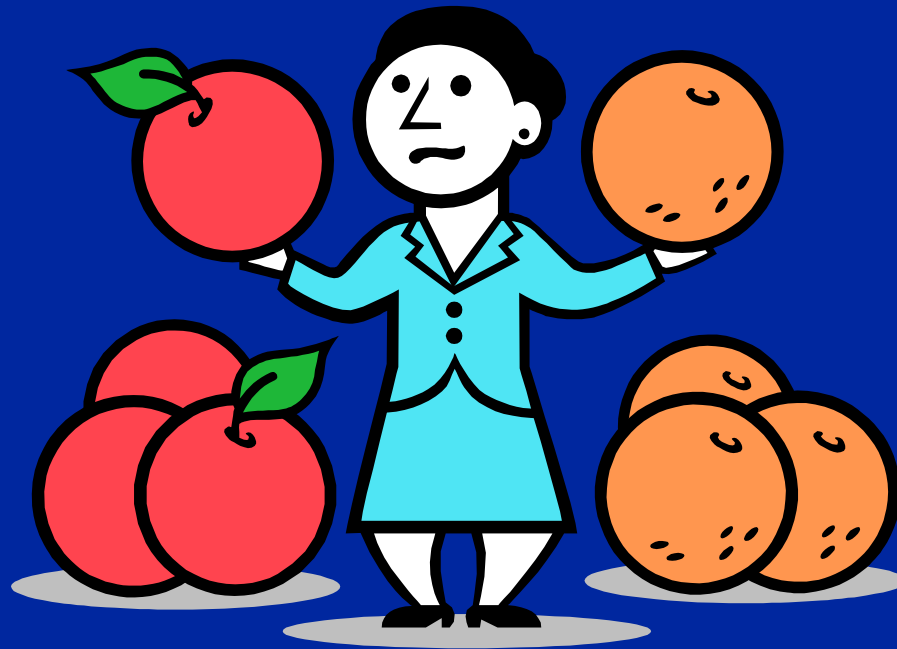


STATEMENT OF THE PROBLEM

- **Determine what, if any, components of complex interventions are related to success**
- **Requires combining information from several studies**
- **We found that...**

Apples and Oranges Can Be Combined Analytically (if done properly)*



* The REACH experience

Reach

Resources For Enhancing Alzheimer's Caregiver Health

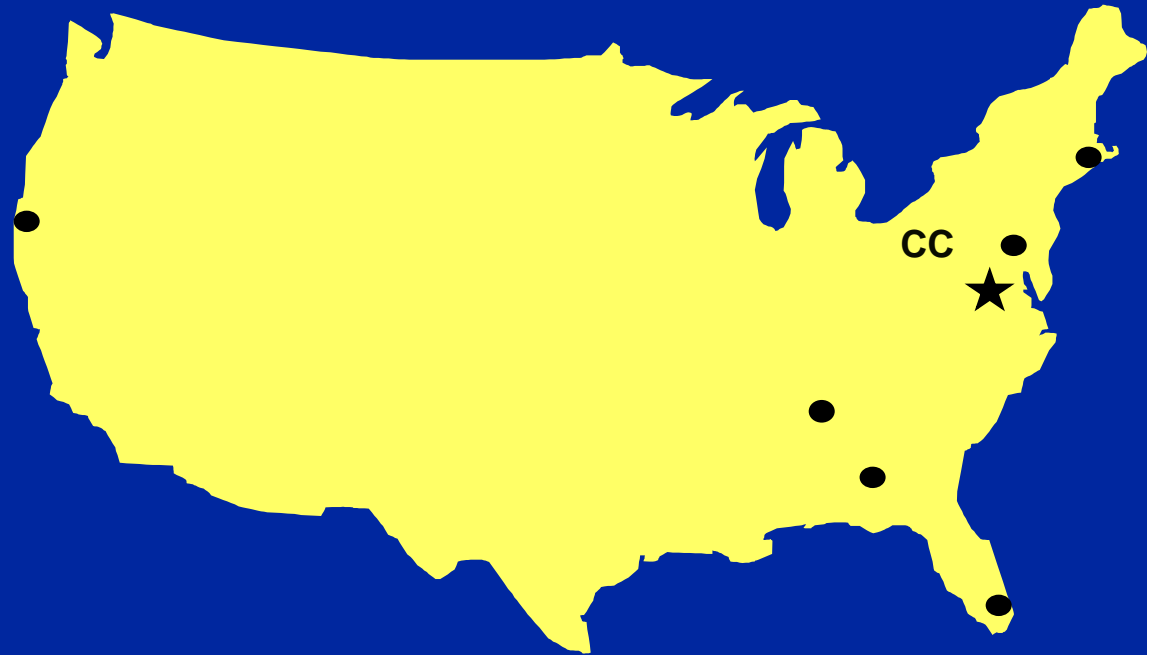
**Cooperative agreement among:
NIH (NIA and NINR)**

6 Intervention sites

- **Birmingham**
- **Boston**
- **Memphis**
- **Miami**
- **Palo Alto**
- **Philadelphia**

Coordinating Center

- **Pittsburgh**



Primary Goal of REACH

**Examine the effectiveness of social,
behavioral and technological interventions to
strengthen family members' capacities to
care for individuals with ADRD**

Multi-Component Interventions

- Skill training
 - Information and referral
 - Voice mail / support / advice / behavioral distraction
 - Environmental skills building
 - Behavioral management
 - Stress management
 - Psychoeducational / coping
 - Technology
-
- Usual care
 - Minimal support (empathic listening)

Standardization

- **Caregiver and care recipient inclusion / exclusion criteria**
- **Core battery**
 - **Demographics**
 - **Physical health and medications**
 - **Behavior – RMBCCL**
 - **Cognition – MMSE**
 - **Function – ADL/IADL**
 - **Depressive symptoms – CES-D**
- **Core timepoints**
 - **Baseline**
 - **Follow up (6 months, 12 months, 18 months)**

Approaches to Combining Information From Several Studies

- **META-ANALYSIS**

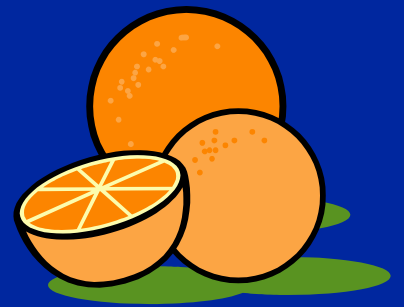
Approaches to Combining Information From Several Studies

DECOMPOSE THE INTERVENTIONS

- MEASURE THE COMPONENTS**
- USE THE COMPONENT DATA IN AN
ANALYSIS**

**...AND JUST HOW DO YOU
PROPOSE TO DO THAT**

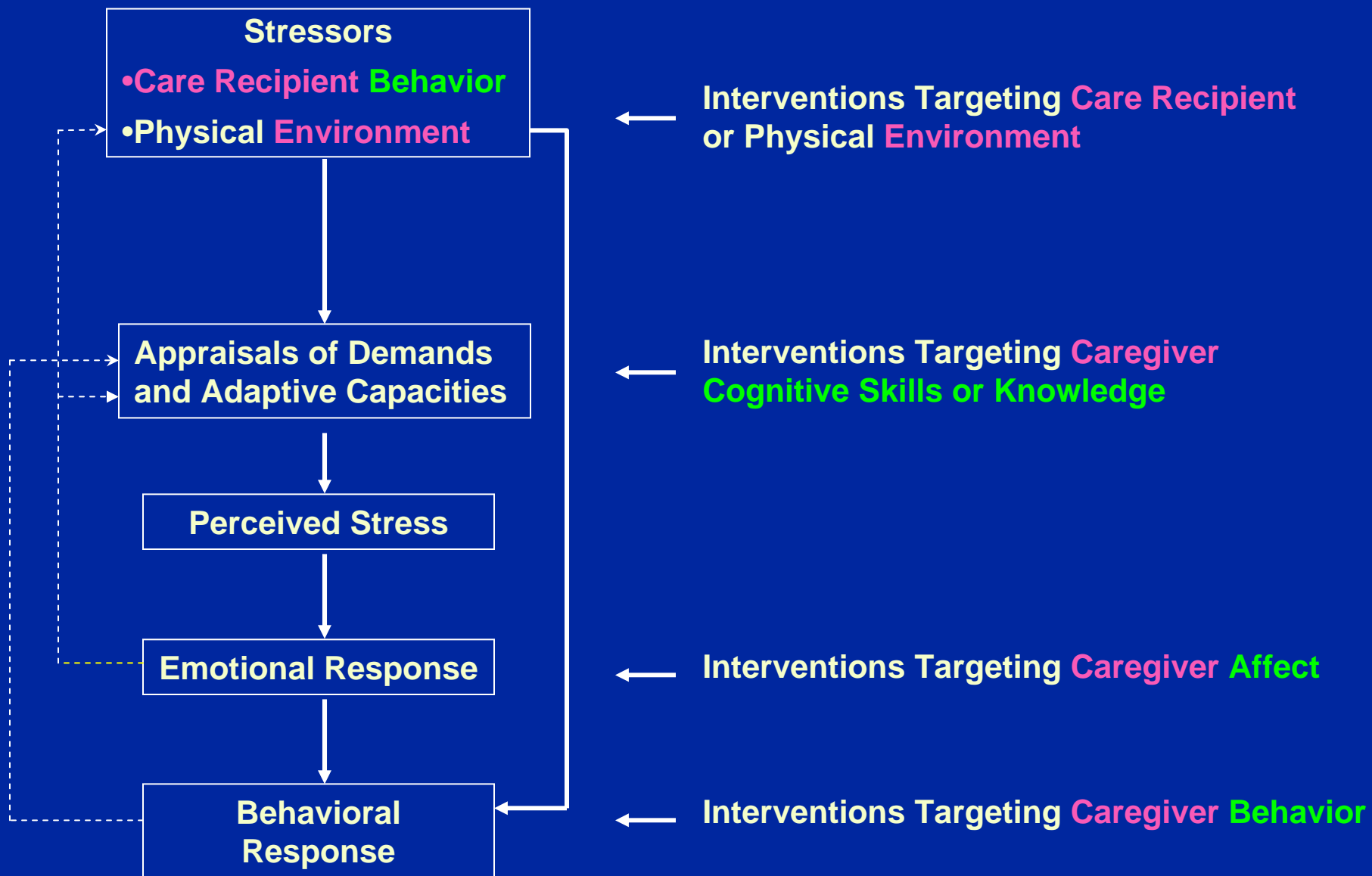
?



DECOMPOSE THE INTERVENTIONS

- 1. USE A THEORETICAL MODEL TO
HELP IDENTIFY COMPONENTS**

INTERVENTION STRATEGIES AND THEIR ROLE IN A STRESS MODEL



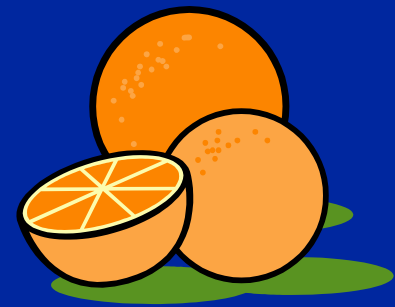
INTERVENTION MEASURES

- Entity targeted
 - Caregiver
 - Care recipient
 - Environment
- Primary domain targeted
 - Knowledge
 - Skills
 - Behavior
 - Affect

2. MEASURE THE COMPONENTS

**...AND JUST HOW DO YOU
PROPOSE TO DO THAT**

?



**Make sure you understand what each
intervention is doing**

Task Analysis

- **Study of actions or cognitive processes that a user is required to do to achieve a task**
- **Method used to understand systems**

Definitions

- A **goal** is an objective that can be comprised of **subgoals**
- A **task** is a set of (sub)goal directed activities that can be subdivided into component **subtasks**
- Subtasks are subdivided into **activities**

Methods – Hierarchical Task Analysis

Goals and Subgoals



Tasks and Subtasks



Activities

Goal : Be Healthy

- Subgoal = Eat right
- Subgoal = Exercise
- Subgoal = Avoid bad habits
- Subgoal = Eliminate bad habits
- Subgoal = Avoid contact with infectious disease agents
- Subgoal = Drink clean water
- Subgoal = **Adopt preventive health care practices**
 -
 -
 -

Hierarchical Task Analysis

- **Subgoals in one task analysis can form goals of another task analysis**
- **Subtasks in one task analysis can form tasks of another task analysis**
 -
 -
 -

Goal : Adopt Preventive Health Care Practices

- Subgoal = Eat right
- Subgoal = Exercise
- Subgoal = Avoid bad habits
- Subgoal = Eliminate bad habits
- Subgoal = Avoid contact with infectious disease agents
- Subgoal = Drink clean water
- Subgoal = Practice proper hygiene
 -
 -
 -

Goal : Practice Proper Hygeine

- Subgoal = Wash hands before eating
- Subgoal = Clean serving implements between meals
- Subgoal = Bathe/shower
- Subgoal = Clean your teeth
 -
 -
 -

Goal: Clean Your Teeth

Tasks

- **Prepare the toothbrush**
- **Brush your teeth**
- **Remove toothpaste from your mouth**
- **Replace implements**

Goal: Clean Your Teeth

Tasks and Subtasks

- **Task: Prepare the toothbrush**
- **Subtasks**
 - **Pick up the toothbrush**
 - **Wet the toothbrush**
 - **Take the cap off the tube**
 - **Put paste on the brush**

Goal: Clean Your Teeth

Subtasks and Activities

- **SUBTASK: Pick up the toothbrush**
- **ACTIVITIES**
 - **Locate the toothbrush**
 - **Reach toward the toothbrush**
 - **Grasp the toothbrush**
 - **Turn the bristles upward**

Task Analysis

- **Can be accomplished for complex systems, e.g., interventions**
- **Example from REACH**

GOAL:
**Enable family CG to manage
caregiving problems**

Task A:

**Educate CG about
CG-identified
problem behaviors**

Task B:

**Enable CG to build
skills to manage
dementia-related
problem behaviors**

Task C:

**Enable CG to
implement
strategies**

ACTIVITIES DETAILED BELOW SUBGOALS

Subgoal A: Educate CG about CG-identified problem behaviors

Activities

- 1. Make 5 home visits and 1 telephone contact over 6 months**
- 2. Identify best approach to establish a collaborative relationship with the CG**
- 3. Identify care issues**
- 4. Assess competencies of CG and CR**
- 5. Provide information about dementia-related behaviors**
- 6. Provide instruction about in task breakdown, communication techniques, and energy conservation**

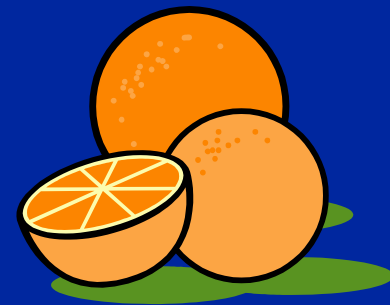
Subgoal B: Enable CG to build skills to manage dementia-related problem behaviors

Activities

- 1. Make 5 home visits and 1 phone contact over 6 months**
- 2. Identify dementia-related problem behaviors**
- 3. Help CG prioritize care issues**
- 4. Negotiate focus of intervention**
- 5. Refine and build a collaborative approach**
- 6. Help CG to name and frame care issues and practices**
- 7. Engage CG in reflection of management strategies**
- 8. Validate CG's knowledge and expertise**
- 9. Modify CG practices using role playing, demonstration, modeling, simulation, or discussion**
- 10. Practice and apply communication and energy conservation techniques**

**...AND JUST HOW DO YOU
DO A TASK ANALYSIS**

?



CONSENSUS PROCESS

- **Training session for task analysis**
- **Provided intervention summaries**
- **Provided definitions of domain and entity**
- **And the result was...**

TARGETED ENTITY-DOMAINS

SITE 2, INTERVENTION 2

ENTITY	DOMAIN			
	KNOWLEDGE	SKILLS	BEHAVIOR	AFFECT
Caregiver	X	X		
Care-Recipient	X			X
Environment	X			

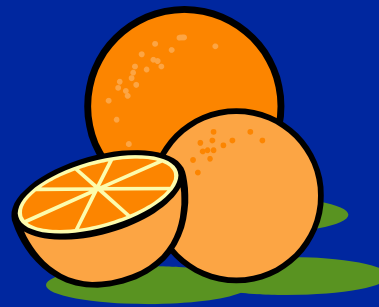
LOOKS GOOD, BUT...

Interventions that target the same entity-domain do so to different extents.

That needs to be taken into account when measuring the interventions.

**...AND JUST HOW DO YOU
PROPOSE TO DO THAT**

?



ANALYTIC HIERARCHY PROCESS

(Saaty, 1970's)

For each intervention, determine the relative dominance of each entity-domain targeted.

This is accomplished through pairwise comparisons.

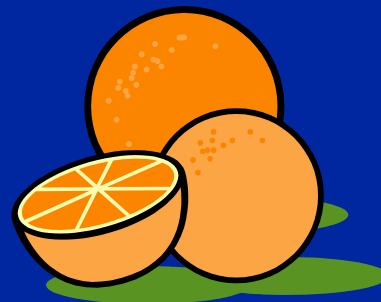
COMPARE RELATIVE DOMINANCE

1=EQUAL 3=MODERATE 5=STRONG 7=VERY STRONG 9=EXTREME

CG KNOWL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CG SKILL
CG KNOWL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CR KNOWL
CG KNOWL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CR AFFEC
CG KNOWL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	EN KNOWL
CG SKILL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CR KNOWL
CG SKILL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CR AFFEC
CG SKILL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	EN KNOWL
CR KNOWL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	CR AFFEC
CR KNOWL	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	EN KNOWL
CR AFFEC	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	EN KNOWL

**...AND JUST HOW DO YOU
PROPOSE TO OBTAIN DOMINANCE
RATINGS**

?



RATING MEETING

DOMINANCE RATINGS

- **Entities and domains targeted were already obtained by consensus**
- **Training session for Analytical Hierarchy Process**
- **Raters were provided with intervention summaries and results of task analysis**
- **Raters were provided with definitions of scale anchors**
- **And the results were...**

ENTITY / DOMAIN WEIGHTS

SITE 2, INTERVENTION 2

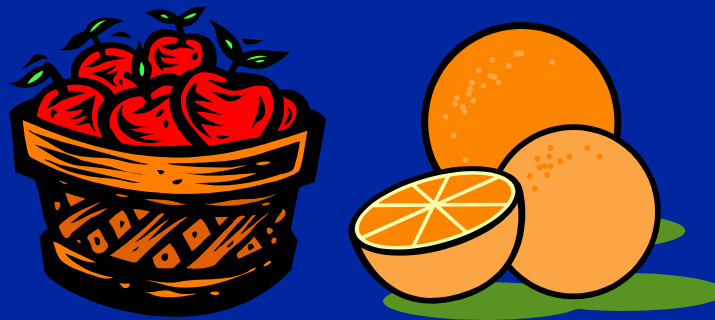
PRIMARY ENTITY	PRIMARY DOMAIN			
	KNOWLEDGE	SKILLS	BEHAVIOR	AFFECT
Caregiver	.277	.187		
Care-Recipient	.391			.095
Environment	.052			

LOOKS GOOD, BUT

- **The scores sum to 1 for each intervention. This means that interventions that target more entity-domains are likely to have smaller scores for each entity-domain than would interventions that target fewer entity-domains.**
- **We need to account for this fact in our measures, since, arguably, interventions targeting more entity domains should receive larger, not smaller, scores for each.**

**...AND JUST HOW DO YOU
PROPOSE TO DO THAT**

?



BRING ON THE INTENSITY MEASURE

- **Measure intensity as the time spent in intervention**
- **Multiply the weights by total intervention time**
- **This partitions the total intervention time**

ENTITY / DOMAIN SCORES

SITE 2, INTERVENTION 2

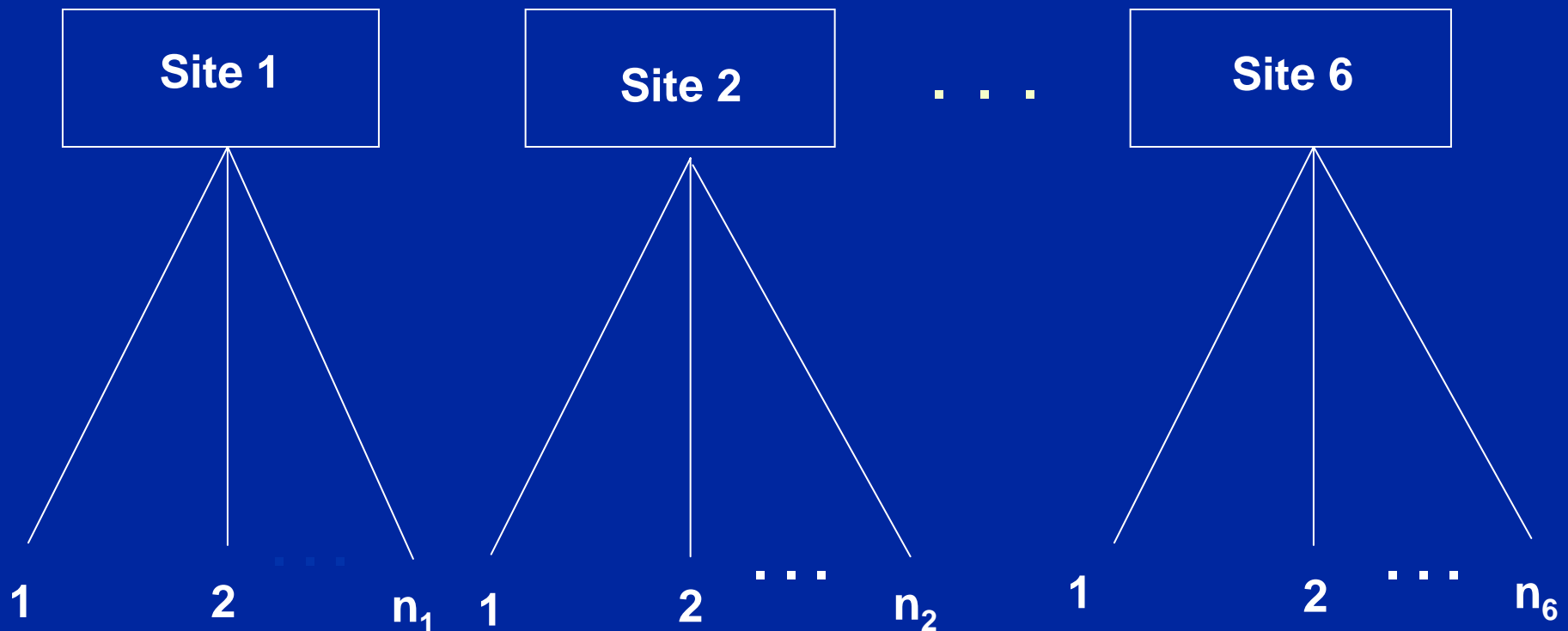
Intervention lasts 4 hours

PRIMARY ENTITY	PRIMARY DOMAIN			
	KNOWLEDGE	SKILLS	BEHAVIOR	AFFECT
Caregiver	$.277 \times 4$ $= 1.11$	$.187 \times 4$ $= 0.75$		
Care-Recipient	$.391 \times 4$ $= 1.56$			$.095 \times 4$ $= 0.38$
Environment	$.052 \times 4$ $= 0.21$			

3. ANALYZE THE DATA

ANALYTICAL STRATEGY MULTILEVEL MODELING

Level 2: Site



**Level 1: Caregiver / Care-Recipient Characteristics
Intervention Characteristics (Entity-Domain Scores)**

MULTILEVEL MODELLING

Outcome: Caregiver Depression (CES-D)

Level 1: Caregiver and Care Recipient Characteristics

Design variables: Age, sex, ethnic identity, relationship, baseline CES-D

Intervention measures: Entity/Domain Targeted multiplied by the length of intervention for each participant

Level 2: Site (Random Effect)

CONCLUSION

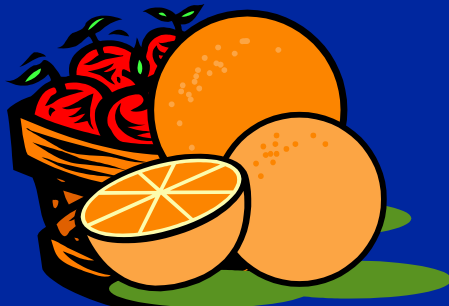
By identifying measures that describe the interventions, either active or control, we were able to identify an intervention component (caregiver behavior) that was associated with depressive symptomatology

AND HOW DID WE DO THAT?

By discovering what components of the “apples” and “oranges” (i.e., the diverse interventions) worked the best.

We did this by first combining the “apples and oranges” and defining them by their characteristics.

Note: It is critical that interventions be fully described for this procedure to work.



WHERE ARE WE NOW?

In a multi-center controlled clinical trial, we are testing the new intervention that was designed to intensively target caregiver

behavior, i.e., *Reach* II
Resources For Enhancing Alzheimer's Caregiver Health

WHAT'S NEXT?

Apply the technique to other multi-component intervention studies

e.g., **Weight loss**
Nutrition
Exercise
Aerobic
Strength
Flexibility