DEVELOPMENTAL AND NEUROPSYCHOLOGICAL
PERSPECTIVES ON THE “SELF”

Laura Mangan
Graduate 2011, Psychology
manganla@tcd.ie

ABSTRACT
The Developmental paradigm posits that different aspects of the self-emerge at different developmental stages. For example, self-perception occurs at about 15 months and any recognition prior to this is most likely due to contingent action learning. Subsequently, following the development of higher cognitive processes the development of self-consciousness takes place. Neuroscientific research has found a self-reference memory enhancement effect and the Depth-of-processing effect both of which result in a memory advantage for any information that is encoded with reference to the self. However, there is much debate as to whether or not the self can actually be studied empirically.

INTRODUCTION
The study of the self has been a major focus of psychology from its formative years through to the present day. Over 100 years ago (1890) William James uncovered the concept of the self (Robinson & Sedikides, 2009) and following this theorists have offered various definitions of the self. For example, Pervin (2003, p. 261) suggested that the self is “the way we perceive and experience ourselves” and that the self is a major part of an individual’s experience and of his construction of the world.

Farthing (1992, p. 139) postulated that the self is “the perceiver of our perceptions, the thinker of our thoughts, the feeler of our emotions and desires, and the agent of our actions.” Perry (1998) stated that the self is compiled of a set of characteristics that a person attributes to himself. According to John, Robins and Pervin (2008) the self is dependent on self-awareness and on stable mental representations. In contrast, Wolfe (2003) has stated that there is a lack of clarity surrounding the meaning of the term “self” and suggests that it needs to be more clearly defined. His own
definition would suggest that the self is an individual’s reflexive awareness of his/her own behaviour, thoughts and feelings. Moreover, Blatt and Segal (1997) have commented on the rediscovery of the self by clinicians. They believe that this rediscovery has afforded greater acceptance and acknowledgement of the self with regard to treatment and psychopathology. The self has been studied from countless psychological perspectives and thus the current essay will endeavour to discuss the “self” with a particular focus on developmental and neuro-scientific evidence.

**Evidence from the Developmental Paradigm**

Current developmental research has found that the infant will begin to formulate self-other differentiations by about 3 months (Lewis, 1990a). Butterworth (1992) has suggested that these differentiations are based on the difference between sensory input from the bodily self and the non-bodily self. For example the sensation of biting one’s own hand is very different from biting the hand of another. Support for self-other differentiation would be that infants show different responses for sounds they make as opposed to sounds made by others. Research has shown that one day old infants tend to cry less to their own sounds than to the sounds of others (Martin & Clark, 1982). Martin and Clark (1982) postulate that the day old infant is somehow able to both recognise and discriminate between its own vocalisations and ones made by other infants.

Watson & Ramey (1972) conducted a study where week-old infants had a mobile attached to their cots. As part of the ‘Contingency’ condition a pressure-sensing pillow detected head movements which then activated the rotation of the mobile. Their results found that the infants in the ‘Contingency’ condition had a significant increase in the number of head movements. However, the ‘Non-contingency’ and ‘Stable’ conditions did not generate significant head activations. Thus they found that week old infants were able to show learning of contingencies between their head movements and resulting changes in their environment. Rovee-Collier (1993) supported the suggestion that infants show knowledge of action-outcome contingency between their own actions and those of others.

Pervin (2003) suggested that the knowledge of action-outcome contingencies is a contributing factor in developing self-perception. He
also stated that cognitive developments, such as contingency learning are significant aspects of the development of the self.

**SELF-CONSCIOUSNESS**

Research has shown that other species have the capacity for self-perception however; self-consciousness eludes all but humans and great apes (e.g. Lewis, 1992a). Self-consciousness involves self-reflection and treatment of the self as an object. The development of self-consciousness occurs at around 15 months. The establishment of self-consciousness can be observed through, for example, recognition of oneself in a mirror. The ‘Rouge’ test is an effective measure of the development of self-consciousness. Lewis and Brooks-Gunn (1979) conducted a study where self-directed mirror behaviour of three groups of children was measured. The infants ranged from 9-12 months, 15-18 months and 21-24 months and were placed in front of a mirror with a red spot on their noses. The first group (9-12 months) responded socially to the ‘other’ child and made no attempts to remove the rouge. They did however; make contingent responses to their movements.

Pervin (2003) argues that this group made no actual self-recognition response. The second and third groups showed self-directed activity where a response was made to the spot of rouge itself. Lewis and Brooks-Gunn (1979) provided evidence for these findings with another study involving television images. Infants who were 9-12 months were compared to a group of 15-18 month old infants for responses to live and week old images of themselves. There was a significant difference between the groups with the younger group showing no difference between responses for the live and week-old images. They found that the younger group could not differentiate between self-images and images of other infants on the week old recordings. They suggested that self-perception is cued by contingent learning of bodily movements and the corresponding movements on screen. Furthermore, they suggested that the 15-18 month group showed self-perception as they were able to differentiate between themselves and week old images. Thus Lewis and Brooks-Gunn concluded that self-perception takes place at approximately 15 months.

Similarly, Gallup (1970) studied self-perception in chimpanzees and found that at first they responded as thought the image in the mirror was that of another chimp. Following several days with the mirrors they
displayed self-directed mirror behaviours (e.g. grooming). The chimps were then anesthetised and a red unscented dot was placed on their faces. Instantly, the chimps explored the dots on their faces which, according, to Gallup is evidence of self-recognition.

In humans, following self-recognition at 15 months, Lewis (1990a) has argued that self-consciousness develops. The development of self-consciousness at this age is supported by cognitive developments such as the use of language to discriminate between the self and others and self-conscious emotions. Self-conscious emotions include shame, pride and embarrassment and are categorised as such because they require the development of self-consciousness.

**NEUROPSYCHOLOGICAL PERSPECTIVES**

In contrast to the developmental approach the neuro-scientific perspective would argue that the self is formed through psychological processes and discrete mental activities. The psychological processes that form the self are dispersed throughout the brain and combine with contributions made from multiple subcomponents which determine discrete mental activities (Turk et al., 2003). Importantly, Heatherton, Krendl, Macrae and Kelley (2007) emphasise that the self is not localised but rather it is dispersed among several regions of the brain. According to Stuss and Levine (2002) frontal lobe insult seems to be reflected in many disorders of the self. For example frontal lobe damage has been associated with diminished capacity for self-awareness (Ackerly & Benton, 1947). Damage to this area of the brain has also been associated with the inability to process information relevant to the self (Wheeler, Stuss & Tulving, 1997).

**SELF-REFERENCE MEMORY ENHANCEMENT EFFECT**

According to Rogers and colleagues (1977) there is a self-reference memory enhancement effect. This effect shows that there is a memory advantage for any information that is encoded with reference to the self. Individuals will tend to remember self-referential information better than information regarding another (Symons & Johnson, 1997). Studies using patients with severe amnesia (as a result of brain injury or Alzheimer’s disease) show that they can correctly indicate that specific traits are reflective of their selves (Klein, 2004). For example patient KC a profound amnesiac could correctly identify new personality traits that had emerged following his
motorcycle accident (Tulving, 1993). With respect to individuals with Alzheimer’s disease, they have provided evidence of self-knowledge despite difficulty in the recognition of their own family members (Klein, Cosmides & Costabile, 2003).

Patient KR, who suffered from severe Alzheimer’s displayed a preserved ability to correctly identify self-relevant personality characteristics (Klein et al., 2003). In addition, Rathbone, Moulin and Conway (2009) found that despite a lack of episodic detail in her memories their amnesiac patient’s sense of self remained intact. Therefore they proposed that conceptual memories alone are sufficient for the preservation of a coherent sense of self and speculated that conceptual autobiographical knowledge can be utilised to maintain a sense of self.

DEPTH-OF-PROCESSING EFFECT

Rogers and colleagues (1977) posited that the self was a cognitive structure that could lead to enhanced memorisation of processed material. Conversely, researchers have found that superior memory can occur as result of more elaborate encoding due to greater self-knowledge, also known as the Depth-of-processing effect (Klein & Kihlstrom, 1986). Positron Emission Topography (PET) and functional Magnetic Resonance Imaging (fMRI) studies have shown that areas in the left prefrontal cortex (LPFC) are active when memorisation is intentional (Kelley et al., 1998) and in tasks that encourage memory formation (Wagner et al., 1998). Even when subjects make no attempts to memorise (e.g. semantic judgement tasks) they show high LPFC activation and increased remembering (Wagner et al., 1998).

However surface-based judgements of words shows diminished frontal lobe activity and they are not likely to be remembered (Buckner, Kelley & Peterson, 1999). In a study by Craik and colleagues (1999) participant’s brain activity was measured using PET while they rated personality characteristics for their selves or for familiar others (e.g. the Canadian Prime Minister). Rating of self-referential information coincided with distinct activations in the frontal regions particularly in the medial prefrontal cortex (MPFC) and right prefrontal cortex (RPFC). In a separate study self-referential memory was examined using fMRI techniques (Kelley et al., 2002). Participants were required to attribute adjectives to the self or to a familiar other (e.g. George Bush). Their
results found that characteristics encoded for the self had higher memorisation than those encoded for the familiar other. Conversely,

Heatherton and colleagues (2007) have argued that LPFC activity cannot expound increased self-referential memory. They implicated activation in the MPFC in self-referential processing however, they failed to elucidate whether the MPFC is accountable for enhanced self-referential memory. In contrast, Kelley and colleagues (2002) stated that the MPFC supports the configuration of self-relevant memories. Also they proposed that self-referential processing is not connected to normal semantic processing as the self is “special” (p. 8). However, Aron and Frayley (1999) offer a criticism of this hypothesis as they suggest that it fails to include significant others in its account of the self. They implied that cognitive processes embrace close others (e.g. partners, parents, friends etc.) as part of the self. This was supported by findings that showed a lack of self-relevant memory enhancement when encoding adjectives for the self or a close other (Keenan & Bailler, 1980).

Conversely, these findings were not supported by Heatherton and colleagues (2007) who found a significant difference between activations of the MPFC between judgments of the self and a close other. They found much more activity for self-judgments than for judgments of a close or familiar other. Therefore they concluded that the MPFC makes a self-specific response to self-based judgments as opposed to those made about intimate or familiar others. Furthermore they suggested that methodological confounds are the source of findings that differ from their own. Ultimately, the MPFC has an essential role in the storage of self-relevant information which aids self-referential processing (Heatherton et al., 2007).

VENTRAL ANTERIOR CINGULATED CORTEX AND THE SELF
With regard to affective self-relevant information research has suggested a possible processing hierarchy (Heatherton et al., 2007). The MPFC is receptive to self-relevant information whereas the ventral anterior cingulated cortex (vACC) is receptive to the affective impact of self-relevant information. Supporting research has found an association between hypometabolism in the vACC and depression (Drevets et al., 1997). Drevets and colleagues suggested a causal link between hypometabolism in the vACC and low self-esteem, which is commonly
associated with depression. Furthermore, Mayberg and colleagues (2005) revealed that deep brain stimulation in the vACC successfully improved depressive symptoms in a treatment-resistant sample.

According to Heatherton and colleagues (2007) self-esteem oversees social acceptance and rejection. They also suggested that the vACC is uniquely responsive to social feedback especially social rejection. Leary’s theory posits that when one behaves in a manner that is conducive to social exclusion this produces cognitive conflict which induces behavioural change thus avoiding rejection (Heatherton et al., 2007). As a result of these findings, they also attribute a self-regulatory role to the vACC.

CRITICISMS OF STUDYING THE SELF CONCEPT
Finally, Danziger (1997) has offered a criticism of both of these approaches in his argument that the self cannot be studied objectively. This is supported by Jussim and Ashmore (1997) who state that the study of the self is highly context dependant as the conceptualisation of the self depends on the specific historical approach. Constantino & Castonguay (2003, p. 6) emphasise the “empirically challenging nature” of the study of the self. Further to this, Danziger (1997, p. 34) stated that the self is an example of certain “essentially contested concepts” which are “saddled with an inescapable ambiguity” Thus the self is an ambiguous concept that poses difficulties for objective investigation. Although, Danziger (p. 34) does admit that the self may be studied empirically (“verified in experience”) nevertheless the indistinctness surrounding the self creates complications for the study of such a concept.

Holland (1997) supports this supposition and denies the slightest possibility of the objective study of the self. She suggests that the study of the self is indirect and rather, the study of the social discourse surrounding the concept. In contrast, Jussim and Ashmore (1997) deny that the self can only be studied through discourse and experience and suggest that regardless of apparent limitations the self can indeed be studied objectively. They propose that through addressing the critical issues and limitations, the objective scientific approach to the self may be fortified.

CONCLUSION
In conclusion, developmental and neuro-scientific approaches offer a wealth of knowledge about the self. Developmental research has found
that self-perception occurs at about 15 months and any recognition prior to this is most likely due to contingent action learning (e.g. Rovee-Collier, 1993; Pervin, 2003). Self-consciousness follows the acquisition of self-perception and is reflective of the development of higher cognitive processes (Lewis, 1990a).

The depth-of-processing effect has provided evidence in support of enhanced self-referential memory and this has been associated with higher activation in the MPFC. Research has also suggested a self-specific response from the MPFC with regard to self-relevant information processing (Heatherton et al., 2007). Furthermore, Mayberg and colleagues (2005) found that certain disorders of the self may be remedied as a result of research into the relationship between the vACC and depression.

Nonetheless, reservations regarding the objectivity of the study of the self have been expressed. In order to tackle this issue developmental and neuro-scientific research has adhered to a stringent scientific method, with for example, the use of functional imaging and video equipment. In contrast to the claims made by Holland (1997) and as might be expected, neither approaches rely on discourse analysis as a means of sourcing evidence. The debate surrounding the study of the self will continue for many years. Research in the paradigms of Developmental and Neuropsychology have provided sufficient evidence that the self can be studied empirically, however, in order to achieve greater clarity and coherence a clear definition of the self is greatly needed.

REFERENCES


