



## Feature Article

## Face-name memory in Alzheimer's disease

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## ARTICLE INFO

## Article history:

Received 17 February 2012

Received in revised form

12 March 2014

Accepted 17 March 2014

Available online 17 April 2014

## Keywords:

Memory

Face recognition

Name recall

Assessments

Strategies

Alzheimer's disease

## ABSTRACT

Alzheimer's disease (AD) affects face-name memory, the ability to recognize faces and recall names. Remembering face and name requires a sophisticated cognitive process because of the complexity and similarity among faces and also because of their arbitrary association with names. Assessments of face-name memory can measure episodic and semantic memory performance and are useful for early detection of AD. Improving face-name memory is possible through cognitive interventions targeted to promote procedural memory, which is often preserved until the late stage of AD. This article describes a conceptual model, assessment tools, and strategies for improving face-name memory in persons with AD.

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## Introduction

Memory loss, such as forgetting names, is the most common early symptom of Alzheimer's Disease (AD). Forgetfulness in AD is different from ordinary forgetfulness that a normal person may experience. For example, people with ordinary forgetfulness can still remember other facts associated with the thing they have forgotten. They may briefly forget their next-door neighbor's name but they still know the person they are talking to is their next-door neighbor. A person with AD not only forgets her or his neighbor's name but also does not know whom she or he is talking to. This results in embarrassment, loss of self-confidence, and social withdrawal among persons with AD. Ability to remember names and faces decreases as the disease progresses (see Table 1). Human faces are critical socio-emotional signals in everyday life. Family caregivers experience loss and grief as their loved ones increasingly have difficulties in remembering and recognizing them as daughters or a spouse. They face challenges in interacting with their loved ones in a meaningful way and in helping engage in everyday activities. Caregiver's stress is one of the most important factors leading to institutionalization of persons with AD.<sup>2</sup> The purpose of this article is to describe a conceptual model, to review assessment tools, and to explore cognitive strategies for improving face-name memory in persons with AD.

## Conceptual model of face-name memory

The models of face recognition and name recall were developed initially by Bruce and Yong<sup>3</sup> and modified by Burton, Bruce, and Johnston.<sup>4</sup> Face-name memory involves the following areas: (a) face recognition; (b) name recall; and (c) retrieval of person-related information (see Fig. 1). First, the cognitive process of face recognition involves structural encoding of the face. A face is a complex and configural representation that requires a perceptual process for face analysis where individual features (nose, eyes, etc.) are examined in order to discriminate between different faces.<sup>5</sup> The analysis of the structural information of a face takes place initially. Rarely, visuo-perceptual deficits due to cortical degeneration may interfere with the analysis process and lead to failure of an integration of facial features. The face analysis includes comparison with previously stored structural representations in order to make a familiarity judgment. If the face is a representation of a familiar person, first a specific area of the brain will be activated so that recognition of face may take place. Second, name recall will occur, which involves "name access and generation." Finally, the retrieval of person-related information occurs, which is generated from cognitive processes of retrieving the particular knowledge that one has about an individual. The knowledge may include semantic information such as the person's occupation (e.g., teacher or politician) or a relationship with the person. In the course of face-name memory, the retrieval of both name and relevant semantic information associated with the face will occur after the successful recognition of the face.

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**Table 1**

Face name memory according to Alzheimer's Disease stages.

Stages of AD <sup>1</sup>	Cognitive loss
Mild cognitive impairment (MCI) or very early-stage Mild or early-stage	Decreased ability to remember names when introduced to new people. Reduced memory of personal history. The affected individual may seem subdued and withdrawn, especially in socially or mentally challenging situations.
Moderate or mid-stage	May retain substantial knowledge about themselves and know their own name and the names of their spouse or children.
Moderately severe	Occasionally forget the name of their spouse or primary caregiver but generally can distinguish familiar from unfamiliar faces.
Severe or late-stage	Lose the ability to respond to their environment and the ability to speak.

For example, recognizing the face of a familiar famous person (e.g., J.F. Kennedy) represented by a photograph would involve the following cognitive processes: the encoding of structural information of the face, the activation of the J.F. Kennedy face recognition, the recall of the name of "J.F. Kennedy," and the retrieval of semantic information "President."

### Assessment tools for face-name memory

Alzheimer's Disease primarily affects the cortex of the brain. Magnetic resonance imaging scans and computed tomography show brain lesions with neuritic plaques, neurofibrillary tangles, and degeneration at the ends of nerve cells.<sup>6</sup> Face-name memory demands a sophisticated cognitive process not only because of the complexity and similarity among faces but also because of their arbitrary association with names. Neuroimaging studies have found that face perception requires visuo-perceptual processes, which occur in the occipitotemporal cortex with interplay among a widely distributed system of cortical areas.<sup>7</sup> In general, AD causes neural degeneration in mediotemporal and temporo-cortical brain regions that are associated with episodic and semantic memory functions. Remembering faces and names are highly associated with episodic and semantic memory performance. Table 2 presents major types and definitions of memory.

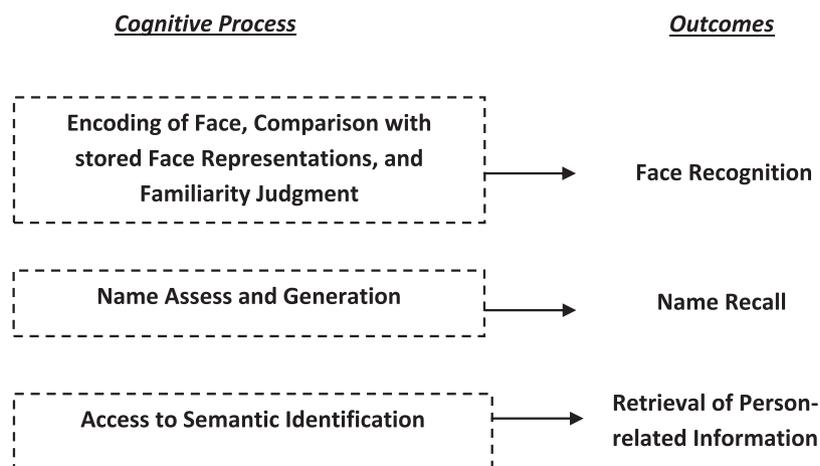
While there is limited evidence on which specific domain in the brain involves face-name memory, testing memory for faces and names can be very useful in clinical settings. Assessments of face-name memory can reveal episodic and semantic memory performance of persons with AD.<sup>13</sup> Remembering 'newly-learned faces' and names successfully is associated with episodic memory capacity. Semantic memory can be measured by testing recognition, identification, and naming of 'familiar faces.'

Alzheimer's disease affects an estimated 5.4 million Americans. This number has doubled since 1980, and will continue to grow to an estimated 16 million by 2050.<sup>13</sup> Alzheimer's Disease usually begins after age 60 and risk increases with age. Approximately 3 percent of Americans between the ages of 54–74, and almost half of those 85 years and older, suffer from AD. Clinical research suggests that testing face-name memory can provide highly sensitive indices for early detection of memory deficits, in particular, in initial stages of AD.<sup>7</sup> Table 3 summarizes the assessment tools that are widely used to test face-name memory. Impairment in face name memory is a significant indicator of impairment in episodic memory and an early sign of dementia. Early detection of AD may help individuals manage its symptoms and plan care decisions.

### Evidence-based techniques for improving face-name memory

Two cognitive strategies, spaced retrieval and errorless learning with vanishing cues techniques, are known to be useful to improve face name memory in AD. Both techniques focus on repeated rehearsal of face name association over time and are considered to utilize intact procedural memory of persons with AD.<sup>28,29</sup> By rehearsal or reinstatement, connections are established within the cortex independent of the hippocampus—so called long-term consolidation. Because normal hippocampal dependent learning (or relearning) is essentially abolished in AD, rehabilitation strategies may operate by slowly reestablishing links between phonological (name) and semantic (person-specific) representations in neocortical regions that are less damaged in early AD.<sup>30</sup>

To date, memory training targeted to increase declarative memory (episodic and lexical memory), which requires an elder to explicitly and actively remember words and facts, has shown minimal rehabilitative value for persons with dementia. Cognitive



**Fig. 1.** Conceptual model of face recognition and retrievals of name and person-related information. Adapted from Bruce & Yong<sup>3</sup> and Burton, et al.<sup>4</sup>

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