Neurological and cognitive processes behind face recognition

Human beings are excellent at recognizing particular human faces given that faces are so similar in appearance. Thus there has been a drive in the research community to account for the underlying neurological and cognitive processes that make such finely accurate distinctions between faces possible.

Initial findings in the literature (Farah 1990, 1994) showed a difference between the way objects are processed and the way words are processed. Objects seemed to involve a combination of two types of different cognitive processing. The first being the processing of distinctive features (featural style processing); the second being analytical processing which is a cognitive process whereby the whole is broken down into more and more basic semantic units. Furthermore, Farah (1994, 1998) suggested that a third type of processing (holistic

processing) was extremely important for facial recognition and somewhat involved in the processing of objects, seemingly indicating that faces are special in the sense that a specialized type of processing occurs for faces in particular which is more important than for other objects in general. Thus Farah's theory (1990, 1994 & 1998) supports three distinct cognitive tasks, reading (analytic processing), object processing (holistic and analytic processing) and facial recognition (largely holistic processing).

From Farah's theory we would expect that any person with severe analytical and holistic processing impairment would not be able to recognize objects very easily. However, Buxbaum, Glosser and Coslett (1999) had a patient who suffered from severe prosopagnosia (impaired facial recognition – in

other words holistic processing impairment) and alexia (inability to read words – severe analytical impairment) and yet still performed reasonably on object recognition – which presumably requires both analytic and holistic processing. Thus, Farah's theory seems to be unable to account for all the evidence.

Farah (1990, 1994, 1998 and 1999) seems to provide a large body of evidence in favour of a major difference existing between the way faces are processed and the way objects are processed – but the existence of evidence refuting Farah's theory explaining this evidence, such as Buxbaum et al (1999) and Humphreys and Rumiati (1998) led to the postulation of an expertise theory to explain the difference in processing of faces and objects.

Expertise effects are the measurable differences in performance on some task which result directly from the difference in expertise of the individuals attempting such tasks. Typical research in expertise effects is exemplified by Ericsson, K. A., Krampe, R. Th., & Tesch-Römer, C. (1993) who did research into why expert chess players are better than untrained chess players. Ericsson et al found that it was deliberate practice (as defined in their study) which was the most salient characteristic in the development of increased performance and not innate ability (cognitive flair).

Gauthier and Tarr (2002) first discussed expertise in the domain of facial recognition but not by using the same sense of ' expertise' as Ericsson et al (1993) but rather as an explanation for the prowess of all humans at recognizing faces that appealed to experience factors and learning, and not specialized cognitive processing modules in the brain. Gautier and Tarr's

research on expertise showed evidence for expertise effects in facial recognition

because they found that experience with faces from an early age optimizes processing of faces. They postulated that this was why facial processing is different to objects in other categories with which we have less ' experience' (i. e. less expertise).

Gauthiers' model differs from Farah's in that Gauthier asserts that there is no special underlying cognitive process being used to process faces, simply that expertise effects are being witnessed upon the same cognitive process – Farah proposed separate cognitive processes for faces.

Subsequently, McKone, Kanwisher and Duchaine (2006) have cast severe doubt on the expertise explanation showing that even very young children have expert facial recognition abilities thus not leaving enough time for expertise to develop. Furthermore, McKone et al (2006) showed that experts in object recognition such as dog experts recognizing dog faces still did not perform as well as they would be expected when compared to human facial recognition thus McKone et al argue that the expertise hypothesis fails and that a separate cognitive domain must exist for facial processing to account for the difference in processing ability.

Thus far, there is evidence to show that faces are processed somewhat differently to objects. Faces are perhaps special in that they are processed by a differing underlying process (Farah 1998; McKone et al 2006) however there is still much counter evidence to this view (Buxbaum et al 1999; Rumiati, (1998); Gauthier and Tarr, 2002). Further, there is evidence to show

that both featural (analytic) and configural (holistic) processing are important for facial recognition (Collishaw & Hole, 2000, Cabeza & Kato, 2000, Rakover, 2002, Zhao, Chellappa, Phillips, Rosenfeld, 2003). Thus even the importance of featural processing in facial recognition is being acknowledged.

This leaves a notable gap in the literature insofar as no expertise effects have been generated which have not been contested. Furthermore, the precise role of expertise in featural processing has not been explored with regard to facial recognition nor vis. a vis. configural processing. There thus seems to be a need to find expertise effects on facial recognition for featural and configural processing tasks so that the precise nature of the relationship between these two types of cognitive processing in facial recognition can be assessed.

Considering the above, the proposed question in this study is, ' is there an expertise effect on the ability to recognize faces in the sense that Ericsson et al uses the word ' expertise'? The reason such an effect would be interesting if found is that this would show the existence of an effect which can be influenced by deliberate practice. Ultimately, prosopagnosics could then be taught the strategies used by expert face recognizers to help them with recognizing faces in general.

References to add to our list.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993) The role of deliberate practice in the acquisition of expert performance . Psychological Review, 100, 363-406.