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The neuropsychology of facial identity and facial expression in children with mental retardation

Nirbhay N. Singh[a,*], Donald P. Oswald[b], Giulio E. Lancioni[c], Cynthia R. Ellis[d], Monica Sage[e], Jennifer R. Ferris[b]

[a]*ONE Research Institute, P.O. Box 5419, Midlothian, VA 23112, USA*
[b]*Virginia Commonwealth University, Richmond, VA, USA*
[c]*University of Bari, Bari, Italy*
[d]*University of Nebraska Medical Center, Omaha, NE, USA*
[e]*University of Florida, Gainesville, FL, USA*

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Abstract

We indirectly determined how children with mental retardation analyze facial identity and facial expression, and if these analyses of identity and expression were controlled by independent cognitive processes. In a reaction time study, 20 children with mild mental retardation were required to determine if simultaneously presented photographs of pairs of faces were pictures of the same person or of different people (identity matching), or to determine if the pairs of faces showed the same expressions or different expressions (expression matching). Faces of familiar and unfamiliar people were used as stimuli. For identity matching, reaction times were faster for familiar faces than for unfamiliar faces. For expression matching, there was no difference between familiar and unfamiliar faces. These results are consistent with neuropsychological findings from the general population indicating that analyses of facial expressions proceed independently from processes involved in establishing a person's identity. Our results suggest that the basic neuropsychological mechanisms that underlie cognitive processing of facial identity and facial expressions in children with mental retardation may be similar to those of people in the general population.

Keywords: Facial identity; Facial expressions; Neuropsychology; Children with mental retardation; Cognitive processing

* Corresponding author. Tel.: +1 804 743 3121; fax: +1 804 743 3448.
E-mail address: nirbsingh52@aol.com (N.N. Singh).

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1. Introduction

There is a growing interest in the neuropsychology of facial identity and facial expression. Early research in the neuropsychology of facial recognition and coding of expressions led scientists to conclude that there was an interrelationship between the recognition of faces and the interpretation of facial expressions. Contemporary researchers, however, have provided evidence that there are in operation specialized, independent neuronal pathways that direct the processing of visual information and affective coding. Researchers investigating the cognitive processes involved in facial recognition and the interpretation of facial expressions have produced compelling theories regarding brain operations. For example, studying cognitive processing at the neuronal level, Perrett et al. (1984, 1986) found that the neurons that respond to facial expression do not respond to facial identification, and vice versa.

Additional support for the belief in the independence of identity and expression recognition functions comes from studies of people with brain injuries. For example, several researchers have examined the effects of brain injuries on a person's ability to recognize faces and distinguish emotions. Studies of people with unilateral cerebral lesions (Bowers, Bauer, Coslett, & Heilman, 1985; Cicone, Wapner, & Gardner, 1980; Etcoff, 1984), right hemisphere damage (Mandal, Asthana, & Maitra, 1998), and nonlocalized brain damage (Kurucz & Feldmar, 1979; Kurucz, Feldmar, & Werner, 1979) support the conclusion that the mechanisms involved in identification and expression recognition are indeed separate.

In an early model of face processing, Hay and Young (1982) suggested that facial recognition and facial expressions may be based on separate cognitive processing systems. Later, Bruce and Young (1986) developed a functional model of the perceptual and cognitive processes involved in facial recognition and provided further details as to how information flows within the cognitive system. This model of face processing is based on the theory that analysis of facial expression, facial speech analysis, and directed visual processing proceed independently from the analysis of facial identity. The model proposes that faces are structurally encoded and then stored for subsequent retrieval. Structural encoding takes place in two ways. The first process is creation of view-centered descriptions, which are used for expression analysis, facial speech analysis, and directed visual processing. The second process is the generation of expression-independent descriptions, which are used for directed visual processing, face recognition units, person identity nodes, and name generation. Expression analysis, facial speech analysis, directed visual processing, person identity nodes, and face recognition units represent separate components of the cognitive system for processing faces. This model also suggests familiarity is established by identity-specific semantic and name codes, and is determined by face recognition units which do not directly affect expression analysis. Therefore, when reaction time is measured for expression matching, familiarity should have no bearing on the outcome. However, familiarity should influence reaction times for identity recognition because the processes involved in facial recognition are directly connected to familiarity of the face. Thus, this model relies on a dual mechanism for analyzing facial expressions and facial identity.