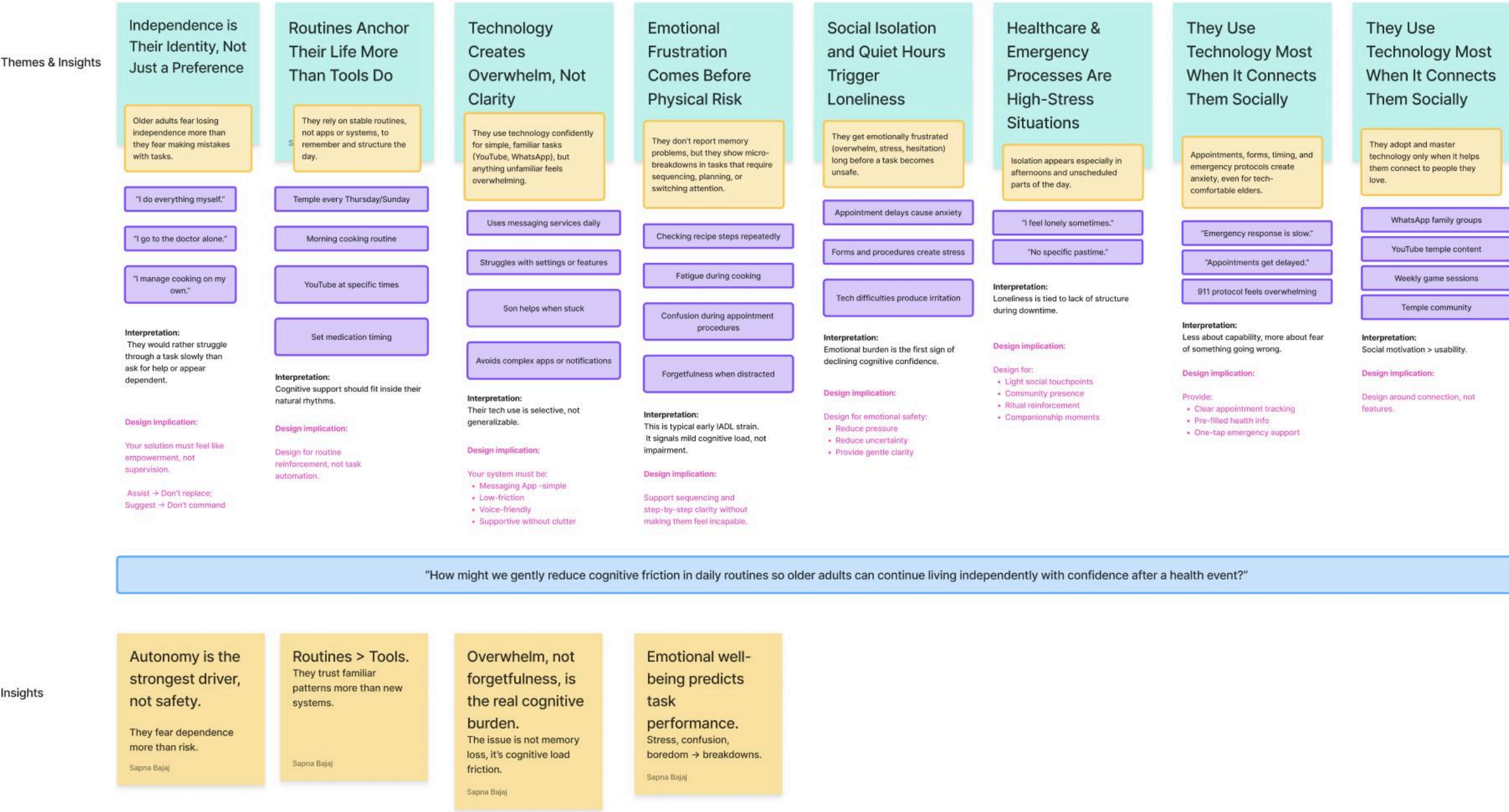
A shift from compliance monitoring to *routine recovery*.

As the global population ages, preserving independent living has become a critical public health mandate. Yet most assistive technologies still operate on a paradigm of surveillance and rigid task compliance.

When an older adult experiences cognitive friction post-surgery, existing systems monitor their failure but offer no cognitive support, leading to massive technology abandonment.

MIRA is a voice-first, ambient AI framework designed to shift elder-care technology from compliance to recovery. Grounded in primary research and clinical gerontology, it uses a seven-domain Cognitive Disruption framework to deploy interaction patterns including **Action-Oriented Scaffolding** and **Threshold Lowering**, and enforces strict **Information Asymmetry** to protect user dignity.

THEMES & INSIGHTS (Based on (primary) Interviews + Secondary Research)





SECTION 01

Introduction

PROBLEM · SCOPE · MANIFESTO

We fundamentally misunderstand how older adults lose their independence. The breakdown happens in the mind, not in the body, in the second between actions, when a phone rings and the routine forgets itself.



01.1 · PROBLEM

We are solving the wrong problem.

When a person transitions home after a major health event, cardiac surgery, chemotherapy, the healthcare system treats their recovery as a purely physical challenge. Grab bars are installed. Ramps are built. But physical mobility is rarely the thing that fails.

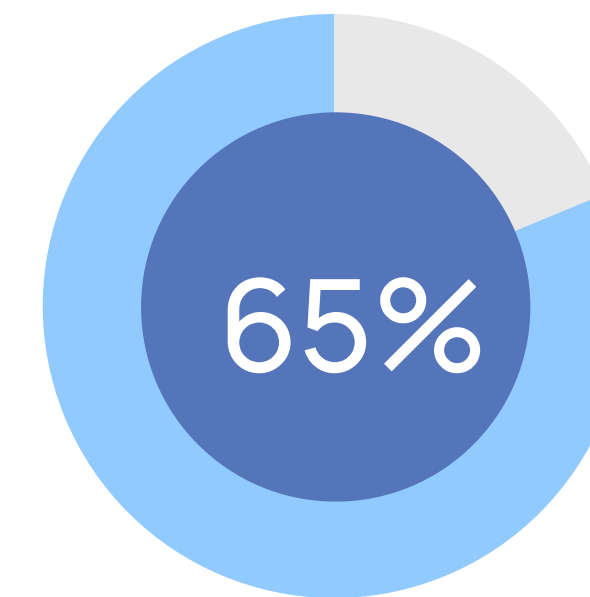
What breaks down is daily life: the choreography required to live alone. Medications, meals, sequences. A phone rings mid-task. Fatigue arrives at 4 p.m. Working memory slips, processing speed drops, and the routine shatters.

Driven by anxious adult children, the tech world has built digital wardens. Reminder apps blare alarms. Cameras turn living rooms into surveillance states. Every forgotten pill becomes evidence in an unspoken trial about a nursing home.

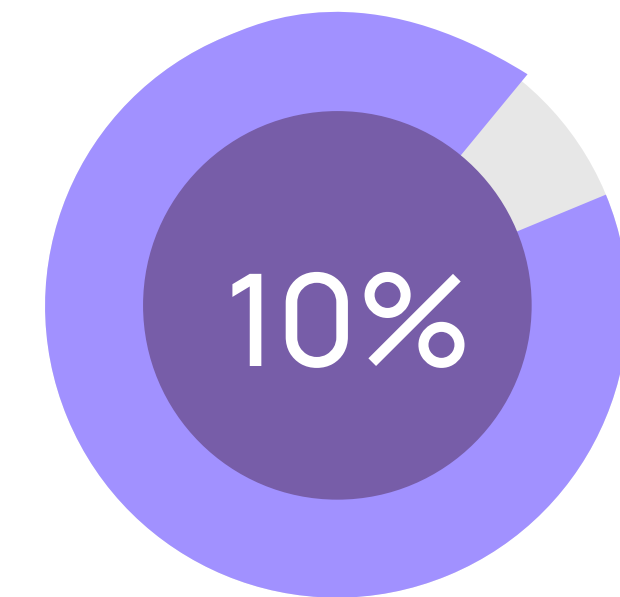
In response, older adults do the only thing left to defend their freedom: they unplug the devices.

JAMA review on cognitive decline in older adults after surgery.

https://jamanetwork.com/journals/jama/fullarticle/2782851?utm_source=chatgpt.com



Temporary cognitive difficulties



Develop long-term cognitive decline

Among patients aged 65 and older, up to 65% experience temporary cognitive difficulties and 10% develop long-term cognitive decline after noncardiac surgery.



Three semesters at the intersection of cognitive aging, voice AI, and the ethics of care.

IN SCOPE

Cognitive friction & recovery

Investigating how disruptions shatter daily routines and defining new interaction patterns that enable autonomous recovery instead of dependence.

IN SCOPE

Voice-first scaffolding

Synthesizing neuropsychological research to design conversational rules that act as cognitive scaffolding, calibrated to the speed-accuracy trade-off.

IN SCOPE

Information asymmetry

Defining the systemic ethics of intentionally hiding data, protecting the elder's privacy while giving the caregiver peace of mind.

OUT OF SCOPE

Mass-market consumer product

This work is a design framework and a validated prototype, not a shipping consumer device or a commercial product roadmap.

OUT OF SCOPE

Medical-grade diagnostics

Cognitive friction is treated as a design context, not a clinical diagnosis. MIRA does not replace neuropsychological assessment.

OUT OF SCOPE

Severe dementia

This is a formative design thesis for mild cognitive slowdown, not a summative clinical intervention for moderate-to-severe dementia.

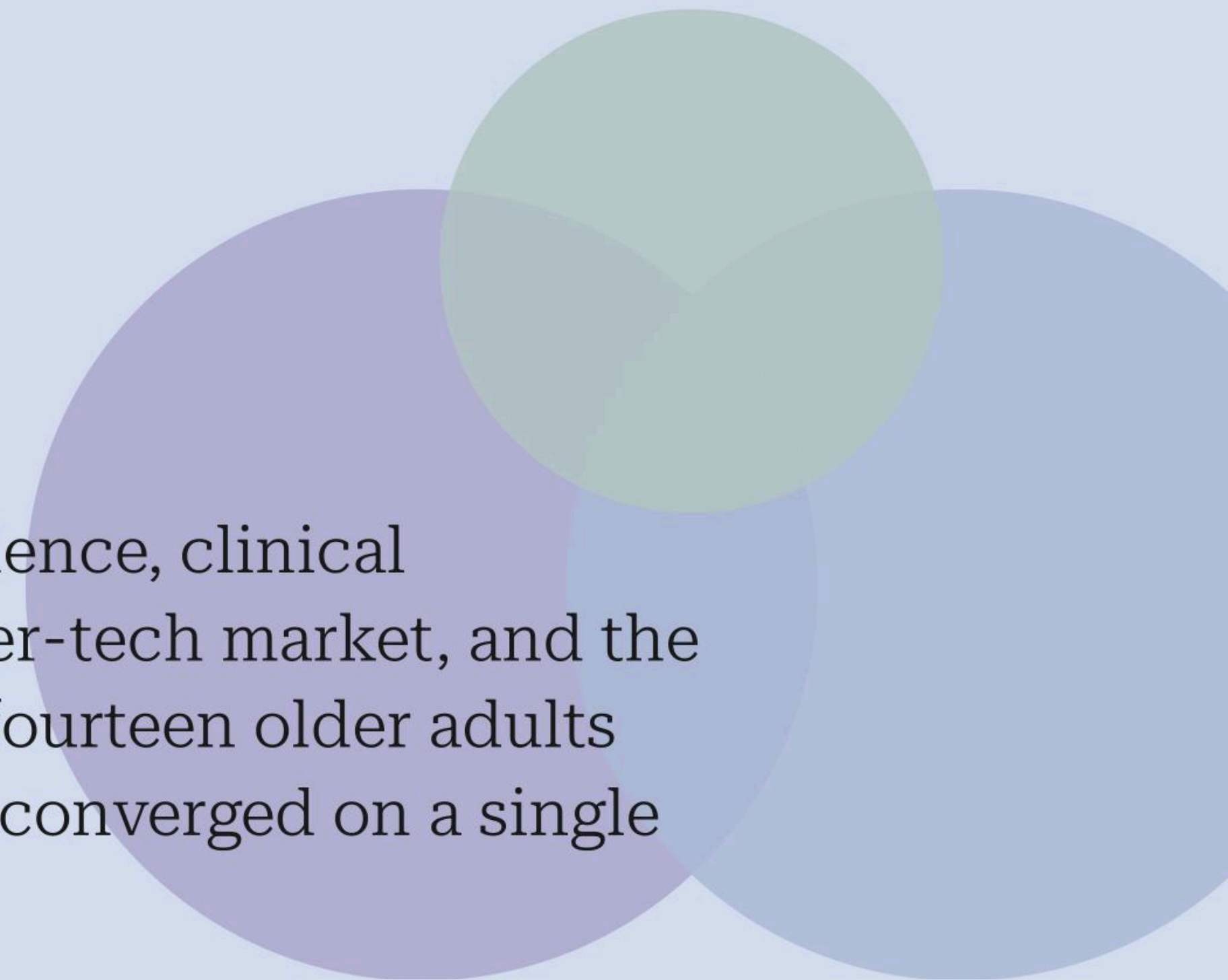


SECTION 02

Research

LITERATURE · MARKET · OBSERVATIONS · INTERVIEWS

Three bodies of evidence, clinical gerontology, the elder-tech market, and the lived experience of fourteen older adults and four caregivers, converged on a single insight.



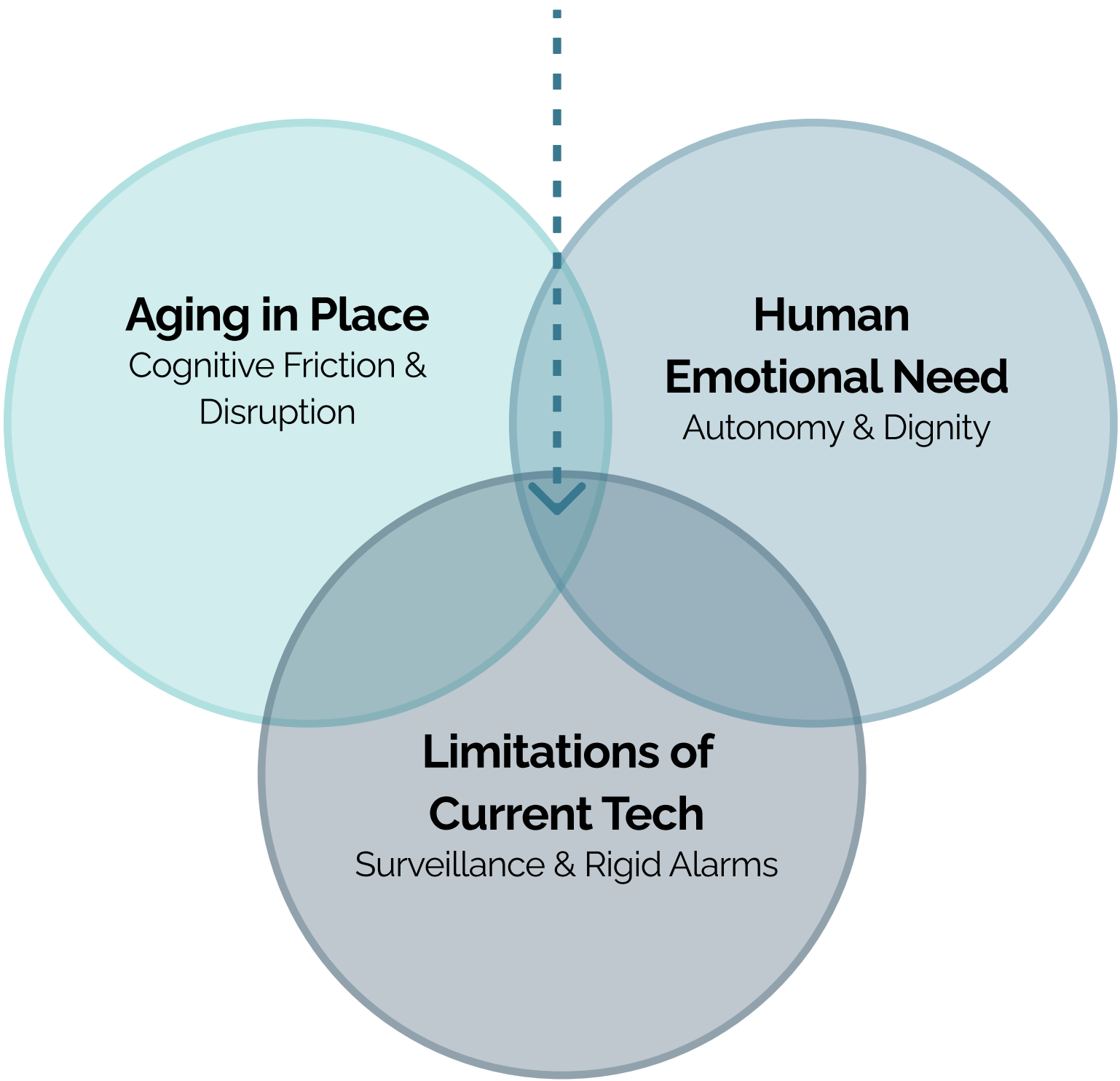
Locating the thesis range

The Clinical Reality (Cognitive Friction)

What actually happens when an older adult transitions home after surgery? The healthcare system often treats aging in place as a purely physical challenge. However, my research reveals that independence frequently fractures at the cognitive level. I will explore how micro-disruptions—like a ringing phone—cause prospective memory decay, speed-accuracy trade-offs, and decision fatigue, shattering complex daily routines (IADLs) even when physical mobility is fully intact.

MIRA Opportunity Space

Re-framing Assistive Tech:
From Task Compliance to Routine Recovery



The Human Emotional Need (Autonomy & Privacy)

Older adults are fighting to maintain their identity, dignity, and purpose. I will explore the deep psychological weight of aging in place—specifically the intense fear of institutionalization and the desire to not be a burden on adult children. How do we design for users who actively crave independence, but are terrified that a single logged mistake will cost them their freedom?

Limitations of Current Tech (Surveillance & Alarms)

The current elder-care technology landscape operates on a broken paradigm. I will examine why reminder apps that rely on loud alarms induce panic and cognitive overload. Furthermore, I will explore the "Abandonment Paradox"—why smart home cameras and sensors that prioritize caregiver surveillance make older adults feel like dependent patients, leading to massive technology abandonment.



02.1 · LITERATURE

The brain's response to disruption is not a glitch, it is a survival strategy.

SPEED-ACCURACY TRADE-OFF

Lassen-Greene et al. (2017) demonstrated a severe speed-accuracy trade-off in MCI: when rushed, errors spike. To remain safe, the brain must slow down. Fast alarms and screen prompts directly oppose this, inducing cognitive overload and panic exactly when the system promised to help.

SEVEN COGNITIVE DOMAINS

Harvey (2019) maps cognition across seven measurable domains, prospective memory, working memory, sequencing, attention, processing speed, language, and executive function. NSHAP (2025) shows these are exactly the domains that fracture in everyday IADLs after a major health event.

The literature converges on one design implication: scaffold the moment of hesitation, do not interrupt it.

Wardens for surveillance.
Synthetic friends for emotion.
No tool for cognitive scaffolding.

The Autonomy-Preserving Matrix



GAPS	ELLIQ	ALEXA	REPLIKA	● MIRA
CONTINUITY AWARENESS	Tracks engagement patterns	Tracks commands / events	No real-world continuity	Understands routines as flow
CONTEXT RECONSTRUCTION	Redirects to engagement	Requires user to ask	Responds conversationally only	Rebuilds disrupted moments
CONFIDENCE RECOVERY	Encourages interaction	Executes commands	Provides emotional dialogue	Reduces hesitation with guidance

REMINDER APPS

Demand perfect execution

Violate the speed–accuracy trade-off. Rushing older adults causes errors and erodes confidence.

VOICE ASSISTANTS

Require active commands

Alexa-style systems wait for invocation — a confused user might forget to ask in the first place.

AI COMPANIONS

Synthetic empathy & elderspeak

Replika fakes intimacy; ElliQ patronizes. Both create dependency or insult — neither scaffolds recovery.

SECURITY CAMERAS

Optimize for surveillance

Trigger the Abandonment Paradox — older adults unplug devices because they feel watched.

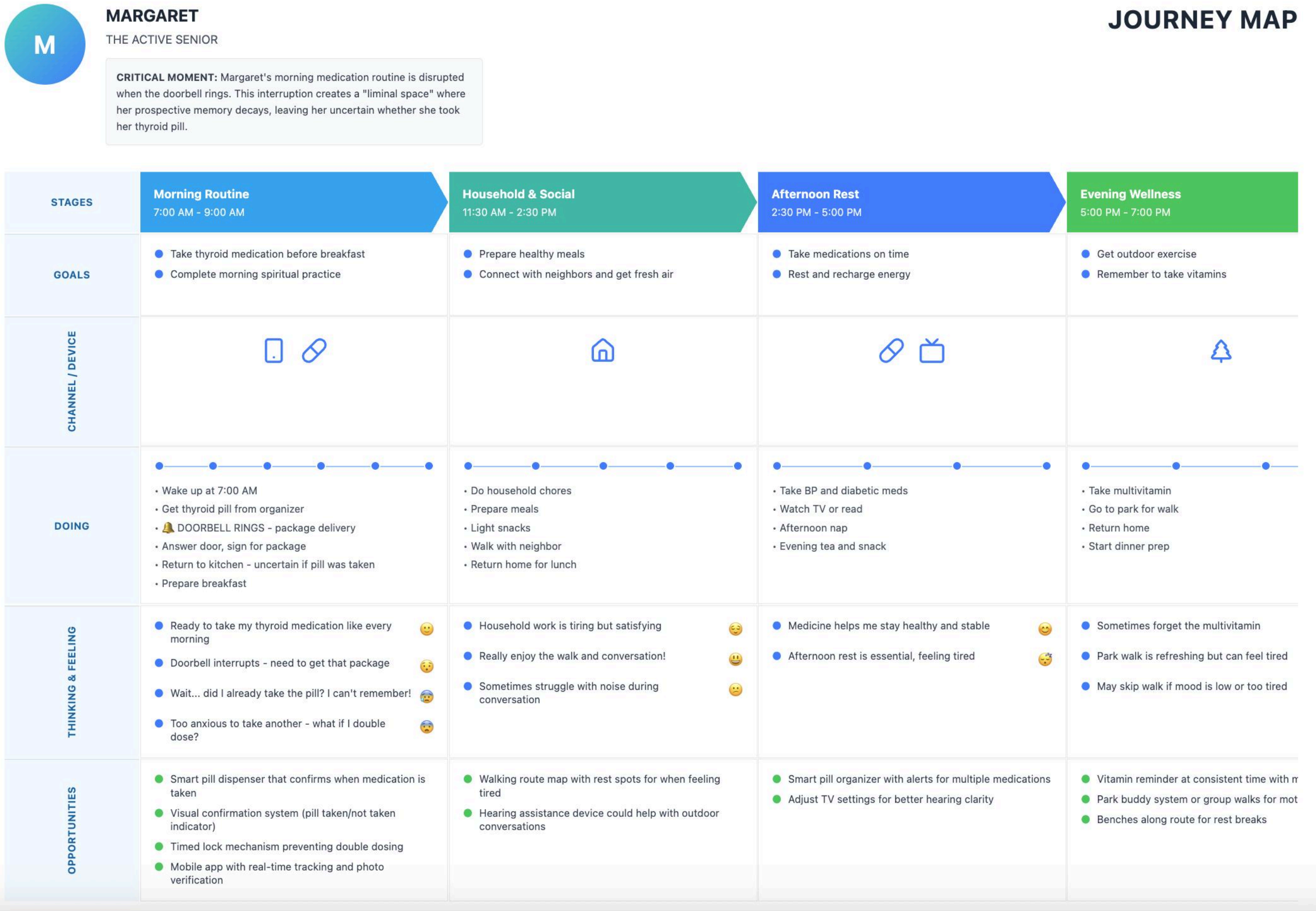
A Day in the Life: The Anatomy of a Disruption

Routines rarely fail because of a physical inability to open a pill bottle. They fail in the space between actions. To visualize exactly where current technology falls short, I mapped the emotional and cognitive journey of Margaret during a standard day. The map reveals that her routine doesn't fail at the initiation phase; it shatters in the "liminal space" of an interruption.

When the doorbell rings, Margaret's attention shifts, and her prospective memory decays. Upon returning to the kitchen, she experiences a moment of profound uncertainty. Currently, reminder apps intervene at this exact moment of high cognitive load by sounding a blaring alarm. As the journey map illustrates, this does not prompt memory retrieval, it induces panic.

More importantly, the map shows that a single unrecovered disruption is not an isolated event. The anxiety and cognitive strain from her morning medication slip drains her mental energy, ultimately causing her to avoid her evening walk.

This map isolates the exact moments of friction where MIRA must intervene. By stabilizing the cognitive load in the morning, rather than sounding an alarm, MIRA prevents a single disruption from shattering the rest of her day.





Three findings that reframed the brief.

01

Fear of institutionalization

Elders actively hide their mistakes because they fear losing their freedom. Errors become evidence in a trial about a nursing home that no one has formally announced.

"She's scared that if she makes a mistake, they'll put her in a home."

AMENDA

02

Alarms cause panic, not action

Loud, binary alerts induce cognitive overload. When an older adult is confused, an alarm feels like a test they are failing in real time. They require calm, contextual guidance, not noise.

03

Routine is identity

Executing daily tasks is the last remaining anchor of personal identity. Altering or removing routines causes deep emotional distress, even when the alteration is framed as "help."

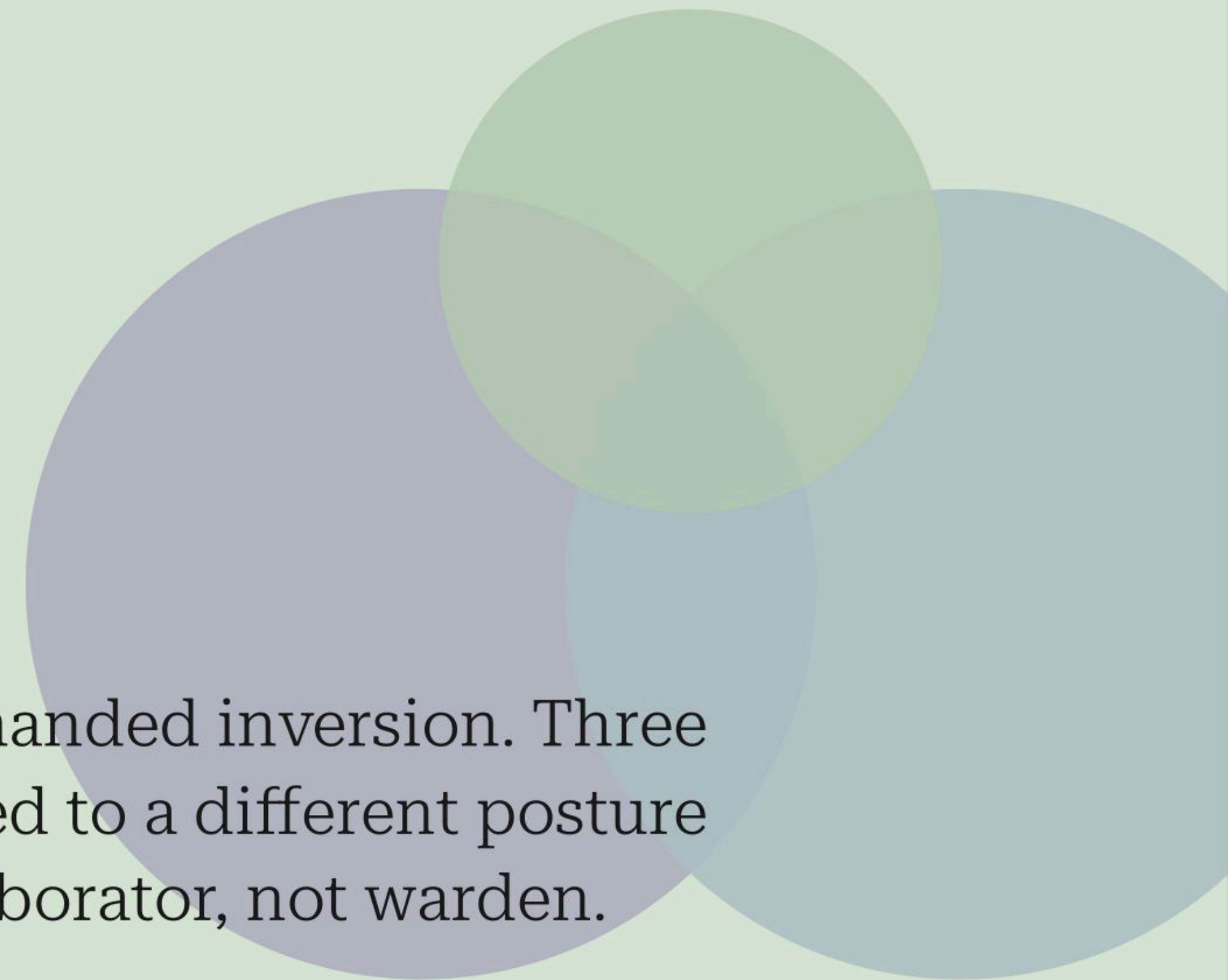


SECTION 03

Concept

PROBLEMS · OPPORTUNITIES · BRAINSTORM · STORYBOARDS

Three problems demanded inversion. Three opportunities pointed to a different posture for the system, collaborator, not warden.





PROBLEMS

Three problems.

01 · UNCUED RECALL CAUSES STRESS

The interrogation problem

"Did you take your pill?" forces a memory search and spikes anxiety in the exact moment the brain needs slack.

02 · FAKE EMPATHY PATRONIZES

The companion problem

AI companions imitate human friends with elderspeak. Independent adults find it insulting, and reject the technology.

03 · THE PANOPTICON EFFECT

The surveillance problem

Raw event streams pushed to caregivers destroy trust. Surveillance, however well-intentioned, ends in unplugged devices.

OPPORTUNITIES

Three inversions.

01 · TANGIBLE-DIGITAL HYBRIDS

Anchor in the physical

Ground digital interventions in the physical environment. Let everyday objects offload working memory naturally.

02 · DESIGN FOR DIGNITY

Treat the elder as a partner

Pragmatic, instrumental support that treats the older adult as a capable partner, respectful, shame-free, never cloying.

03 · EXCEPTION-ONLY SHARING

Asymmetry as ethics

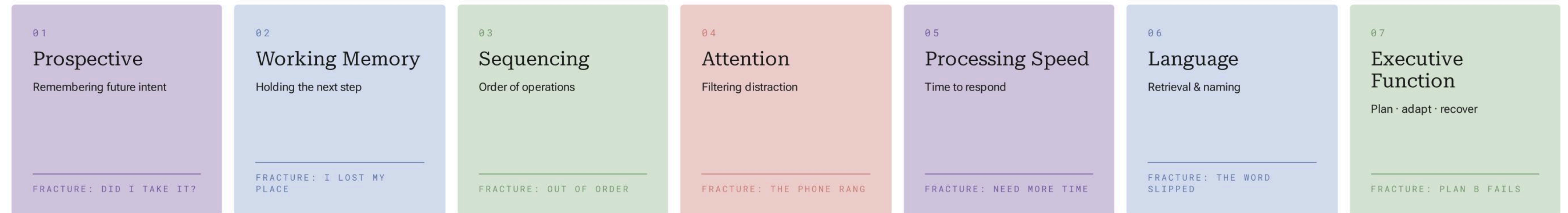
A strict data boundary. Macro reassurance for caregivers; no micro-surveillance of the elder. Asymmetry as ethics.



03.2 · BRAINSTORMING

Seven domains where routines fracture under stress.

Based on NIH neuropsychological assessments, routine disruption is a cascading failure across specific brain functions. Mapping these fracture points let me brainstorm conversational responses that act as a safety net for each one.



Hierarchical Domains: *Harvey (2019) PMC6829170*

Domain-Specific IADL Decay: *NSHAP Study (J. Gerontology, 2025)*

Speed-Accuracy Trade-off: *Lassen-Greene et al. (2017) PMC5812285*



03.3 · STORYBOARDS

Three moments. One quiet loop.

AM

Morning Interruption.

The phone rings mid-sort. MIRA pauses, waits for hesitation, and offers a single physically-anchored next step.

PM

Afternoon Fatigue.

Conflicting hospital diets meet Sunday family tradition. MIRA navigates decision fatigue with a small compromise, not a lecture.

EVE

Evening Avoidance.

Too tired for the PT walk. MIRA validates the pain and offers two minutes of breathing, keeping the habit alive.

03.4 · ROUTINE RECOVERY LOOP

01 / DETECT

Detect hesitation

Notice the silence, the pause, the missed cue, without interrogating it.

02 / WAIT

Hold the silence

Resist the urge to alert. Give the brain its slack.

03 / SCAFFOLD

Scaffold the next step

Offer one calm, action-oriented voice prompt anchored to a physical cue.

04 / RESUME

Resume autonomously

Step back. Let the elder finish the routine themselves. Independence intact.

A loop, not a ladder. The system always returns the elder to autonomy.

A Day in the Life: The Anatomy of a Disruption

Routines rarely fail because of a physical inability to open a pill bottle. They fail in the space between actions. To visualize exactly where current technology falls short, I mapped the emotional and cognitive journey of Margaret during a standard day. The map reveals that her routine doesn't fail at the initiation phase; it shatters in the "liminal space" of an interruption.

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This map isolates the exact moments of friction where MIRA must intervene. By stabilizing the cognitive load in the morning, rather than sounding an alarm, MIRA prevents a single disruption from shattering the rest of her day.



MARGARET
THE ACTIVE SENIOR

CRITICAL MOMENT: Margaret's morning medication routine is disrupted when the doorbell rings. This interruption creates a "liminal space" where her prospective memory decays, leaving her uncertain whether she took her thyroid pill.

JOURNEY MAP

STAGES	Morning Routine 7:00 AM - 9:00 AM	Household & Social 11:30 AM - 2:30 PM	Afternoon Rest 2:30 PM - 5:00 PM	Evening Wellness 5:00 PM - 7:00 PM
GOALS	- Take thyroid medication before breakfast - Complete morning spiritual practice	- Prepare healthy meals - Connect with neighbors and get fresh air	- Take medications on time - Rest and recharge energy	- Get outdoor exercise - Remember to take vitamins
CHANNEL / DEVICE				
DOING	- Wake up at 7:00 AM - Get thyroid pill from organizer 🔔 DOORBELL RINGS - package delivery - Answer door, sign for package - Return to kitchen - uncertain if pill was taken - Prepare breakfast	- Do household chores - Prepare meals - Light snacks - Walk with neighbor - Return home for lunch	- Take BP and diabetic meds - Watch TV or read - Afternoon nap - Evening tea and snack	- Take multivitamin - Go to park for walk - Return home - Start dinner prep
THINKING & FEELING	- Ready to take my thyroid medication like every morning 😊 - Doorbell interrupts - need to get that package 😬 - Wait... did I already take the pill? I can't remember! 🤔 - Too anxious to take another - what if I double dose? 😬	- Household work is tiring but satisfying 😊 - Really enjoy the walk and conversation! 😊 - Sometimes struggle with noise during conversation 😊	- Medicine helps me stay healthy and stable 😊 - Afternoon rest is essential, feeling tired 😊	- Sometimes forget the multivitamin 😊 - Park walk is refreshing but can feel tired 😊 - May skip walk if mood is low or too tired 😊
OPPORTUNITIES	- Smart pill dispenser that confirms when medication is taken - Visual confirmation system (pill taken/not taken indicator) - Timed lock mechanism preventing double dosing - Mobile app with real-time tracking and photo verification	- Walking route map with rest spots for when feeling tired - Hearing assistance device could help with outdoor conversations	- Smart pill organizer with alerts for multiple medications - Adjust TV settings for better hearing clarity	- Vitamin reminder at consistent time with r - Park buddy system or group walks for mot - Benches along route for rest breaks

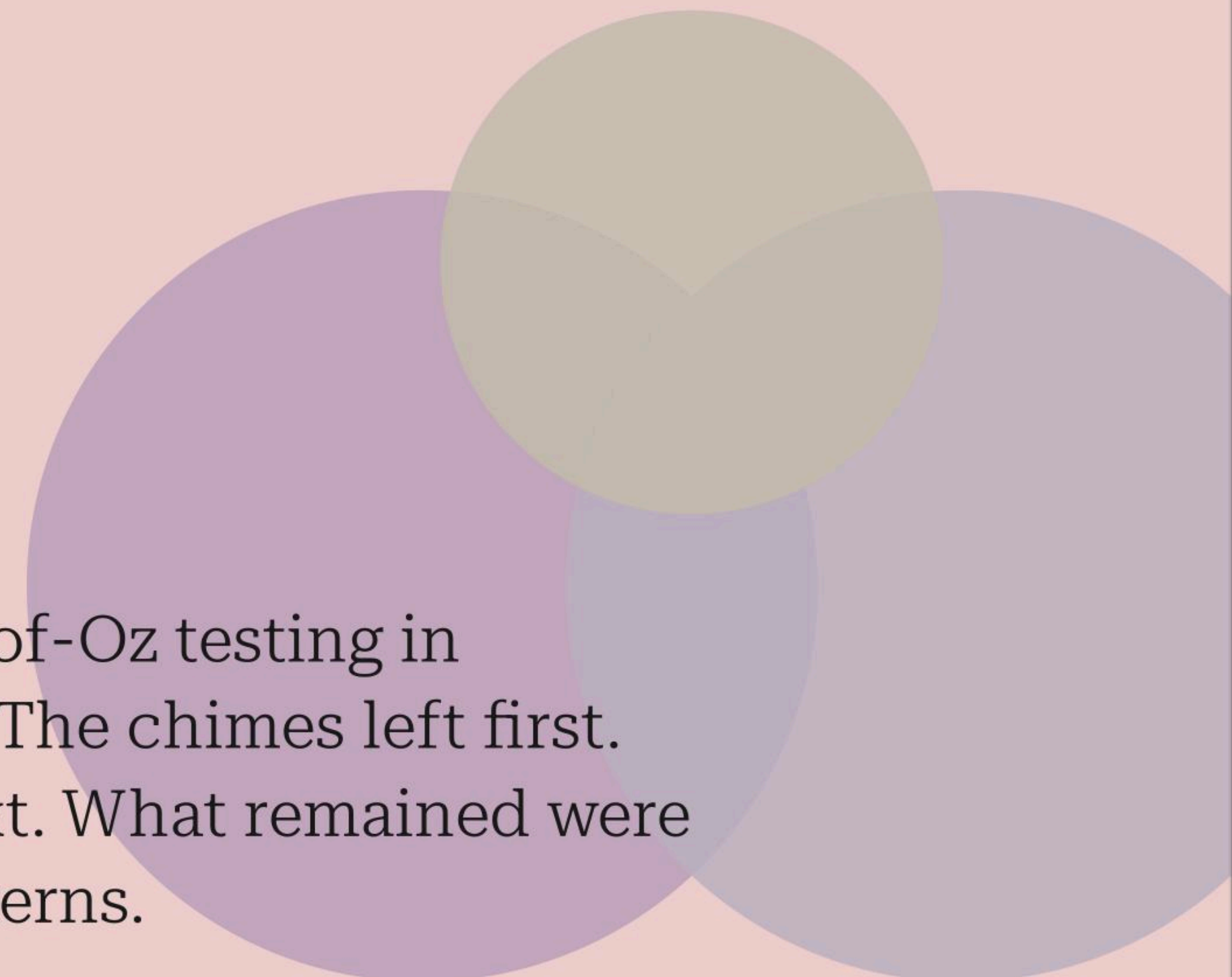


SECTION 04

Validation

PROTOTYPE · WIZARD OF OZ · PATTERNS

Voice-only, Wizard-of-Oz testing in simulated kitchens. The chimes left first. The lectures left next. What remained were four interaction patterns.





Three iterations stripped the system back to its useful core.

ITERATION 01

From alerts to conversations

Early wireframes used standard auditory chimes. Testing showed every chime spiked cognitive load. The system was rebuilt around purely conversational scaffolding, no bells, no buzzers, no "ding."

ITERATION 02

Tone calibration

Elderspeak and synthetic empathy were actively rejected. Scripts were re-tuned until participants described the voice as respectful, shame-free, and practical, not a friend, not a nurse, not a coach.

ITERATION 03

Caregiver UI redesigned

Detailed event logs triggered elder anxiety about institutionalization. The caregiver dashboard was rebuilt around pattern summaries, not transcripts, enforcing Information Asymmetry as a non-negotiable rule.

The most empathetic thing a system can do is refuse to share data it does not need to share.

DESIGN PRINCIPLE, DERIVED FROM TESTING



04.4 · DESIGN PROTOTYPE

Four patterns. One quiet posture.

ONBOARDING · ROUTINE

Action-Oriented Scaffolding

Shifts the burden from internal memory to external physical cues. The pillbox becomes the prompt. Backed by Baylor / JAGS trials on voice apps and IADL improvement.

"Let's check the Tuesday box together."

MEDICATION

Calm Re-Anchoring

When the routine is interrupted, MIRA does not interrogate. It pauses, waits, then offers one calm, physically-anchored next step.

"No rush. I'll stay right here."

NUTRITION

Non-Reflective Pragmatism

Strips away synthetic empathy. Offers shame-free dietary guidance that respects tradition, family, and the dignity of a normal Sunday lunch.

"One small upgrade. No lecture. No pity."

MOVEMENT

Threshold Lowering

During pain or fatigue, the bar is lowered, not removed. The habit loop survives the bad day, which is the whole point of a habit loop.

"Let's just do two minutes of breathing instead."

SYSTEM PATTERN
+ INFORMATION ASYMMETRY · CAREGIVER BOUNDARIES

The daughter's app receives pattern summaries, **"Morning routine resolved"**, never transcripts. The system intentionally hides data to protect dignity, and that is what makes it adoptable.



PHASE 03 · DESIGN CONCEPT & PROTOTYPES

Design Concept.

From three real lives to three personas, one framework, and the routine-recovery loop that holds the elder's side of the line.



Three lives. Three cognitive barriers.

To keep MIRA grounded in human reality, three personas were distilled from primary research — Linda's chemo-brain, Sonali's fierce privacy, Amenda's caregiver voice. Each persona names a specific cognitive barrier the framework must hold.

MARGARET · 72

The Interrupted Routine

Inspired by participants with prospective memory decay. Physically capable, but processing is delayed. A ringing phone interrupts her morning medication — she loses her place, and confidence shatters.

"Where was I...?"

GEORGE · 78

The Dietary Overwhelm

Navigating strict post-cardiac discharge instructions, George faces extreme decision fatigue. His hospital diet conflicts with lifelong family traditions — minor slips spiral into emotional overwhelm and guilt.

"It's just one Sunday."

RONALD · 75

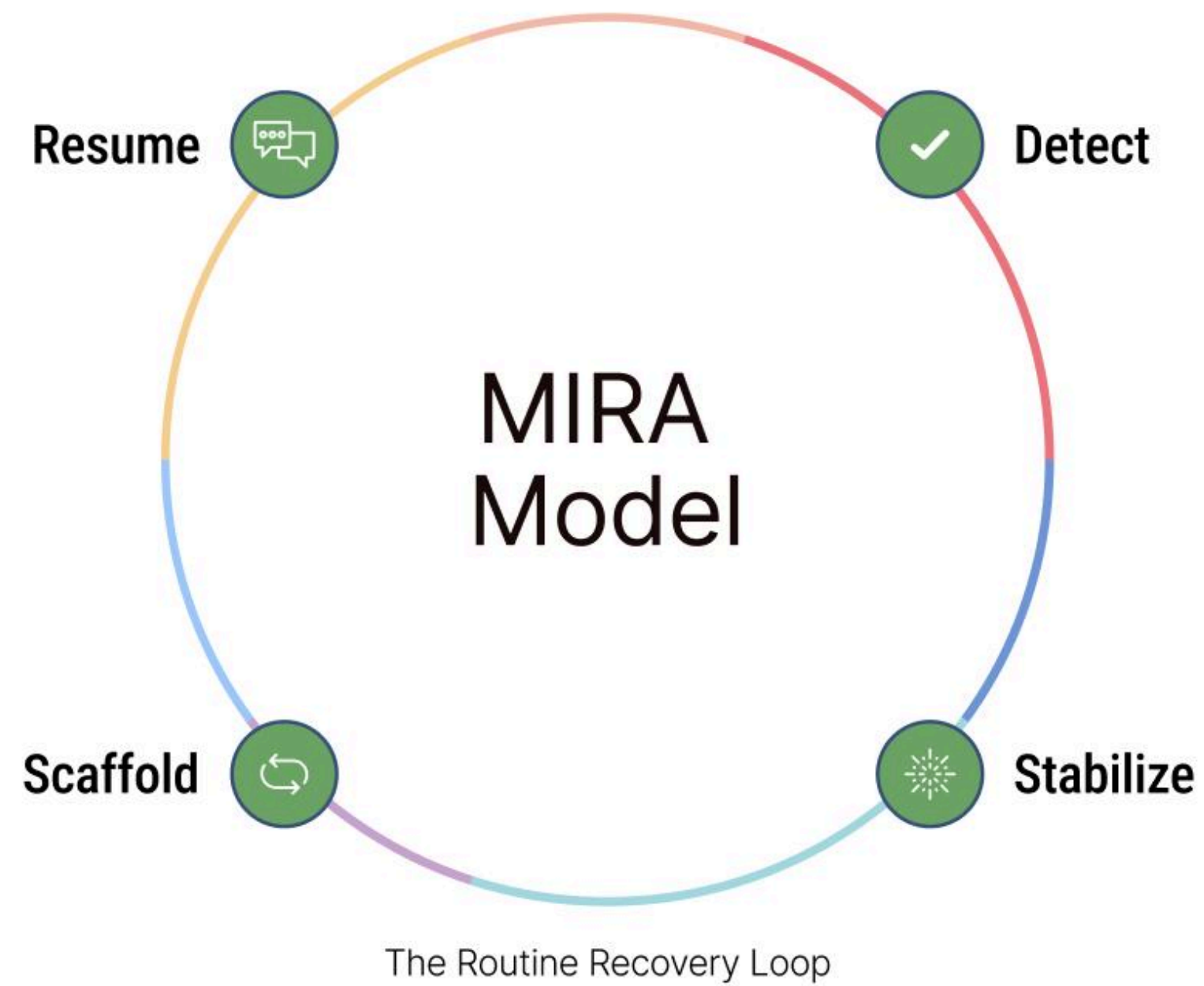
The Avoidance Barrier

Ronald is supposed to do daily PT walks, but joint pain and fatigue lead him to avoid the activity entirely. He doesn't need a loud reminder — he needs the barrier to entry lowered before the habit loop breaks.

"Not today."



From compliance monitoring to *continuity support*.



MIRA shifts the elder-care paradigm. It operates as an ambient collaborator running a four-step **Routine Recovery Loop**, then dissolves back into the room.

01 · DETECT

Detect the disruption

Notice the missed cue without interrogation.

02 · STABILIZE

Stabilize the load

Pause loud alarms. Give the brain its slack.

03 · SCAFFOLD

Scaffold the next step

One calm, physically-anchored voice prompt.

04 · RESUME

Resume autonomously

Step back. Let the elder finish themselves.

PATTERN 01

Action-Oriented Scaffolding

PATTERN 02

Non-Reflective Pragmatism

PATTERN 03

Threshold Lowering

Anchored to clinical ground truth.

Never hallucinated.

An AI assisting an older adult cannot invent medical advice. MIRA's onboarding integrates with the elder's existing healthcare ecosystem — patient portal, local pharmacy (e.g. CVS), discharge instructions — so every conversational guidance is bound by professional medical rules, not generated text.

ROUTINE SETUP

Menu:

SCENARIOS

Medication Support

Help with medication reminders and tracking

Nutrition Guidance

Support with meals and dietary needs

Movement & Exercise

Guide activity reminders and support

SETTINGS

Profile & Routine

Manage your daily schedule

ABOUT

MIRA v1.0

Your voice-based AI assistant for managing daily routines with care and support.

OR SAY YOUR ANSWER

Let's build your routine

Hi Margaret, I'll suggest a gentle daily schedule. You can review it, edit anything, or start fresh, whatever feels right.

Set up my routine

View suggested routine

OR SAY YOUR ANSWER

MIRA helps you stay on track with medications, meals, and daily activities through gentle reminders and supportive conversations.

Continue

OR SAY YOUR ANSWER

What's your name?

I'd like to know what to call you

Margaret

Continue

OR SAY YOUR ANSWER

Let's set up your routine

Your daily schedule helps me support you better

Thyroid medication on empty stomach

07:30 AM Daily

Breakfast

08:15 AM Daily

Lunch

12:30 PM

Afternoon walk or light exercise

04:30 PM

Dinner

06:30 PM

Continue

OR SAY YOUR ANSWER

All set!

MIRA is ready to support your daily routine

Continue

Back to menu

OR SAY YOUR ANSWER

View Routine

View your today's routine

Thyroid medication on empty stomach

07:30 AM Daily

Breakfast

08:15 AM Daily

Lunch

12:30 PM

Afternoon walk or light exercise

04:30 PM

Dinner

06:30 PM

Continue

OR SAY YOUR ANSWER

Edit Routine

Adjust the title, time, or remove anything that doesn't fit.

Thyroid medication on empty stomach

07:30 AM Daily

Breakfast

08:15 AM Daily

Lunch

12:30 PM Daily

After

OR SAY YOUR ANSWER

CONNECT PHARMACY

Connect pharmacy

1 Pharmacy

2 Account

3 Confirm

Pick your pharmacy

Sync prescriptions, fill reminders, and pickup notifications

CVS Pharmacy

Nationwide · RX + refills

walgreen

Nationwide · RX + refills

AteRite Alderbrook walk or light exercise

Nationwide · RX + refills

Local Pharmacy

OR SAY YOUR ANSWER

Connect pharmacy

1 Pharmacy

2 Account

3 Confirm

Using

CVS pharmacy

Pharmacy member or RX ID

e.g. 1234567890

Zip code

94110

Phone number

(555) 123-4567

We use this information only to verify your account

OR SAY YOUR ANSWER

Connect pharmacy

1 Pharmacy

2 Account

3 Confirm

Confirm connection

Please double-check before we link your account

Pharmacy

CVS Pharmacy

Account / RX ID

--

Zip

--

Phone

--

Sync active prescriptions

☒

Refill reminders

☒

Pickup notifications

☒

OR SAY YOUR ANSWER

CONNECT DOCTOR OFFICE

Pharmacy connected

I'll let you know when refills are ready and remind you before pickups.

3 active prescriptions

Synced from CVS

Next refills: Mar 18

Levetiracetam 50 mg

Continue

OR SAY YOUR ANSWER

Connect your doctor's office

Share your routine and adherence summaries so visits feel prepared and calm

Practice or portal

Dr. Patel - Cedar family medicine

Patient portal email

margaret@exam-ple.com

Share with the office

Daily routine schedule ☒

Medical adherence ☒

Custom medication ☐

OR SAY YOUR ANSWER

Request Sent

Cedar family medicine will confirm shortly. I'll keep your routine in sync once confirmed.

Dr. Patel

Cedar family medicine

End-to-end encrypted

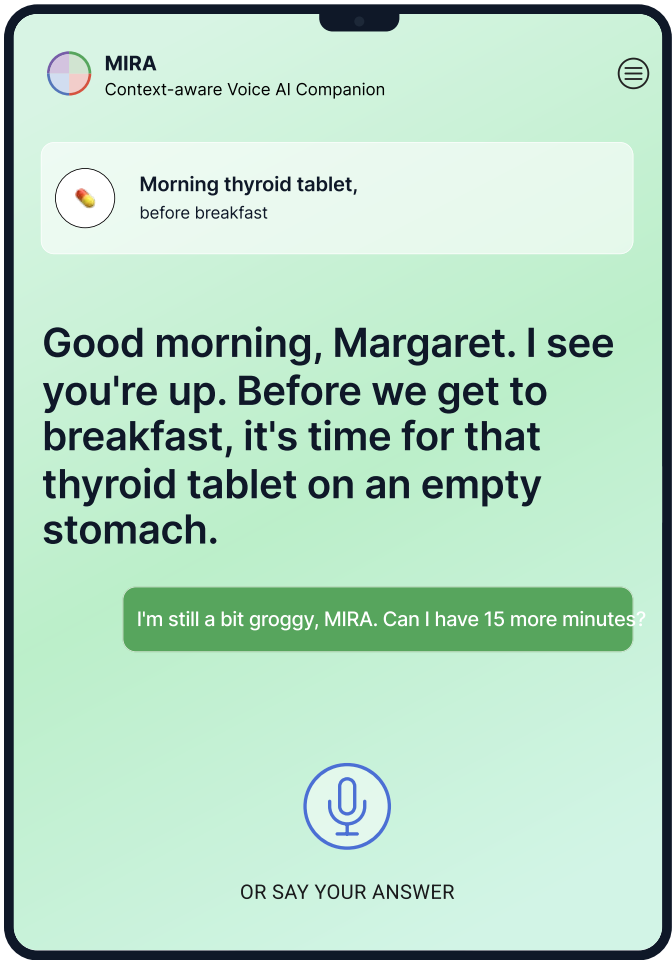
You control what's shared

Continue

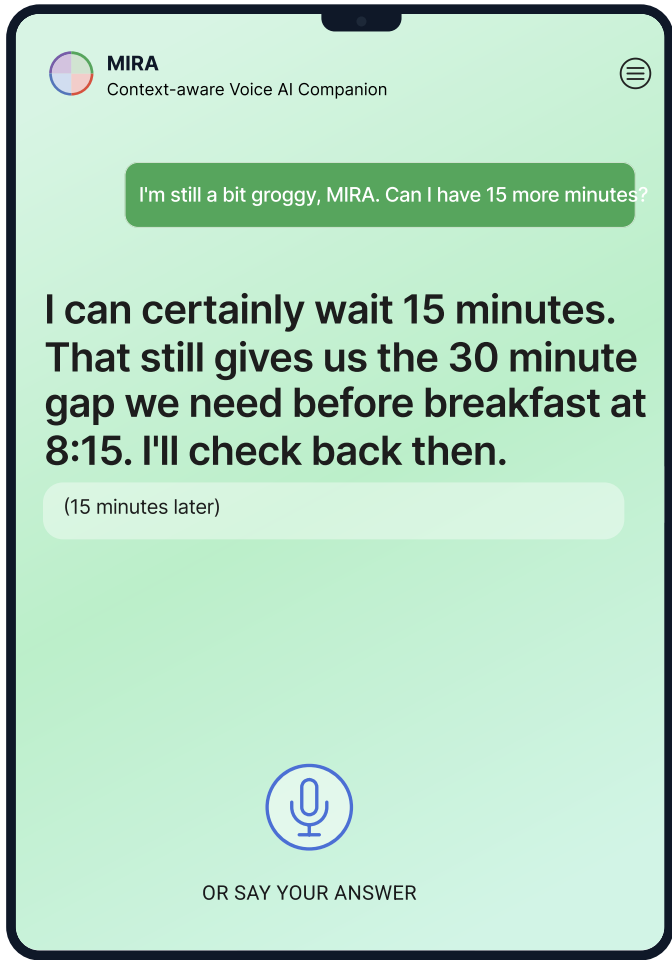
OR SAY YOUR ANSWER



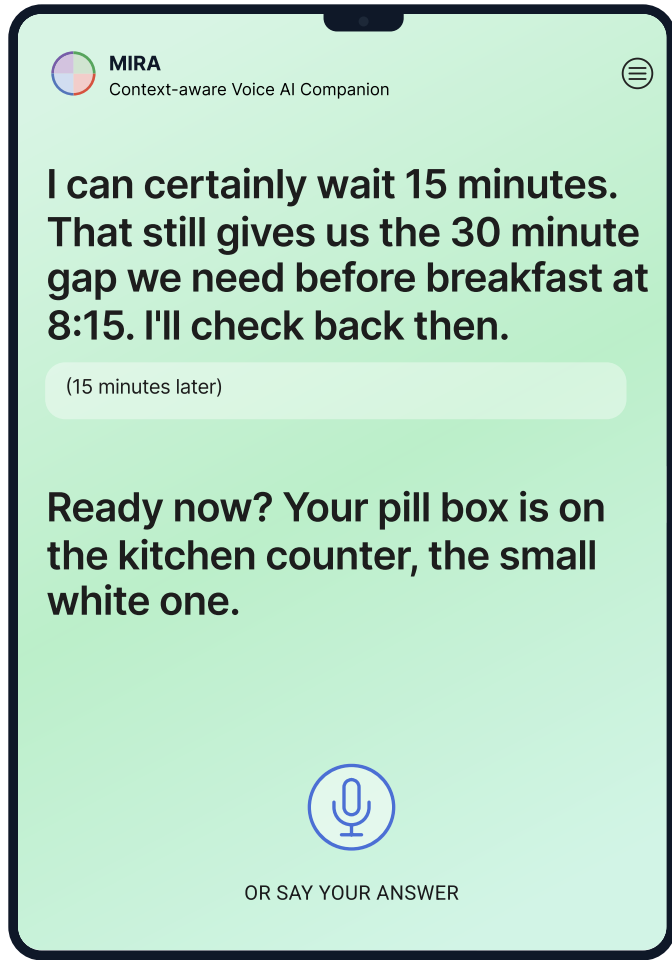
"Let's check the *Tuesday box* together."



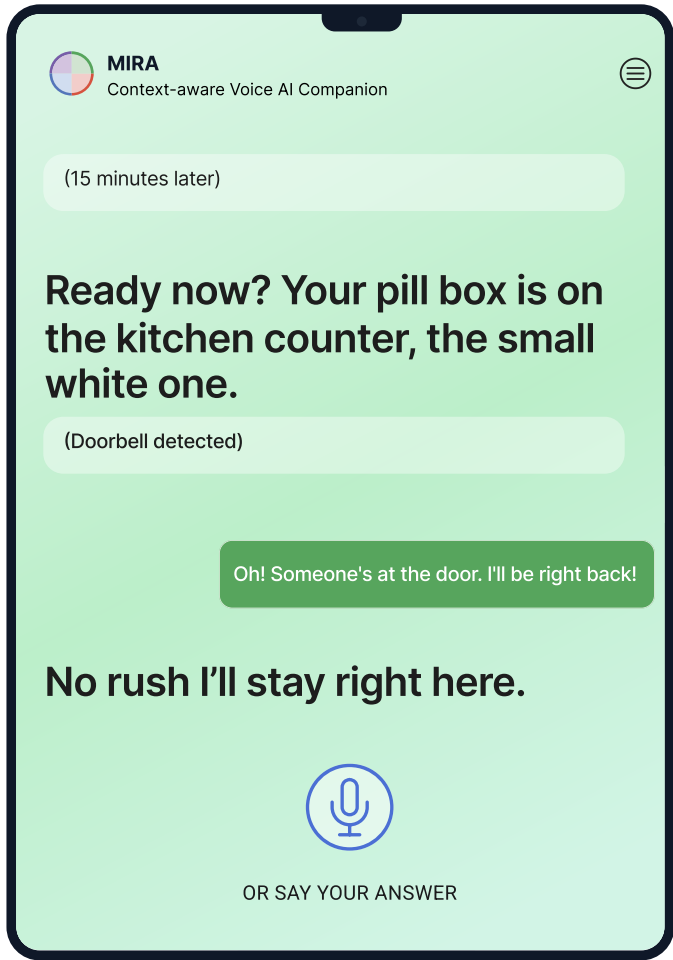
Routine Initiated



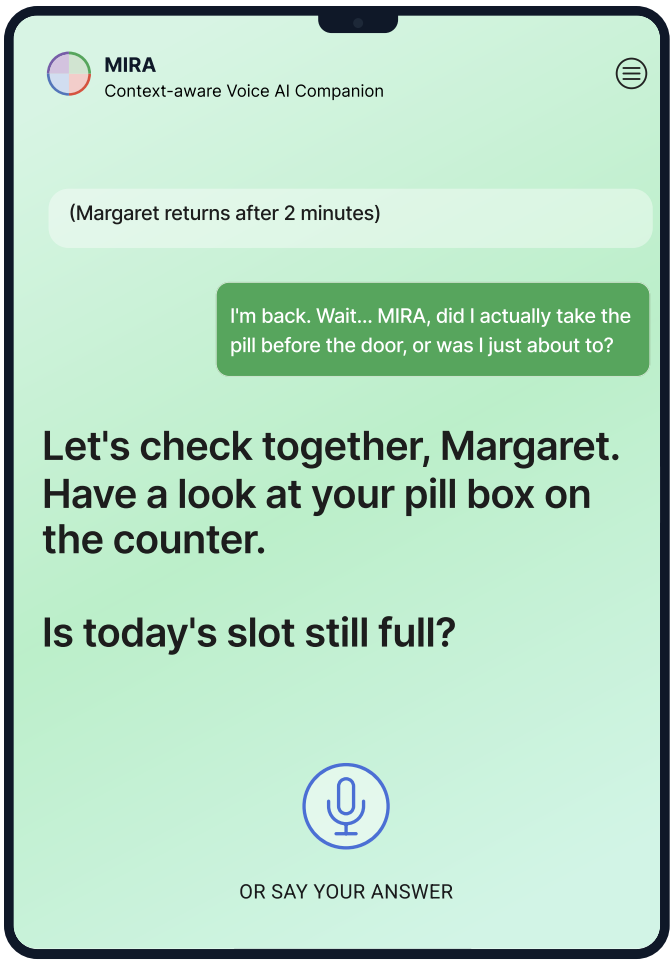
Threshold Lowered



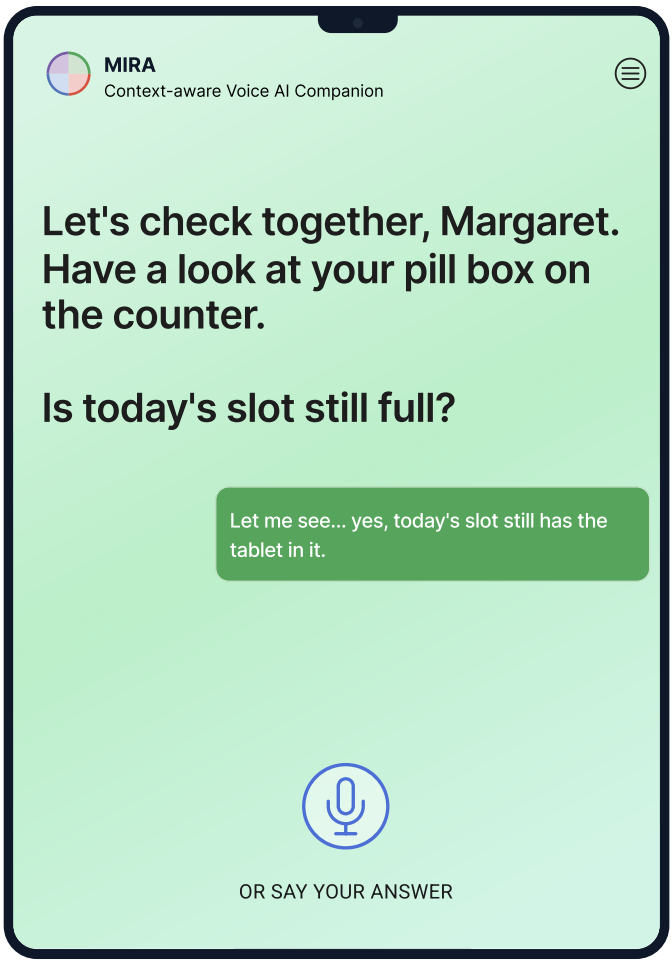
Context Maintained



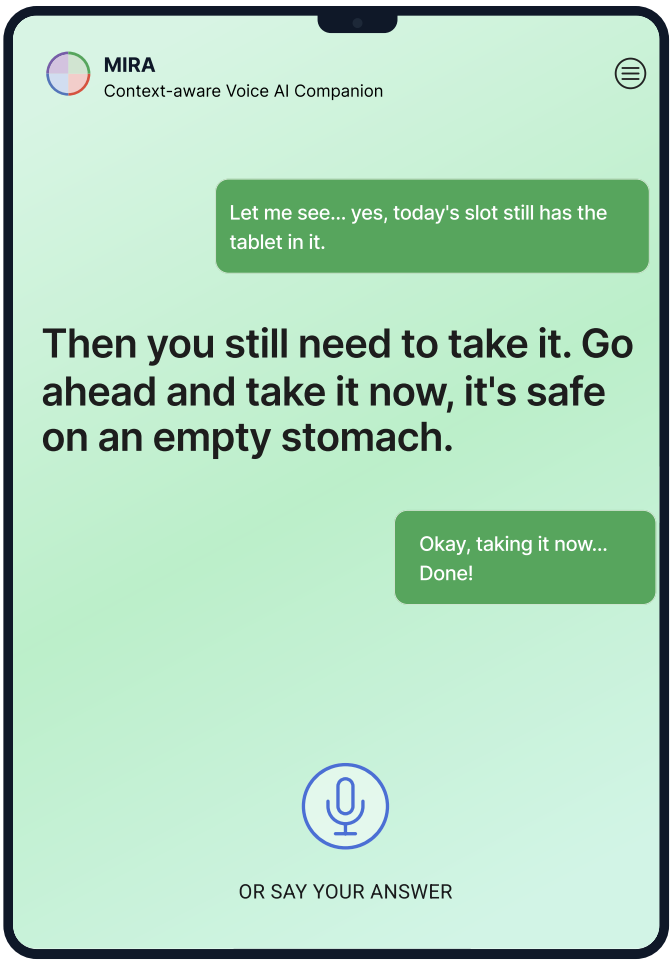
Disruption Detected



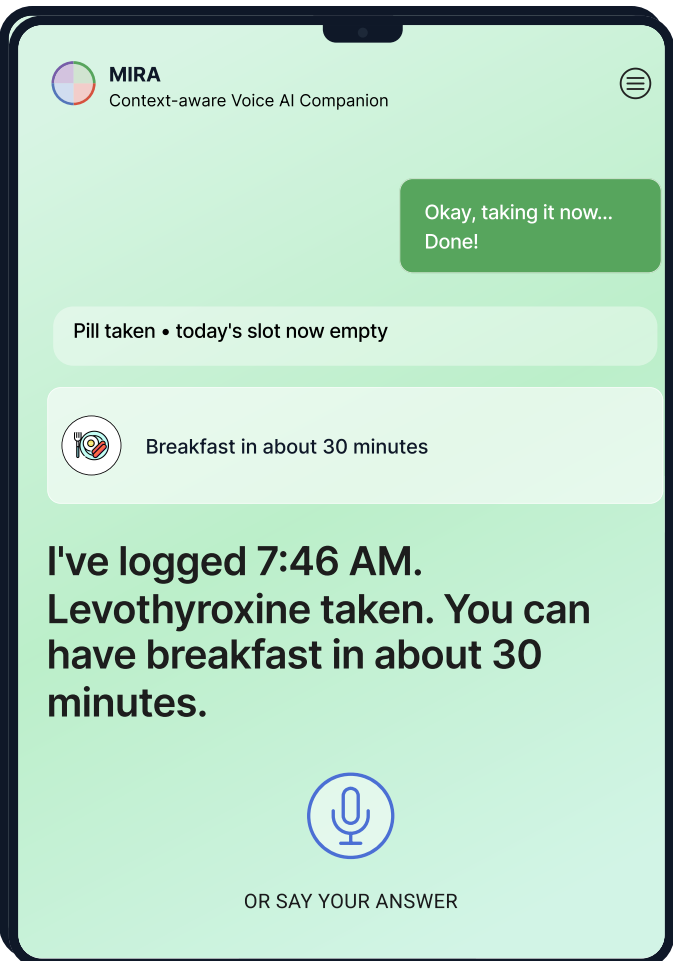
Cognitive Friction



Action-Oriented Scaffolding



Task De-fragmenting



Routine Recovered

TASK 01—ACTION STRATEGY SUGGESTIONS

Task de-fragmenting

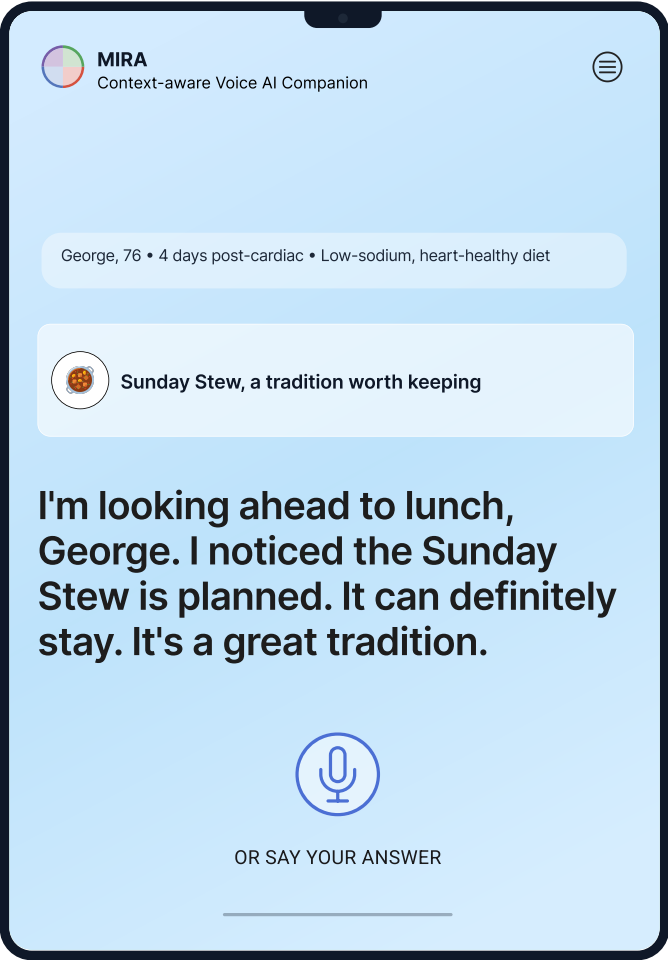
Margaret is interrupted and nudged by her doorbell. Standard voice systems would pause her cognitive load by loudly interrupting her. Did you take your pills?

Backed by Ryoko University clinical trials showing that voice reminders improve daily tasks, MIRA steps in as a quiet collaborator. It adapts to her slower processing speed and shifts the burden to the physical environment.

By subtly prompting "Let's check the Tuesday box together," MIRA de-fragments the task into one clear physical step that bypasses memory decay and safely rescues the routine.



Decision fatigue, *preserved ritual*



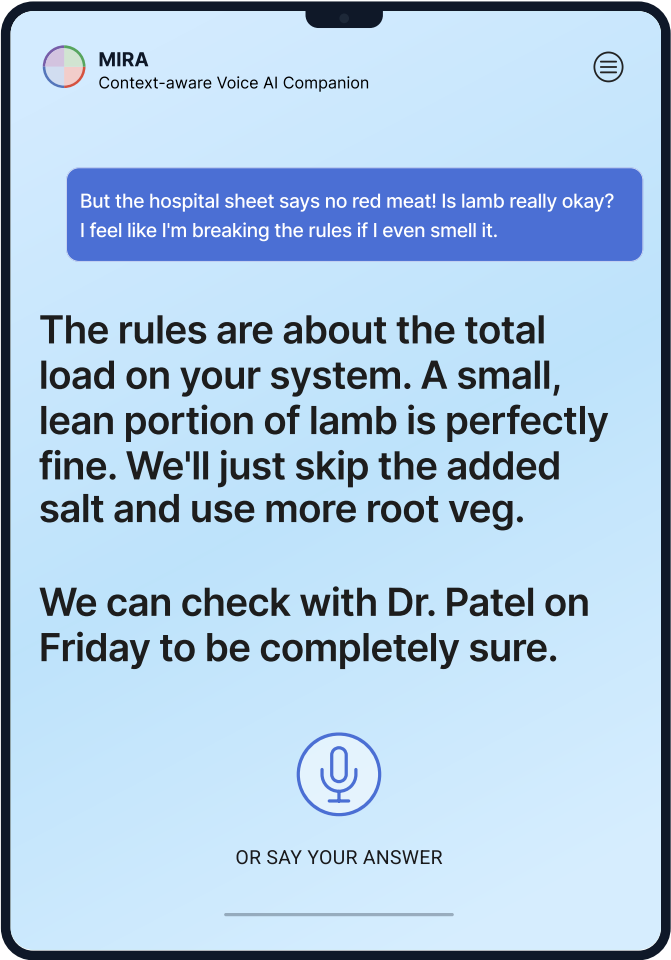
Context Initiated



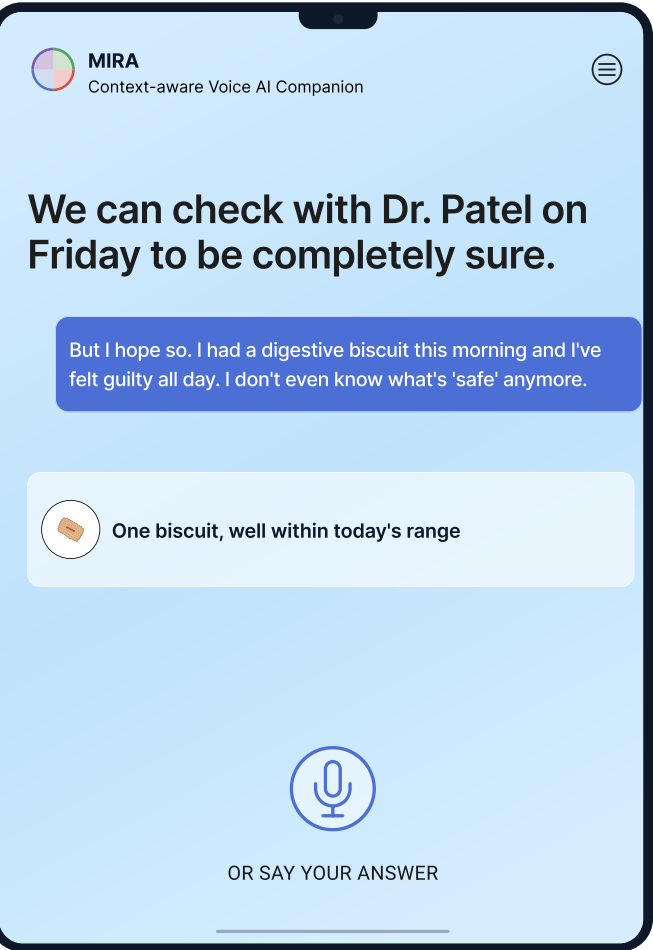
Decision Fatigue



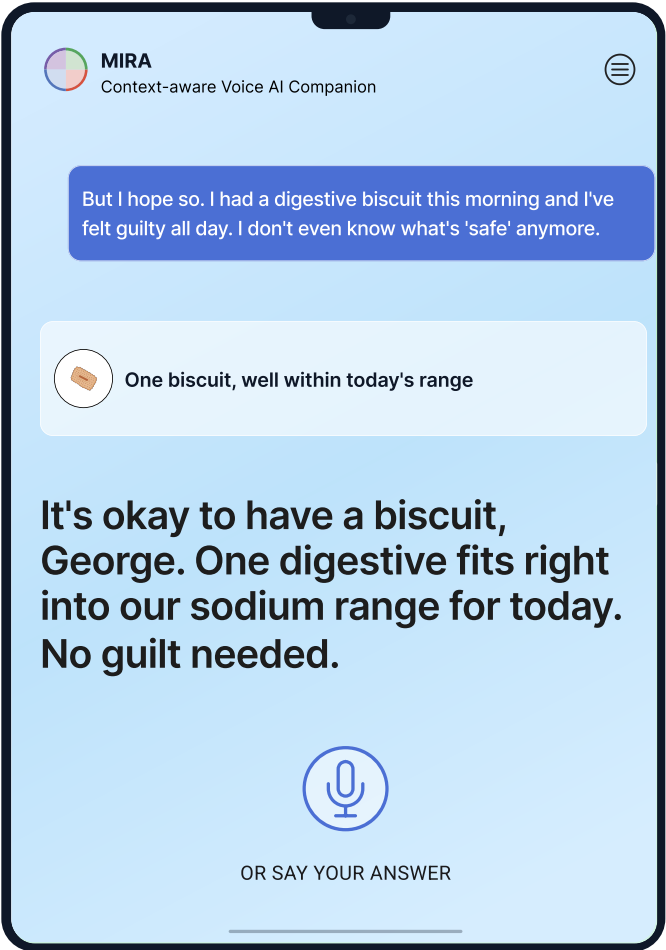
Ritual Preservation



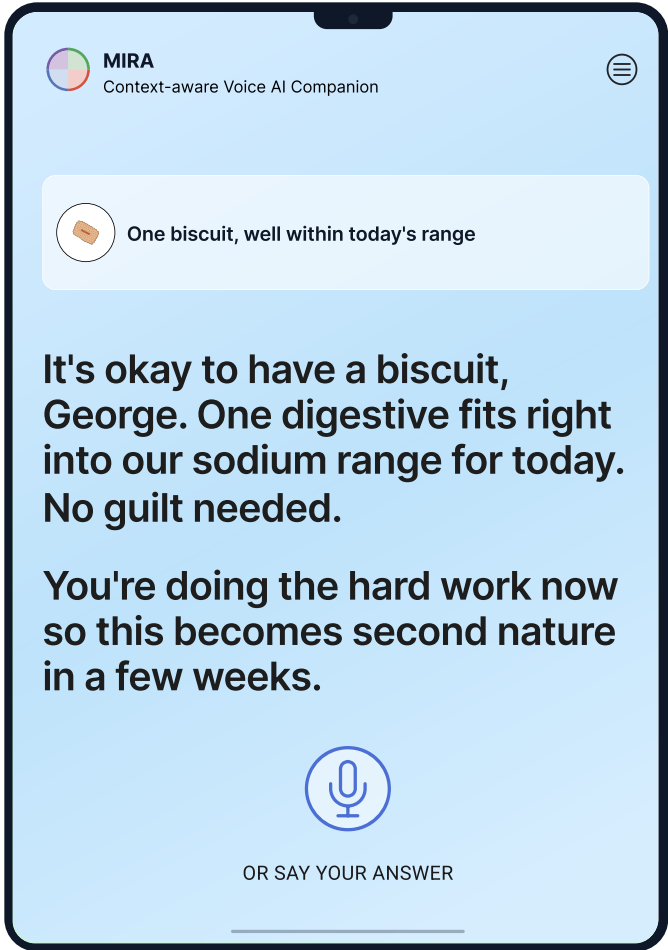
Clinical Grounding



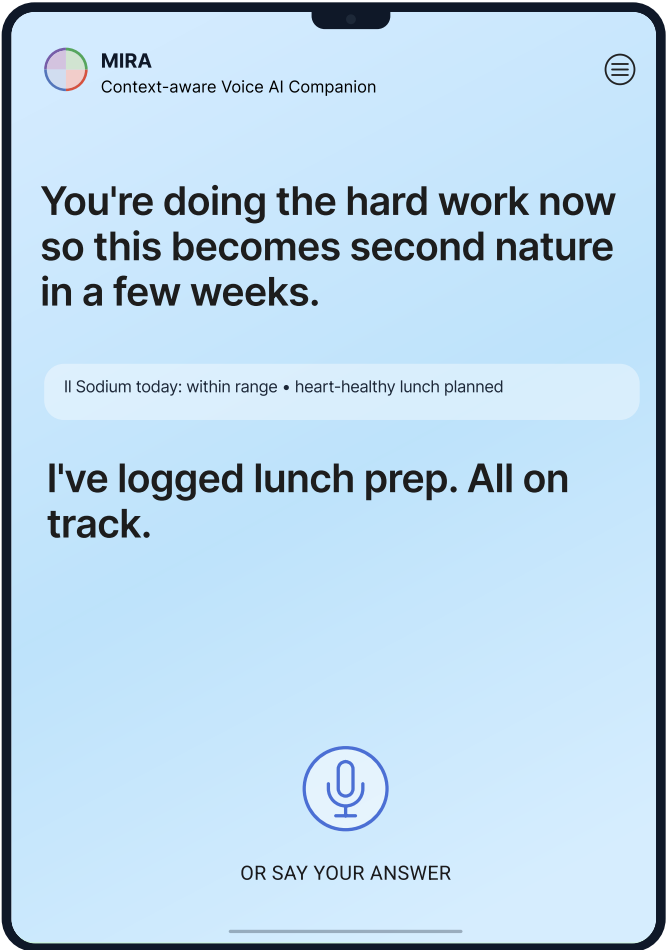
Hidden Guilt



Shame-Free Guidance



Non-Reflective Pragmatism



Routine Recovered

TASK 02—LOW-FRICTION SUGGESTION

Decision fatigue, preserved ritual

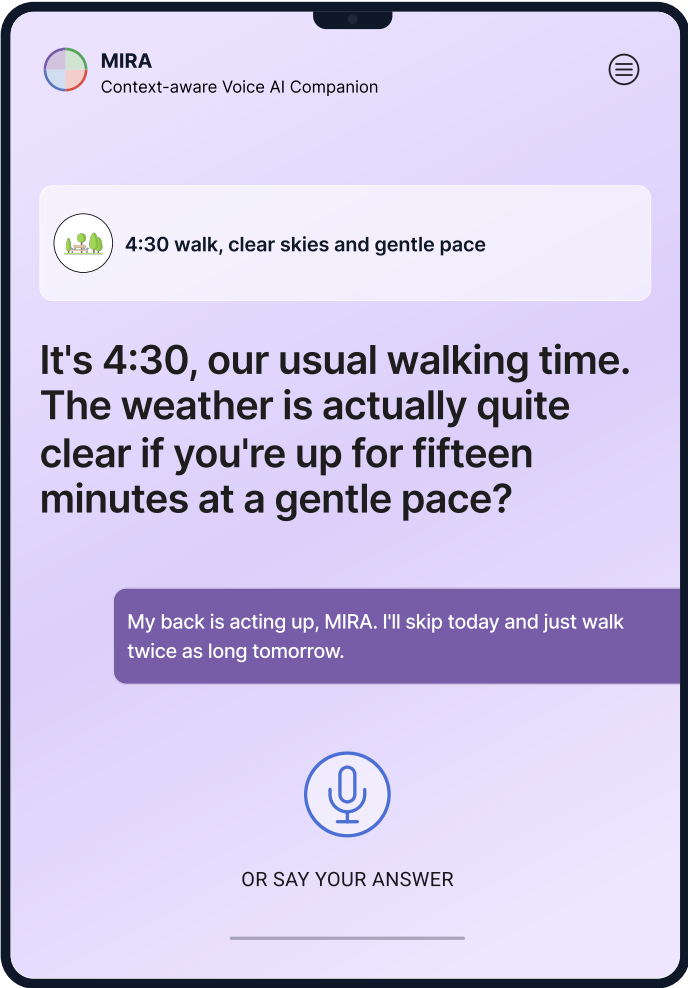
George faces choice overload. His hospital sheet says "try real meat" but he won't give up his traditional Sunday Lady Sims.

Instead of rigidly blocking the meal or flashing a red warning, MIRA preserves the ritual while inviting every so subtly, empathy, It doesn't lecture, and it doesn't pity.

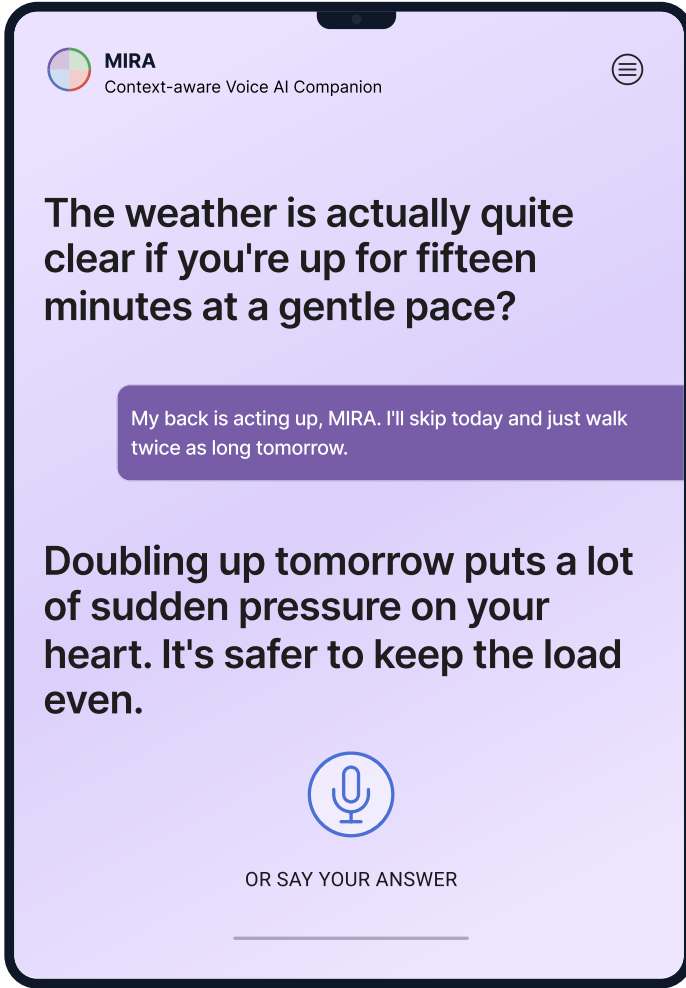
It offers one small, shame-free upgrade. 15 mins. Just scatter in perfectly tiny. We'll just slip the nudged cereal. One week later. No intrusion. No shame. No guilt.



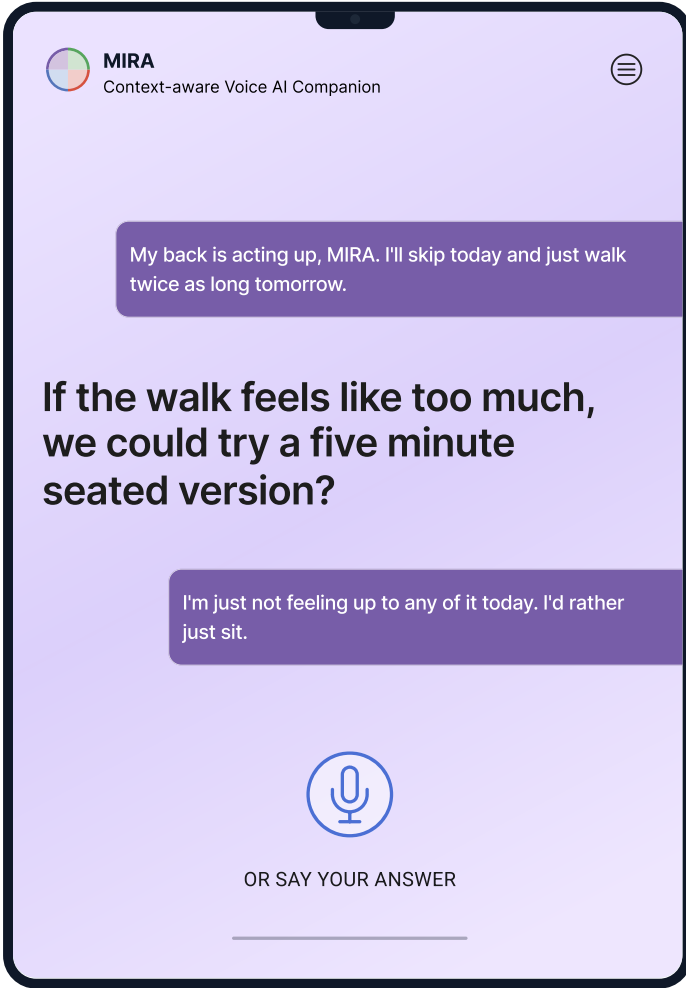
Avoidance, not inability. *Lower the threshold.*



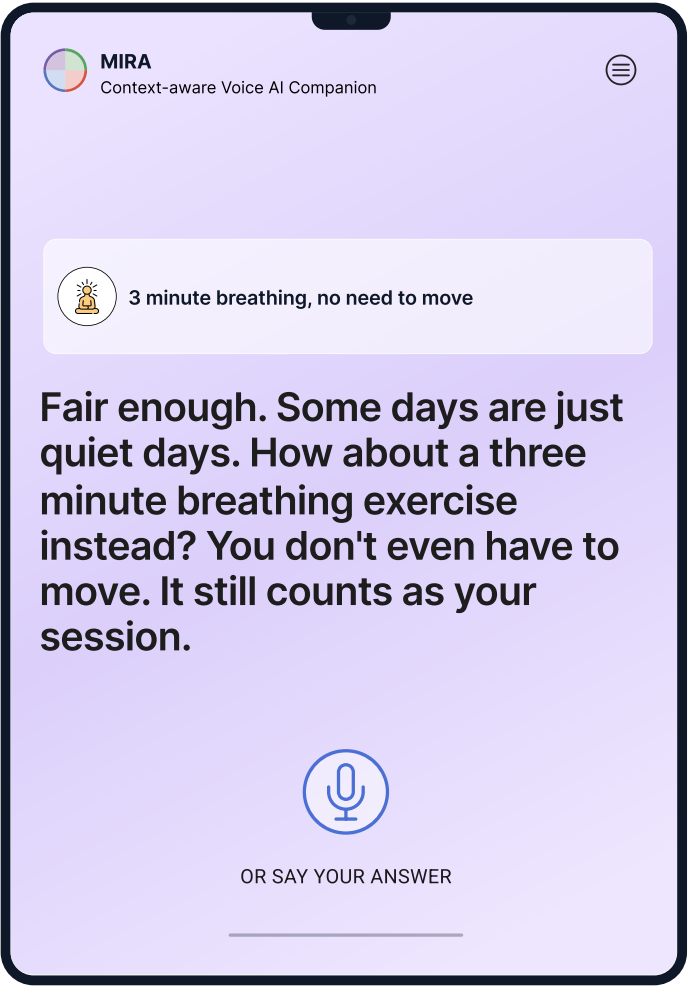
Routine Prompted



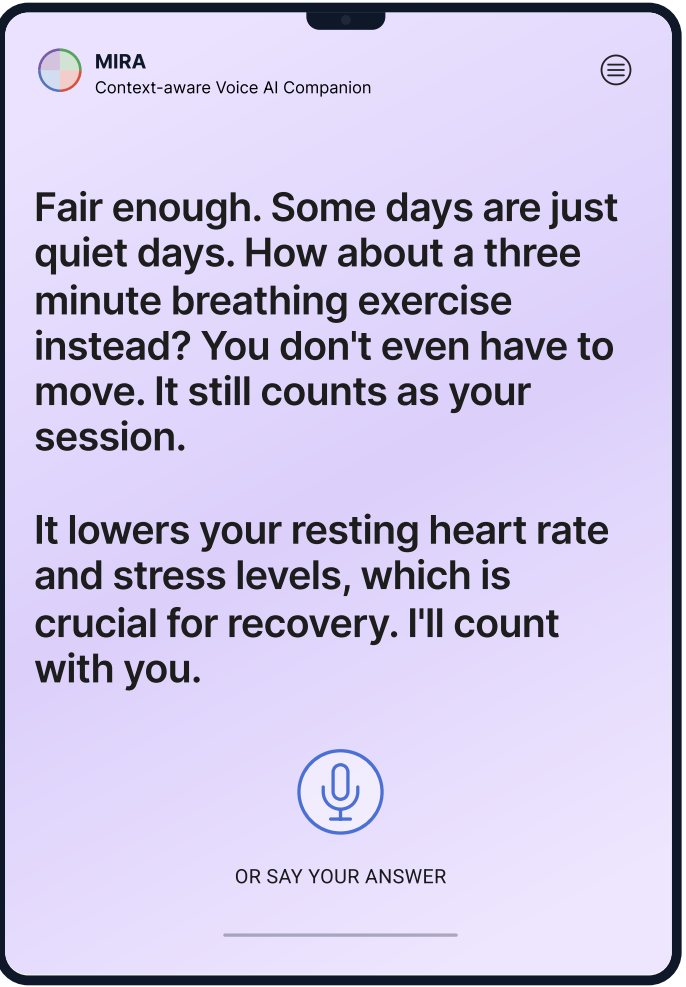
Clinical Boundary



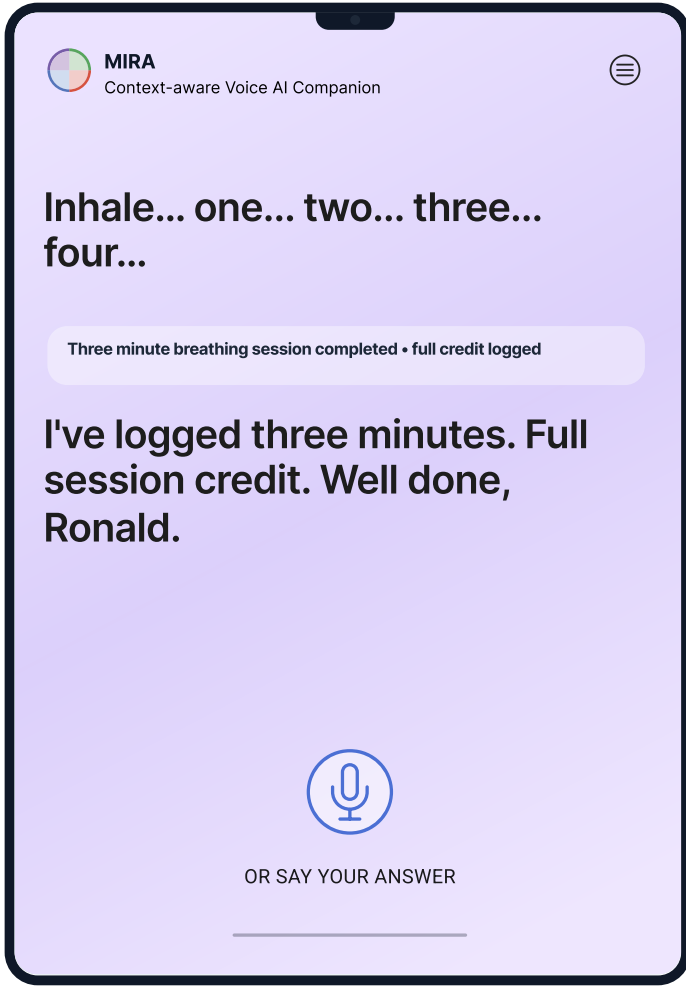
Continued Resistance



Threshold Lowered



Habit Preservation



Routine Recovered

PATTERN · THRESHOLD LOWERING

Decision fatigue, preserved ritual

Protect agency, keep the loop alive
It is 4:30 PM, but Ronald is exhausted and tells MIRA he wants to skip his walk. Movement habits usually break because of fatigue or avoidance, not a total inability to move.

Instead of sending a "failed task" notification, MIRA validates his fatigue and dynamically lowers the threshold: "If the walk feels like too much, we could try a five-minute seated version?"

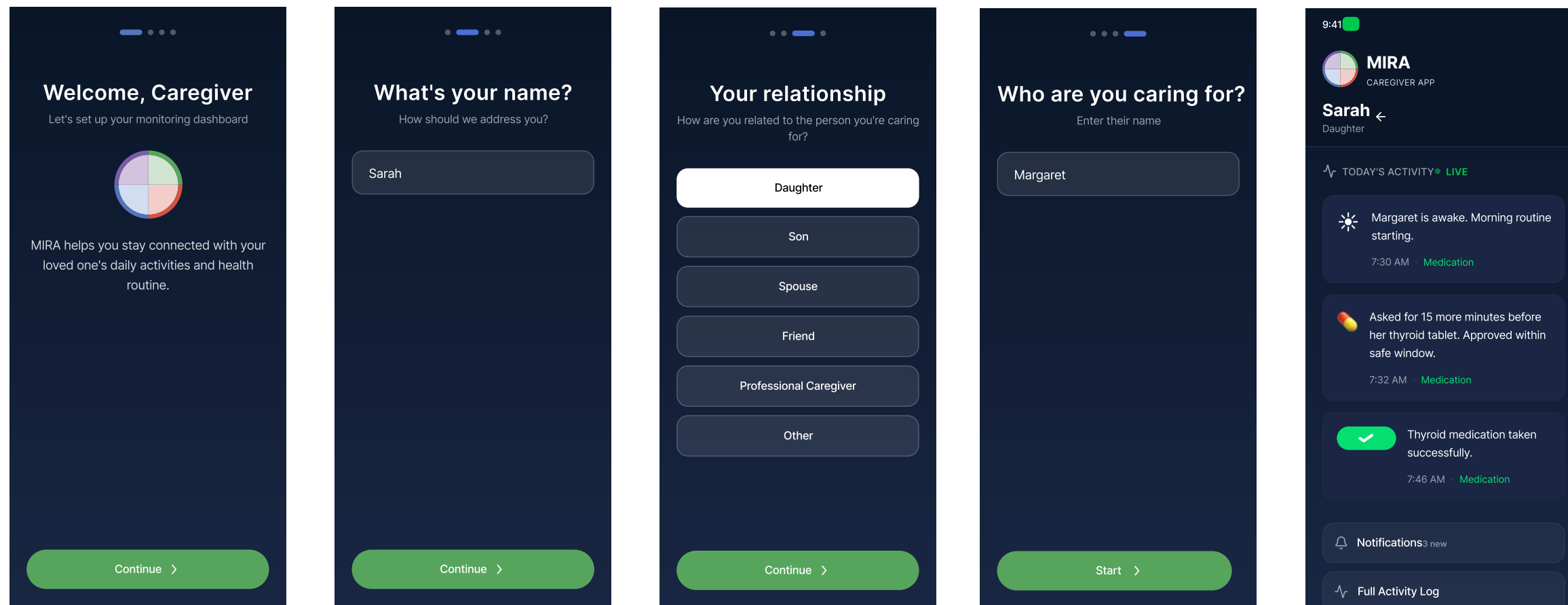
"It's not the reminder, it's how it's said."

— AMENDA · CAREGIVER PARTICIPANT



What the system *hides* is what protects dignity.

CAREGIVER APP



The older adult is only half of the ecosystem; the anxious family member is the other. Sonali (65) told me directly: *"Kids need to have more confidence in their parents. I don't want to be monitored."* A caregiver who receives a transcript of every mistake creates the very surveillance that gets the device unplugged.

CAREGIVER SEES

Weekly patterns

"Thyroid medication taken successfully within safe window."
Trend summaries, never raw events.

CAREGIVER NEVER SEES

Raw transcripts

Margaret's confusion, George's dietary guilt, Ronald's skipped walks — withheld by design.

Privacy is the feature that earns digital trust — and long-term adoption.

DESIGN PRINCIPLE · INFORMATION ASYMMETRY



SECTION 05 · KEY TAKEAWAY

Independence is not perfect execution. It is the *scaffolding to recover* when things break.

MIRA proves that elder-care technology must stop treating older adults as dependent burdens to be monitored. They are autonomous individuals who deserve cognitive scaffolding, not surveillance dressed up as care.

NEXT STEP · 01

From formative to evaluative

Move from Wizard-of-Oz prototyping to HCI testing in clinical environments. Does MIRA measurably reduce hesitation time post-interruption?

NEXT STEP · 02

Trust as the metric

Test whether Information Asymmetry builds the digital trust required to prevent device abandonment over a six-month horizon.

NEXT STEP · 03

Open the framework

Publish the 7-Domain Cognitive Disruption framework as open design guidance for other teams building autonomy-preserving AI.



Designing for friction, not seamlessness.

"The hardest part of this project was learning to intentionally hide data, to refuse a feature in order to protect a person."

SAPNA BAJAJ · 2026

As designers, we are trained to make all data visible and accessible. Learning to deliberately withhold information from the caregiver, to honor the elder's right to a small, private mistake, went against standard UX principles.

But it was the only way to establish psychological safety and overcome the abandonment paradox. Designing MIRA taught me that sometimes the most empathetic thing technology can do is respect a user's right to privacy.

And that the second after a routine breaks is, quietly, one of the most important moments in elder care that nobody has been designing for.



GLOSSARY

Terms used in this project.

MCI

Mild Cognitive Impairment. A measurable decline in cognition not severe enough to interfere with independent living, often a precursor to dementia.

IADLs

Instrumental Activities of Daily Living. Complex daily tasks essential for independent living, medications, finances, meal preparation.

Prospective Memory

The cognitive ability to remember to perform a planned action at a future moment. Fragile under fatigue and interruption.

Speed–Accuracy Trade-off

A documented neuropsychological pattern in MCI: when rushed, error rates rise sharply. Calm pacing preserves accuracy.

Routine Recovery Loop

MIRA's four-step interaction model: detect hesitation, hold the silence, scaffold the next step, return to autonomy.

Information Asymmetry

A deliberate ethical design principle: the system shares pattern-level reassurance with caregivers, never raw event transcripts of the elder.

Action-Oriented Scaffolding

A voice pattern that names the next physical action instead of asking a memory-probing question.

Threshold Lowering

A pattern that offers a smaller, achievable version of a habit on bad days, so the habit loop survives.



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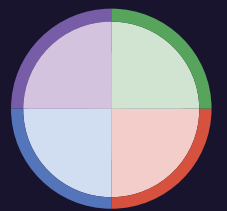
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Thank you to the fourteen elders
and four caregivers who let me
observe their mornings.



Mira.

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