OREGON HEALTH & SCIENCE UNIVERSITY

OHSU

An AAC Social Media Intervention for people with Primary Progressive Aphasia

ISAAC 2016

Aimee R. Mooney, Melanie Fried-Oken, Glory Noethe, Steven Bedrick, Kyle Gorman, Scott Spaulding, Amy Golinker

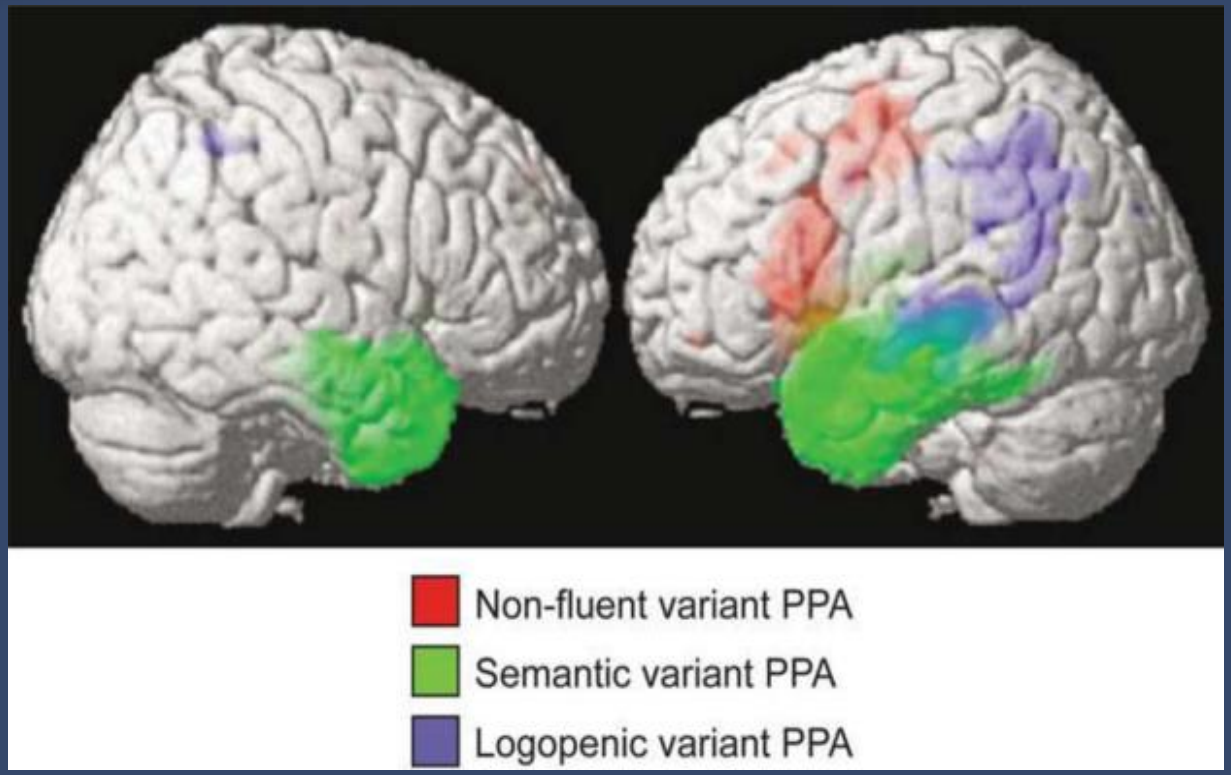
PPA

- slowly progressive aphasia caused by neurodegenerative disease; a frontotemporal dementia
- no focal lesion (e.g., stroke)
- most prominent clinical feature is difficulty with speech/language
- speech/language deficits are the principal cause of impaired activities of daily living; (eventually affects cognitive, behavioral and functional domains)
- often affects individuals <65 years

(Mesulam, 2008; Gorno-Tempini et al., 2011)

Communication changes:

1. Location of atrophy
2. Underlying pathology
3. Stage of disease



Degeneration of brain structures that result in different PPA variants (Wilson et al., 2012).

OREGON HEALTH & SCIENCE UNIVERSITY

Sapolsky et al. (2014) *Bettcher et al. (2014)*	**Logopenic Variant (PPA-L)**	**Nonfluent/Agrammatic Variant (PPA-G)**	**Semantic Variant (PPA-S)**
Speech & Language Characteristics	*palpable **word finding difficulties**, pauses, circumlocutions in conversational speech *grammatically simple sentences *impaired repetition of sentences and phrases; phonologic errors in speech.	* motor speech impairment, **slow and effortful speech**; sound errors: distortions, substitutions, deletions, insertions of speech sounds *(consistent with apraxia of speech)* *altered prosody *difficulty understanding complex sentence structure	*gradual decline in **semantic/object knowledge**: anomia, deterioration of single-word comprehension; *hyper verbal and fluent speech with word-finding difficulties and semantic paraphasias *dyslexia/dysgraphia
Cognitive Characteristics	*poor verbal memory, **working memory** and cognitive switching; *impairments in executive functions, visuospatial tasks *impairments in processing numbers	*disproportionate difficulty with **executive functions**– specifically verbal fluency, set-shifting and abstract thinking.	*difficulties with episodic **memory and executive function**
Probable Pathology	Alzheimer's Disease	Tau (Fronto-Temporal)	TDP-34 (Fronto-Temporal)

Treatment themes in PPA

Timing

- Start early & be proactive so person with PPA can learn to use communication strategies and tools as soon as possible

Partner Training

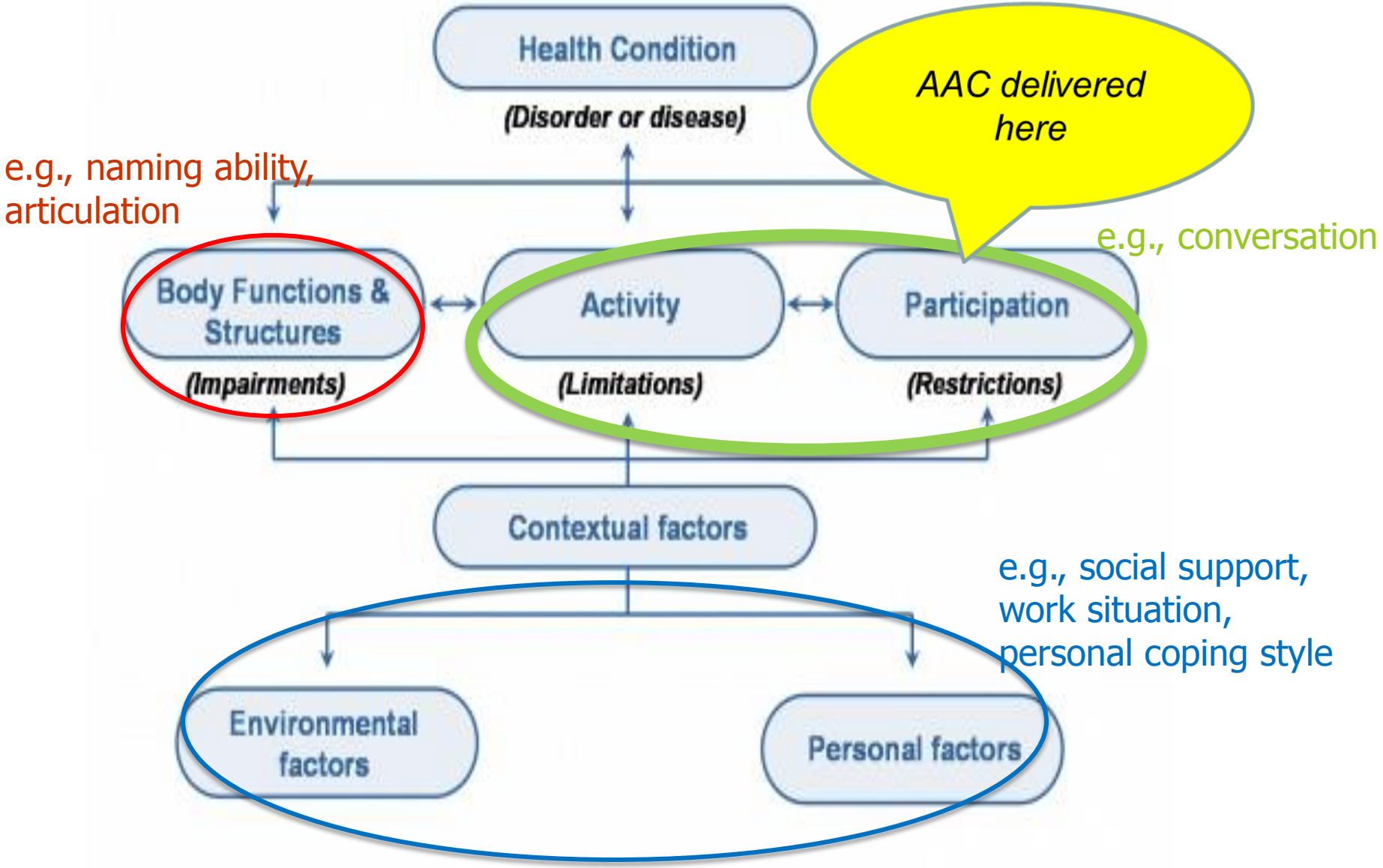
- Training from the beginning and throughout

Degeneration

- Adjust treatment strategies over time **and** use multiple modalities to capitalize on patients' strengths

(Fried-Oken, M., Mooney, A., & Peters, B., 2015)

OREGON HEALTH & SCIENCE UNIVERSITY



http://www.rehab-scales.org/international-classification-of-functioning-disability-and-health.html

NIH National Institutes of Health

NIDCD award #1 R21 DC041099-01

- Development of a mobile technology social networking app to support language co-construction and word finding skills.

- Combines AAC technology and innovative Natural Language Processing (NLP) techniques to develop and evaluate a novel intervention tool for individuals with language loss secondary to PPA.

OREGON HEALTH & SCIENCE UNIVERSITY OHSU

Hypothesis

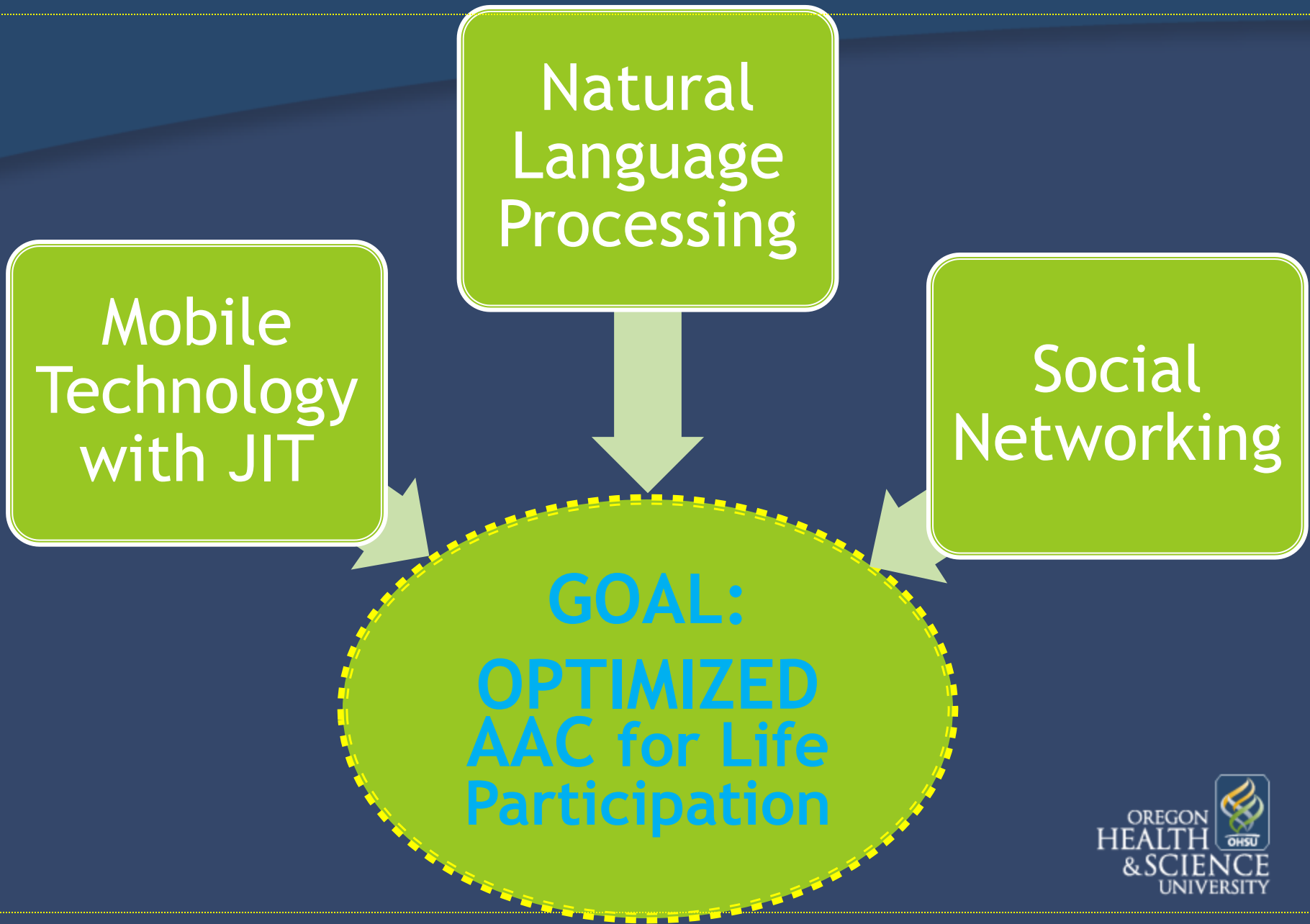
Using dynamic mobile technology support, people with PPA will increase use of target words during conversation.

OREGON HEALTH & SCIENCE UNIVERSITY

Methods: Participants

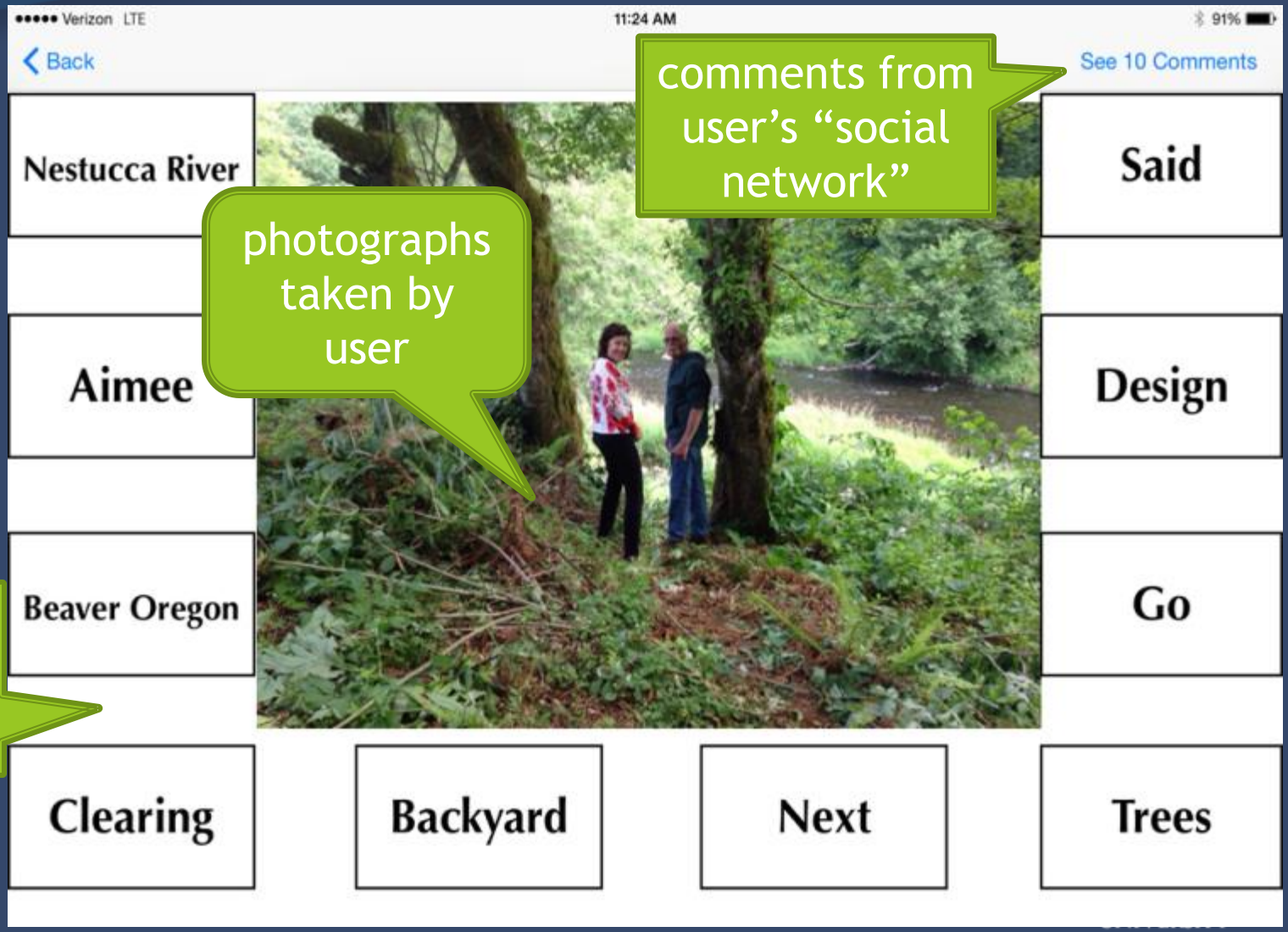
Gender	Age	S/P	PPA Type	Edu.	Profession	Residence & Conversation Partner
Female	73	2.5 years	PPA-A Agrammatic	15 yrs	Nurse	Home husband
Female	80	1 year	PPA-A Agrammatic	15 yrs	Comptroller	Home friend
Male	62	4 months	PPA-S Semantic	16 yrs	Physical Therapist	Home wife
Male	72	6 months	PPA- L Logopenic	20 yrs	Engineer	Home partner
Female	63	1 year	PPA-S Semantic	16 yrs	Accountant	Home husband
Male	58	6 months	PPA-A Agrammatic	16 yrs	Sheriff	Home wife

Methods: Materials



OREGON HEALTH & SCIENCE UNIVERSITY

Co-Chat™ : Generates a display using NLP techniques, based on:



auto-curated list of target words

Mobile Tech + Just In Time (JIT):

HISTORICAL PROBLEM IN AAC

- Time consuming to program current Visual Scene Displays (VSDs) with vocabulary
- Partners do not add or update frequently
- Difficult to dynamically capture new experiences and add them to AAC technologies or apps
- Lose spontaneity

POSSIBLE SOLUTIONS: JIT

- JIT allows quick and easy import of photos as VSDs
- Allows partners to dynamically respond to interests
- Partners add communicative contexts to support conversation 'on the fly' during daily interactions

Drager, Light et al., 2014

OREGON HEALTH & SCIENCE UNIVERSITY

Visual Scene Displays:

CAN BE USED TO:

- Stimulate and support conversation: shared context with communication partner
- Facilitate active participation in spontaneous activities
- Shift focus from expression of wants/needs to social interaction and exchange of ideas

FOR PEOPLE WITH APHASIA:

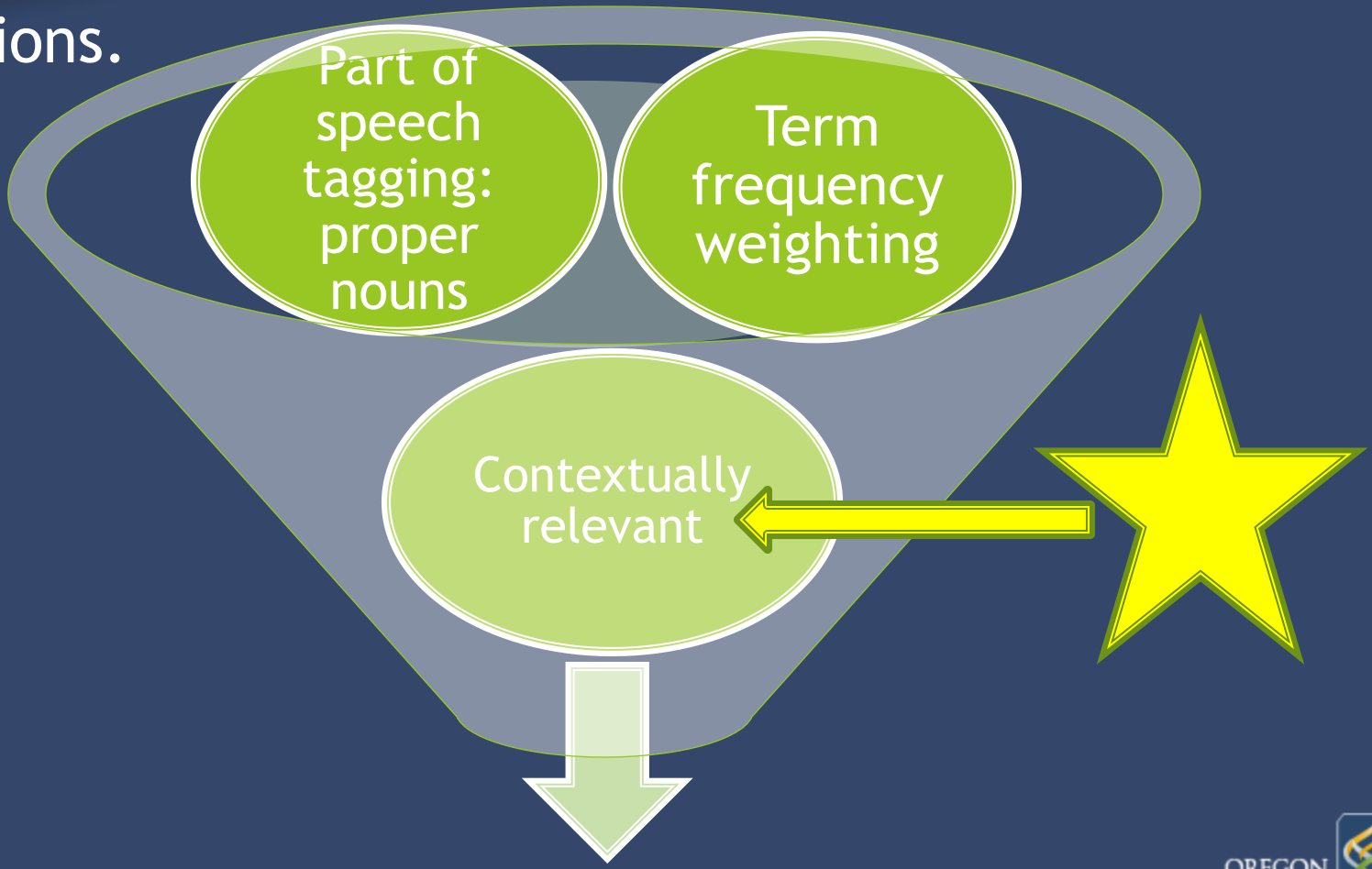
- Personally relevant
- High context photographs
- Text boxes

(Beukelman, Hux, Dietz et al., 2015)

OREGON HEALTH & SCIENCE UNIVERSITY

Natural Language Processing:

Computer processing of human language to analyze, modify, augment or generate words for machine applications.



OREGON HEALTH & SCIENCE UNIVERSITY

Contextually Relevant: *Similar but diverse!*

DOG: SIMILAR, BUT NOT VERY DIVERSE

- doggie
- puppy
- canine
- hound

DOG: SIMILAR YET DIVERSE

- bark
- leash
- pet

OREGON HEALTH & SCIENCE UNIVERSITY

Social Network Comments:

Good

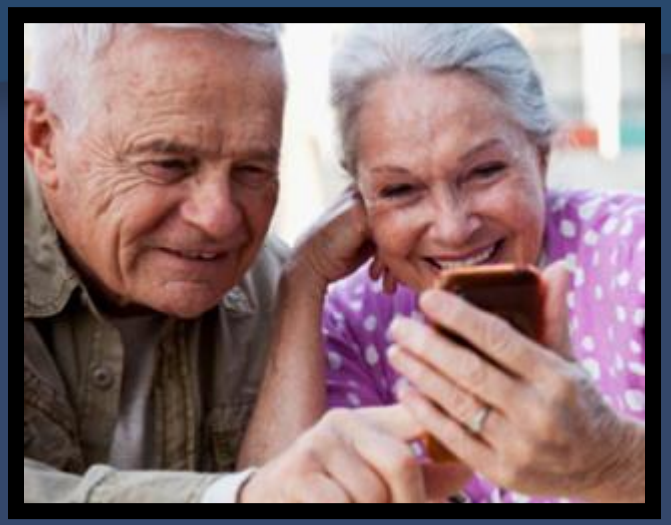
- Your Dad and Mike taking a boat ride on the lake
- They are celebrating Mike's birthday
- Mike loves driving the boat
- Dad and Mike enjoy boating together
- A perfect Michigan summer day on Lake St. Clair

Bad

- What lake are you on?
- You guys are rocking it!
- Great day
- Fun!
- Is it sunny?

OREGON HEALTH & SCIENCE UNIVERSITY

Social networking: Social media use in seniors (65+)



- 56% use Facebook

(up from 45% 1 year prior)

- 16% use Pinterest
- 12% use LinkedIn
- 8% use online discussion forums
- 4-6% use Twitter & Instagram

http://www.pewinternet.org/2015/08/19/mobile-messaging-and-social-media-2015-main-findings/ (2015)

Methods: dependent variable

- Number of target words used per conversation
- 10 Target words produced from “Social Network” comments + innovative NLP

Methods: Experimental Design

- Single Subject Research
- Alternating Treatments Design (ATD)
- Compare effect of Co-Chat™, photo-only and no technology on the number of target words
- Use the What Works Clearinghouse (WWC) design standards for visual analysis

ATD (Wolery, Gast & Ledford, 2014); WWC (2014)

OREGON HEALTH & SCIENCE UNIVERSITY

Methods: Procedures

- Consent
- Assess language, cognition
- Train Co-Chat™ to mastery
- Complete Conversation Partner training

OREGON HEALTH & SCIENCE UNIVERSITY

Methods: Procedures

- Conduct activity when conversation partner NOT present, photograph activity and send to “social network” for comment
- NLP analyzes comments and generates lexical display with original photo
- Participant engages in conversations over 3 conditions

OREGON HEALTH & SCIENCE UNIVERSITY

Three conversation conditions

1. No tech
2. Photo only
3. Co-Chat™

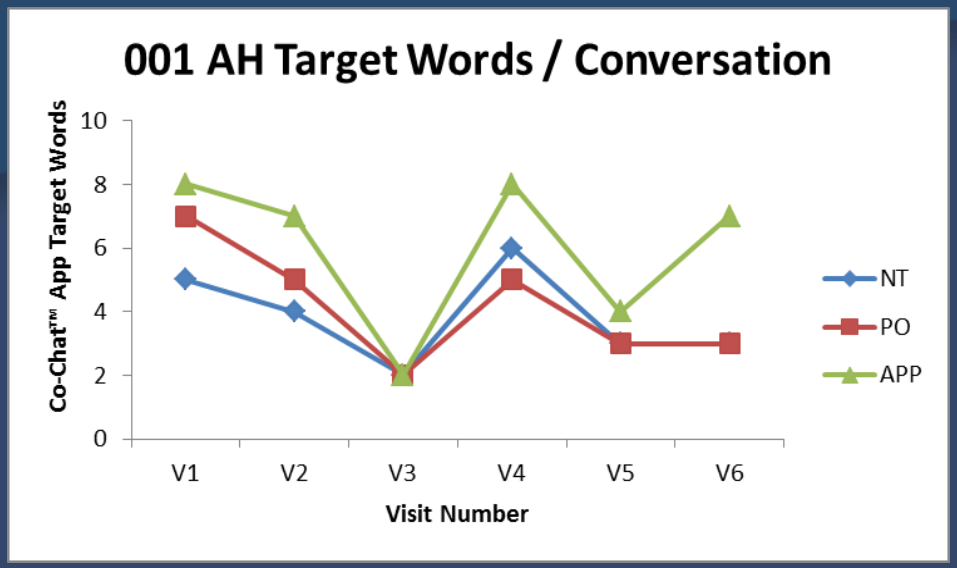
Results: Target Words generated

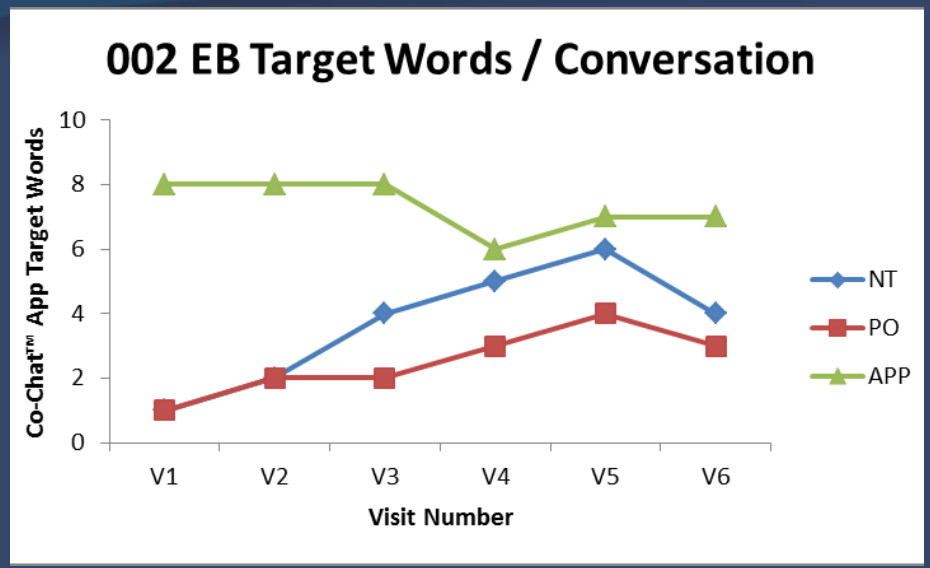
- Data evaluated using visual analysis, focusing on
  - overlap between conditions
  - changes in level
  - variability
  - trend within and across intervention conditions

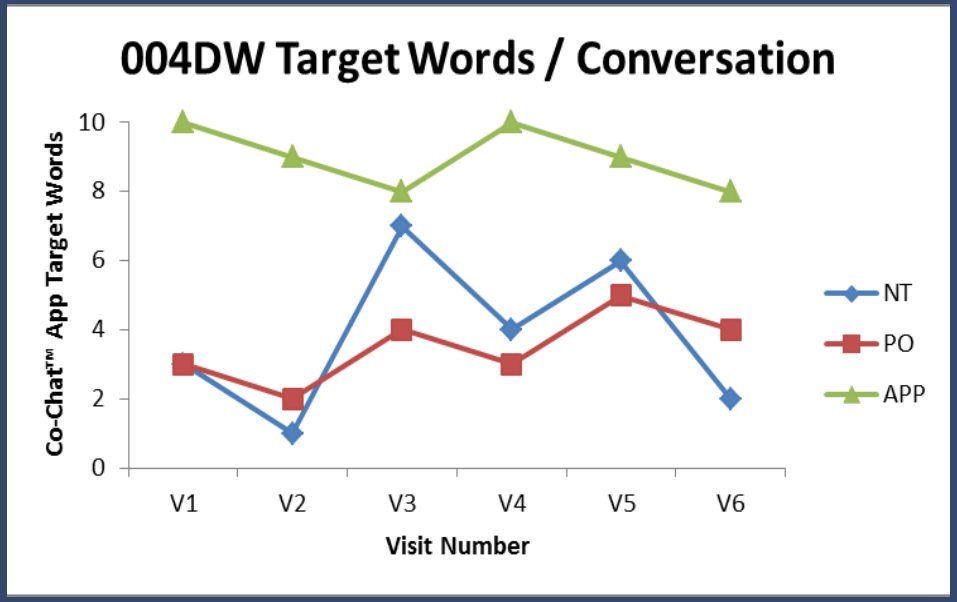
- RESULTS INDICATE A HIGHER NUMBER of TARGET WORD PRODUCTION in Co-Chat™ condition for all participants.

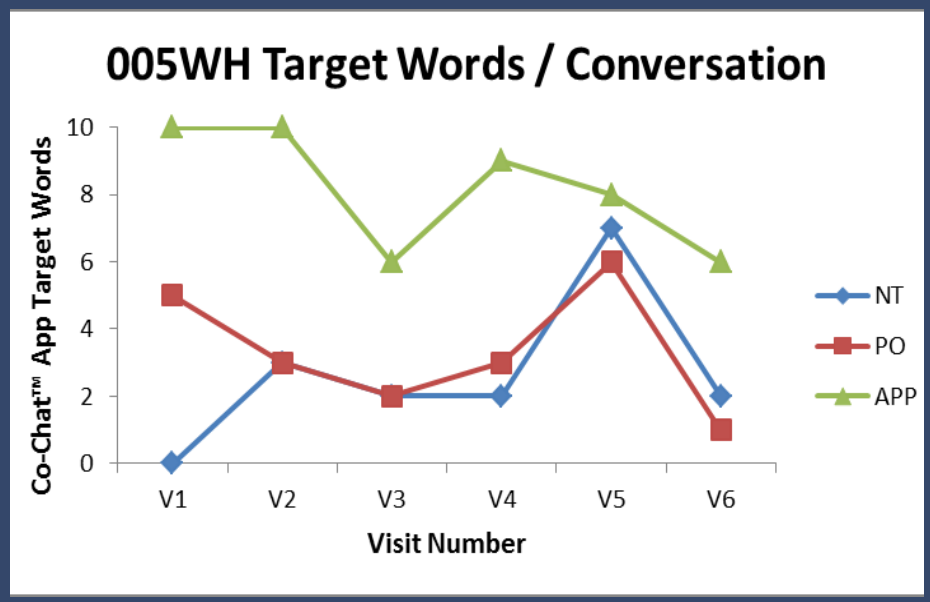
OREGON HEALTH & SCIENCE UNIVERSITY

Results: Target words



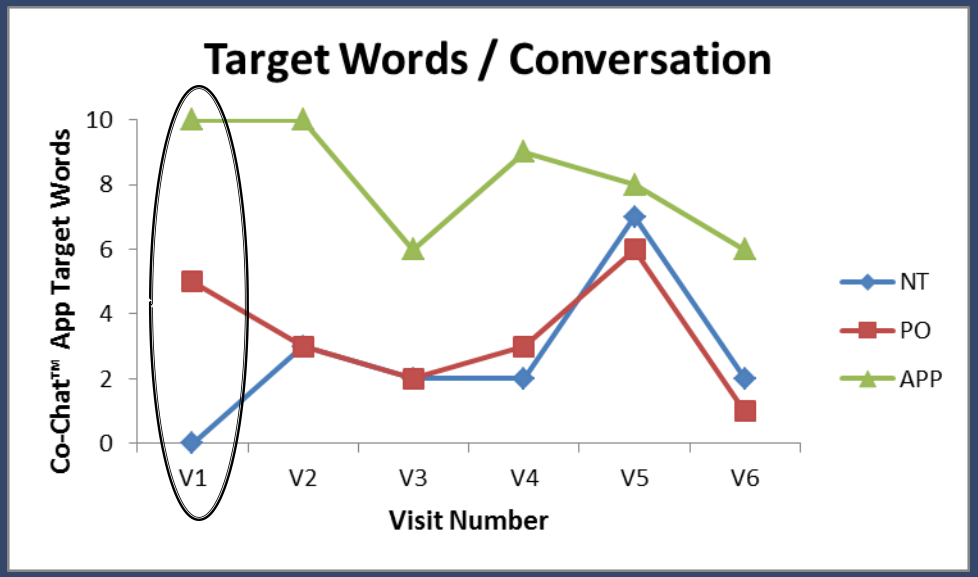






005 WH Results: Target words

100% non-overlapping data between Co-Chat™ and other two conditions.



Condition	TW Range	TW Average
No Technology	0-7	3.5
Photo-only	1-6	3.0
Co-Chat™	6-10	7.5

OREGON HEALTH & SCIENCE UNIVERSITY

005WH: Making Risotto

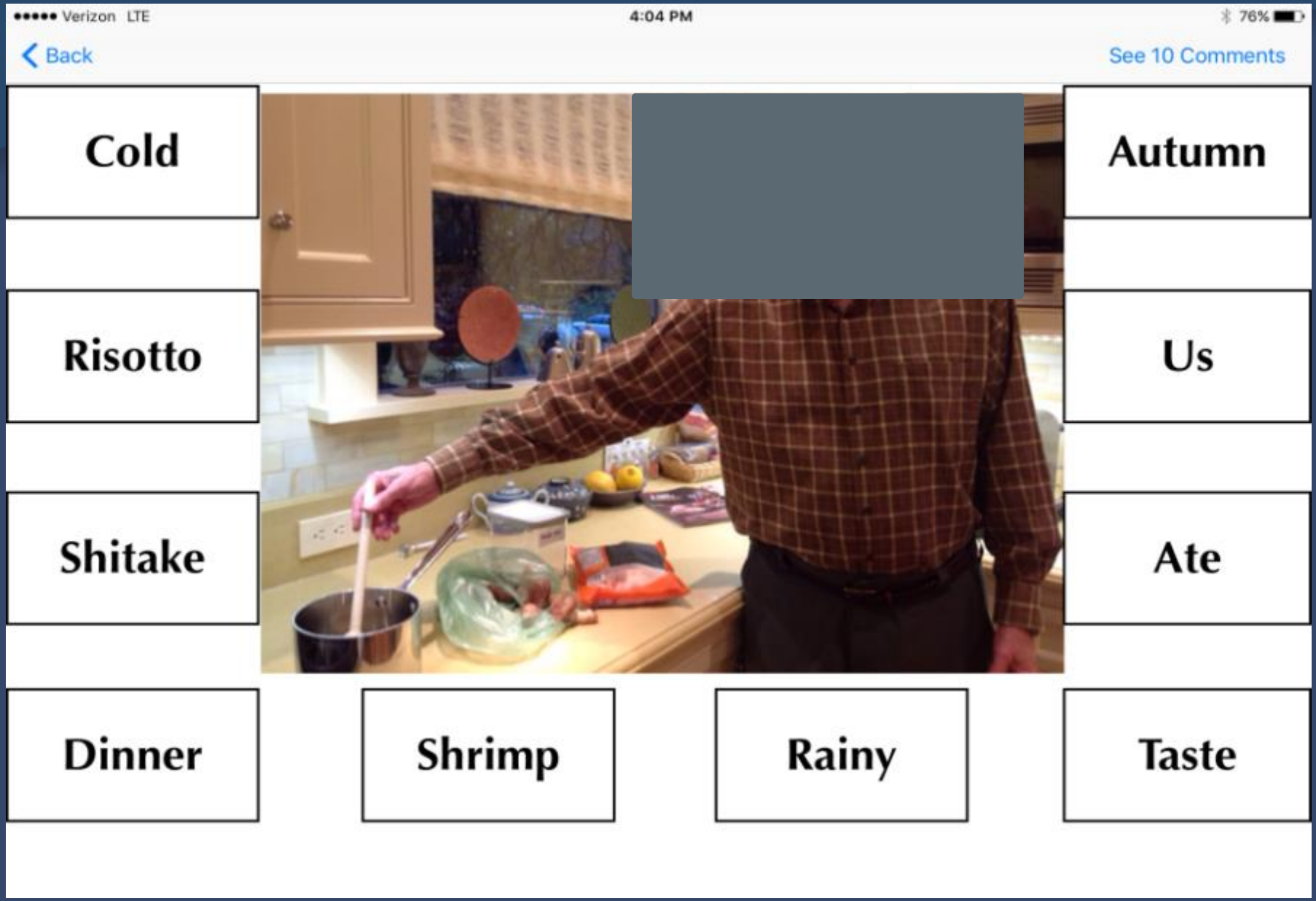
Social Network Comments:

- *"I would love to eat risotto with shrimp and shitake for dinner."*
- *"Risotto on a rainy night is a perfect dinner."*
- *"A dinner alone at home with shrimp and shitake mushrooms sounds yummy."*
- *"Have a bottle of wine with your shrimp risotto on this cold night."*
- *"This is a delicious dinner for a rainy fall night."*
- *"Tonight is perfect night to eat at home."*
- *" You are a wonderful chef for your family."*

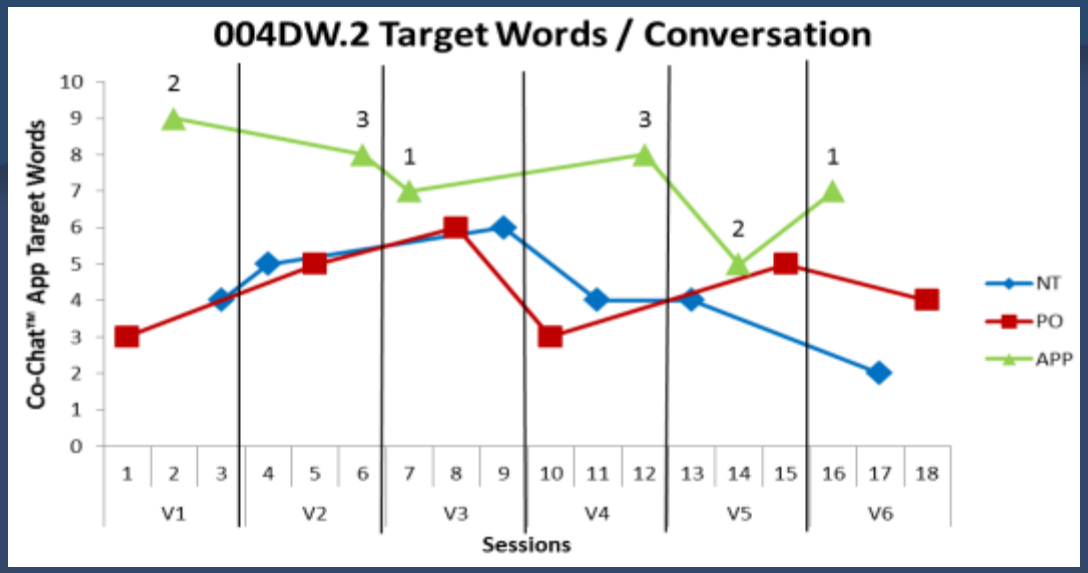
OREGON HEALTH & SCIENCE UNIVERSITY

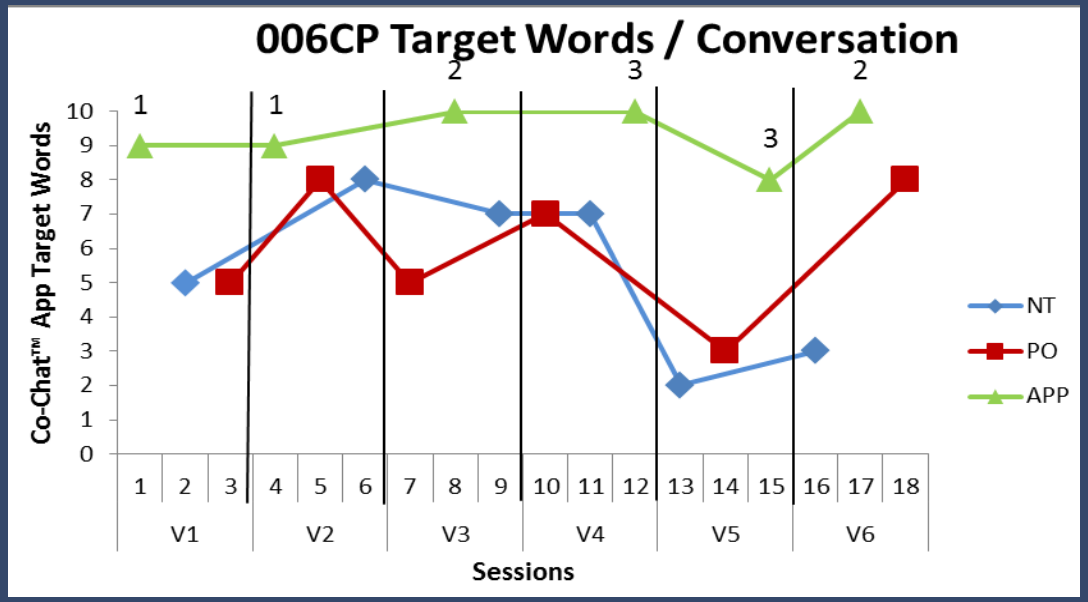
005WH Photo only

005WH app


Verizon LTE
4:04 PM
76%
Back
See 10 Comments
Cold
Autumn
Risotto
Us
Shitake
Ate
Dinner
Shrimp
Rainy
Taste

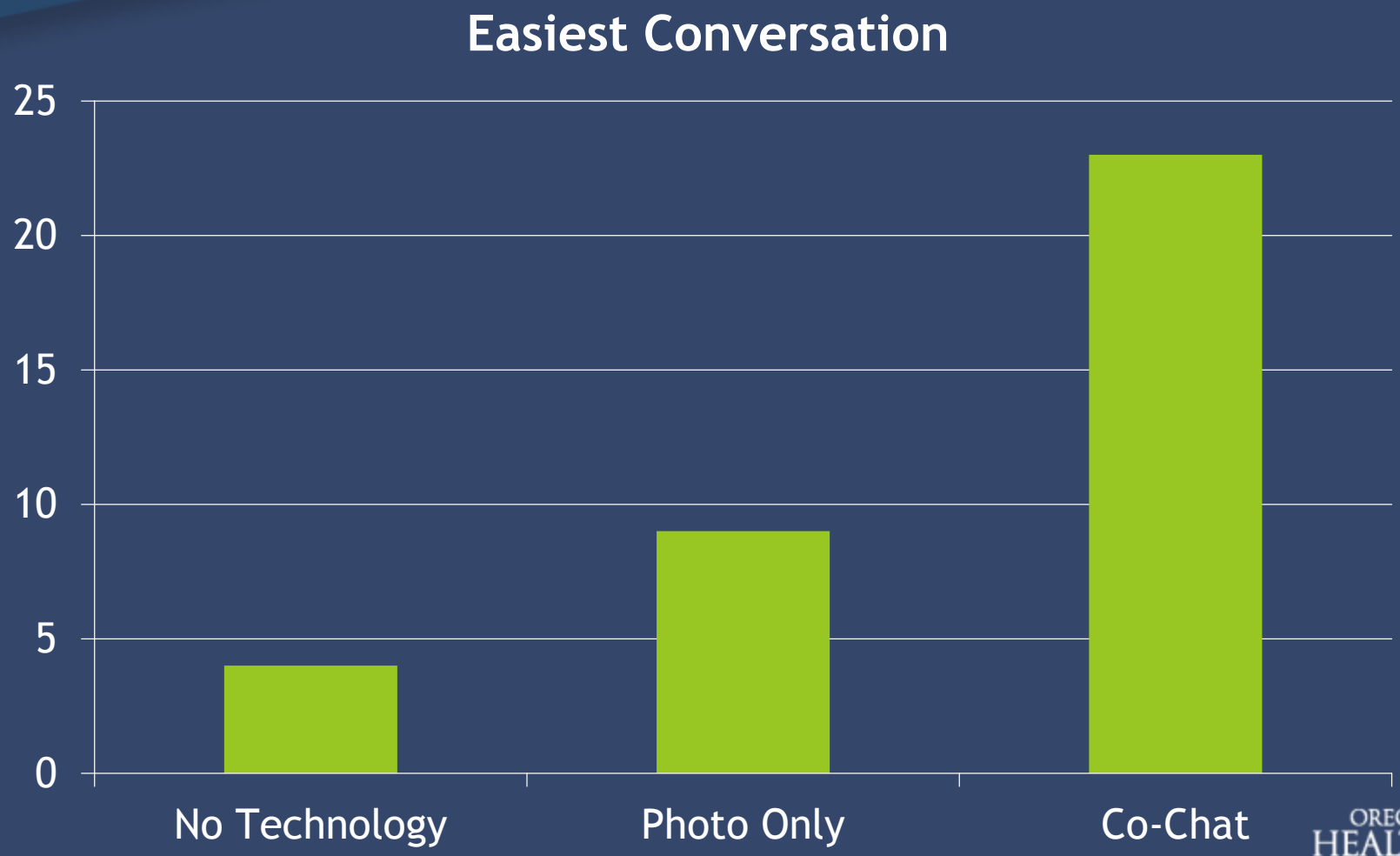
Cohort 2: Counterbalanced





OREGON HEALTH & SCIENCE UNIVERSITY

"Which conversation was the easiest?" *n* = 36



OREGON HEALTH & SCIENCE UNIVERSITY

User Experience of Co-Chat™

PARTICIPANT WITH PPA

- *"More informational."*
- *"I really like this."*
- *"It helps, especially with the right words."*
- *"I like the words {on the app}; if nothing else it refreshes my memory on the names and words."*
- *"I think the words around the picture really help."*
- *"The words really help to direct and focus my storytelling."*
- *"When I don't have enough time to talk it helps."*

CONVERSATION PARTNER

- *"He talked more than ever!"*
- *"He talked longer and started to add more detail."*

OREGON HEALTH & SCIENCE UNIVERSITY

learnability

support

User Experience Questionnaire (UEQ)

Measure the User Experience of your product

fast, easy and flexible

N = 36	Range	Mean
learnability	0 to 3	2.67
support	-1 to 2	2.61

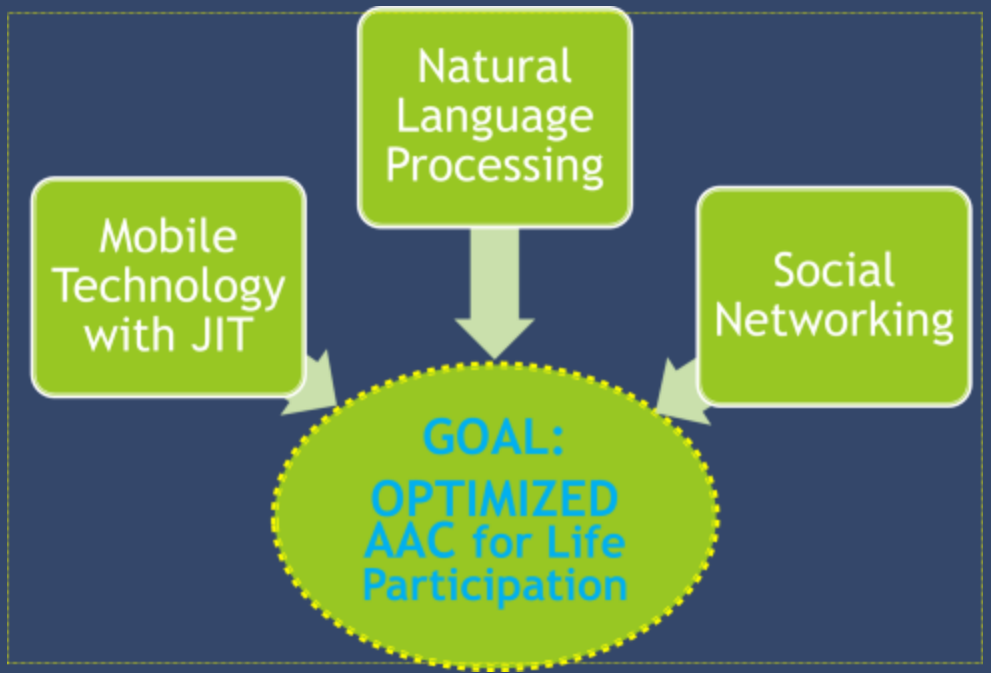
Discussion:

- We conducted a rigorous single subject experimental design study including 6 people with PPA
- Trends indicate that the intervention increases production of Target Words; showing a STRONG experimental effect
- Users find conversations to be easier when using this technology
- Users find the intervention both easy to learn and supportive during unstructured conversation

OREGON HEALTH & SCIENCE UNIVERSITY

Take aways

Our data indicate that the use of Mobile Technology (incorporating Just In Time photo capturing, innovative Natural Language Processing and Visual Scene Display) paired with Social Networking is useful as an AAC compensatory strategy to support language loss in PPA



OREGON HEALTH & SCIENCE UNIVERSITY

Thank you

We humbly thank all of our research participants and their conversation partners.

OREGON HEALTH & SCIENCE UNIVERSITY