**Introduction**: The rate of cognitive-communication impairments in adults is increasing rapidly: by 2050 the number of people age 65 and older with dementia syndromes is projected at 13.8 million Americans [1]. Primary Progressive Aphasia (PPA) is one dementia syndrome that is characterized by an insidious onset and gradual loss of word finding, object naming, or word comprehension skills which profoundly affects verbal participation in daily activities [2]. PPA progression limits the ability to spontaneously discuss enjoyable life experiences, potentially resulting in activity limitation, reduced participation and social isolation [8]. There is a recognized lack of evidence regarding the efficacy of clinical interventions to help people living with PPA [2]. Case studies demonstrate that augmentative and alternative communication (AAC) benefits patients with PPA [3] though there is no empirical research for specific AAC treatment protocols. The goal of our research is to develop and evaluate AAC interventions that can augment conversation as individuals with PPA lose their language abilities. To do this, we harnessed expertise from natural language processing (NLP) [4,5], just-in-time photo acquisition of relevant visual scenes [6], and social media applications on mobile devices [7]. We developed an application, referred to as CoChat, that allows a user to take a photo which is automatically labelled by social networks and inferential language models. Adults with PPA can use CoChat to describe activities, objects and events since the app provides them with personalized vocabulary to generate language. CoChat was tested in different conversational situations as one AAC intervention for adults with PPA.

**Aims**: We developed and evaluated an AAC mobile application that generates lexical displays based on user-captured photos, related comments and an automatically curated list of key words. We determined if individuals with PPA can utilize the photos and lexical display on their mobile devices to improve or maintain word finding skills during conversation.

**Materials**: CoChat is an iOS-based application which automatically forms an ‘external lexicon’ for a user based on photos that are annotated by social networks. CoChat uses a combination of NLP techniques to produce a set of suggestion words that surrounds a visual scene. The user interface is designed for simplicity and functionality so that it is usable by people with PPA and dementia.

**Method**: Ten individuals with mild-to-moderate PPA participated in an ABAB withdrawal single case research design with intra-subject and inter-subject replication. Participants were met in their residences by a research associate who engaged with them in five community-based activities (i.e., taking the dog for a walk; meeting at the local bakery). One photo was taken during each activity using guidelines suggested for visual scene displays. The photo was sent to a wizard in the research lab who served as a simulated social network. The wizard generated 10 comments to the photo which were uploaded to a server and analyzed by the language model.

The natural language processing technique that is employed subsequently by CoChat follows. First, the system performs part-of-speech tagging of the wizard-generated comments to identify proper nouns denoting the names of entities such as "Joan Smith"
or "Starbucks". Next, the system uses term frequency and inverse document frequency weighting to identify keywords from the comments themselves. These are words that appear more frequently in the comments than they do in a large corpus of newswire text, and indicate important words that the user might wish to employ to communicate about the scene depicted in the photo. Finally, CoChat identifies a new set of words which did not occur in the comments but which are contextually relevant. These words are similar to those in the comments but somewhat dissimilar from each other. For example, if the comment contained the word "Starbucks", it might suggest words like "espresso" and "cafe". Word similarity is determined using the word2vec recurrent neural network, which attempts to learn relationships between words by analyzing very large corpora of text. Relying on automatic manipulation of language, the app in real time then surrounds each photo with 10 words: six from the wizard’s simulated social network; four from the language model as a suggestion word set.

**Experimental procedure:** Participants were asked to describe the community activities to familiar partners in three conditions: (1) conversations without technology; (2) conversations with one photo on the iPad only; (3) conversations with CoChat (the photo surrounded by 10 relevant words). Conversations were videotaped and analyzed for # of target words produced in each condition; # details understood by communication partner in each condition; participant and partner satisfaction with each condition.

**Results and Conclusions:** Research hypotheses are tested using visual analysis of changes across conditions and repeated measures ANOVAs to evaluate intervention effects. Initial results reveal a trend toward increased lexical retrieval and partner understanding when CoChat is used during conversations. Results will be discussed in detail.

This project indicates a need for a larger research agenda to further assess the efficacy of a longitudinal AAC/NLP intervention for patients with PPA in order to maintain vocabulary access, communication functions and social networks over the course of language degeneration.

**References Cited**


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