I am the boss of me:

The executive function of self-awareness in 3- and 4-year-olds

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Dedication

"Some people are scared of children, but they shouldn't be, they're just little people with some peculiarities………much like women"

Dr. Robin Campbell. Lunch conversation, 2007.

"I made you out to be a kind of Einstein-like figure, so you don't have much to live up to. Let your hair grow and buy a false moustache."

Dr. Robin Campbell. Email correspondence 11th July 2008.

Robin, your questionable advice lured me into academia, and your questionable references keep me here. Without question, without you, this thesis would not exist.

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Declaration

I declare that the work undertaken and reported within this thesis is my own and has not been submitted in consideration of any other degree or award.

Josephine Ross

Dissemination

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Abstract

The current research explored the thesis that cognitive self-recognition might have an executive function in 3- and 4-year-olds. Although it is well established that children recognise themselves in mirrors by the end of infancy, the cognitive and behavioural impact of this capacity has yet to be elucidated. Experiments 1 to 6 showed that preschool children could form and maintain a cognitive link between the self and external stimuli, as a result of which, self-referent stimuli were given mnemonic priority. Experiments 4 to 8 indicated that in tasks involving self-recognition, 3- and 4-year-olds' ability to process other-referent stimuli was compromised by self-focus. Finally, Experiments 9 and 10 demonstrated that mirror self-recognition increased preschoolers' tendency to self-regulate, leading them to behave in line with socially accepted standards. Together, these experiments provide novel evidence to confirm that cognitive self-recognition has a role in preschoolers' performance on tasks requiring memory, attention, inhibition, and planning. This implies that when salient, the self may become the ultimate executer of behaviour. By observing 3- and 4-year-olds' differential processing of self- and other-referent stimuli we infer the existence of a functionally active, self-reflective agent. Moreover, the role of the self is temporally extended, influencing children's cognition and behaviour in the past (Experiment 1 to 3), present (Experiments 4 to 8) and future (Experiments 9 to 10). This implies that preschool children may have developed the foundations necessary to build the experience of personal identity.

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1. The Self in development

Most simplistically described as the belief "I am me, I was me, I will be me", personal identity is a universally experienced, yet under researched, phenomenon. In making the claim "I am me, I was me, I will be me" we refer to distinct aspects of the self. A distinction can be made not only between the self in the past, present and future, but between the agentive "I" and the descriptive "me". Indeed, William James (1890) was the first to make this distinction, breaking self-knowledge into various categories (material, social, spiritual), and referring to the "I" self as the keeper of this knowledge, greater than the whole of its parts. Modern researchers have followed suit, seeking to understand self-awareness by categorising various aspects of the self (for example see Duval & Wicklund, 1972; Neisser, 1988; Lewis 1991). However, the sum of these parts has largely been left to philosophical enquiry. Moreover, in modern research, the Jamesian "I" is often equated with the self perceived subjectively, contrasting this to objective self-knowledge. However, agency is experienced both subjectively and objectively. It requires explicit self-reflection to abstract from the sum of parts the claim for "I". Likewise, subjective experience arises from many aspects of objective knowledge (consider the knowledge "I am charitable").

Perhaps understandably, psychologists have preferred to avoid this overlap, studying the self in strict dichotomy. However, over a century since James' (1890) dissection of the self, attempts to put the self back together again are arguably long overdue. This is regrettable as James (1890), and subsequently Mead (1934), offered a relatively simple empirical route to the study of the elusive "I". They suggested that agentive experience of personal identity might be measured by focusing on the consequences, as opposed to the content, of self-reflection. The idea here is that in observing the cognitive or behavioural impact of self-reflection, we infer the existence of a reflective agent. The aim of the current thesis is to use this method to explore the ontogeny of self-reflection, and by inference, the experience of personal identity. The present chapter begins by reviewing evidence for the onset of the capacity for objective self-reflection. Although self-reflection is both a subjective and objective process, discussion of a full sense of personal identity cannot begin until the capacity to explicitly acknowledge one's agency is proven. Having assessed this evidence, the specific aims and methodology of the research to follow is introduced.

1.1 The development of objective self-reflection

Supporting a precocious capacity for self-recognition, newborn infants discriminate their own cries from those of others, failing to show contagion of distress when exposed to their own, rather than another infant's pre-recorded cry (Martin and Clark, 1982; Dondi, Simion, Caltran, 1999). Moreover, by 3 months of age, infants appear to discriminate their own image from the images of others. Field (1979) demonstrated that 3-month-olds show decreased social and cardiac responses to their own mirror-image versus the equivalent visual stimulus of a peer. Further, Bahrick & Watson (1985), and Legerstee, Anderson & Shaffer (1998) show that 3- and 5-month-old infants are already habituated to their own image, preferring to view a live video image of a novel peer. In support, Legerstee, Anderson & Shaffer

(1998) and Rochat & Striano (2002) report that at least by 4 months, infants make significantly more social responses (vocalising and smiling) to live representations of other people, even when contingency is controlled for through mimicry.

However, children do not behave as though they have a cognitive understanding that they are the object reflected in the mirror until the end of infancy. This aspect of self-awareness is measured by the mirror mark test of self-recognition (independently developed by Gallup, 1970 for use in comparative research, and Amsterdam, 1972 for use with infants). In this test, children are surreptitiously marked (classically with rouge) in a visually inaccessible area (such as the forehead). When a mirror is introduced, children are expected to take appropriate mirror guided action, reaching for, or trying to remove the mark. This behaviour indicates that the child has inferred a relationship between the mirror image and themselves. In other words, they have cognitively identified themselves as an object in the environment. The finding that children typically fail the mark test of mirror self-recognition under the age of 18 to 24 months is robust (see Anderson, 1984 for an early review; later papers include: Asendorf & Baudonniere, 1993; Asendorf, Warkentin & Baudonniere, 1996; Vyt, 2001; Howe, Edison & Courage, 2003; Courage, Edison & Howe, 2004; Lewis & Ramsay, 2004; Nielsen, Dissanayake & Kashima, 2003; Nielsen & Dissanayake, 2004; Bard, Todd, Bernier, Love & Leavens, 2006; Nielsen, Suddendorf, & Slaughter, 2006).

Importantly, younger infants do not fail the mark test due to an inability to follow task requirements. Prompts drawing attention to the marked area, or asking children to wipe the mark with a tissue, do not alter behaviour (Howe, Edison & Courage, 2003; Courage, Edison & Howe, 2004). Likewise, younger infants perform well when asked to attend to directly visible marks on their mother's face (Lewis & Brooks-Gunn, 1979), a doll's face (Bard *et al*, 2006; Asendorf, Warkentin & Baudonniere, 1996), or their own hand (Nielsen, Dissanayake & Kashima, 2003). Comparing infants with and without prior exposure to mirrors, Priel & de Schonen (1986) showed that although locating other objects using the mirror was related to previous experience of reflective surfaces, self-directed behaviour was not. In doing so, Priel & de Schonen (1986) supported the cross-cultural validity of the test. Although there appear to be cultural variations in the onset of mirror self-recognition within the 18 to 24 month window, later work has supported this conclusion (Keller, Yovisi, Borke, Kärtner, Jensen, & Papaligoura, 2004).

Priel & de Schonen's (1986) results imply that prior experience of mirrors is not necessary for contingency detection between self and mirror image. However, in populations where mirrors are common, it is not clear if contingency detection between self and image precedes mirror self-recognition. Lewis and Brooks-Gunn (1979) reported that 8-month-olds spent significantly longer attending to a live image of themselves than a delayed self-image, or a pre-recorded image of another child. Likewise, Field (1979) reported that, although reacting more positively to an image of a peer, 3-month-old infants spent longer looking at their mirror image. However, as noted, several other researchers report that infants prefer images of others to contingent images of themselves (Bahrick & Watson, 1985; Legerstee, Anderson & Shaffer, 1998; Rochat & Striano, 2002). Although the direction of bias differs, these studies imply that very young infants distinguish displays on the basis of contingency or familiarity. However, in a recent longitudinal sample of 9- to 24-month-old infants, Nielsen, Dissanayake & Kashima (2003) failed to find a significant preference in either direction prior to 18 months. Tracking preferences individually, infants began to prefer their own image to that of a peer (as opposed to looking equally at both images) only in the session where they first demonstrated mirror self-recognition as measured by the mark test.

A less ambiguous measure of contingency detection is provided by object search studies; however, the results remain equivocal. Bertenthal & Fischer (1978) and Bigelow (1981) demonstrated that prior to mirror self-recognition, infants are able to use the mirror to guide their search for objects; for example, reaching up to a hat held above their head, or turning around to fetch a toy. However, more recently, Vyt (2001) and Courage, Edison & Howe (2004) have shown that the ability to use reflective surfaces to infer the location of objects is variable in onset, sometimes preceding and sometimes following mirror self-recognition. Perhaps as a result, using the mirror to guide searches for objects appears statistically unrelated to mark directed behaviour. Nevertheless, in support of a role for contingency detection, identification of self in the mirror typically precedes identification of the self in static photographs by a few months (Lewis & Brooks-Gunn, 1979; Brooks-Gunn & Lewis, 1984; Johnson, 1982; Courage, Edison & Howe, 2004). This implies that physical representation of own features can, at least briefly, be dissociated from cognitive identification arising from proprioceptive feedback.

Perhaps the clearest evidence for the importance of contingency is provided by Povinelli, Landau & Perilloux (1996), who demonstrated that 2-year-old children fail non-contingent mark tests of self-recognition. To manipulate contingency, Povinelli, Landau & Perilloux (1996) showed children photographs or videos depicting a marking event which had taken place 3 minutes earlier. Despite labelling these images as self-referent, the majority of 2-year-olds failed to reach for the mark until a contingent stimulus (the mirror) was introduced. Further, it was not until the age of 4 years that the majority of children exhibited mark directed behaviour. Povinelli, Landau & Perilloux (1996) interpret this result as implying that 2- and 3-year-olds cannot objectively connect the experience of past and present selves. In support, 2- and 3-year-olds appear to be aware of the capacity for photographs and videos to reflect other aspects of reality; they can be trained to use these stimuli to guide their search for objects (Suddendorf, 2003; Troseth, 2003; Skouteris, Spataro & Lazaridis, 2006; Skouteris & Robson, 2006; Skouteris, Boscaglia, & Searl, 2007). However, implying that the developmental lag in delayed self-recognition is not as wide as originally proposed, this training facilitates 3-year-olds' mark directed behaviour (Skouteris, Spataro & Lazaridis, 2006; Skouteris & Robson, 2006).

Even with video-guided training, 2-year-olds fail the delayed test (Skouteris, Spataro & Lazaridis, 2006; Skouteris & Robson, 2006; Skouteris, Boscaglia, & Searl, 2007). Nevertheless, it is not clear that 2-year-olds' failure is due to a lack of self-awareness. Note, when children use mirrors and delayed videos to search for objects, they have no existing representation of the location of the object prior to the "clue" being provided. On the contrary, Zelazo, Sommerville & Nichols (1999) argue that assuming the existence of an internal self-representation, the mark test requires children to process conflicting representations. Specifically, in both immediate and delayed mark tests, children should experience conflict between an internal self-representation (not marked) and an external self-representation (marked), causing them to take action. Indeed, 2-year-olds' successful labelling of self-image in the delayed mark test implies that they match featural aspects of the display to an internal self-representation[1]. However, in the absence of kinaesthetic matching, it appears that the external self-representation is not sufficiently convincing to induce a change in belief, from not marked, to marked. Put simply, this result implies that 2-year-olds value their own self-perception over the novel perception provided by the video or photograph. Although this implies that 2-year-olds may value subjective feedback over objective reasoning when making decisions, it is difficult to characterise their obstinate stance (I am/was not marked) as a failure of self-conservation.

Moreover, there is evidence to suggest that 2-year-olds mistrust video self-representations even when they are live. As implied by the above literature review, it is generally assumed that live video footage is an adequate mirror substitute. However, Povinelli, Landau & Perilloux (1996; Experiment 3) found that only 60% of 3-year-olds passed the mark test in this medium. In response to this, and similar findings (Johnson, 1982; Vyt, 2001), Suddendorf, Simcock & Nielsen (2006) directly compared mirror self-recognition and live video self-recognition in a

[1] For contingent mark tests one need not assume that the youngest children hold a mental representation of their features; however, once self-labelling and self-recognition in photographs is demonstrated, this would appear a valid assumption.

sample of 2 to 3-year-olds. Strikingly, although 90% of 2-year-olds passed the mirror test, only 35% passed a mark test using a live video. Tallying with the revised pass mark for the delayed test, success in the live video test did not match that of the mirror mark test until the age of 3 years. This result was replicated by Skouteris, Boscaglia, & Searl, (2007). Although Demir & Skouteris (2008) demonstrated that 2- and 2.5-year-olds' ability to pass the live mark test could be improved by training, performance was not brought to ceiling. This result implies that video-based tasks put younger children at a disadvantage even when contingency is held constant.

Perhaps as a result of such concerns, an alternative task for self-awareness in which self-reflection is fully internalised has recently been revived. Inspired by the observations of Piaget (1953/1977); Geppert & Kuster (1983) and Bullock & Lutkenhaus (1990) tested whether young children sitting on a mat appreciated that their body weight was an obstacle when attempting to hand the mat to the experimenter. They found that passing this task ontogenetically (Bullock & Lutkenhaus, 1990) and longitudinally (Gepper & Kuster, 1983) preceded mirror self-recognition. More recently, Moore, Mealiea, Garon & Povinelli (2007) have developed a new apparatus, designed to provide a less familiar (and so less easily solved) problem. In this task, children are placed on a rug which is attached to the axle of a shopping trolley, and encouraged to push the trolley towards their mother. However, in order for the trolley to move, children first have to step off of the rug. To 15-month-olds' evident frustration, the need to remove one's body weight is not appreciated until 18 to 21 months of age. As might be expected, Moore *et al* (2007) found that passing this task strongly correlated with mirror self-recognition. However, unlike mirror self-recognition, which at least in later stages involves feature matching, this task does not imply accurate knowledge of the body. Brownell, Zerwas, & Ramani (2007) demonstrated that the majority of 18- to 26-month-olds make body representation errors, such as attempting to put on dolls' clothes, sit on dolls' chairs, or squeeze through spaces which are too small.

Despite recent controversy concerning video self-representations, it is commonly accepted that mirror self-recognition is indicative not only of embodied or featural self-awareness, but a wider sense of self-reflection. This conviction is supported by concurrent developments in linguistic and affective domains. For example, from around 18 months of age children begin to refer to themselves using their own name, and as early as 20 months show systematically correct usage of first- ("I, me, my, mine") and second-person ("you, yours") pronouns (Brown, 1973; Bates, 1990; Hay, 2006). Implying that linguistic self-reference is premised on objective self-recognition, children who pass the mirror mark test use more self-other differentiation in language than non self-recognisers (Lewis & Ramsay, 2004; Courage, Edison & Howe, 2004). Moreover, children's verbal labelling of the mirror image typically lags slightly behind nonverbal behavioural indicators (Amsterdam, 1972; Bertenthal & Fischer, 1978; Harter, 1983; Pipp, Fischer & Jennings, 1987; Bard *et al*, 2006).

Acting on Amsterdam's (1972) observation of self-admiring and coy mirror behaviour in 21- to 24-month-olds, Lewis, Sullivan, Stranger & Weiss,

(1989) confirmed that embarrassment (averted gaze with smile, blushing, facial touching) typically occurred for self-recognisers, but not non self-recognisers, both in front of the mirror and in public exposure situations (for example, being asked by the experimenter to sing). Children's empathetic reactions to others' distress (as measured by sad facial expressions, prosocial helping, sharing, and comforting behaviours) have also been repeatedly linked to the onset of mirror self-recognition (Johnson, 1982; Bischof-Kohler, 1991; Zahn-Waxler, Radke-Yarrow, Wagner & Chapman, 1992). These results are notable, as to feel embarrassment or empathy, one must consider oneself as other, i.e. pass an emotional analogue of the mirror test. However, cognitive and emotional consideration of self and other is not complete at age 2 years. Self-conscious emotions involving evaluation of self to a standard (for example, pride, shame) are not established until at least 3 years of age.

For example, Heckhausen (1984 and later Stipek, Recchia & McClintic, 1992) observed in a number of studies that following success in a competitive task 3- and 4-year-olds (but not 2-year-olds) looked toward their competitor, stretched their body and arms upwards and displayed positive affect. Following failure, the children no longer made eye contact, their body shrunk downwards, and they displayed negative affect. These reactions are consistent with the pro-typical expressions of pride and shame. Further, Lewis, Alessandri & Sullivan (1992) demonstrated that by the age of 3 years, children show more pride when succeeding on difficult than easy tasks, and the converse for failing and shame. This confirms that children's reactions are not simply based on positive and negative outcomes. More recently Kochanska, Gross, Lin & Nichols (2002) reported that the level of self-recognition reflected in language and behaviour at 18 months correlated with "guilty" behaviour (averted gaze, body tension, distress) following a staged mishap in the laboratory at 22 and 33 months. Mother's reports of naturally occurring guilty reactions (averted gaze, body tension, distress, seeking reparation) increased during this period.

1.2 The current thesis

The above literature review ends with the culmination of the capacity to reflect on oneself, instrumentally (mark directed behaviour/removing body as obstacle), linguistically (self-referent language), and emotionally (self-conscious and self-evaluative emotions). This end point is justified, not only theoretically, but by necessity. Between the ages of 2- and 4-years, the research reviewed is largely all that is available in experimental psychology[2]. In introducing the six empirical chapters in the current volume we will encounter some further research that is relevant to our aims. However, in no case does this existing research offer an established view of the early development of objective self-awareness beyond mirror self-recognition. Moreover, beyond mark directed behaviour or exposure emotions, the direct consequences of preschoolers' self-reflection are yet to be determined. For this reason, the aims of the current thesis are warranted not only by the need to consider the self as a whole entity, but by the need to elucidate the ontogenetic development of the agentive self.

[2] Research concerning the development of children's self-concepts taken from self- and parental report is not reviewed here due to confound between self-expression and increasing vocabulary skills. However, see Eder (1990) for evidence to suggest that children as young as 3 years can provide consistent reports of their typical temperament and behaviour.

A series of ten experiments will be reported, in turn, testing the extent to which preschoolers' cognition and behaviour imply the subjective and objective belief "I was me", "I am me", and "I will be me". A clear distinction between these aspects of self-awareness, as for subjective and objective experience of the self, is arguably illusory. However, appreciation of the self as a temporally continuous agent is necessary for a full experience of personal identity. Further, as implied by Povinelli, Landau & Perilloux's (1996) research, the extent to which children younger than 4 years understand the self as an extended entity is yet to be established. Two key routes to measuring the role of personal identity in cognition and behaviour are adopted. Firstly, if an agent is self-reflective we should expect to see a difference in the cognitive processing of self- as opposed to other-referent stimuli. This hypothesis is tested in reference to children's encoding and retrieval of events (Chapters 2 to 4), and their inhibition of typical processing responses (Chapter 5). If the agent is not only self-reflective but self-evaluative, we might also expect children to adhere to salient standards as a result of self-focus (Chapters 6 and 7). This hypothesis is tested in direct reference to the predictions of Duval & Wicklund's (1972) theory of objective self-awareness, one of the earliest theories to consider self-consciousness as a functional phenomenon.

In line with other researchers, Duval and Wicklund (1972) dichotomise self-awareness, suggesting that self-focus results in explicit and objective self-awareness, whereas external focus renders self-awareness implicit and subjective. However, contrary to the majority of theorists, Duval & Wicklund (1972) recognise the role of subjective processes in contributing to our experience of objective identity. Specifically, Duval & Wicklund (1972) suggest that objective self-focus typically results in positive or negative affect, dependent on one's perceived consistency with a salient internalised standard for self. As a result of this self-evaluation, those who judge themselves inconsistent with the standard will either adjust their behaviour to conform, or withdraw from the evaluation-inducing situation. In this way, cognitive and affective equilibrium regarding the self is maintained. Any stimulus which reminds one of the self as an object (for example, mirrors, audiences, personal narratives or reports) will induce self-focused attention, and in turn, self-evaluation. Importantly, Duval & Wicklund (1972) recognise that without subjective identification with the self, the motivation to self-regulate is absent[3].

Support for the central tenets of Duval & Wicklund's (1972) theory is plentiful (for reviews see Gibbons, 1990; Fejfar & Hoyle, 2000; Silvia & Duval, 2001a). However, the earliest work offers the simplest illustration of Duval & Wicklund's (1972) predictions. Support for the assumption that external stimuli can lead to self-focused attention is neatly demonstrated by Davis & Brock, (1975) (and more recently by Stapel & Tesser, 2001). They asked adults to guess the correct

[3] Higgins' (1987) self-discrepancy theory offers a similar viewpoint. However, Higgins (1987) predicts different affects dependent on whether the situation dictates that the actual self (self-perceived now) is compared to the ideal self (wishes and aspirations) or the ought self (duties and obligations). However, Duval & Wicklund's (1972) less fractionated model is better suited to the current aims. Similarly, Carver & Scheier (1998) have introduced a cybernetic feedback model of self-awareness, inspired by and extending objective self-awareness theory. Duval has also contributed to extension of his theory, publishing 'Self-awareness and causal attribution theory' (Duval & Silvia, 2001) to deal with complex behaviour predictions dependent on the attribution of responsibility. However, as the basic chain of events remains unchanged, and the aim was to detect functional self-reflection rather than model it, Duval & Wicklund's (1972) original and well supported model was considered the most appropriate frame of reference.

pronoun when reading a foreign language; those exposed to a mirror interpreted significantly more pronouns as being personal (I, me, my) than those in the control group. Support for Duval & Wicklund's (1972) idea of the behavioural consequences of objective self-awareness is clearer still. Carver (1975) found that participants who claimed to oppose punishment as a method of learning gave fewer electric shocks to others in the context of an experiment than those who did not oppose punishment. The converse also held. Crucially, though, this effect was only significant when a mirror was present. In other words, self-standards had a functional impact on behaviour only when attention was self-focused. Similarly, Diener & Wallbom (1976) found that whereas 71% of undergraduates cheated on an anagram task when seated in a room without a mirror, only 7% did so when the mirror was present. These experiments suggest that self-focus promotes adherence to behavioural standards, the breaches of which are known to be the antecedents of self-conscious emotion (guilt, shame, embarrassment).

Despite over 30 years of research refining Duval & Wicklund's (1972) theory, and considerable interest in moral development (see Eisenberg, 2000 and Kochanska & Aksan, 2004 for review), little attention has been given to the ontogeny of these effects. Thus, a primary aim for the current research was to determine if preschool children behave as though self-aware as predicted by Duval & Wicklund's (1972) model. In addition to testing the morally valanced aspects of Duval & Wicklund's (1972) theory (Chapters 6 and 7), attempts are made to determine if the introduction of an opportunity for explicit self-focus impacts upon non emotive aspects of cognitive processing (Chapters 3 and 4). This was judged important as the developmental lag between the onset of exposure emotions and evaluative emotions suggests that the capacity to self-focus and the capacity to self-evaluate are dissociable. Following full discussion of the motivations, methods, and results of each experiment, the current volume culminates with a summary of what this research implies for preschoolers' subjective and objective experience of self-reflection. Given the lack of prior research in this area, suggestions for future research are a recurrent theme, revisited and extended in the final chapter. Although characterising the sum of self-awareness available to preschoolers was never likely to be achievable in the context of a single project, the key contribution of the present thesis is to offer novel methodology which has the potential to elucidate this complex phenomenon.

1.3 Methodological note

In total, 771 preschool children were recruited, with parental consent, from thirteen mixed demographic nurseries in Stirling, Scotland. In most cases testing took place in a separate room within the nursery building. Each study used a roughly equal number of boys and girls. Although children as young as 2.5 years participated in the research, the target age-range for comparison was between 3 and 4 years. This demographic was targeted as by the age of 3 years, typically developing children's ability to self-recognise linguistically (necessary in Chapters 2 and 3), in mirrors (necessary in Chapters 4 to 7) and photographs (necessary in Chapters 4 and 5) can be safely assumed.

The research used a variety of methods, described in full for each experiment. Means (M) and standard deviations (SD) are reported for relevant data (in Figures standard deviations are shown as error bars). All statistical analyses are two-tailed and where possible exact p values are reported. For quantitative data, multivariate and mixed models analyses of variance (ANOVAs) are used to investigate main effects and interactions; in both, age-group is used as a between-subjects factor, together with experimental conditions where appropriate. Post-hoc Bonferroni tests are used to explore between-subjects effects, and split sample analyses for mixed level interactions. For all ANOVAs partial eta squared (η_p^2) is presented as an estimate of effect size. This value can be interpreted following Cohen's (1969) criteria: $\eta_p^2 > 0.2$ large, > 0.1 medium, and > 0.05 small. Occasionally, Pearson's correlations are used to explore age-effects where age-group analyses are not appropriate, or to compare performance across tasks. Where relevant, above chance performance is assessed using probability calculations and one-sample t-tests. Finally, for qualitative data presented in Chapters 6 and 7, non-parametric signed-rank tests (Friedman's *k* related samples, Wilcoxon's paired samples) are used for within-subject comparison, and Pearson's chi-square analyses are used to explore the distribution of behaviour within conditions.

2. Self-reflection and the self in the past I

An important component of personal identity is recognition of the continuity between past and present selves. One of the ways in which adults express this knowledge is through autobiographical event narratives. In describing their role in past experiences, adults are expressing their ongoing identification with a past self. For this reason the reporting of autobiographical memories can be considered an explicit expression of self-conservation. However, autobiographical memories cannot be reduced to external expression. To access and maintain information pertaining to one's involvement in a past event requires an internal, autobiographically organised system. It is arguably this system, as opposed to its product (a narrative), which is at the root of personal identity. Following this reasoning, Chapters 2 and 3 aim not to elicit early autobiographical event narratives, but to experimentally assess the extent to which the self has an active role in event memory in the preschool years.

Complementary to cross-cultural studies emphasising the pervasiveness of autobiographical life narratives (see Fivush & Haden, 2003), there is a large body of research suggesting a general mnemonic advantage for material which has been encoded as relevant to the self. The subject-performed task effect (SPT) refers to an established memory bias for action statements that have been acted out relative to statements recited verbally, or witnessed being performed by others (see Engelkamp 1998, for review). This effect is thought to occur due to the greater depth of processing involved in an event in which one actively engages. The cognitive equivalent, a memory bias for adjectives judged to be self-descriptive relative to those processed without reference to the self, is known as the self-reference effect (SRE) (see Symons & Johnson, 1997 for meta-analysis).

The SPT effect and SRE are well established in adults; however, relatively few studies have addressed the ontogeny of these phenomena. This neglect is regrettable as the emergence of a mnemonic bias toward self-related material is relevant to the development of both self-awareness and autobiographical organisation in memory. The SRE is thought to be based on the organisational properties of a highly elaborated self-concept (Symons & Johnson, 1997). By contrast, the SPT effect is often considered to be based on lower-level proprioceptive feedback (for example, Engelkamp, 1998). According to this interpretation, physically experienced events are processed at a deeper level than passively experienced events without recourse to cognitive identity. However, there is evidence to suggest that at least when comparing memory for self-performed versus other-performed actions, the SPT effect relies on higher level self-awareness.

Firstly, children with clinical impairments in objective self-awareness fail to show self-reference effects in social paradigms. Millward, Powell, Messer & Jordan (2000) tested free- and verbally prompted recall for target events experienced by autistic and normally developing children on a 25-minute walk. Half of the target events were experienced by the child, and the remainder by a companion. After they had returned from the walk, Millward *et al* (2000) found that normally developing 5- to 6-year-olds remembered and expressed more information relating to events they had actively experienced. However, autistic children of the same verbal mental age showed the opposite bias, recalling more information about the experiences of their companion. Confirming that asymmetrical performance is not traceable to a lack of proprioceptive engagement, Summers & Craik (1994) reported that both normally developing and autistic children (each with an average mental age of 5 years) showed the same magnitude of bias for recognition of self-performed versus self-verbalised tasks. Consequently, it has been argued that although children are capable of benefiting from agency on a proprioceptive basis (for further evidence see Williams & Happe, 2008), they fail to take (or at least to capitalise on) the cognitive perspective of the self in memory (Powell & Jordan, 1993; Russell & Jarrold, 1999).

Secondly, in typically developing children, the bias for self- versus other-performed actions is tempered by the level of cognitive identification with “other”. Baker-Ward, Hess & Flannigan (1990) asked 5- to 8-year-old children to take turns performing 21 actions with objects and later to recall the actions made. Children were questioned immediately after the play session, and again three weeks later. Some of the children were also questioned about the event in the intervening weeks. Baker-Ward, Hess & Flannigan (1990) found that regardless of timeframe, repeated questioning, or age, children showed a bias for correct recall of actions they had performed relative to those they had observed being performed by randomly selected classmates. However, in a second study, Baker-Ward, Hess & Flannigan (1990) showed that the mnemonic advantage for self-performed actions disappeared when contrasted with memory for actions performed by the children’s most regular playmates. It is possible that self-performed actions were well remembered due to subjective feedback, whereas actions performed by highly familiar others benefited from their association with an elaborated person-concept. However, it is difficult to see how cognitive familiarity could play a role for other's actions, but not for own.

Millward *et al* (2000) and Baker-Ward, Hess & Flannigan's (1999) research confirms that higher-level cognition plays a mediating role when comparing memory for self- and other's actions. For this reason, investigation of the functional effect of self-reflection on memory need not preclude action-based paradigms. Indeed, the use of physical play seems better suited to developmental research than the complex processing of word lists required by the standard SRE. Nevertheless, researchers using the standard SRE paradigm have had some success in demonstrating an effect for young children. For example, Bennett & Sani (2008) have recently demonstrated a SRE for trait descriptions in a sample of 5-, 7- and 10-year-olds. Children recalled more simple adjectives (clever, friendly, funny, greedy, happy, messy, naughty, noisy, small, and rough) which had been processed with the question "Do you think you are _____?" than those processed semantically (Do you think ___ means the same as ____ ?). Pullyblank, Bisanz, Scott & Champion (1985) earlier reported positive results in a similar study comprised of 7- and 10-year-olds. Like the SPT effect studies reviewed above, neither of these SRE studies uncovered a significant interaction between mnemonic self-bias and age, implying that the effects of self-involvement are functional in children as young as 5 years.

Interestingly, Bennett & Sani (2008) found that answering the question "Do you think people in your family are ______?" also led to better recall than semantic processing. This effect, reminiscent of the equalising effects of familiarity found by Baker-Ward, Hess & Flannigan (1990), has been repeatedly found in SRE studies using adult participants. This has led to the criticism that mnemonic self-bias is premised on familiarity, as opposed to self-awareness per se (see Symons & Johnson, 1997). However, social research strongly suggests that identification with a social group (comprised of familiar others) is a major aspect of an elaborated self-concept (see Johnson, Gadon, Carlson, Southwick, Faith & Chalfin, 2002, Bennett & Sani, 2008). In others words, both self-processing and familiar other processing seem likely to involve recourse to cognitive identity. Moreover, it is difficult to see how self-awareness and familiarity could, or should, be separated. The self is by definition, uniquely familiar. Likewise, given the continuous link the self provides between encoding and retrieval conditions, it is arguably in a unique position to facilitate memory. Most importantly, whatever the "specialisation" of the underlying mechanism, the minimum requirement for a cognitive SRE is self-recognition.

Using a new paradigm, especially designed to circumvent the complexity of trait adjectives and semantic judgements, Sui & Zhu (2005) also provide evidence that SREs occur in children as young as 5 years old. Sui & Zhu (2005) presented 4-, 5- and 10-year-old children with pictures showing various objects being pointed to by a generic figure. To manipulate self-referencing this figure was altered to include a photograph of either the child's own or an unfamiliar child's face. For each presentation the child was asked to report who was pointing to the object. After a short distraction task, Sui & Zhu (2005) introduced a surprise recall test for the encoding phase. They found that although all age-groups were above chance in monitoring who had pointed to the objects they recalled, only 5-year-olds named significantly more of the objects associated with their self-image than those associated with the other image. Ten-year-olds showed a non-significant bias towards self-referent material, and 4-year-olds a non significant bias in the opposite direction. In a second experiment, Sui & Zhu (2005) demonstrated that when the task demands were sufficiently challenging for 10-year-olds, they also showed a significant SRE.

Sui & Zhu's (2005) study is perhaps the first to directly assess the impact of self-recognition on memory in children under the age of 5 years. Both Howe, Courage & Edison (2003) and Harley & Reese (1999) found that mirror self-recognition had a positive effect on very young children's event recall; however, their tests of self-recognition were parallel to, rather than integrated with the memory task. There was no attempt to elicit or measure autobiographical organisation of the to-be-remembered event. In interpretation of their results, Sui & Zhu (2005) suggest that prior to the age of 5 years, children's self-concepts, although present, may not be sufficiently elaborated to have a functional effect on memory. However, adults report autobiographical details of events occurring between the ages of 3 and 4 years (Pillemer & White, 1989). Importantly, for an adult to remember details of an event as it happened to them as a child, a link between the adult and child self must be maintained. It is difficult to see how this link could persist if the event details were not originally encoded as self-referent. This suggests that the impact of the self on the organisation of event memories begins in the preschool years, and that Sui & Zhu's (2005) conclusion is open to challenge[4].

2.1 Experiment 1

SRE/SPT paradigms appear well suited to investigating the development of autobiographical organisation in memory because they make a functional link between self-reference and memory. Moreover, in contrast to pass/fail mark tests of mirror self-recognition, the magnitude of the SRE/SPT effect is likely to be a relatively sensitive tool to measure developmental change in self-reflection. Due to the preliminary nature of the investigation this potential has yet to be fully explored. To investigate the onset of functional self-awareness in memory, Experiment 1 used a new paradigm which aimed to combine the investigation of SRE and SPT effects using a delayed measure of one week. A delay of one week was chosen to determine if the SRE was maintained in long-term memory (necessary to be considered autobiographical). To manipulate subjective self-reference, children were asked to take turns with the experimenter to perform actions. To manipulate objective self-reference, each action was introduced by one of two cartoon peers; a boy and a girl. Concepts of own gender and age-group are among the first aspects of self-knowledge expressed (Stipek, Gralinski & Kopp, 1990). To further stimulate identification with gender-matched peers, this character was given the same name as

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[4] See Chapter 4 for further discussion of Sui & Zhu's (2005) result.

the child. This explicit label provides one of the simplest entry points to activate self-recognition. Although our own name is highly (if not uniquely) familiar, it is also inextricably linked, post objective self-awareness, with the idea of “me”.

One motivation for combining SRE and SPT effects in the same study was to ensure that the stimuli were memorable. When physically involved in an event, 5-year-olds have been shown to maintain self-bias in event memory up to three weeks later (Baker-Ward, Hess & Flannigan, 1990). If preschoolers could also maintain a SRE or SPT effect over a delay, this would imply not only a functional role for self-awareness at encoding, but a capacity for “autobiographical” retrieval. In turn, this would imply maintenance of a cognitive link between past and present selves. Another motivation to combine the study of SRE/SPT effects was to contribute new data to discussion regarding the basis of the SPT effect in social paradigms. Finding SRE and SPT effects of different magnitudes or onsets in the same age-range would imply that SRE and SPT effects are functionally distinct. Finally, as noted, in addition to providing children with physical scaffolding for the processing the stimuli, cognitive scaffolding was provided in the form of cartoon figures. An advantage of this method was that the cartoon figures provided a visual record of the actions performed in the encoding session. This allowed children’s free recall of the stimuli to be supplemented with a recognition measure. Such measures are important as young children are likely to be relatively poor at narrative encoding and retrieval of perpetually based events (see Simcock & Hayne, 2002).

Method

Participants

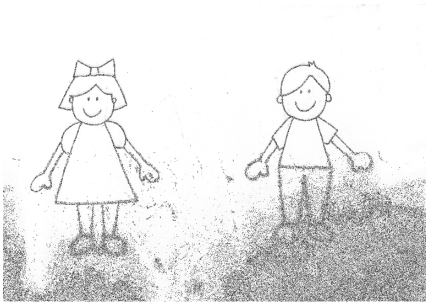
Forty-five children from three age-groups took part; 15 3-year-olds (M = 36.5 months, SD = 2.9 months, range = 31 - 41 months), 15 3.5-year-olds (M = 44.7 months, SD = 1.5 months, range = 42 – 47 months) and 15 4-year-olds (M = 53.5 months, SD = 4 months, range = 48 - 59 months). Ten additional children (six 3-year-olds, four 3.5-year-olds) were excluded due to failure to follow the procedure for taking turns in action re-enactment.

Stimuli

The experimental stimuli at encoding consisted of an introductory drawing of two preschool children (one male, one female) standing side by side and facing the viewer, and two sets of 18 A6 action cards (including two practise cards) depicting these children performing an action. In each set, half of the actions were depicted by the male, and half by the female. The actions depicted by each character were counterbalanced across sets[5]. At retrieval two sets of 16 A4 recognition cards were used, the set selected matched the action cards used at encoding. Each recognition card depicted four actions (of the same type) performed by the same actor, one of which had been introduced at encoding. All actions were comparably

[5] An equal number of actions depicted could be categorised as self-directed (acts on self with or without object), other-directed (actions directed away from self, with or without object) and actions with or without an imaginary object. Post-hoc, these action categories appeared to have no influence on performance and so are not discussed in detail.

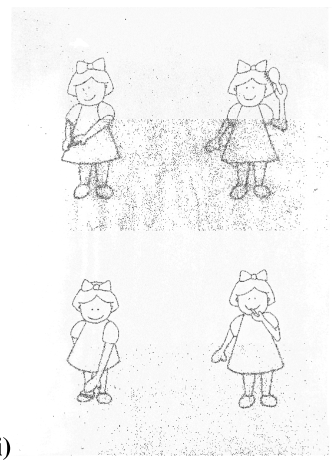
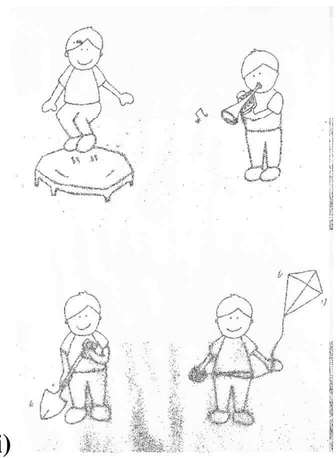
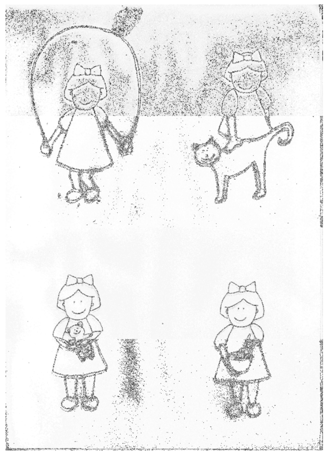
simple to perform and familiar to preschool children. Examples of the stimuli used are shown in Figure 2.1.



Introductory card

i)  ii)  iii) 

Modelled Action cards

i)  ii)  iii) 

Action recognition cards

Figure 2.1: Examples of Experiment 1 encoding and retrieval stimuli.

Procedure

In the first session children were introduced to the two cartoon characters on the introductory card (order counterbalanced). The default names of the characters were Mary and Bob. However, children were routinely told that the character of their own gender shared their own name. So, for example, for a child named Louisa, the first session would commence: “Today we’re going to see Louisa and Bob do lots of different things then we’re going to take turns acting just like them.” To ensure they understood the procedure, children were shown two practise action cards and instructed: “Let’s have a practise. Here is Louisa clapping, and here is Bob standing on one leg. I am going to clap my hands, just like Louisa (perform action). Can you stand on one leg just like Bob?” (or vice versa). Having successfully completed this practise phase children were praised and reminded only to perform actions when prompted by the experimenter. As noted, children were excluded if they failed to follow this instruction.

In the encoding phase, children were presented with action cards one at a time in random order: “Look! In this picture *name* is *description of action*”, and instructed either to perform the modelled action themselves, or watch the experimenter perform it. The procedure was counterbalanced so that child and experimenter each performed half of the actions modelled by the male child, and half by the female child. When all of the action cards had been presented the child was praised for their participation and given a sticker as a reward.

One week later, children were re-introduced to the drawings of the actors and reminded of the previous session: “Do you remember last time I was here and we met a little girl called Louisa and a little boy called Bob? Can you remember any of the things we saw them do last time?”. After responding to this free recall question, children were told that they were going to be shown some drawings to help them remember more about the previous session. A total of 16 recognition cards were introduced one at a time in random order. As noted, each recognition card showed one of the actors performing four actions, one of which had been presented at the previous session. After each of the actions on the recognition card was described briefly, the child was asked “Can you remember which of these things we saw X doing last time?” When all of the recognition cards had been presented the child was again praised and given a sticker as a reward.

Results

Recall

Only seven children (four 3.5-year-olds, three 4-year-olds) spontaneously reported any of the 16 target actions from the encoding session. Of the children reporting explicit memories of the previous session, four recalled two of the 16 target actions, and three recalled only one. The low incidence of action recall precludes statistical analysis; however, of the 11 actions recalled, the majority (seven) were self-related on both encoding dimensions (performance and model).

Recognition

On average children recognised just under half of target actions from the encoding session (M = 7.3, SD = 3.4), no children performed at ceiling. Nevertheless, a one-sample t-test indicated that this success rate was significantly greater than the 25% (1 in 4) predicted by chance ($t(44) = 6.4$, $p < 0.01$). As shown in Table 2.1, this held true for every age-group. However, although the older age-groups performed above chance in the recognition of both self and other-related stimuli, 3-year-olds' performance was above chance for self-related stimuli only.

Table 2.1: Experiment 1 recognition performance split by age-group and encoding dimension

Recognition	**Age-group**		
	3-year-old	**3.5-year-old**	**4-year-old**
Overall	M=5.6 (35%), SD=2.6 ($t(14) = 2.39$, $p = 0.03$)	M=6.6 (41%), SD=3.4 ($t(14) = 2.93$, $p = 0.01$)	M=9.8 (61%), SD=2.9 ($t(14) = 7.7$, $p < 0.01$)
Self-performed	M=2.9 (36%), SD=1.7 ($t(14) = 2$, $p = 0.05$)	M=3.5 (44%), SD=1.9 ($t(14) = 2.9$, $p = 0.01$)	M=5.6 (70%), SD=1.6 ($t(14) = 8.9$, $p < 0.01$)
Other-performed	M=2.6 (32%), SD=1.4 ($t(14) = 1.8$, $p = 0.09$)	M=3.1 (39%), SD=1.8 ($t(14) = 2.3$, $p = 0.04$)	M=4.1 (51%), SD=1.9 ($t(14) = 4.1$,$p = 0.01$)
Picture model self-referent	M=3 (37%), SD=1.7 ($t(14) = 2.3$, $p = 0.04$)	M=3.3 (41%), SD=1.8 ($t(14) = 2.8$, $p = 0.01$)	M=5.4 (68%), SD=1.8 ($t(14) = 7.4$, $p < 0.01$)
Picture model other-referent	M=2.6 (32%), SD=1.4 ($t(14) = 1.6$ $p = 0.1$)	M=3.3 (41%), SD=1.9 ($t(14) = 2.6$, $p = 0.02$)	M=4.3 (54%), SD=1.5 ($t(14) = 5.8$, $p < 0.01$)

Age had a significant main effect on the total number of actions recognised ($F (2, 42) = 8.03$, $p = 0.01$, $\eta_p^2 = 0.28$). Specifically, 4-year-old children recognised significantly more target actions than the younger age-groups (post-hoc Bonferroni tests $p < 0.01$). As shown in Table 2.2, analysis of the effect of age-group on recognition of actions from each category indicated that the 4-year-olds' advantage was particularly strong for the recognition of self-related stimuli (note η_p^2).

Table 2.2: Experiment 1 effect of age-group on recognition, split by encoding dimension

Recognition	**Between-subjects ANOVA** **Main effect of age-group**	**Post-hoc Bonferroni test**
Self-performed	$F (2, 42) = 9.7$, $p < 0.01$, $\eta_p^2 = 0.3$	4 year old – 3-year-old $p < 0.01$ 4-year-old – 3.5-year-old $p = 0.006$
Other-performed	$F (2, 42) = 2.7$, $p = 0.07$, $\eta_p^2 = 0.1$	4 year old – 3-year-old $p = 0.08$ 4-year-old – 3.5-year-old $p = 0.3$
Picture model self-referent	$F (2, 42) = 8.6$, $p = 0.01$, $\eta_p^2 = 0.3$	4 year old – 3-year-old $p = 0.01$ 4-year-old – 3.5-year-old $p = 0.006$
Picture model other-referent	$F (2, 42) = 4.3$, $p= 0.02$, $\eta_p^2 = 0.17$	4 year old – 3-year-old $p = 0.017$ 4-year-old – 3.5-year-old $p = 0.2$

Figure 2.2 shows that proportionately more self-related than other-related actions were recognised on both encoding dimensions. A 2 (self-performed versus other-performed) x 2 (self-referent actor versus other-referent actor) repeated-measures ANOVA, including age-group as a between-subjects variable, indicated a significant mnemonic advantage for both self-performed actions ($F (1, 42) = 7.2$, $p = 0.011$, $\eta_p^2 = 0.15$) and actions modelled by a self-referent actor ($F (1, 42) = 4.96$, p

= 0.031, $\eta_p^2 = 0.11$). These effect sizes are equivalent to the typical effect size found in Symons & Johnson's (1997) meta-analysis of SRE effects.

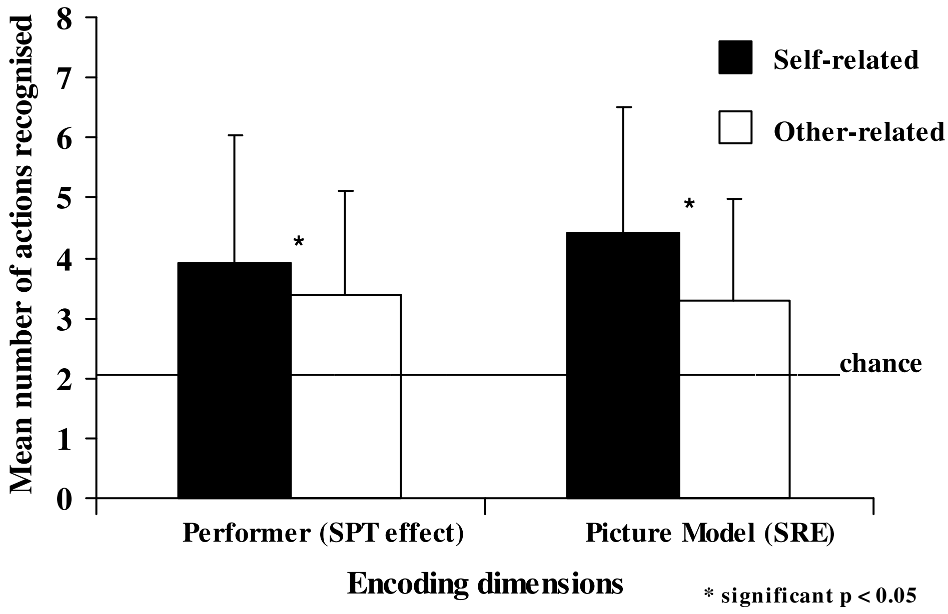


Figure 2.2: Mean number of self and other-related target actions recognised in Experiment 1

Neither self-related bias was found to significantly interact with age-group (SPT effect, $F(2, 42) = 1.9$, $p = 0.15$, $\eta_p^2 = 0.08$; SRE, $F(2, 42) = 1.7$, $p = 0.2$, $\eta_p^2 = 0.07$). Nevertheless, as evident in Table 2.1, 4-year-olds showed a larger self-related bias than the younger age-groups on both encoding dimensions. Moreover, there was developmental progression in the number of individuals expressing a bias: 60% 3-year-olds, 67% 3.5-year-olds, and 100% 4-year-olds showed a self-bias on at least one dimension.

To investigate the developmental factor further, and to determine the effect size for each age-group, a repeated-measures ANOVA investigating self-bias was run separately for each age-group. These tests indicated that the self-related mnemonic bias reached significance only for 4-year-olds (SPT effect, $F(1, 14) = 6.7$, $p = 0.015$, $\eta_p^2 = 0.3$; SRE, $F(1, 14) = 7.7$, $p = 0.021$, $\eta_p^2 = 0.3$). As shown in Table 2.1, this age-group showed a large self-reference effect on both dimensions. Although in the expected direction, the bias did not reach significance for 3-year-olds (SPT effect, $F(1, 14) = 0.3$, $p = 0.5$, $\eta_p^2 = 0.02$; SRE, $F(1, 14) = 0.7$, $p = 0.4$, $\eta_p^2 = 0.05$) or 3.5-year-olds (SPT effect, $F(1, 14) = 1.1$, $p = 0.3$, $\eta_p^2 = 0.07$; SRE, $F(1, 14) = 0.04$, $p = 0.8$, $\eta_p^2 = 0.003$).

Discussion

Experiment 1 provides evidence of a mnemonic advantage for self-related material in preschool children. By the age of 4 years, children showed a significant bias for recognising stimuli that were related physically (through performance) or cognitively (through nominal/gender matching) to themselves at encoding. This confirms that both SRE and SPT effects have an earlier onset than implied by previous research (Pullyblank *et al*, 1985; Baker-Ward, Hess & Flannigan, 1990; Summers & Craik, 1994; Millward *et al*, 2000; Sui & Zhu, 2005; Bennett & Sani, 2008). Only a few children offered free recall of the actions performed at encoding. Nevertheless, of these memories, more referred to past events in which the child had participated nominally or physically than those passively experienced. If the SPT effect was based entirely on subjective feedback, then one might expect it to precede the “objective” SRE in ontogeny. However, Experiment 1 found SPT and SRE effects of an equivalent magnitude. Moreover, the onset of significant effects was delayed until the second half of the 4th year. As the physical component was controlled in the SRE, this result lends some support to Millward *et al* (2000) and Baker-Ward, Hess & Flannigan*'s* (1990) suggestion that objective self-recognition contributes to the SPT effect, at least in social situations.

Observation of a developmental lag in the magnitude (though not the direction) of the SRE and SPT effects measured confirms that this paradigm has the potential to measure developmental change. However, it is possible that the developmental change observed in Experiment 1 is not attributable to cognitive elaboration of the self-concept. For example, younger children’s expression of the SRE/SPT effect may have been compromised by task-specific demands at encoding. Qualitative improvements occur in the understanding of external representations between the 3rd and 4th year (Zelazo, Sommerville & Nichols, 1999; DeLoache, 1991). For this reason, older children might have been better able to identify with the to-be-remembered cartoon representation than their younger counterparts. This would result in a relatively strong SRE.

Older children were less likely to need coaching in order to inhibit action performance when it was the other player’s turn. As out-of-sequence action performances would undermine the distinction between self and other-related stimuli, children were excluded from the study if they could not follow this rule. However, it was evident that for many of the younger children, this involved effortful control (for example, sitting on hands); failure to do this resulted in ten 3- to 3.5-year-olds being excluded from the experiment Similar difficulties were reported when 3-year-olds were required to follow the action instructions of one puppet but not another (Jones, Rothbart & Posner, 2003). Importantly, there is evidence to suggest that the younger children's tendency to "over-participate" in the game may have blurred the distinction between self and other-performed actions, even when suppressed.

It has been established (Foley, Passalacqua & Ratner, 1993; Foley & Rather, 1998; Ratner, Foley & Gimpert, 2002; Foley, Ratner & House, 2002; Sommerville & Hammond, 2007) that when engaged in a "turn-taking" activity, 3- to 5-year-old children internalise the actions of their playmate to the extent that they later claim the latter's actions as their own (dubbed the "I did it" bias). Importantly, under these collaborative circumstances, Foley & Ratner (1998) report that young children's memory for stimuli that were previously acted upon personally or by their partner is equivalent. Of current interest, children sometimes show a form of self-reference effect in this paradigm. Sommerville & Hammond (2007) demonstrated that 3- and 4-year-olds' learning from an activity, as measured by re-enactment of previous actions, increases as their "I did it" bias increases (Sommerville & Hammond, 2007). In other words, preschoolers' cognitive engagement with an activity appears to improve as a function of their perception of self-performance, even where this label is unwarranted. For this reason, if Experiment 1's 3-year-olds were prone to judge the actions performed as collaborative, the SPT effect might extend to both self-performed and other-performed actions.

We might also find an explanation for the observed developmental differences by considering the task demands at retrieval. Despite efforts to support their memories, the youngest children still appeared to struggle to recognise the task stimuli, performing significantly worse than 4-year-olds. Developmental improvement in recognition memory capacity was expected. However, just as it is imperative that children have an equal opportunity to encode events as self-referent, their opportunity to retrieve material should also be age-appropriate. This was the motivation for the picture recognition test. However, given younger children's difficulties in interpreting representations (Zelazo *et al*, 1999; DeLoache, 1991), a more appropriate way to support perceptual memory might have been to introduce re-enactment of the action sequences at recall and recognition. Preschool children are capable of re-enacting more actions from a previous activity than they can express verbally (Smith, Ratner & Hobart, 1987; Ratner, Foley & McCaskill, 2001). However, asking the children to enact actions at retrieval would introduce a cueing bias for self-performed actions. Only these actions would be experienced in the same mode (action) at encoding and retrieval; i.e. only the target item would constitute re-enactment. Even at recall, the instruction "show me an action from last time" is likely to preferentially cue actions that were previously "shown" by the child.

For this reason, although re-enactment is likely to prove useful in assessing the importance of the subjective aspect of the SPT effect (see Mulligan & Horstein 2003), it is unsuited to establishing its natural occurrence. By contrast, children objectively experience the cartoon picture cards in the same mode (visual) at both encoding and retrieval. The pictures led to different performance experiences at encoding, and they were likely to induce a processing bias if the child interpreted one but not the other as being self-referent. However, any systematic bias is traceable to the child (the SRE/SPT effect), not to the encoding specificity of the retrieval cue provided. For these reasons, it seems that picture recognition tests may be advantageous for determining the natural onset of SRE/SPT effects. However, one way to reduce the visual complexity of these tests would be to reintroduce objects involved in actions at encoding, as opposed to action-object models. As objects are more easily labelled than action statements, this might also reduce the linguistic demands of recall. This method gave Summers & Craik (1994) a positive result for 5-year-old children, and is used for 3- and 4-year-olds in the experiments presented in Chapter 3 of this volume.

In addition to the practical challenges of retrieval, there is theoretical reason to expect a developmental lag in long-term SRE between the 3rd and 4th year. As noted in Chapter 1, Povinelli, Landau & Perilloux's (1996) results imply that 3-year-olds may have difficulty making reference to the self in the past, at least without training (Skouteris, Spataro & Lazaridis, 2006; Skouteris & Robson, 2006). On this account, SRE/SPT effects may not have been present for younger children one week after encoding, not due to a generally unelaborated self-concept, but due to a self-specific retrieval failure. Indeed, not only were 4-year-olds better than younger children at retrieval, this was largely attributable to better recognition of self-related stimuli. However, the observation that children from all age-groups tend to be better at the recognition of self than other stimuli undermines the case for a critical deficit in self-processing. Indeed, 3-year-olds were above chance for self-related stimuli only.

Experiment 1 provides novel evidence to suggest that 4-year-olds, and possibly 3-year-olds, retrieve the self in memory in an implicit sense. Importantly, the early ontogeny of SRE/SPT effects implies that, even without the socio-linguistic structuring of autobiographical memories (see Nelson & Fivush, 2004), our cognition may be inherently disposed to give self-referent events mnemonic priority. However, this research permits no comment on children's explicit reference to the self in the past. It remains possible that the role of the self in memory is not open to conscious reflection, for either 3- or 4-year-olds. Using the current paradigm, it might have been possible to gather data on explicit awareness of the past self by asking children to report at retrieval which actor modelled an action and/or who performed it. However, asking children to source-monitor on both physical and cognitive dimensions would have constituted an overly demanding test (I performed it but he modelled it). Given the importance of explicit mnemonic self-conservation for both higher-level self-awareness and declarative autobiographical memory, the following chapter introduces a paradigm aimed at measuring the ontogeny of this capacity. Rather than SRE/SPT phenomena (to which we return in Chapter 4), an inherently memorable aspect of self-reflection was used. Specifically, the following chapter seeks to capitalise on 3- and 4-year-olds' natural propensity to claim "That's mine!".

3. Self-reflection and the self in the past II

Previous research suggests that preschool children can report detailed memories for life events after sizable delays. For example, Fivush, Hudson & Nelson (1984) reported that preschool children were able to recall and identify pictures of a museum and its layout up to 1 year after they had visited it with their playgroup. Similarly, Hammond & Fivush (1991) found that 2.5- to 4-year-old children were able to accurately answer questions about a trip to Disneyland after an 18-month delay. These studies confirm that preschool children have explicit memories of past events. The research presented in Chapter 2 suggests that the strength of children's memories in these studies is likely to benefit from their active involvement. However, the role of self-other differentiation in these early life narratives is unclear. One way to probe this factor further is to study children's memories of ownership. In encoding an object as "mine", an explicit link is made between that object and oneself. Moreover, in recovering this link, one brings knowledge of the past self to bear on self-other differentiation in the present. This has led to the suggestion that accurately claiming ownership after a delay implies self-conservation (Fasig, 2000). For this reason, Experiments 2 and 3 focus on exploring preschool children's capacity to make ownership claims based on explicit knowledge of the past self.

Through observation of children at home or in playgroups, it has been established that children as young as 2 years act as though they have an understanding of ownership. Hay's (2006) longitudinal data suggest that children begin to use the possessive pronouns "mine/yours" in spontaneous conversation with their peers by the age of 2 years. Further, Ross (1996) found that 2-year-olds were capable of making coherent arguments for ownership, distinguishing between current possession and past possession, when involved in toy disputes with siblings. Investigating how children typically acquire ownership information in social contexts, Friedman & Neary (2008) showed that 2- to 4-year-olds make implicit assumptions about ownership based on which story character first possessed an item. Providing further evidence that preschool children act appropriately on ownership information, Eisenberg-Berg and colleagues ((Eisenberg-Berg, Haake, Hand & Sadalla, 1979; Eisenberg-Berg, Haake & Bartlett, 1981) reported that 2.5- to 3-year-olds given a novel toy and told it belongs to them defended this toy in a classroom situation to a greater extent than children given a toy with the instruction that it "belongs to the class".

Of direct relevance to the claim that self-referent ownership information relies on self-awareness, Levine (1983) demonstrated that 2-year-old children scoring highly in personal pronoun production and comprehension claimed and maintained contact with their own toys to a greater extent than less verbally accomplished peers. Contrary to nominal labels, the referents of pronominal forms constantly shift depending on speaker/listener roles (Bates, 1990). For this reason, personal pronoun production and comprehension requires a capacity to reflect on the self from the perspective of another, i.e. a linguistic analogue of the mirror self-recognition. Indeed, as noted in the introductory chapter, objective self-awareness as measured by the mirror mark test predicts competency in personal pronoun use (Lewis & Ramsay, 2004; Courage, Edison, & Howe, 2004). In further support, in autism difficulties with socio-cognitive self-awareness extend to problems in the acquisition and use of personal pronouns (Tager-Flusberg, 1993; Lee, Hobson & Chiat, 1994). Note though, as “mine” is an extension of the “my/your” distinction, a correlation between personal pronoun competency and ownership as expressed verbally is hardly surprising. Despite this caveat, the link between children’s “territorial” toy behaviour and their grasp of personal pronouns confirms that children are not only paying lip service to their agency. The extent to which children are self-defining in language is linked to their capacity to behaviourally mark items as their own.

Rather than observing peer-interactions, Fasig (2000) sought to experimentally assess 2-year-olds’ ownership understanding by asking them to explicitly differentiate between objects based on ownership. To substantiate the link between ownership understanding and the self, she compared performance on this task with parental reports of children’s self-awareness (as measured by Stipek *et al’s* (1990) Self-Development Questionnaire) and performance in the mark test of mirror self-recognition. In the ownership task children were first asked to label everyday items as belonging to themselves or their mother. For each object (toothbrush, book, shoe) two familiar exemplars and one unfamiliar example were shown. Children were given three ownership questions relating to these objects, each potentially earning one point; “Whose is this?” for child’s item, “Whose is this?” for mother’s item, and “Pick up the one that is yours”. Fasig (2000) also asked for ownership information concerning three differently coloured blocks; one block was entirely novel, and two had been presented a few minutes before. To encode ownership information, one of the previously encountered blocks had been repeatedly labelled as belonging to the child, and the other as belonging to the experimenter.

When ownership scores for all four stimuli types (toothbrush, book, shoe, block) were combined, 2-year-olds were found to be above chance in assigning ownership, with a success rate of 77%. Fasig (2000) suggests that this implies that self-conservation has an earlier ontogeny than implied by Povinelli, Landau & Perilloux's (1996) task. However, despite acknowledging the block task as the "most stringent test of ownership understanding", and suggesting it be analysed separately (Fasig, 2000, p.377), analysis of children's performance on this task was not reported independently. Analogous to the distinction in mechanistic levels of the SPT effect, one can distinguish between ownership claims based on the cumulative trace of previous experience or on higher-level cognitive knowledge. When judging familiar items, it is difficult to distinguish whether children have explicit knowledge of the object as belonging to them in the past, or if they are simply expressing a current strong association. For this reason, only ownership information for novel objects clearly requires explicit self-reference. Moreover, it is not clear that the short delay between encoding and retrieval would have necessitated reference to a *past* self. In the absence of experimental manipulation to make a self-representation out of date (as in Povinelli, Landau & Perilloux, 1996), time is necessary to separate past from present selves. For this reason, Fasig's (2000) findings are insufficient evidence that very young children show extended, non-conditioned ownership understanding of the type relevant to explicit self-conservation.

Further, Fasig's (2000) success in empirically linking performance in the ownership task with other measures of self-awareness was mixed. Fasig (2000) found a positive link between competency in the ownership tasks and children's use of descriptive and evaluative language concerning the self. In this 12-item facet of Stipek *et al's* (1990) scale, mothers rate their child's tendency to make descriptive claims beginning with "I am" or "Johnny is", extending to those which involve an aspect of evaluation (for example, "I am bad"), or desire (for example, "I want chips"). Similar talk concerning other people also earns points. Importantly, this suggests that the link between ownership claims and self-reflective language may extend beyond personal pronoun competency. There was also a moderate correlation with mother's assessments of their child's self-recognition. This 5-item assessment asks whether the child recognises themselves in mirrors and/or photographs, if they call attention to their own physical features and actions, and whether they can communicate their likes and dislikes. However, no direct link between the mark test of mirror self-recognition and ownership performance was found.

In explanation, Fasig (2000) suggests that the external nature of mirror self-recognition might dissociate it from internalised measures of self-recognition such as ownership, linguistic self-reference, attention seeking and the communication of desires. However, it is not clear how owning an object can be considered internalised to a greater extent than “owning” one’s self-image, as implied by mirror self-recognition. Moreover, Lewis & Ramsay (2004) and Courage, Edison & Howe (2004) have shown longitudinally that internalised self-reflection, as implied by personal pronoun use, can be related to mirror self-recognition. For these reasons, it appears more likely that the lack of association in Fasig’s (2000) study reflected a lack of power arising from her coding mirror self-recognition on a binary basis, with the majority of the sample passing the task. Importantly, this highlights a) the difficulty in using mirror self-recognition as a correlating factor in cross sectional studies, and b) the limitation of mirror self-recognition as a tool to validate increments in self-awareness beyond the onset of “me”.

3.1 Experiment 2

Building from Fasig’s (2000) research, Experiment 2 aims to assess whether children can encode ownership information for recently acquired items at above chance levels. To allow thorough assessment of their performance, children were asked to distinguish a total of 8 items based on ownership. Moreover, prior to declaring ownership information, children were required to a) recall stimuli or b) recognise the stimuli from a group of previously unseen distracters. This ensured that children were accessing their memory of the previous session before making ownership judgements. To substantiate Fasig’s (2000) suggestion that ownership claims make reference to the past self, the delay between encoding of ownership information was increased from a few minutes to one week. Maintenance of ownership information beyond the present (or recent past) is important as it implies that the information has been encoded, and is explicitly retrievable, with reference to the self-concept.

To support the encoding of lasting ownership memories, Experiment 2 includes both verbal labelling of objects as belonging to self or other, and active processing of this information. Specifically, children are asked to act on verbally presented ownership information by sorting the objects into distinct locations based on their owner. As highlighted in Experiment 1, participating actively in an event is likely to improve depth of processing, and so aid retrieval of to-be-remembered material. However, to allow focus on higher-level self-reference, children had equal physical experience of both owned and not-owned stimuli. Animal pictures were chosen as to-be-remembered ownership stimuli for three reasons. Firstly, the concept of owning animals is likely to be familiar to preschool children. Secondly, as noted in the previous chapter, easily labelled stimuli (for example, "monkey", "lion") may reduce the demands of free recall. Finally, animal pictures provide a rich basis for visual encoding, rendering stimuli a) memorable and b) easily incorporated in a recognition test.

By virtue of the theoretical link made between ownership memory and the self-concept, Experiment 2 might also be open to self-reference effects. In fact, the discovery of an ownership SRE would empirically consolidate the claim that owned items are associated with the self-concept. Reminiscent of Sui & Zhu's (2005) within-subjects SRE for self- versus other-image, this paradigm has the potential to index a mnemonic bias for stimuli owned by the self relative to stimuli owned by others. Encouragingly, Cunningham, Turk, MacDonald & Macrae (2008) have recently reported that adults given a surprise recognition test after equally sorting 216 shopping items into their own or a confederate's basket (according to a random colour code) showed a mnemonic bias for owned items. Recall though, that Bennett & Sani (2008) found a difference between children who judged words in terms of whether they applied to the self and those who processed words in a non-self-reflective way. Asking children to claim or disown an object might also be considered self-reflective. For this reason, indexing SREs with fewer ownership stimuli might be more clearly expressed in a between-subjects comparison of self-related and non self-related ownership tasks. Consequently, Experiment 2 includes a comparison group of children, asked to retrieve stimuli and ownership information concerning two peers.

Method

Participants

Ninety preschool children recruited from four nurseries took part, including 30 3-year-olds (M = 38.1 months, SD = 0.45 months, range = 33 – 41 months), 30 3.5-year-olds (M = 44 months, SD = 0.3 months, range = 42 – 47 months) and 30 4-year-olds (M = 52.9 months, SD = 0.6 months, range = 48 – 59 months). Half of the children from each age-group completed a self-referent ownership task, and half a non self-referent version (total N per task = 45).

Stimuli

At encoding, the experimental stimuli comprised eight A6 ownership cards depicting different animals, and two boxes (one red, one blue) painted to resemble zoos. At retrieval eight A4 recognition cards were introduced. Each recognition card showed one of the animals from the ownership cards together with three "distracter" animals that were not previously encountered. All animals were comparably drawn and pilot work confirmed that they were easily recognizable to preschool children. Examples of these stimuli are shown in Figure 2.4. In the non self-referent version of the game two Polaroid photographs of unfamiliar peers (one male, one female) were also included.

Zoo boxes

Target animal cards

Example recognition selection

Figure 3.1: Examples of Experiment 2 encoding and retrieval stimuli

Procedure

Throughout the procedure the order of personal and other-referent pronouns and names (i.e. mine, my; yours, your; Billy, Mary) was counterbalanced. In the non self-referent game Polaroid photographs, each showing the face of an unfamiliar child ("Mary" and "Billy"), were stuck to the front of the appropriate zoos. The procedure was introduced to children as follows: "Today we are going to look after some zoo animals. This zoo is Y's (yours/Mary's), and this zoo is Z's (mine/Billy's). I have some animals to share between the zoos. Some will be Y's and some will be Z's".

Encoding Ownership

Having introduced the task, the experimenter drew animal cards at random from the pack and said: "This is a(n) X *(for example, elephant)* and it belongs to Y. The X lives in Y's zoo." The child was then asked to place the animal out of sight in the appropriate zoo. The experimenter proceeded: "This is a(n) X and it belongs to Z. The X lives in Z's zoo." Again, the child was asked to place the animal out of sight inside the appropriate zoo. This procedure continued until all eight animals had been assigned an owner (four animals per zoo). Placing the animals inside the zoos ensured that the next animal drawn from the pack was given full visual attention and helped to engage the children.

After distributing the animals, the experimenter removed the cards from each zoo (order counterbalanced) and laid them on the desk in front of their owners, saying: “So these are all of Y’s animals and these are all of Z’s animals. It is important that we know which animals belong to whom so that they don’t get lost. I need you to help me remember which animals belong to which zoo.” For each animal the experimenter then asked the child “Is this Y’s animal or Z’s animal?”. Incorrect answers were corrected. After ownership had been established in this way the animal cards were shuffled and laid out one at a time on the desk. For each card the child was asked “Does this animal belong in Y’s zoo or Z’s zoo? Put the animal back in the zoo it belongs in.”

Retrieving Ownership

One week later children met again with the experimenter and were verbally reminded of the first session and asked if they could recall any of the animals, and if so, who owned them. Children were then told that the animals had escaped and become mixed up with animals belonging to other people. To test for recognition of animals from the previous session they were then shown one animal from the previous session together with three novel animals (placement of target on recognition card counterbalanced). The experimenter stated the types of animals on each card and asked: “I know we only played with one of these animals last time. Do you remember which one?”. This procedure was repeated for all eight previously encountered animals, each time with a different set of distracters. To cue recall of ownership the child was then asked for each original animal: “Is that Y’s animal or Z's animal?". Children were given general praise throughout, but no specific feedback concerning accuracy.

As each child had the same amount of visual and motor exposure to all stimuli, animals were equally experienced, only the verbal-cognitive link specifying ownership differentiated them. One constraint of this paradigm is that in the first session children may have relied on the colour of zoos to distinguish between animals. However, no child made any explicit reference to zoo colour in either session. Moreover, answering the ownership question correctly in the second session, when the zoos were absent, ultimately required that the child acknowledged the link between stimuli (animal or zoo) and owner.

Results

Encoding ownership

As shown in Table 3.1, one-sample t-tests confirmed that children were above chance (50%) in assigning ownership in the first session, returning a mean of 85% animals to the correct zoo. Moreover, when age-groups were analyzed separately, all children were above chance in assigning ownership for both task types.

Table 3.1: Experiment 2 encoding ownership, split by age-group and task

Age-group	Overall	Self-referent task	Other-referent task
Overall	M=6.8 (85%), SD=1.2 (t (89) = 21.5, p< 0.01)	M=6.9 (86%), SD=1.1 (t (44) = 15, p< 0.01)	M=6.6 (82%), SD=1.3 (t (44) = 15.4, p< 0.01)
3-year-olds	M=6 (75%), SD=1.4 (t (29) = 7.5, p< 0.01)	M=6 (75%), SD=1.6 (t (14) =4.6 , p< 0.01)	M=6 (75%), SD=1.2 (t (14) = 6.1, p< 0.01)
3.5-year-olds	M=7.3 (91%), SD=0.7 (t (29) = 24.1, p< 0.01)	M=7.6 (95%), SD=0.6 (t (14) = 22, p< 0.01)	M=7 (87%), SD=0.7 (t (14) =15.3, p< 0.01)
4-year-olds	M=7.1 (89%), SD=1 (t (29) = 17.1, p< 0.01)	M =7.2 (90%), SD=0.8 (t (14) = 15.8, p< 0.01)	M=7 (87%), SD=1.2 (t (14) = 9.7, p< 0.01)

A between-subjects ANOVA indicated that age had a significant effect on the percentage of ownership assignments correctly encoded (F (1, 84) = 12.9, $p <$ 0.01, $\eta_p^2 = 0.24$); post-hoc Bonferroni tests indicated that the 3-year-olds' correct assignment of ownership was significantly lower than the older age-groups'. However, there were no main effects of task type (F (1, 84) = 1.5, $p = 0.25$, $\eta_p^2 =$ 0.018) or interaction between age-group and task type effecting ownership assignment at this stage (F (1, 84) = 0.7, $p = 0.49$, $\eta_p^2 = 0.017$).

Recall

In the second session, 46 children (nine 3-year-olds, 15 3.5-year-olds, 22 4-year-olds) offered free recall of the animals presented in session one (M = 2.7, SD = 1.6) animals. Age had a main effect on recall rates (F (2, 84) = 14.4, $p < 0.01$, η_p^2 =0.25), and post-hoc comparison indicated that developmental improvements in recall rates between all age-groups were significant (3-year-olds: $M = 0.5$, $SD = 0.8$; 3.5-year-olds: $M = 1$, $SD = 1.4$; 4-year-olds: $M = 2.6$, $SD = 2$).

Ownership assignments were accurate for an average of 84% (SD = 24%) of recalled animals. A one-sample test confirmed this was significantly above chance ($t\ (45) = 9.5$, $p < 0.01$). There was no correlation between age in months and the percentage of recalled animals accurately assigned ownership after the delay ($r^2 = -0.17$, $p = 0.26$) and no effect of task on the percentage of animals recalled with the correct ownership information (self-referent M = 86%, SD = 22%; non self-referent M = 81%, SD = 26%; $F\ (1, 44) = 0.36$, $p = 0.55$, $\eta_p^2 = 0.008$).

Likewise, there was no effect of task type on the total number of animals recalled ($F\ (1, 84) = 2$, $p = 0.15$, $\eta_p^2 = 0.02$), for any age-group (3-year-olds: $F\ (1, 28) = 0.4$, $p = 0.5$, $\eta_p^2 = 0.01$; 3.5-year-olds: $F\ (1, 28) = 1.3$, $p = 0.2$, $\eta_p^2 =0.047$; 4-year-olds: $F\ (1, 28) =0.6$, $p = 0.4$, $\eta_p^2 = 0.02$). However, within the self-referent task children recalled significantly more of the animals owned by themselves ($M = 0.9$, $SD = 1.2$) than those owned by the experimenter ($M = 0.7$, $SD = 0.9$) ($F\ (1, 44) = 4.2$, $p = 0.046$, $\eta_p^2 = 0.09$). Moreover, in the non self-referent control, children recalled marginally more animals owned by a same gender peer ($M = 0.7$, $SD = 0.9$) than those owned by a different gender peer ($M = 0.4$, $SD = 0.8$) ($F\ (1, 44) = 3.1$, $p = 0.008$, $\eta_p^2 = 0.07$). Due to the unequal representation of age-groups in the recall data, the interaction between age and self-bias was not explored.

Recognition

A one-sample t-test confirmed that the average number of 77.5% animals recognized was significantly greater than the 25% success rate predicted by chance. As shown in Table 3.1, this result held for every age-group, for all tasks and encoding dimensions. Age had a significant main effect on recognition performance ($F(2, 84) = 8.5$, $p = 0.01$, $\eta_p^2 = 0.2$), with post-hoc tests indicating significant developmental progressions between all age-groups. This result held for both stimuli types (self/gender matched $F(2, 84) = 7.5$, $p = 0.01$, $\eta_p^2 = 0.1$; non-gender matched other $F(2, 84) = 6$, $p = 0.03$, $\eta_p^2 = 0.1$).

Table 3.2: Experiment 2 recognition performance, split by age-group, task and encoding dimension

Recognition	Overall	Age-group		
		3-year-old	3.5-year-old	4-year-old
Overall	M=6.2 (77.5%), SD=1.9	M=5.1 (64%), SD=1.9	M=6.1 (76%), SD=2	M=7.1 (89%), SD=1.5
	(t (89) = 18.6, p < 0.01)	(t (29) = 9.2, p< 0.01)	(t (29) = 11, p< 0.01)	(t (29) = 18.9, p< 0.01)
Self-referent task	M=6.4 (80%), SD=1.9	M=5.1 (64%), SD=1.9	M=6.8 (85%), SD=1.8	M=7.5 (94%), SD=0.3
	(t (44) = 15.7, p< 0.01)	(t (14) = 6.3, p< 0.01)	(t (14) = 9.9, p< 0.01)	(t (14) = 20.2 , p< 0.01)
Self-owned	M=3.2 (80%), SD=1.1	M=2.6 (65%), SD=1.1	M=3.3 (82.5%), SD=1	M=3.8 (95%), SD=1.1
	(t (44) = 13.8, p< 0.01)	(t (14) = 5.5, p< 0.01)	(t (14) = 8.6, p< 0.01)	(t (14) = 14, p< 0.01)
Other-owned	M=3.2 (80%), SD=1	M=2.5 (62%), SD=1.2	M=3.5 (87.5%), SD=0.9	M=3.7 (92.5%), SD=0.8
	(t (44) = 15, p< 0.01)	(t (14) = 5.2, p< 0.01)	(t (14) = 10.4, p< 0.01)	(t (14) = 23, p< 0.01)
Non self-referent task	M=5.7 (71.2%), SD=1.9	M=5.2 (64%), SD=1.8	M=5.4 (67%), SD=2	M=6.7 (84%), SD=1.7
	(t (44) = 12.8, p< 0.01)	(t (14) = 6.5, p< 0.01)	(t (14) = 6.4, p< 0.01)	(t (14) = 10.5, p< 0.01)
Matched gender owned	M=2.9 (72.5%), SD=1.3	M=2.6 (65%), SD=1.2	M=2.9 (72.5%), SD=1	M=3.4 (85%), SD=0.8
	(t (44) = 12.5, p< 0.01)	(t (14) = 5.2, p< 0.01)	(t (14) = 7.2, p< 0.01)	(t (14) = 11.2, p< 0.01)
Unmatched gender owned	M=2.8 (70%), SD=0.9	M=2.6 (65%), SD=1	M=2.4 (60%), SD=1.3	M=3.2 (80%), SD=1.1
	(t (44) = 9.9, p< 0.01)	(t (14) = 5.8, p< 0.01)	(t (14) = 4.1, p< 0.01)	(t (14) = 7.9, p< 0.01)

Children gave accurate ownership information for an average of 70% (SD = 23%) of the animals they recognised. A one-sample t-test confirmed that this was significantly greater than chance (t (89) = 7.9 $p < 0.01$). Table 3.3 shows that this held for all age-groups and both task types. Moreover, there was no main effect of age (F (2, 84) = 0.707, p = 0.496, $\eta_p^2 = 0.017$) or task type (self-referent: M = 73%, SD = 22%; non self-referent: M = 66%, SD = 24%; F (1, 84) = 1.7, p = 0.19, $\eta_p^2 = 0.02$) on the percentage of recognized animals correctly assigned ownership. Nor was there a significant interaction between these variables (F (2, 84) = 1.39, p = 0.87, $\eta_p^2 = 0.003$).

Table 3.3: Experiment 2 ownership performance split by age-group and task

Age-group	**Overall**	**Self-referent task**	**Other-referent task**
3-year-olds	M=66%, SD=22% (t (29) = 3.9, p< 0.01)	M=67%, SD=26% (t (14) = 2.5, p = 0.02)	M=64 %, SD=18% (t (14) = 3 , p = 0.008)
3.5-year-olds	M=72%, SD=26% (t (29) = 4.6, p< 0.01)	M=75%, SD=21% (t (14) = 4.8, p< 0.01)	M=67 %, SD=31% (t (14) = 2.2 , p= 0.04)
4-year-olds	M=72%, SD=22% (t (29) = 5.4, p< 0.01)	M=76 %, SD=21% (t (14) = 4.9, p< 0.01)	M=67 %, SD=24% (t (14) = 2.8, p= 0.01)

As shown in Table 3.2 children recognised marginally more stimuli in the self-referent task than the non self-referent task (F (1, 84) = 3.8, p = 0.05, $\eta_p^2 = 0.04$), regardless of age (F (2, 84) = 1.3, p = 0.3, $\eta_p^2 = 0.03$). This was largely attributable not to a boost in memory for self-referent stimuli (F (1, 84) = 1.5, p = 0.2, $\eta_p^2 = 0.02$), but to a recognition advantage for other-referent stimuli presented in the context of the self-referent task (F (1, 84) = 4.5, p = 0.03, $\eta_p^2 = 0.05$).

Within the self-referent task, a repeated-measures ANOVA showed that children recognised an equivalent number of self- and other-owned stimuli ($F (1, 42) = 0$, $p = 1$, $\eta_p^2 = 0$), regardless of age ($F (2, 42) = 0.3$, $p = 0.8$, $\eta_p^2 = 0.01$). The number of same gender-owned stimuli and other gender owned stimuli recognised was also statistically equivalent ($F (1, 42) = 1.3$, $p = 0.2$, $\eta_p^2 = 0.03$), and again there was no interaction with age ($F (2, 42) = 0.6$, $p = 0.5$, $\eta_p^2 = 0.03$). Further, no age-group showed a significant SRE on either dimension when considered separately (self-referent task: 3-year-olds, $F (1, 14) = 0.05$, $p = 0.8$, $\eta_p^2 = 0.004$; 3.5-year-olds, $F (1, 14) = 0.6$, $p = 0.4$, $\eta_p^2 = 0.04$; 4-year-olds, $F (1, 14) = 0.1$, $p = 0.7$, $\eta_p^2 = 0.01$; non self-referent (matched gender): 3-year-olds, $F (1, 14) = 0$, $p = 1$, $\eta_p^2 = 0$; 3.5-year-olds, $F (1, 14) = 1.9$, $p = 0.2$, $\eta_p^2 = 0.1$; 4-year-olds, $F (1, 14) = 0.3$, $p = 0.5$, $\eta_p^2 = 0.02$). However, 37 children (six 3-year-olds, 12 3.5-year-olds, 19 4-year-olds; 14 non self-referent, 23 self-referent) performed at ceiling in the recognition test, meaning that less than 40% of the sample had the potential to index a SRE.

Discussion

Providing empirical evidence that preschoolers can encode non conditioned ownership information, Experiment 2 showed that children as young as 3 years were above chance in distinguishing recently acquired objects on the basis of ownership. Moreover, although 3-year-olds had a more limited capacity to acquire ownership information, and to remember previously presented material, they were as adept as 4-year-olds in retrieving ownership information for stimuli they did remember after a delay. Importantly, retrieving accurate ownership information for the self required the children to make a retrospective cognitive link between the current self and owned material. The current self could not be implicitly associated with the stimuli, as children had the same physical experience of both self- and other-owned stimuli.

For the non self-referent task it is possible to argue that the cognitive link made between owners and animals is based on paired-associate learning. In fact, the lack of a pre-existing concept of the owners, and the visually accessible pairing of owners and stimuli, lends itself to such an explanation. However, not only did the unique perspective of the self preclude children from making simple visual associations between stimuli and owners in the self-referent version of the task, the nature of personal pronouns meant that children could not rely on word associations to encode ownership. Put simply, if children relied on the same paired associations verbalised by the experimenter in the self-referent task, their ownership information would be encoded wrongly. When the experimenter says "Yours - Lion", children must encode "Mine - Lion" to succeed. Even if 3- and 4-year-old children were engaged in reflexive associative learning for example, "Your (- My) – Lion", "My (- Your) – Monkey", their translation of yours to mine is a mystery without recourse to contextual self-other differentiation. Even adults, who process the personal relevance of pronouns automatically, show activation of specific brain areas associated with other aspects of self-reflection when engaged in such a task (Esslen, Metzler, Pascual-Marqui & Jancke, 2008; Walla, Duregger, Griener, Thurner & Ehrenberger, 2008). For this reason, if the children were learning contextually translated word associates at encoding, they were doing so with the self in mind.

In support of a link between owned stimuli and the self-concept, there was some evidence of mnemonic bias for self-related stimuli. Children recalled more animals that they owned than animals owned by the experimenter, despite experiencing them equally on a physical-cognitive level. Unexpectedly, children also showed an owner-based advantage in the non self-referent version of the task. Here, children recalled more animals which were owned by peers of the same gender than animals owned by peers of the opposite gender. As noted, gender information is one of the first aspects of self-knowledge acquired. Moreover, in addition to an advantage for trait judgements concerning children's families, Bennett & Sani (2008) found a marginal recall bias for judgements concerning children of the same gender (Do you think boys/girls are?) and of mixed-gender peers (Do you think children of your age are?). One explanation for Bennett & Sani's (2008) findings, and our similar result, is that children are indexing a self-reference effect resulting from a judgement made of "someone like me", where "me" activates the self-concept. Certainly, the simple paired- associate account of ownership encoding is inadequate to explain the recall advantage for stimuli associated with one owner over another in the non self-referent task. This implies that the children were not making simple associations, even when given the opportunity in the linguistically and visually straightforward non self-referent task. This noted, there was a marginally significant SRE between task-types, with stimuli judged according to self-ownership recognised more often than stimuli judged according to gender-matched ownership. As might be expected, this implies that direct self-reference may support a stronger SRE than indirect self-reference.

3.2 Experiment 3

Aside from the amount of information available, Experiment 2 uncovered no differences in 3- and 4-year-olds' capacity to claim ownership of animals that were labelled as belonging to them one week before. Contrary to Povinelli, Landau & Perilloux (1996) then, Experiment 2 indicates that young 3-year-olds were typically successful in maintaining a cognitive link between their past and present selves. Nevertheless, it remains possible that success in the DSR task might predict children's success in encoding ownership. To explore this possibility, Experiment 3 directly compares 3- to 4-year-old children's performance in Povinelli, Landau & Perilloux's (1996) DSR task with their ability to encode and retrieve stimuli with reference to ownership. If Povinelli, Landau & Perilloux's (1996) task does measure self-conservation; performance here might also predict the magnitude of any SRE found.

Method

Participants

Thirty preschool children recruited from one nursery took part, including 15 3-year-olds (M = 37 months, SD = 0.49 months, range = 34 – 41 months) and 15 3.5- to 4-year-olds (M = 48 months, SD = 1.4 months, range = 42 – 55 months). The 3.5- to 4-year-olds are grouped together here as the likelihood of passing Povinelli, Landau & Perilloux's (1996) DSR task increases sharply from the age of 3.5 years.

Stimuli

The experimental stimuli for the self-referent ownership game were those used in Experiment 2. For the delayed self-recognition task a television, two videorecorders, a pink “Post-it” sticker, three paper cups and a small toy shopping trolley were used.

Procedure

The procedure for the self-referent ownership task was described in Experiment 2; prior to this task children were tested for delayed self-recognition (DSR). The DSR test was adapted from Povinelli, Landau & Perilloux’s (1996) procedure as follows. Upon entering the testing room, children were alerted to an activated video-camera and asked to wave to it. They were told the camera was taping so that “we can watch the game we are about to play on the television afterwards”. The child and experimenter then played a game in which a toy shopping trolley was hidden under one of three cups whilst the child had their eyes shut. After the toy was hidden the child was told to open their eyes and to lift the cups one at a time in order to find the toy. Children were given verbal and physical (brief pat on the head) praise every time they located the toy for a total of four trials. On the third trial the experimenter used the head-pat to surreptitiously place a pink sticker on the hair just above the child’s forehead.

When the game was finished the tape was rewound to the point at which the child had waved. As the child was shown waving, the experimenter asked a self-recognition question: “Who is that?”. The child was then encouraged to watch to see how well they played the game. After watching the marking event on video, corresponding to an approximately three minute delay from the “real” marking event, the experimenter waited 30 sec for a reaction before prompting: “What is that?.......Is it a sticker?......Where is the sticker really? Can you get me it?”. If the child did not react by reaching up for the sticker they were given a hand held mirror and the prompt repeated as appropriate. Delayed self-recognition was scored post-hoc using video-footage of the children's reactions; children received two points for reaching for the mark before prompting, one point for reaching after prompting and zero points for failing to reach during the video-playback.

Results

DSR task

All 15 3.5- to 4-year-olds reached up to locate the sticker having viewed the marking event, six after being verbally prompted. Seven 3-year-olds also reached for the mark, three after verbal prompting. The remaining eight 3-year-olds did not reach up to locate the sticker until prompted by exposure to the mirror. There was a positive correlation between age in months and delayed self-recognition score ($r = 0.46$, $p = 0.01$).

Of the 22 children who displayed mark-directed behaviour, 17 responded "me" to the self-recognition question, two gave their proper name and three gave no verbal response. Of the eight children who did not display mark-directed behaviour, three responded "me", two gave their proper name and three gave no verbal response. Controlling for age, the relationship between responses to the self-recognition question (two points "me", one point proper name, zero points no verbal response) and performance in the delayed self-recognition test was not significant ($r^2 = 0.17$, $p = 0.35$).

Self-referent ownership task

Encoding ownership

In the first session, children returned an average of 85% ($M = 6.8$, $SD = 1.2$) of animals to the correct zoo. A one-sample t-test confirmed that this was significantly above chance ($t(89) = 11.8$, $p < 0.01$). Although both age-groups were above chance (3-year-olds: $M = 6.2$, $SD = 1.1$, $t(14) = 7.4$, $p < 0.01$; 3.5- to 4-year-olds: $M = 7.4$, $SD = 1.2$, $t(14) = 11.1$, $p < 0.01$), a between-subjects ANOVA indicated that age had a significant effect on the percentage of ownership correctly encoded: as in Experiment 2, 3.5- to 4-year-olds outperformed 3-year-olds ($F(1, 28) = 7.9$, $p = 0.009$, $\eta_p^2 = 0.2$).

Recall

In the second session, 11 children (five 3-year-olds, six 3.5- to 4-year-olds) offered free recall of animals presented in session one. These children remembered an average of 2.36 ($SD = 0.8$) animals and gave accurate ownership information for a mean of 72% ($SD = 28\%$) of them. This level of ownership assignment was significantly above chance (one-sample t-test: $t(10) = 2.5$, $p = 0.03$). There was no correlation between age and the percentage of recalled animals accurately assigned ownership ($r^2 = 0.516$, $p = 0.104$). Considering the sample as a whole, children recalled more of their own animals ($M = 0.5$, $SD = 0.8$) than the experimenter's ($M = 0.4$, $SD = 0.7$), but, as might be expected given the low number of children offering free recall, this self-reference effect did not reach significance ($F(1, 29) = 1.4$, $p = 0.2$, $\eta_p^2 = 0.05$).

Recognition

As shown in Table 3.4, a one-sample t-test showed that the average number of animals recognized was significantly greater than chance; this result held for both age-groups and encoding dimensions. Although there was age-related improvement in recognition scores, this main effect of age failed to reach significance ($F(1, 28) = 1.2$, $p = 0.28$, $\eta_p^2 = 0.042$).

Table 3.4: Recognition performance in Experiment 3, split by age-group

Recognition	**Overall**	**Age-group**	
		3-year-old	**3.5- to 4-year-old**
Overall	M=5.6 (70%), SD=1.8 (t (29) = 10.4, p < 0.01)	M=5.4 (67%), SD=1.9 (t (29) = 6.6, p< 0.01)	M=5.9 (74%), SD=1.7 (t (29) = 8.1, p< 0.01)
Self-owned	M=3 (75%), SD=1 (t (44) = 11.1, p< 0.01)	M=2.7 (67%), SD=1 (t (14) = 6.9, p< 0.01)	M=3.2 (80%), SD=1 (t (14) = 9.1, p< 0.01)
Other-owned	M=2.6 (65%), SD=1 (t (44) = 8.9, p< 0.01)	M=2.5 (62%), SD=1.1 (t (14) = 5.2, p< 0.01)	M=2.7 (67%), SD=0.8 (t (14) = 7.5, p< 0.01)

Children gave accurate ownership information for an above-chance average of 73% (SD = 17%) of the animals recognized ($t(29) = 7.3$ $p < 0.01$), regardless of age-group (3-year-old: M = 69%, SD = 17%, $t(14) = 4.2$, $p = 0.01$; 3.5 to 4-year-old: M = 77%, SD = 16%, $t(14) = 6.3$, $p < 0.01$). Moreover, as in Experiment 2, a between-subjects ANOVA indicated no significant main effect of age on the percentage of recognized animals correctly assigned ownership ($F(1, 28) = 1.5$, $p = 0.225$, $\eta_p^2 = 0.052$).

In this sample, where only 13% of children (two 3-year-olds, two 3.5-to 4-year-olds) performed at ceiling, a repeated-measures ANOVA uncovered a significant advantage for recognition of self-owned over other-owned stimuli ($F(1, 28) = 7$, $p = 0.013$, $\eta_p^2 = 0.2$). There was no significant interaction with age ($F(1, 28) = 1.4$, $p = 0.23$, $\eta_p^2 = 0.49$). However, when the data for each age-group were analysed separately the effect reached significance only for the older age-group (3-year-olds: $F(1, 14) = 1$, $p = 0.34$, $\eta_p^2 = 0.07$; 3.5- to 4-year=olds: $F(1, 14) = 7.7$, $p = 0.015$, $\eta_p^2 = 0.35$).

Comparison of self-referent ownership and DSR task

Children who failed the self-recognition task performed similarly to those who passed in encoding and retrieving ownership information. As shown in Table 3.5 one-sample t-tests confirmed that all DSR groups were above chance level in assigning ownership. Moreover DSR and ownership performance did not correlate when controlling for age. Of the 11 children offering free recall of the ownership session, six (two younger, four older) children passed the DSR task immediately, three after verbal prompting (one younger, two older), and two (both younger) failed the DSR task. Controlling for age, there was no correlation between DSR performance and magnitude of self-reference effects ($r^2 = 0.14$, $p = 0.45$) or bias in memory scored qualitatively (-1 = other-reference effect, 0 = no bias, +1 = SRE, $r^2 = 0.2$, $p = 0.3$).

Table 3.5: Comparison of performance in self-referent ownership and delayed self-recognition tasks (Experiment 3)

DSR performance	% correct ownership assignments	
	Session One: Encoding	Session Three: After Recognition
No reaching	83% (t (7)=7, $p< 0.01$)	71% (t(7)= 3, $p= 0.01$)
Reach after prompt	85% (t(9)=6, $p< 0.01$)	73% (t(9)=4, $p= 0.03$)
Immediate reach	86% (t(11)=7, $p< 0.01$)	75% (t(11)=5, $p< 0.01$)
Partial Correlation (controlling for age)	$r^2 = 0.15$, $p = 0.68$	$r^2 = 0.03$, $p = 0.9$

Discussion

Performance in the DSR task closely replicated Povinelli, Landau & Perilloux's (1996) results; 60% of 3.5- and 4-year-olds, but only 27% of young 3-year-olds reached for the mark without prompting. A further 40% of 3.5- to 4-year-olds and 20% of younger children passed the task after verbal prompting. The remaining 3-year-olds successfully retrieved the sticker upon being exposed to a mirror. As noted, Povinelli, Landau & Perilloux (1996) interpreted younger children's failure on the DSR task as a failure to make a cognitive link between the past self, as represented in the video-footage, and the present self. However, in Experiment 3, success on the DSR task was not associated with the ability to link the past self, as represented in a claim of ownership, with the present self. Children who failed the DSR task were as adept at assigning ownership as those who passed it. Moreover, despite the significance of the recognition advantage for self-owned stimuli being delayed until children approached their 4th year, the magnitude of the SRE was not related to DSR performance.

As noted in Chapter 1, Skouteris, Spataro & Lazaridis (2006) have recently shown that using the video to guide searches prior to DSR results in a greater proportion of 3-year-olds exhibiting mark directed behaviour. This raises the possibility that performance in the DSR might be related to ownership memory when difficulties interpreting video-based representations are controlled for. To test this hypothesis, training could be provided and 2-year-olds included in the sample to represent poor DSR performance. However, the likely benefit of video-guided searches is that they allow the child to learn that searching in the location on the video will bring success. This makes the extent to which trained children make reference to the self (other than as a location) doubtful. In support, six of 13 children in Skouteris, Spataro & Lazaridis (2006) training conditions reached for the mark only after hearing the prompt "find me the sticker". For the remainder, who showed self-directed behaviour immediately, Skouteris, Spataro & Lazaridis (2006) provide no record of ability to pass the DSR prior to training. This makes it impossible to determine if they belonged to the subset of 3-year-olds who pass the DSR naturally.

In any case, the dissociation between the ownership task and the DSR task can be explained in reference to the relative demands of each task. The DSR task requires making a link between self as represented internally, and the self as represented externally. Likewise, the ownership task requires maintenance of an internal link with an external object. However, only in the DSR task do past and current self-representations conflict, meaning that the children must revise a false belief ("I am not marked"). Younger preschoolers' difficulties in acknowledging false beliefs are well documented (see Mitchell, 1996; Wellman, Cross & Watson, 2001). This implies that the DSR task may be overly demanding for this age-group, regardless of self-recognition. Interestingly, Saltmarsh & Mitchell (1999) have shown that experience of video-footage can actually support 3-year-olds' in reporting memories which conflict with current knowledge. 3-year-olds asked to predict the contents of a familiar container (for example, a smartie tube) and then shown that the container holds unexpected contents (for example, crayons) will typically deny their original prediction ("sweets"), stating instead what they now know to be in the container ("crayons"). However, when confronted with video-footage of their original prediction, Saltmarsh & Mitchell (1999) found that 3- to 4-year-olds were significantly (41%) more likely to acknowledge their past false belief.

The crucial difference between Saltmarsh & Mitchell's (1999) task and the DSR task is that the video-footage makes salient what they child previously subjectively experienced; it does not require them to objectively re-interpret a past event. Although using time rather than representational change to separate past from present selves, the ownership task also supports children's memories of the self in the past through the provision of salient cues. For this reason, it would be interesting to determine if performance on Saltmarsh & Mitchell's (1999) task and the ownership task are related. In contrast to both of these tasks, the DSR task requires children to revise, rather than recover, a memory of the self in the past. The demands of the ownership task appear particularly closely matched to those of autobiographical memory, requiring that children maintain a non-conflicting connection between past and present selves. However, the self-conservation involved in the ownership task and autobiographical recollection may not be considered synonymous. A distinction can be made between remembering, as when one recalls a specific episode, and knowing, when one stores information from the past (Tulving, 2002). For example, one could answer an ownership question by remembering the specific episode in which you gained possession, or by the feeling of knowing "this is mine". Importantly, many suggest that only the former knowledge can be considered autobiographical (see Nelson & Fivush, 2004). Accordingly, an important question to consider is whether children could have retrieved the ownership information without explicit reference to the past experience.

The novel nature of task stimuli ensured that children did not gain the information "this is mine" implicitly. In other words, information was explicitly encoded with reference to the self-concept. The SREs found confirm that this link later helped children to retrieve information concerning the previous session. However, did the children also make explicit reference to the past self when retrieving ownership information? To answer this question, one has to consider what it would take for a preschooler to "know" something was theirs (at above chance levels) without remembering when or how they came to possess it. Importantly, it would seem that such associative knowledge would require more than one episode of verbal labelling one week previously. Indeed, the ownership information gained was not expected to become permanently included in the self-concept, as appears to be the case for items owned and valued over a long period of time[6]. Nevertheless, Experiments 2 and 3 do not allow empirical distinction between these aspects of self-reference. For adults, the distinction between remember and know judgements is usually made via self-report; however, it is difficult to see how this question could be appropriately phrased for preschool children.

Minimally, Experiments 2 and 3 show that 3- and 4-year-old children know things which are specific to the experience of the self in the past. Here, the growth of the self-concept is tracked empirically. As a result, new evidence is provided to suggest that the capacity to tag objects as self-referent increases quantitatively during the preschool years. Moreover the mnemonic impact of having tagged a memory as self-referent also increases. Importantly, this is in line with Howe and colleagues' (Howe and Courage, 1993, 1997; Howe, Courage & Edison, 2003) interpretation of the ontogeny of autobiographical memory. They suggest that the onset of the self-concept provides the cognitive base necessary for self-referent memories. As this base grows, so too does the probability of encoding lasting memories of "me".

[6] Belk (1988) has convincingly argued that adults' behave as though valued possessions constitute an extension of the self. More recently, Hood & Bloom (2008) have demonstrated that 3- to 6-year-olds define highly familiar possessions in reference to the self; when faced with a choice between keeping their own attachment object (for example, a favourite toy) and an exact duplicate, children chose the original, stating "because its mine". For novel and non-attachment objects the opposite trend held.

4. Self-reflection and the self in the present I

This chapter explores the impact of cognitive self-recognition on preschoolers' processing of current events. Without reference to the self in the past our experience of the self as a continuous entity would be compromised. However, the capacity to acknowledge the self in the present is no less crucial. In fact, current self-recognition may be a prerequisite for more distal self-reflection. The SRE introduced in Chapter 2 is illustrative of this point. Stimuli which are recognised implicitly or explicitly as self-referent at encoding are linked to the self-concept. This greater depth of processing results in the stimuli becoming relatively easy to retrieve. Encoding specificity (the self is present at both encoding and retrieval) may also contribute. However, the initial recognition of stimuli as self-referent is at the root of the effect. For this reason, the SRE paradigm also has the potential to index cognitive processing of the self in the present. To the extent that SPT effects have a higher-level cognitive component, they share this potential. However, to allow clear measurement of the impact of cognitive self-recognition on memory, it may be necessary, as in Experiments 2 and 3, to control for physical aspects of self-involvement.

Although they make no reference to the SPT effect, Sui & Zhu's (2005) innovative developmental SRE paradigm combines physical and cognitive aspects of self-reference. As noted, Sui & Zhu (2005) asked children to recognise an external self-representation linked via a pointing gesture to to-be-remembered objects. The advantage of this procedure is that it exploits the simple and memorable nature of physical self-involvement, whilst requiring children to process stimuli on a cognitive basis. Contrary to Experiment 2 and 3's ownership task, the cognitive link between self and object is immediately transparent. Moreover, during encoding and at retrieval, Sui & Zhu (2005) asked the children to monitor which actor (self or other) pointed to an object. This simple judgement is important as it confirms that the link between self and object is available on an explicit level. Interestingly, given their failure to find a SRE for 4-year-olds, Sui & Zhu (2005) found that 4-, 5- and 10-year-old children were similarly equipped to differentiate between self and other in memory. For the objects they did recall, each age-group showed a success rate of around 70% in reporting the actor they were associated with.

Success in this aspect of the task is in line with previous research suggesting that young children have little difficulty in monitoring the source of past events which are other-generated and publicly perceived[7]. For example, Foley Johnson & Raye (1983) found that 6-year-olds were as adept as adults in monitoring which of two adults said a word after a short delay. Using a similar delay, Lindsay, Johnson & Kwon (1991) report that 4- and 6-year-olds perform similarly to adults in remembering which of two stuffed toys (placed on top of speakers) "said" a word. Importantly, these results confirm that children as young as 4 years have the capacity to encode information which explicitly differentiates between stimuli related to different actors in the event. Extending these results, Sui & Zhu (2005) demonstrated that children as young as 4 years can explicitly encode information differentiating between the roles of self and other in recently past events, at least when "self" is given an external representation. However, it is not clear why 4-year-olds' cognitive self-recognition, which was objectively equivalent to the older age-groups', was not sufficient to support a SRE.

[7] See Roberts (2000) for developmental review of more demanding source-monitoring capacities.

In interpreting this disparity, Sui & Zhu (2005) suggested that despite their ability to self-recognise, younger children's self-concepts may be underdeveloped relative to the older children's. As a result, the association of to-be-remembered stimuli with the younger children's self-concepts is inadequate to induce a bias at retrieval. This conclusion is in line with our claim that the SRE paradigm has the potential to index developmental change in the cognitive elaboration of the self-concept. However, Sui & Zhu (2005) subsequently concluded that the self has no functional role in memory for younger children. This conclusion doesn't necessarily follow. Indeed, it seems absurd to suggest that the 4-year-old's capacity to explicitly recall stimuli in association with self-representation had no agentive basis. The mirror mark test of self-recognition indicates that by the age of 2 years, the naming of self-representations can no longer be considered superficial. Although tagging objects as self-referent was yet to be of mnemonic benefit, the self-concept nonetheless had a mnemonic impact in differentiating the material; i.e. a function. Moreover, Experiments 1, 2 and 3 showed that 4-year-olds (and to some extent 3-year-olds) can show a bias in memory for events associated with the self-concept.

It is possible that the difference between the current findings and Sui & Zhu's (2005) results are traceable to the higher task demands of Experiments 1, 2 and 3. The external self-representation used in Experiment 1 was not a direct reflection of the child, meaning that any association between the self-concept and to-be-remembered stimuli required cognitive mediation. Moreover, in Experiments 2 and 3, no external self-representation was used. Rather, children had to make the link between self and stimuli based purely on a cognitive understanding of ownership. It is perhaps counterintuitive that these complex levels of self-recognition should allow 4-year-olds to index a SRE, whereas Sui & Zhu's (2005) simpler procedure did not. However, Sui & Zhu's (2005) task relied on making explicit a visual link between self and stimuli, whereas Experiments 1, 2 and 3 required that the link between self and stimuli be actively constructed. This occurred either via physical involvement, or cognitive interpretation of otherwise neutral stimuli as self-related. For this reason, Experiments 1, 2 and 3 may have elicited a greater depth of self-referent processing than Sui & Zhu's (2005) task. In support, 3- to 4-year-olds' recall rates after one week (34%) in our object recall tasks (Experiments 2 and 3) were similar to those shown by 4-year-olds after two minutes (37%) in Sui & Zhu's (2005)[8]. One interpretation then, is that to elicit an effect one must ensure that younger children actively elaborate the link between self and to-be-remembered stimuli. Without this, any link made may be too weak to be of cognitive benefit.

An alternative explanation for the disparity between our results and Sui & Zhu (2005) focused on the specific task demands of their study. Although the association between self and stimuli in Sui & Zhu's (2005) study appeared simple, their method for ensuring children encoded this information was not. Firstly, Sui & Zhu (2005) used hybrid stimuli for self-recognition, digitally placing children's heads on a generic pointing body. Although the children were evidently able to correctly differentiate between self and other in declarative memory, it is a peculiarity of Sui & Zhu's (2005) procedure that representation of the pointing action was divorced from the actor

[8] Note, 4-year-olds' failure to index a SRE doesn't appear to result from poor memory performance per se; in their second study Sui & Zhu (2005) found a SRE for 5-year-olds with recall performance of only 26%. However, Sui & Zhu (2005) do not report the percentage of 4-year-olds offering free recall, leaving open the possibility of floor effects.

involved. This may have compromised self-other differentiation on an implicit level. Moreover, this problem might have been particularly pronounced for the younger children, whose understanding of external representations is relatively new (Zelazo *et al*, 1999). Of further detriment to implicit self-other differentiation, Sui & Zhu (2005) used the image of an unfamiliar other of the same age and gender as the child. However, Experiments 1 and 2 showed that observable similarities between self and other sometimes led children to show a mnemonic bias for "other"-referent stimuli. Although it is not clear why younger children would be selectively prone to such an effect, it is clear that this factor has the potential to undermine a self-reference advantage.

The complexity of Sui & Zhu's (2005) presentation schedule is also open to criticism. At encoding, representations of actor and object were presented on screen for just 4 seconds before the display disappeared to be replaced by a source-monitoring prompt. During the prompt (which was displayed for an unlimited time) the child was encouraged to state the sentence "I am" or "Other is" "pointing to the *object*".[9] These mini-tests of declarative memory served to emphasise the link between actors and objects, and were presumably designed to support the encoding of expressible memories. Consequently, children spent most of their time not experiencing the impact of self-recognition, but recreating this experience verbally. For developing linguists in particular, these mini-tests might have distracted from continued elaboration on a

[9] Although stimuli-object pairs were no longer available Sui & Zhu (2005) report that children stated who was pointing in the present tense, and used the unnatural phrase "Other is". These idiosyncrasies might be traceable to the translation of the study, which was conducted in Beijing. However, if children were required to use the unusual phrase "Other is" this novelty might explain why 4-year-olds found other-referent stimuli slightly more memorable. However, the results of Experiment 4 suggest this is not the full explanation.

deeper level. The cognitive correlates of visual self-recognition are presumably activated most strongly during the recognition event, not after it.

Sui & Zhu (2005) justify their separation of visual and linguistic processing by noting that children cannot be expected to respond on a strict schedule. However, they do not discuss their motivation for using a fixed interval to present visual stimuli. Their use of a shorter interval in the second study, which aimed to increase task difficulty for 10-year-olds, implies that this factor was intended to make the task sufficiently challenging to allow a SRE. In Symons & Johnson's (1997) meta-analysis, short presentation times were found to increase SREs. However, as discussed, brief presentation time in this paradigm might reduce the cognitive impact of self-recognition. It is also possible that the fixed interval was introduced to ensure that children spent an equivalent amount of time exposed to self- and other-referent stimuli. Symons & Johnson (1997) did not flag within-task timing as an issue in studies of the SRE in adults. Further, comparison of studies with (N = 28) and without (N = 41) fixed interval presentation times in Symons & Johnson's (1997) meta-analysis suggests that this factor does not dictate whether an effect occurs. However, as with the picture stimuli used in Experiments 1[10], 2 and 3, the word stimuli used in these studies were objectively self-neutral. By contrast, Sui & Zhu's (2005) stimulus-object pairs were transparently self-referent. For this reason, Sui & Zhu (2005) might have considered it important to control for the amount of time allowed to make simple visual associations.

[10] Children's names might be considered directly self-reflective; however, in Experiment 1, the name referred to the cartoon, not to the child.

However, even if stimuli were presented on a schedule dictated by responses, it is unclear how a selective time bias would emerge, particularly in the direction needed to support a SRE. The most likely scenario is arguably that self-interest would lead to fast responding to self-referent questions, which would undermine any time-driven SRE. If self-interest led to slow responding due to distraction, failing to focus on the link between self and stimuli (the response required) would also undermine the SRE. If preschoolers chose to withhold answers to the self-referent question not because they were unsure of them but because of a desire to prolong exposure, they would be showing an unlikely amount of Machiavellian control. In any event, the motivation to linger over stimuli presented with the self-image would remain indicative of higher level self-recognition. Moreover, to confer mnemonic benefit, extra processing time must refer not only to the self but to the to-be-remembered object. At the very least then, concurrent activation of the object-concept and self-concept would be central to the mnemonic bias. It would be difficult to argue that this was not a SRE.

4.1 Experiment 4

Having identified some complexities in Sui & Zhu (2005) procedure, Experiment 4 aims to determine if the paradigm can be adapted to allow younger children to show a SRE. Sui & Zhu's (2005) approach is of particular interest as it identifies an unambiguous aspect of self-reference which might be used to trace the ontogeny of the SRE. It is clear that 3- and 4-year-olds recognise their self-image. What is not clear is if the cognitive correlates of visual self-recognition are strong enough to play a supportive role in memory. Answering this question is of relevance to the functional impact of self-recognition beyond mark-directed behaviour. In addition to being of theoretical interest due to content, Sui & Zhu's (2005) paradigm provides an opportunity to assess the impact of delay in the ontogeny of the SRE. Their use of a very short interval between encoding and retrieval is typical of the SRE paradigm, suggesting that our previous tests of the effect may have been overly challenging, particularly for 3-year-olds. If 3-year-olds do have a specific difficulty referring to the self in the past (which Experiments 1, 2 and 3 failed to provide evidence of), or simply a smaller memory capacity, the link between self and object being more recent might enhance their ability to show an effect.

Sui & Zhu's (2005) paradigm can be modified in a number of ways to support the cognitive impact of self-recognition. Addressing concerns about a possible recognition overlap between self and other, Experiment 4 substituted Sui & Zhu's (2005) same-gender peer photograph with a photograph of the experimenter. To avoid ambiguity concerning action ownership, full body shots of self and experimenter pointing were used. Crucially, children were asked to judge who was pointing to the object *during* stimulus pair presentation. Here the linguistically simple response "I am" or "You are", or even a gesture toward the appropriate person was sufficient. When children made a response the stimulus pair was removed. Finally, as in Experiments 1, 2 and 3, the recall test was supplemented by a recognition measure designed to support the children's reporting of visual memories of the event.

Method

Participants

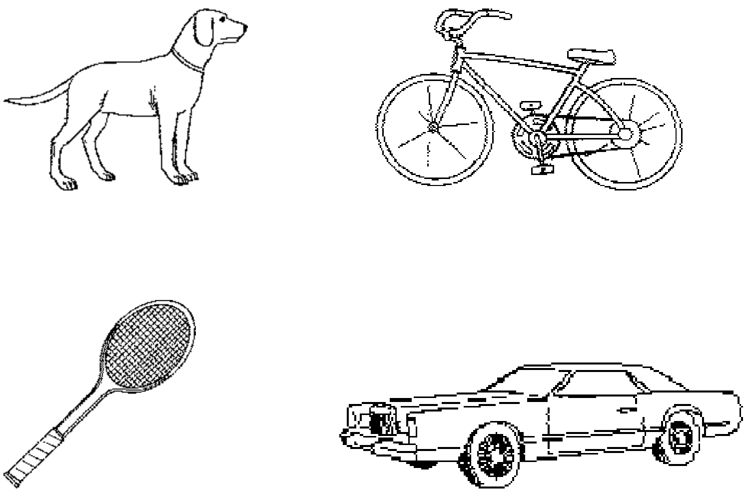
Sixty preschool children from two age-groups took part; 3-year-olds: 30 children, M = 38.5 months, SD = 2 months, range = 35 - 41 months; 3.5 to 4-year-olds: 30 children, M = 49.4 months, SD = 4 months, range = 44 - 57 months.

Materials

During testing, one of two Polaroid photographs was placed on A4 sheets of paper on a target approximately one inch from an object outline picture. Photograph and objects were arranged so that the person in the picture (child or experimenter) appeared to be pointing at the object (see Figure 4.1 for example). Ten sheets, each featuring a different object, were presented during testing, five with self-image and five with other-image. As in Sui & Zhu's (2005) study, object outline pictures were taken from a set standardised for familiarity by Snodgrass and Vanderwart (1980). A4 recognition cards consisted of one target object, and three distracter objects (see Figure 4.1). Three paper cups and a toy shopping trolley were used in a distracter task separating encoding from retrieval.

"I am pointing to the bike"

Example of encoding stimuli



Example of recognition stimuli

Figure 4.1: Examples of Experiment 4 encoding and retrieval stimuli

Procedure

Children were shown a Polaroid image of the experimenter pointing, after which they were asked to adopt a pointing pose and had their own Polaroid photograph taken. In the encoding phase, ten object-outlines were shown one at a time with one of the Polaroid images held adjacent (order counterbalanced). Sui & Zhu (2005) used 12 object pictures, but piloting suggested that ten was a more appropriate number of stimuli for this younger sample. During each stimulus-pair presentation the experimenter pointed to the object and said “What is that?”, and the child typically answered with the object name (if they did not the experimenter named the said “it’s a X (for example, *ball*) isn’t it?”). The experimenter then pointed to the adjacent photograph and said “Who is pointing to the X?”. The target response was “I am” or “You are”, or a gesture toward the appropriate person. If the child refused to respond the experimenter said “You are/I am pointing to the *object*”, whilst gesturing to the appropriate person, and then moved on.

Following encoding of all ten objects, the child participated in a two minute long distracter task which required them to hide a toy shopping trolley from the experimenter under one of three cups. Sui & Zhu (2005) do not provide details of their distracter task but this task was of an equivalent duration, and unrelated to the picture game. After the interval, the child was reminded of the previous game (verbally, and via re-introduction of the photographs) and asked to recall the object pictures shown. For each object correctly recalled the child was asked the explicit source monitoring question “Who pointed to the X?”. This time the target response was “I did” or “You did”, or a gesture toward the appropriate person or photograph (both were present).

Children were then given a recognition test for each object. Recognition cards showed objects from the previous display together with three distracters (placement on card counterbalanced). The experimenter named each object on the card and said "I only showed you one of these pictures, can you remember which one?". Again, for each object correctly recognised the child was asked "Who pointed to the X?", target responses were as for the recall test. At the end of the game, children were given their own photograph to keep as a reward for taking part.

Results

Recall

Only 15 children (three 3-year-olds, 12 4-year-olds) offered free recall, recalling an average of 2.2 objects (SD = 1.4). Age had a significant effect on recall performance (3-year-olds: M = 0.2, SD = 0.8; 3.5- to 4-year-olds: M = 0.9, SD = 1.4; F (1, 56) = 4.7, p= 0.03, η_p^2 = 0.08). At an average of 69.4% (SD = 40%) correct source-monitoring judgements for recalled stimuli, performance failed to significantly exceed chance (t (14) = 1.8, p = 0.08). There was no recall advantage for self (M = 0.25, SD = 0.5) or other-referent (M = 0.3, SD = 0.8) stimuli (F (1, 56) = 0.3, p = 0.6, η_p^2 =0.005), regardless of age (F (1, 56) = 0.03, p = 0.8, η_p^2 =0.001). Note that poor recall rates would have given low power to these analyses.

Recognition

As shown in Table 4.1, recognition performance was significantly above chance (25%) overall, for both self and for other-referent stimuli, for all age-groups. Five 4-year-olds performed at ceiling, recognising all ten stimuli. There was no overall effect of age on recognition scores (F (1, 58) = 2, $p = 0.15$, $\eta_p^2 = 0.03$). However, when considering stimulus types separately, 4-years-olds significantly outperformed 3-year-olds in the recognition of other- (F (1, 58) = 5.5 $p = 0.02$, $\eta_p^2 = 0.08$), but not self-referent stimuli (F (1, 58) = 0.1, $p = 0.7$, $\eta_p^2 = 0.002$).

Table 4.1: Experiment 4 recognition performance, split by age-group

Performance measure	**Overall**	**Age-group**	
		3-year-old	**4-year-old**
Overall recognition	M=5.3 (53%), SD=2.9 (t (59) = 7.4, p < 0.001)	M=4.8 (48%), SD=2.8 (t(29)= 4.3, p < 0.001)	M=5.8 (58%), SD=2.9 (t(29)=6.2, p < 0.001)
Recognition self-related stimuli	M=2.5 (50%), SD=1.6 (t (59) = 6.2, p < 0.001)	M=2.5 (50%), SD=1.6 (t(29)= 4.1, p < 0.001)	M=2.6 (52%), SD=1.6 (t(29)=4.7, p = 0.001)
Recognition other-related stimuli	M=2.7 (54%), SD=1.6 (t(59)=7.3, p < 0.001)	M=2.3 (46%), SD=1.4 (t(29)= 4, p < 0.01)	M=3.2 (64%), SD=1.6 (t(29)=6.7, p < 0.001)

Children made correct source-monitoring judgements for an above chance average of 61.5% (SD = 29%) of recognised stimuli (t (58) = 3, $p = 0.004$). The effect of age on the percentage of correct source monitoring failed to reach significance (between-subjects ANOVA; F (1, 55) = 3.2, $p = 0.08$, $\eta_p^2 = 0.05$). However, one-sample t-tests indicated that whereas 3-year-olds were below chance in monitoring the source of recognised stimuli at 55% (SD = 34%, t (28) = 0.8, p = 0.48), 4-year-olds were above chance at 68% (SD = 24%, t (29) = 4, p < 0.01).

A repeated-measures ANOVA suggested that children recognised a similar number of self- and other-referent stimuli (F (1, 58) = 2.2, p = 0.13, η_p^2 = 0.038). However, this factor significantly interacted with age (F (1, 58) = 6.6, p = 0.012, η_p^2 = 0.1). To investigate further the file was split according to age-group and the ANOVA repeated. As shown in Table 3.1, whereas 3-year olds recognised a similar number of self- and other-related objects (F (1, 28) = 0.6, p =0.4, η_p^2 = 0.02), 4-year-olds showed a strong bias for recognition of other-related objects (F (1, 28) =7.5, p = 0.011, η_p^2 = 0.2).

Discussion

Four-year-olds performed above chance in monitoring who had pointed to recognised objects, confirming that this age-group is capable of explicitly differentiating between self and other in memory. However, 4-year-olds did not recognise self-referent stimuli more often than other-referent stimuli at retrieval. Just as in Sui & Zhu's (2005) recall data, they showed a bias in the opposite direction, recognising more stimuli associated with the image of an unfamiliar other. Moreover, in Experiment 4, 4-year-olds' mnemonic bias for other-referent stimuli was significant. The results for 3-year-olds are also negative. As in Experiments 1, 2 and 3, 3-year-olds failed to show a significant SRE, despite the shorter interval between encoding and retrieval. However, contrary to their performance in Experiments 2 and 3, children of this age were below chance in monitoring the source of the stimuli they did recognise.

This result implies that this paradigm was not equipped to allow 3-year-olds to maintain an explicit cognitive link between self and stimuli, and undermines any expectation of a SRE.

The replication of Sui & Zhu's (2005) other-reference effect (ORE) confirms that 4-year-olds' failure to index a SRE was not due to those authors' use of a similar other or generic representation of the pointing action. Even when given the opportunity to focus for longer on self-referent stimuli, 4-year-olds showed no SRE. However, children showed the same pattern here where exposure to photographs was longer, as in Sui & Zhu's (2005) study, where they were presented for only a few seconds. This refutes the suggestion that the fixed interval schedule might have been overly demanding for 4-year-olds. Nevertheless, discovery of a significant ORE precludes acceptance of Sui & Zhu's (2005) conclusion that 4-year-olds failed to show a SRE due to a relatively weak self-concept. There is no reason to expect that 4-year-olds' concepts of unfamiliar others should be superior to their own, albeit early, self-concepts.

A more plausible explanation for the ORE is inspired by previous discussion of self-focus. As noted, one reason to include a fixed interval stimulus presentation schedule is to control for self-interest as a mediating factor in a visual-cognitive SRE. However, in addition to a possible impact on the time spent encoding self- versus other-referent stimuli, self-focus might have an impact within stimulus presentations. Specifically, photographs were presented separately from to-be-remembered objects in the visual field, and the integration between the two relatively passive (pointing). For this reason, it seems plausible that self-photographs sometimes distracted from, rather than drew attention toward, task stimuli. Clearly, this could result in a reversed self-reference effect. This might also explain why the expected age-related recognition advantage emerged only for other-referent stimuli. Only here could 4-year-olds encode stimuli-object pairs without distraction.

4.2 Experiment 5

Following the above reasoning, Experiment 5 introduced two SRE paradigms in which the impact of visual self-focus was controlled. The first aimed to more clearly integrate to-be-remembered stimuli with representations of self and other. To achieve this, objects were placed on top of, as opposed to adjacent to, person photographs. The objects were chosen to give the impression of an action. For example, a cut-out tennis racket placed on top of a figure in a photograph gives the impression that the figure is playing tennis. Placing to-be-remembered objects in the same visual field as the self was expected to minimise any interference arising from self-focus. Moreover, it seemed likely that the elaborated link between people and objects would result in a greater depth of processing. Experiments 1, 2 and 3 suggested that active processing might help young children to show a SRE. To ensure that children actively interpreted the link between people and objects they were asked to give a verbal description of actor and action (for example, "I played tennis") during stimulus presentation. This additional support was expected to facilitate 3-year-olds' source-monitoring, reviving the possibility of a SRE for this age-group.

Rather than integrate self- and object-representations, the second paradigm returned to the use of self-neutral stimuli. Here, objects were presented with a verbal action description only. Crucially, each description began with linguistic reference to self ("I") or other ("He/She"). To compensate for the paucity of these presentations, descriptions no longer focused on the generic "played with" but described specific actions, for example "I stroked the cat". As noted in Chapter 2, first person pronouns are reflexive, meaning that depending on the context of their production, they may refer to self or other. As such, "I" does not yield an attention or familiarity advantage over "you", "he", or "she" in the way that one's own name (Experiment 1) or own photograph (Experiment 4) might yield an advantage over less familiar names or images. However, this theoretical advantage has practical implications. As the children were not of reading age, action statements had to be presented verbally in the pronoun-based task. This meant that the first person pronoun used in action statements could be interpreted as referring to the speaker (an other) as opposed to the listener. For this reason, children were required to repeat action statements, in other words, to verbally take the perspective of "I". To address the possibility that action statement repetition might not be sufficient to prompt children take the cognitive perspective of "I" a second variable was introduced to promote self-referent processing: specifically, half of the children were exposed to their own mirror image during encoding.

As described in Chapter 1, the introduction of a mirror has been shown to result in an increased tendency to interpret ambiguous language as self-referent (Davis & Brock, 1975; Stapel & Tesser, 2001). This result implies that the introduction of a mirror may encourage children to interpret the first person pronoun employed in Experiment 5 as self-referent, thus promoting a SRE. Even in the photo based version of the task, where first person pronouns are disambiguated, it seems possible that any increased activation of the self-concept resulting from mirror exposure would facilitate a SRE. For this reason, the introduction of a mirror to the SRE paradigm might be expected to help children, particularly the youngest age-group, index an effect.

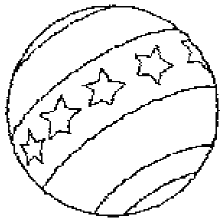
Method

Participants

In total, 120 preschool children from four nurseries took part: 60 3-year-olds: M = 38.3 months, SD = 2.5 months, range = 33 - 41 months; and 60 3 ½ to 4-year-olds: M = 49.5 months, SD = 5.5 months, range = 42 - 59 months. Half of the children from each age-group completed the photo-action task, and half the pronoun-action task (total N per task = 60).

Materials

Stimuli for the photo-action task included three Polaroid photographs (one of the child, one male and one female peer) and ten cut-out object outlines as described for Experiment 4. Stimuli for the pronoun-action task were the same ten object outline pictures, this time accompanied by an action statement to be read out by the experimenter. See Figure 4.2 for examples of photo-action and pronoun-action encoding stimuli. A mirror (6" x 6") was also used at encoding to manipulate self-awareness. As described for Experiment 4, recognition stimuli for both tasks comprised ten A4 recognition cards including one target object and three previously un-encountered objects. Materials and procedure for the distracter task were as described in Experiment 4.



"He played with the kite" **"He bounced the ball"**

(Photo-action task) *(Pronoun-action task)*

Figure 4.2: Examples of Experiment 5 encoding stimuli

Procedure

Children participating in the photo-action task were shown a Polaroid photograph of a child of the opposite gender, then had their own photograph taken. For half of the children a mirror was present and angled to reflect the child's face (high self-awareness condition). For the remainder the mirror's non-reflective surface was presented (low self-awareness condition). Those in the high self-awareness condition had their attention drawn to their mirror-image whilst waiting for the photograph to develop ("Can you see yourself in my mirror? Is that what your photograph will look like?"). Children were asked to self-recognise in the photograph, then shown with a series of stimulus-pair presentations. During the presentation each object was placed on top of one of the Polaroid images (order counterbalanced), and the child was asked "What's that?" and "Who is playing with the X?". Upon response, the experimenter prompted “So you say, I (He/She) am (is) playing with the X” and encouraged the child to repeat the sentence.

Photographs of unfamiliar opposite gender peers replaced the experimenter’s image in this paradigm to avoid confusion arising from the reflexive nature of personal pronouns (“I” becomes “You”). Contrary to Sui & Zhu (2005), an opposite-gender peer was used, intended to maximise differentiation between self and other. As described in Experiment 4, following a short distracter task the child was reminded of the previous game and asked to recall, recognise and source monitor for the object pictures shown. The mirror was not present at retrieval, in order to avoid any bias in cueing self-referent information. Again, children were given their own photograph to keep at the end of the game to reward participation.

Children participating in the pronoun-action task were presented with the same object pictures. Again, children in the mirror condition were encouraged to attend to their reflection before the task began. In this task, as each object was shown, the experimenter made a simple action statement involving the object and the first person pronoun “I” or an opposite gender-referent pronoun (for example, “I/He bounced the ball”). Here, the generic “played with” was not used to describe actions as, in the absence of photographs, this might not result in sufficient differentiation between encoding stimuli. Following a short distracter task the child was reminded of the previous game, and asked to recall and recognise the object pictures shown as described in Experiment 4 (again the mirror was now absent). In piloting, children failed to respond to the simplest framing of the source-monitoring question for example, “What did we say about the ball?” or “Who bounced the ball?”. For this reason, source monitoring questions were not asked for the pronoun-action task. At the end of the game, children were given a sticker to reward them for taking part.

Results

Recall

Fifty children (18 3-year-olds, 32 3.5- to 4-year-olds) offered free recall, recalling an average of 2.9 objects (SD = 1.4). Age had a main effect on overall recall rates ($F(1, 112) = 10.4$, $p = 0.002$, $\eta_p^2 = 0.08$), with 3.5- to 4-year-olds (M = 1.7, SD = 1.4) outperforming 3-year-olds (M = 0.8, SD = 1.9). Source-monitoring for those offering free recall in the photo-action task was remarkably high at 97.5% (SD = 8%) correct (above chance one-sample t-test, $t(24) = 27.9$, $p < 0.01$).

There was no recall advantage for task type (photo-action task: M = 1.1, SD = 1.6; pronoun-action task: M = 1.3, SD = 1.8; $F(1, 112) = 0.6$, $p = 0.4$, $\eta_p^2 = 0.006$) or self-awareness condition (mirror present: M = 1.2 , SD = 1.6; mirror absent: M = 1.4, SD = 1.8; $F(1, 112) = 0.6$, $p = 0.4$, $\eta_p^2 = 0.006$), nor any significant interactions involving the between-subjects variables. Similarly, there was no recall advantage for self- (M = 0.6, SD = 0.9) over other-related (M =0.6, SD = 1) stimuli, regardless of task ($F(1, 112) = 1$, $p = 0.3$, $\eta_p^2 = 0.009$), self-awareness condition ($F(1, 112) = 0.6$, $p = 0.43$, $\eta_p^2 = 0.005$) or age-group ($F(1, 112) = 1$, $p = 0.3$, $\eta_p^2 = 0.009$).

Recognition

As shown in Table 4.2, recognition was above chance for both tasks, for all age-groups and self-awareness conditions. In fact, 26 4-year-olds and nine 3-year-olds performed at ceiling, recognising all ten stimuli. Age had a significant effect on the number of stimuli recognised overall ($F\ (1,\ 112) = 6.7$, $p = 0.01$, $\eta_p^2 = 0.06$). This reflected a significant advantage for 4-year-olds in the recognition of other-referent stimuli ($F\ (1,\ 112) = 9.2$, $p = 0.002$, $\eta_p^2 = 0.08$) but not self-referent stimuli ($F\ (1,\ 112) = 3.2$, $p = 0.7$, $\eta_p^2 = 0.03$).

Table 4.2: Recognition performance for Experiment 5, split by task, age-group and self-awareness condition

Photo-action task

Performance measure	**Overall**	**Age-group**		**Self-awareness condition**	
		< 3.5 years	**≥ 3.5 years**	**Mirror**	**No mirror**
Overall recognition	M=7 (70%), SD=2.9 (t (59) = 11.8, p < 0.01)	M=6.5 (65%), SD=2.9 (t (29) = 7.5, p < 0.01)	M=7.5 (75%), SD=3 (t (29) = 9.3, p < 0.01)	M=7 (70%), SD=2.9 (t (29) = 8.3, p < 0.01)	M=7.1 (71%), SD=3.1 (t (29) = 8.2, p < 0.01)
Recognition self-related stimuli	M=3.6 (72%), SD=1.6 (t (59) = 11.5, p 0.01)	M=3.5 (70%), SD=1.6 (t (29) = 7.7, p < 0.01)	M=3.7 (74%), SD=1.6 (t (29) = 8.4, p < 0.01)	M=3.6 (72%), SD=1.6 (t (29) = 7.9, p < 0.01)	M=3.6 (72%), SD=1.6 (t (29) = 8.1, p < 0.01)
Recognition other-related stimuli	M=3.4 (68%), SD=1.5 (t (59) = 10.7, p < 0.01)	M=3 (60%), SD=1.5 (t (29) = 6.4, p < 0.01)	M=3.8 (76%), SD=1.5 (t (29) = 9.2, p < 0.01)	M=3.4 (68%), SD=1.4 (t (29) = 7.9, p < 0.01)	M=3.4 (68%), SD=1.8 (t (29) = 7.2, p < 0.01)

Pronoun-action task

Performance measure	**Overall**	**Age-group**		**Self-awareness condition**	
		< 3.5 years	**≥ 3.5 years**	**Mirror**	**No mirror**
Overall recognition	M=5.9 (59%), SD=3.5 (t (59) = 7.6, p < 0.001)	M=4.9 (49%), SD=3.4 (t(29)=3.9, p < 0.001)	M=6.9 (69%), SD=3.3 (t(29)=7.2, p < 0.001)	M=5.4 (54%), SD=3.6 (t(29)=4.5, p < 0.001)	M=6.4 (64%), SD=3.3 (t(29)=6.3, p < 0.001)
Recognition self-related stimuli	M=3.2 (64%), SD=1.7 (t (59) = 8.2, p < 0.001)	M=2.6 (52%), SD=1.7 (t(29)=4.5, p < 0.001)	M=3.6 (72%), SD=1.7 (t(29)=7.4, p < 0.001)	M=2.9 (58%), SD=1.7 (t(29)=5.4, p < 0.001)	M=3.3 (66%), SD=1.8 (t(29)=6.3, p < 0.001)
Recognition other-related stimuli	M=2.8 (56%), SD=1.9 (t(59)= 6.4, p < 0.001)	M=2.3 (46%), SD=1.8 (t(29)= 3, p = 0.005)	M=3.4 (68%), SD=1.8 (t(29)=6.5, p < 0.001)	M=2.5 (50%), SD=2 (t(29)=3.5, p = 0.001)	M=3.1 (62%), SD=1.8 (t(29)=5.7, p < 0.001)

At an average of 89% (SD = 18.5%) correct, source-monitoring for recognised stimuli in the photo-action task was significantly improved from Experiment 4 (independent sample t-test $t(113) = 5.7$, $p < 0.01$). Moreover, one-sample t-tests indicated that both age-groups were now significantly above chance at monitoring the source of recognised stimuli (3-year-olds: M = 84%, SD = 24%, $t(26) = 7.4$, $p < 0.01$; 4-year-olds: M = 92%, SD = 11%, $t(28) = 19.8$, $p < 0.01$). The effect of age on source-monitoring performance failed to reach significance ($F(1, 52) = 2.4$, $p = 0.1$, $\eta_p^2 = 0.045$), as did the effect of self-awareness condition (mirror present: M = 83%, SD = 22%; mirror absent: M = 92%, SD = 12%; $F(1, 52) = 2.9$, $p = 0.09$, $\eta_p^2 = 0.05$).

Recognition memory appeared more robust in the photo-action task, and the main effect of task type approached significance (overall, $F(1, 112) = 3.6$, $p = 0.058$, $\eta_p^2 = 0.03$; self-referent, $F(1, 112) = 2.8$, $p = 0.09$, $\eta_p^2 = 0.025$; other-referent, $F(1, 112) = 3.8$, $p = 0.053$, $\eta_p^2 = 0.03$). However, self-awareness condition had no main effect on recognition scores (overall, $F(1, 112) = 0.8$, $p = 0.3$, $\eta_p^2 = 0.008$; self-referent, $F(1, 112) = 0.5$, $p = 0.5$, $\eta_p^2 = 0.004$; other-referent, $F(1, 112) = 1.1$, $p = 0.2$, $\eta_p^2 = 0.01$). There were no significant interactions involving these variables.

A repeated-measures ANOVA indicated a significant recognition advantage for self-related stimuli ($F(1, 112) = 7.7$, $p = 0.006$, $\eta_p^2 = 0.06$), regardless of task type ($F(1, 112) = 0.2$, $p = 0.6$, $\eta_p^2 = 0.002$), or self-awareness condition ($F(1, 112) = 0.3$, $p = 0.5$, $\eta_p^2 = 0.004$). However, this effect significantly interacted with age ($F(1, 112) = 5$, $p = 0.027$, $\eta_p^2 = 0.04$). Strikingly, 3-year-olds ($F(1, 56) = 13.1$, $p = 0.01$, $\eta_p^2 = 0.19$), but not 3.5-to 4-year-olds ($F(1, 56) = 0.14$, $p = 0.7$, $\eta_p^2 = 0.002$) showed a significant

SRE. Moreover, the interactive effect of age, task-type and self-awareness condition approached significance ($F(1, 56) = 2.9$, $p = 0.09$, $\eta_p^2 = 0.025$).

To confirm, whereas 3-year-olds showed strong SRE in the photo-action task ($F(1, 28) = 8.1$, $p = 0.008$, $\eta_p^2 = 0.2$), 3.5- to 4-year-olds failed to show a bias in either direction ($F(1, 28) = 0.3$, $p = 0.6$, $\eta_p^2 = 0.01$) (see Table 4.2 for means). Likewise, in the pronoun-action task, 3-year-olds ($F(1, 28) = 5.1$, $p = 0.03$, $\eta_p^2 = 0.15$) but not 3.5- to 4-year-olds ($F(1, 28) = 1.1$, $p = 0.3$, $\eta_p^2 = 0.04$) showed a significant SRE. However, the 3-year-olds' SRE interacted with self-awareness condition ($F(1, 28) = 5.1$, $p = 0.03$, $\eta_p^2 = 0.15$). As shown in Figure 4.3, 3-year-olds showed a bias for stimuli encoded with first person pronouns within the task only when the mirror was present at encoding ($F(1, 14) = 16$, $p = 0.001$, $\eta_p^2 = 0.5$); when the mirror was absent they recognised an equivalent number of each stimuli ($F(1, 14) = 0$, $p = 1$, $\eta_p^2 = 0.00$).

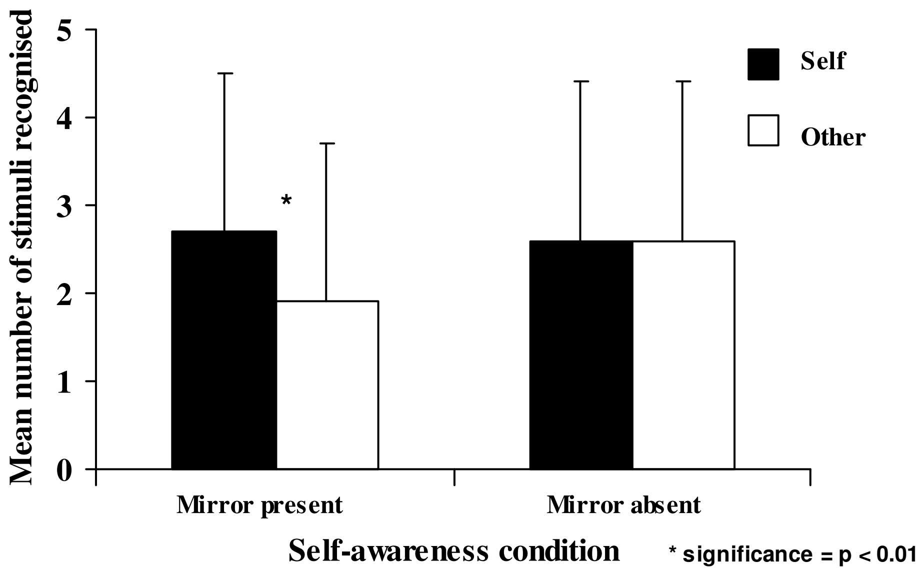


Figure 4.3: 3-year-olds' recognition of self- and other-referent stimuli in Experiment 5, split by self-awareness condition

Discussion

Experiment 5 provides new evidence to suggest that children as young as 3 years show a SRE in memory. Three-year-olds showed a bias for the recognition of stimuli which had been presented pictorially as part of a self-performed action. This occurred regardless of mirror-induced self-focus at encoding. However, children only showed a bias for the recognition of stimuli that verbally implicated the self when self-focus was primed by the mirror. Both results indicate that helping 3-year-olds to actively link events with the self at encoding can facilitate retrieval of those events. However, there was no accompanying SRE for 4-year-olds. For this reason, Experiment 5 is not enlightening with regards to developmental progressions in the effect.

A plausible explanation for this unexpected reversal in developmental effects lies in older children's greater recognition success. Over 40% of the 4-year-olds in both tasks performed at ceiling when recognising encoding stimuli. This result means that a relatively small number of 4-year-olds were capable of showing differential recognition of self- versus other-referent stimuli. By contrast, 15% of 3-year-olds performed at ceiling. A similar problem was encountered by Sui & Zhu (2005), who, although uncovering a SRE for 5-year-olds in their first experiment, failed to find an equivalent effect for 10-year-olds. This problem was overcome in their second experiment by increasing the number of to-be-remembered stimuli. Following Sui & Zhu's (2005) reasoning, Experiment 6 aimed to increase task demands to increase the likelihood that 4-year-olds would be able to show a significant SRE.

4.3 Experiment 6

Method

Participants

Sixty 4-year-olds, recruited from three nurseries took part, 30 in the photo-action task (M = 51 months, SD = 5 months, range = 43 - 60 months), and 30 in the pronoun-action task (M = 54.2 months, SD = 6 months, range = 42 – 63 months).

Materials and Procedure

The materials and procedure were as described for Experiment 5. However, to increase difficulty six extra object outline pictures and recognition cards were now included, bringing the total number of to-be-remembered stimuli to 16. Again, all object outlines were taken from Snodgrass and Vanderwart's (1980) standardised set.

Results

Recall

Thirty-nine children (M = 54 months) offered free recall, recalling an average of 2.7 objects (SD = 1.4). In the photo-action task an above-chance average of 87% (SD = 27%) of source-judgements arising from free recall were correct ($t(19) = 5.9$, $p < 0.01$).

Recall rates did not show a significant correlation with age in months (r^2= .13, p = 0.3) and neither task-type (photo-action task: M = 1.8, SD = 1.6; pronoun-action task: M = 1.7, SD = 1.8; F (1, 56) = 0.008, p = 0.9, η_p^2 = 0.00) nor self-awareness condition (mirror present: M = 1.9, SD = 1.9; mirror absent: M = 1.5, SD = 1.5; F (1, 56) = 1.1, p = 0.3, η_p^2 = 0.003) had a significant main effect on recall, or combined effects (F (1, 56) = 0.8, p = 0.4, η_p^2 = 0.002). Similarly, within- subjects analysis found no recall advantage for self- (M = 0.8, SD = 0.9) over other-referent (M = 0.9, SD = 1.1) stimuli (F (1, 56) = 0.3, p = 0.6, η_p^2 = 0.007), regardless of task type (F (1, 56) = 0.2, p = 0.7, η_p^2 = 0.005) or self-awareness condition (F (1, 56) = 0.7, p = 0.4, η_p^2 = 0.002), or a combination of these factors (F (1, 56) = 2.6, p = 0.1, η_p^2 = 0.07).

Recognition

As shown in table 4.3, recognition was above chance overall, for self and for other-related stimuli and for all self-awareness conditions. Recognition rates were significantly positively correlated with age in months (r^2= 0.26, p = 0.04). Eleven children (M = 54 months) performed at ceiling, recognising all 16 stimuli. At an average of 83% (SD = 17%) correct, children were significantly above chance at monitoring the source of recognised stimuli in the photo-action task (t (29) = 10.5, p < 0.01). There was no effect of self-awareness condition on accurate source-monitoring (mirror present: M = 82%, SD = 14%; mirror absent: M = 84%, SD = 20%, F (1, 28) = 0.08, p = 0.8, η_p^2 = 0.003).

Table 4.3: Recognition performance for Experiment 6, split by task type and self-awareness condition

Photo-action task

Performance measure	**Overall**	**Self-awareness condition**	
		Mirror	**No mirror**
Overall recognition	M=12 (75%), SD=4.2 (t (29) = 10.2, p < 0.01)	M=12.2 (76%), SD=4.1 (t (14) = 7.7, p < 0.01)	M=11.9 (74%), SD=4.6 (t (14) = 6.6, p < 0.01)
Recognition self-related stimuli	M=6.3 (78%), SD=2 (t (29) = 11.4, p 0.01)	M=6.3 (78%), SD=2 (t (14) = 8.2, p < 0.01)	M=6.2 (77%), SD=2.1 (t (14) = 7.7, p < 0.01)
Recognition other-related stimuli	M=5.7 (71%), SD=2.4 (t (29) = 8.3, p < 0.01)	M=5.9 (74%), SD=2.3 (t (14) = 6.4, p < 0.01)	M=5.6 (70%), SD=2.6 (t (14) = 5.3, p < 0.01)

Pronoun-action task

Performance measure	**Overall**	**Self-awareness condition**	
		Mirror	**No mirror**
Overall recognition	M=13.1 (81.8%), SD=3.5 (t (29) = 14.1, p < 0.01)	M=12.6 (79%), SD= 4 (t (14) = 8.3, p < 0.01)	M=13.6(85%), SD=3.1 (t (14) = 12.2, p < 0.01)
Recognition self-related stimuli	M=6.7 (84%), SD=1.8 (t (29) = 14.5, p 0.01)	M=6.7 (84%), SD=1.8 (t (14) = 10, p < 0.01)	M=6.7 (84%), SD=1.8 (t (14) = 10.2, p < 0.01)
Recognition other-related stimuli	M=6.4 (80%), SD=2 (t (29) = 12.1, p < 0.01)	M=5.9 (74%), SD=2.2 (t (14) = 6.7, p < 0.01)	M=6.9 (86%), SD=1.6 (t (14) = 12.1, p < 0.01)

Neither task-type (F (1, 56) = 1.2, p = 0.3, η_p^2 = 0.02) nor self-awareness (F (1, 56) = 0.1, p = 0.7, η_p^2 = 0.002) condition had a significant main effect on recognition, nor did these factors interact (F (1, 56) = 0.4, p = 0.5, η_p^2 = 0.007). However, 3.5- to 4-year-olds showed a small but significant recognition bias for self-referent stimuli (M = 6.5, SD = 1.9) over other-referent stimuli (M = 6.05, SD = 2.2) (F (1, 56) = 6.1, p = 0.02, η_p^2 = 0.1), regardless of task type (F (1, 56) = 0.6, p = 0.4, η_p^2 = 0.001), or self-awareness condition (F (1, 56) = 1.3, p = 0.2, η_p^2 = 0.02).

The combined effects of task-type and self-awareness condition on this SRE approached significance ($F (1, 56) = 2.9$, $p = 0.09$, $\eta_p^2 = 0.05$). To investigate further, task types were analysed separately. In the photo-action task children showed a significant bias for self-referent stimuli ($F (1, 28) = 4.6$, $p = 0.04$, $\eta_p^2 = 0.1$), regardless of self-awareness condition ($F (1, 28) = 0.1$, $p = 0.7$, $\eta_p^2 = 0.005$) (see Table 4.3 for means). The overall SRE in the pronoun action task failed to reach significance ($F (1, 28) = 1.7$, $p = 0.2$, $\eta_p^2 = 0.06$); however, as found for 3-year-olds in Experiment 5 there was a significant interaction between self-reference effects and self-awareness condition ($F (1, 28) = 4.9$, $p = 0.035$, $\eta_p^2 = 0.15$). As evident in Table 4.3, and confirmed by independent analysis, 4-year-olds showed a strong bias for self-referent stimuli when the mirror was present at encoding ($F (1, 14) = 9.3$, $p = 0.01$, $\eta_p^2 = 0.4$). However, when the mirror was absent they recognised a similar number of self- and other-referent stimuli ($F (1, 14) = 0.3$, $p = 0.6$, $\eta_p^2 = 0.021$).

Comparison of the magnitude of significant SRE in Experiments 5 and 6

In Experiment 5, 3-year-olds showed a significant overall SRE, and this effect was replicated for 3.5- to 4-year-olds in Experiment 6. To confirm that age had no impact on the magnitude of the SRE, the relevant data were brought together (60 3-year-olds Experiment 5, 60 3.5- to 4-year-olds Experiment 6) and a repeated-measures ANOVA, including age, task type and self-awareness condition as between-subjects variables was run. This analysis confirmed a significant SRE ($F (1, 112) = 17.2$, $p < 0.001$, $\eta_p^2 = 0.13$), with no suggestion of any significant interaction with age-group ($F (1, 112) = 0.02$, $p = 0.8$, $\eta_p^2 = 0.00$). The only significant interaction was between task type and self-awareness ($F(1, 112) = 5.3$, $p = 0.02$, $\eta_p^2 = 0.045$); this reflected the role of the mirror in driving the SRE in the pronoun task.

Discussion

Experiment 6 confirms that 4-year-olds show a SRE in memory. Just as shown by 3-year-olds in Experiment 5, 4-year-olds showed a bias for the recognition of stimuli which had been presented pictorially or, provided they were self-focused, verbally as part of a self-performed action. As in Experiments 2 to 5, 4-year-olds proved adept at explicitly differentiating between the roles of self and other in an event after a short delay. Together then, Experiments 5 and 6 provide novel evidence that preschool children show both explicit self-other differentiation in memory, and an accompanying self-reference advantage. Although memory capacity generally increased with age, younger and older children showed a similar magnitude of self-bias, providing task difficulty was calibrated to their abilities. This confirms that preschoolers' cognitive processing of events can be linked to, and is likely to mnemonically benefit from, the activation of self-awareness.

Note though, although mirror-induced self-focus was expected to boost memory for "I" statements, the data suggested that this was not the case. Rather, the mirror-induced SRE was largely attributable to a decrease in recognition of other-referent stimuli (see Figure 4.3, Table 4.3). This result highlights an oversight in the developmental SRE literature. As in our experiments, most developmental studies have relied on comparison of memory for self- and other-referent events experienced in tandem (Pullyblank *et al*, 1985; Baker-Ward, Hess & Flannigan, 1990; Summers &

Craik, 1994; Millward *et al*, 2000; Sui & Zui, 2005). Crucially though, when self-processing is qualified only in the context of other-processing, it is difficult to conclude that self-processing is independently superior. Rather, it may be that the introduction of self-focused attention detracts from non self-referent processing. For example, in this study, it is difficult to determine whether self-photographs increased self-memories or decreased other memories, relative to the norm.

Importantly, if the SRE is premised on the strength of the self-concept, self-processing should be superior to other-processing even when considered in isolation. One simple way to test this hypothesis would be to compare self-referent and other-referent processing in separate sessions, or in separate children. Note though, it has been repeatedly suggested that one of the reasons the self-concept is so elaborated (and mnemonically valuable) is that self-reference is our default encoding condition (Catrambone, Beike, & Niedenthal, 1996; Catrambone & Markus, 1987; Fong & Markus, 1982; Wells, Hoffman & Enzel, 1984). This implies that finding social comparisons which do not involve an aspect of self-referent processing is likely to be challenging. This problem was encountered in Experiment 2, where children showed a mnemonic bias for same-gender characters. Bennett & Sani (2008) report similar difficulties. In their study, when self (for example, "Are you clever?") and non-self (for example, "Are dogs clever?") processing was compared between children, many in the non-self condition began to talk of the family pet. Perhaps as a result, the SRE obtained was marginal. This is frustrating, as social processing provides the clearest analogue to self-processing, and so is important in determining if self-bias in memory is a specialised process.

Where stimuli are not inherently self-reflective, the SRE appears more likely to be a bottom-up process based on extensive cognitive networking, and less vulnerable to interference effects. For this reason, the self-neutral stimuli used in trait description tasks, or the ownership stimuli used in this volume, may be better suited to tracing the ontogeny of the effect. For attention-based SREs, developmental progression is not expected, as there is reason to believe that both 3- and 4-year-olds have an established capacity for self-focus. Nevertheless, it is likely that selective attention contributes even to conceptually based SREs. The SRE paradigm, whether employing linguistic or visual processing, depends on self-reflection and, as formalised by Duval & Wicklund (1972), this will inevitably lead to self-focus. Importantly, whether the SRE is primarily driven by self-focus, or by cognitive elaboration, the existence of an effect is enough to make clear that self-recognition has a functional impact.

5. Self-reflection and the self in the present II

Previous chapters indicate that self-recognition leads to superior cognitive processing of self-referent over other-referent stimuli. The competitive aspect of cognitive processing is formalised in the “Stroop” paradigm. This paradigm reveals a difficulty in choosing between naturally competing responses to an event. For example, the classic Stroop task highlighted the difficulty of stating the font-colour of the word “blue” when word-meaning and font-colour are incongruent, as shown (Stroop, 1935). A developmental approximation of this task is provided by Gerstadt, Hong & Diamond (1994), who asked children to switch naming responses for picture-stimuli. Both tasks require inhibition of a pre-potent response. By providing an explicit record of cognitive processing as it occurs, the Stroop paradigm could be usefully adapted to provide an *online* measure of self-referent processing. This is the aim of the current chapter.

In their non literate version of the Stroop task, Gerstadt *et al* (1994) asked 3.5- to 7-year-olds to respond “day” to a picture of the moon, and “night” to a picture of the sun. They found that error rates decreased with age from 30% to 9%. Task difficulty was also reflected in the latency to give correct answers, decreasing from 2 to 1.3 seconds. Gerstadt *et al’s* (1994) paradigm can be easily adapted to allow measurement of the impact of self-focused attention in preschool children. A relatively simple way to introduce self-focus to this situation is to ask children to complete the task in front of a mirror. If self-recognition results in the cognitive load of objective self-awareness, this condition might be expected to compromise performance. Alternatively, self-recognition could be included as a response to be inhibited in the context of the task. In fact, these approaches are complementary. Priming self-focus through mirror exposure might add to the pre-potency of self-responses, rendering inhibition for self more challenging than inhibition for other. This result would directly confirm that mirror self-recognition induces self-focused attention in preschool children.

Moreover, this result would establish a method for checking the effectiveness of self-awareness manipulations in children. For adults this has been achieved by administering a current self-consciousness questionnaire (Govern & Marsh, 2001)[11], by scoring open ended responses for linguistic self-reference (Wegner & Guiliano, 1980) [12], and by measuring the tendency to interpret ambiguous stimuli as self-referent (Davis & Brock, 1975; Stapel & Tesser, 2001). Of particular interest, Eichsteadt & Silvia, (2005) recently showed that completing a self-consciousness questionnaire primed adults' recognition of masked self-referent words (me, myself, self, face, mine) relative to masked neutral words (up, theory, walk, drop, they). Masking was achieved by interspersing the words with other letters in a constantly changing display.

5.1 Experiment 7

To allow measurement of the inhibition of self-recognition Experiment 7 replaced Gerstadt *et al's* (1994) day and night pictures with a self-photograph and a photograph of a familiar cartoon character. Linguistic identification of self and other in photographs is a habitual response, and switching linguistic identification of self and other requires overcoming incongruence. Therefore, the new task provided a self-

[11] With the disadvantage that asking questions related to the self is likely to, and indeed has been used to (Brown, 1988), induce self-focus.
[12] Note though, Wegner & Guiliano's (1980) manipulation of self-focus was unusual, involving running on the spot (high self-focus), sitting in an uncomfortable chair (intermediate self-focus), and a comfortable chair (low self-focus).

referent analogue of the established day/night task. To allow independent comparison of self- and other-referent performance, Experiment 7 also included a non self-referent control task. Here, children were required to switch the names of two familiar cartoon characters. To manipulate levels of self-awareness, mirror exposure was an independent variable for both tasks.

Using familiar cartoon characters ensured that children had the appropriate naming response in their repertoire, whilst, in the self-referent task, controlling for cognitive overlap between self and other. Although both self-image and the cartoon-image were likely to be highly familiar to preschool children, they shared few morphological features and were not intimately associated. Previous research suggests that intimacy and familiarity are cognitively dissociable. For example, Mashek, Aron & Boncimino (2003) report that adults had difficulty monitoring whether trait descriptions were judged in reference to self or close other (for example, partner/best friend). However, they had little difficulty differentiating judgments made for self with those made for a highly familiar celebrity. This implies, in line with our interpretation of other-reference effects (Baker-Ward, Hess & Flannigan, 1990; Bennett & Sani, 2008; Experiments 2 and 3, this volume), that cognitive closeness to the self, as opposed to familiarity, may mediate the scope of self-reference.

In addition to addressing the above hypotheses, substitution of Gerstadt *et al's* (1994) day/night stimuli with photographs of recognisable characters has potential practical advantages over the original. As noted by Wright, Waterman, Prescott & Murdoch-Eaton (2003), the default perspective for naming photographs of a sun or a moon is not necessarily the higher-level interpretation "day" or "night". For this reason, Gerstadt *et al's* (1994) task may not have capitalised on the most pre-potent response available, reducing inhibitory demands. In turn, the demands on working memory (responsible for maintenance of the response set) may have been relatively large. Naming photographs of people is likely to be more habitual than day/night responses, placing the emphasis on inhibition. Another advantage of this version of the task is the element of fun introduced by switching nominal responses for familiar people. Given the difficulty and inexplicable purpose of the name switching task for preschoolers, motivational issues are likely to be relevant.

Method

Participants

A total of 96 children took part, half of them completed the self/other name switching task (24 3.5-year-olds: M = 43.4 months, SD = 2.9 months, range = 37 - 47 months; 24 4.5-year-olds: M = 55 months, SD = 4.8 months, range = 48 – 64 months), and half the other/other name switching task (24 3.5-year-olds: M = 41 months, SD = 3.9 months, range = 36 - 47 months; 24 4.5-year-olds: M = 53.5 months, SD = 3.8 months, range = 48 – 64 months).

Twenty additional children (18 3-year-olds, two 4-year-olds) were excluded due to failure to follow the procedure (nine self/other, 11 other/other). Three-year-olds who passed the pre-test were included in the 3.5-year-old age-group; however, as noted by Gerstadt *et al* (1994) the task instructions were generally too hard for younger 3-year-olds to follow.

Materials

The tasks included a Polaroid photograph of the child and mocked-up Polaroid photographs of popular cartoon characters. Mocked-up Polaroid images were created by sticking a laminated cartoon image to a blank Polaroid photograph[13]. Examples of stimuli for each task are shown in Figure 5.1. A mirror (6” x 6”) was used to manipulate self-awareness during task completion. All tasks were recorded using a Dictaphone and stored digitally as audio files to allow for post-hoc analysis. This was achieved using the sound analysis package Audacity©. Image presentations were signalled by the press of a buzzer.

[13] Photographs were mocked for obvious reasons. Although attempts were made to take a photograph of stuffed toys of the characters these images were unclear. In any case children appeared to accept these mocked-up photographs, a common question being “How did you get a photograph of X?”

Self/other name switching task

Other/other name switching task

Figure 5.1: Examples of Experiment 7 stimuli

Procedure

Each period of testing began by establishing the child's familiarity with the popular television character(s) involved. To indicate familiarity the child had to name the character unprompted. To avoid exclusion due to unfamiliarity with stimuli seven cartoon characters were available (Spongebob, Tigger, Shrek, Winnie the Pooh, Scooby-do, Barney, Po). To ensure the majority of children played with the same character(s) children were shown the cartoons individually in the order listed above, stopping when familiarity was shown. Photo self-representations were introduced by informing the child that they were going to have their photograph taken just like the cartoon character. A full figure Polaroid photograph was then taken of the child. To check for self-recognition, when the photograph had developed the child was asked "Who's that?".

During testing, children were asked to inhibit the pre-potent naming response, responding with the name of the other character in the game. The correct naming response for self was determined by children's answer to the self-recognition check. For example, a boy named John who had answered "John!" in the self-recognition check would be told "In my game we're going to call people by the wrong name. So, when you see Spongebob's picture I want you to say John, and when you see your own picture, I want you to say Spongebob. Isn't that funny!". Had John answered "me!" this would be the response required on viewing Spongebob. After being told the rule for responding to each picture, the children were allowed to practise and given feedback until their grasp of the rule was established, or for up to six presentations (three per stimulus). Children who had failed to grasp the rule following the practise presentations were excused from further testing.

Following Gerstadt *et al* (1994), 16 individual presentations of stimuli (eight of each type) in pseudo-random order (ABBABAABBABAABAB) were shown. Each presentation was signalled by a buzzer press activated by the experimenter simultaneous to picture presentation. To ensure children held the rule in mind, any incorrect responses which the child did not subsequently correct were corrected by the experimenter. In their replications of the day/night task, Simpson & Riggs (2005a; 2005b) demonstrated that reminding 3.5- to 5-year-olds of the response rule decreased error rates by around 10%. Half of the children faced a mirror angled to reflect the face during testing (high self-awareness condition). For the remainder the mirror's non-reflective surface was shown (low self-awareness condition). At the end of the game children participating in the self-referent task were given their own photograph, and children participating the non self-referent version were given a sticker.

Accuracy and average latency of accurate responses were calculated post-hoc for each stimulus type (i.e. self-representation versus other-representation, character one versus character two). As in previous research (Wright *et al*, 2003) answers were considered accurate only if children articulated the correct response without making audible reference to the incorrect pre-potent response: for example, "Spo….John" would be considered inaccurate. Response latency refers to the interval between stimulus onset (indicated by a buzz) and the beginning of a correct response: this was calculated using the acoustic analysis program Audacity©. To reach a reliable average, response latencies were only included when individuals responded correctly to half of the stimuli in question.

Results

Accuracy

Table 5.1 shows that the sample was above chance level (50%) in giving the correct response to stimuli in the switching tasks, regardless of age-group or self-awareness condition. This is perhaps unsurprising, given that children had to demonstrate an ability to follow the procedure before taking part.

Table 5.1: Experiment 7 response accuracy, split by task-type, stimuli-type, age-group and self-awareness condition

*Although characters used varied according to the child's familiarity with them, names used here were the most common combination.

Self/other name switching task

Accuracy	**Overall**	**Age-group**		**Self-awareness condition**	
		3.5-year-old	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=13.1 (82%), SD=2.5 (t (47) = 14.1, p < 0.01)	M=12.9 (81%), SD=2.6 (t (23) = 9, p < 0.01)	M=13.4 (84%), SD=2.4 (t (23) = 11, p < 0.01)	M=13.4 (84%), SD=2.7 (t (23) = 9.8, p < 0.01)	M=12.9 (81%), SD=2.3 (t (23) = 10.1, p < 0.01)
Self	M=6.8 (85%), SD=1.4 (t (47) = 14.1, p < 0.01)	M=6.8 (85%), SD=1.2 (t (23) = 11.5, p < 0.01)	M=6.8 (85%), SD=1.6 (t (23) = 8.7, p < 0.01)	M=7 (87.5%), SD=1.3 (t (23) = 11.1, p < 0.01)	M=6.6 (82%), SD=1.4 (t (23) = 8.9, p < 0.01)
Spongebob*	M=6.3 (79%), SD=1.6 (t (47) = 10.1, p < 0.01)	M=6.1 (76%), SD=1.8 (t (23) = 5.6, p < 0.01)	M=6.6 (82.5%), SD=1.3 (t (23) = 9.3, p < 0.01)	M=6.3 (79%), SD=1.7 (t (23) = 6.8, p < 0.01)	M=6.3 (79%), SD=1.5 (t (23) = 7.2, p < 0.01)

Other/other name switching task

Accuracy	**Overall**	**Age-group**		**Self-awareness condition**	
		3.5-year-old	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=13.7 (86%), SD=2.3 (t (47) = 17.2, p < 0.01)	M=13 (81%), SD=2.9 (t (23) = 8.3, p < 0.01)	M=14.4 (90%), SD=1.1 (t (23) = 28.4, p < 0.01)	M=13.6 (85%), SD=2.5 (t (23) = 11 , p < 0.01)	M=13.7 (86%), SD=2.1 (t (23) = 13.4 , p < 0.01)
Tigger*	M=6.7 (84%), SD=1.5 (t (47) = 12.8, p < 0.01)	M=6.4 (80%), SD=1.8 (t (23) = 6.3, p < 0.01)	M=7.1 (89%), SD=0.8 (t (23) = 17.1, p < 0.01)	M=6.8 (85%), SD=1.5 (t (23) = 8.9, p < 0.01)	M=6.7 (84%), SD=1.4 (t (23) = 9.1, p < 0.01)
Spongebob*	M=6.9 (86%), SD=1.1 (t (47) = 18.7, p < 0.01)	M=6.6 (82.5%), SD=1.3 (t (23) = 9.5, p < 0.01)	M=7.3 (91%), SD=0.6 (t (23) = 25.8, p < 0.01)	M=6.8 (85%), SD=1.2 (t (23) = 11.8, p < 0.01)	M=7.1 (89%), SD=1 (t (23) = 14.8, p < 0.01)

A between-subjects ANOVA indicated that although the main effect of task type was not significant overall ($F(1, 88) = 1.2$, $p = 0.3$, $\eta_p^2 = 0.014$), or for Self/Tigger ($F(1, 88) = 0.8$, $p = 0.7$, $\eta_p^2 = 0.001$), this factor was significant for responses to Spongebob ($F(1, 88) = 4.9$, $p = 0.028$, $\eta_p^2 = 0.05$). As shown in Table 5.1, children were less accurate for Spongebob in the context of the self-referent game.

Neither age-group (overall: $F(1, 88) = 1.8$, $p = 0.1$, $\eta_p^2 = 0.02$; Self/Tigger: $F(1, 88) = 1.3$, $p = 0.2$, $\eta_p^2 = 0.015$; Spongebob: $F(1, 43) = 2.5$, $p = 0.1$, $\eta_p^2 = 0.003$) nor self-awareness condition (overall, $F(1, 88) = 0.2$, $p = 0.7$, $\eta_p^2 = 0.002$; Self/Tigger: $F(1, 88) = 1$, $p = 0.3$, $\eta_p^2 = 0.012$; Spongebob: $F(1, 88) = 0.08$, $p = 0.7$, $\eta_p^2 = 0.001$) had a main effect on accuracy, or any interactive effect.

There was a significant within-task interaction between task type and accuracy of responses ($F(1, 88) = 5.8$, $p = 0.018$, $\eta_p^2 = 0.06$). Children were significantly more accurate for Self than for Spongebob in the self/other switching task ($F(1, 44) = 4.2$, $p = 0.046$, $\eta_p^2 = 0.09$). In the other/other switching task there was no variation in accuracy as a function of stimuli type ($F(1, 44) = 1.6$, $p = 0.2$, $\eta_p^2 = 0.03$).

Latency

Table 5.2 gives the mean latency for accurate responses in each task, for each age-group and self-awareness condition.

Table 5.2: Experiment 7 accurate response latency, split by task-type, stimuli-type, age-group and self-awareness condition

Self/other name switching task

Latency	**Overall**	**Age-group**		**Self-awareness condition**	
(secs)		**3.5-year-old**	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=1.9, SD=0.7	M=2.1, SD=0.8	M=1.9, SD=0.6	M=2, SD=0.6	M=1.9, SD=0.9
Self	M=2.1, SD=0.9	M=2.2, SD=1	M=1.9, SD=0.6	M=2.2, SD=0.9	M=2, SD=0.8
Spongebob	M=1.9, SD=0.9	M=1.9, SD=1	M=1.8, SD=0.7	M=1.8, SD=0.7	M=1.8, SD=1

Other/other name switching task

Latency	**Overall**	**Age-group**		**Self-awareness condition**	
(secs)		**3.5-year-old**	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=1.8, SD=1.4	M=2.2, SD=1	M=1.5, SD=0.7	M=1.7, SD=1.6	M=1.9, SD=1.2
Tigger	M=1.8, SD=0.9	M=2.2, SD=0.9	M=1.4, SD=0.7	M=1.7, SD=0.9	M=1.9, SD=1.3
Spongebob	M=1.9, SD=1.3	M=2.2, SD=1.4	M=1.5, SD=0.7	M=1.7, SD=1.4	M=2, SD=1

The 3.5-year-olds were significantly slower to give accurate responses than 4.5-year-olds (overall: $F (1, 78) = 8.6$, $p = 0.004$, $\eta_p^2 = 0.1$; Self/Tigger: $F (1, 78) = 8.5$, $p = 0.005$, $\eta_p^2 = 0.09$; Spongebob: $F (1, 78) = 6.7$, $p = 0.01$, $\eta_p^2 = 0.08$). However, neither task-type (overall: $F (1, 78) = 0.8$, $p = 0.3$, $\eta_p^2 = 0.01$; Self/Tigger: $F (1, 78) = 2.7$, $p = 0.1$, $\eta_p^2 = 0.03$; Spongebob: $F (1, 78) = 0.06$, $p = 0.9$, $\eta_p^2 = 0.00$) nor self-awareness condition (overall: $F (1, 78) = 0.02$, $p = 0.6$, $\eta_p^2 = 0.003$; Self/Tigger: $F (1, 42) = 0.01$, $p = 0.9$, $\eta_p^2 = 0.00$; Spongebob: $F (1, 78) = 0.09$, $p = 0.3$, $\eta_p^2 = 0.012$) had a significant effect on response latencies, and there was no interaction involving these variables.

As found for accuracy, there was a significant within-task interaction between task type and latency of responses ($F (1, 88) = 6.5$, $p = 0.01$, $\eta_p^2 = 0.07$). Children took significantly longer to give accurate answers for Self than Spongebob within the self/other switching task (F (1, 41) = 9.9, $p = 0.003$, $\eta_p^2 = 0.2$). In the other/other task there was no such variation in latency of accurate responses (F (1, 41) = 0.2, $p = 0.6$, $\eta_p^2 = 0.006$).

Discussion

Experiment 7's name switching tasks yielded comparable results to the day/night task. The error rate (approximately 20%) was similar to that observed by Simpson & Riggs (2005a; 2005b) in their replication of the original task, as is the response latency (around two seconds)[14]. As observed by Simpson & Riggs (2005a, 2005b) there was developmental improvement in response latency, but not accuracy, between the ages of 3.5 and 4 years. Contrary to expectation then, naming responses for people appeared to be as easy for preschool children to inhibit as less habitual day/night responses. It may be that experimental instruction primes responses for stimuli regardless of their initial pre-potency (see Simpson & Riggs, 2005b). On this reading, the habitual nature of the response is relatively unimportant. Alternatively, the difficulty of inhibition may have been tempered by the more distinct response set; the cognitive association between self and Spongebob is likely weaker than that between day and night. Simpson & Riggs (2005b) have shown that this factor decreases (although does not erase) inhibitory demands. Finally, it could be that despite added pre-potency, the "fun" response stimuli increased children's motivation to respond to rule. The majority of children were evidently amused by switching

[14] The replication of response latency is notable as our response times were based on a manual signal of stimulus presentation. Simpson & Riggs (2005a) used a computer-based presentation schedule. Our use of manual presentation was due to the difficulty in gaining permission to digitally store children's images.

naming responses for characters and/or self, and this amusement (together with the volume of responses) tended to increase as the session progressed.

From the perspective of assessing the impact of self-recognition on cognitive processing, the comparability of Experiment 7's task with the established day/night task is in any case welcome. However, the pattern of results arising from self-focus was not as predicted. Mirror-induced self-recognition had no detectable effects on performance in the task, regardless of the introduction of self-referent task stimuli. Between games, performance for self-image was similar to performance for other-image. However, contrary to prediction, the cognitive salience of self-recognition was not emphasised by the mirror. Moreover, within the self-referent game, children were more accurate in inhibiting self-recognition than other-recognition, regardless of the mirror. This result was attributable to responses for other being less accurate here than in a non self-referent context.

The lack of mirror effects, at least in the self-referent game, is perhaps unsurprising. As observed in Experiments 5 and 6, the introduction of self-image is likely to strongly activate the cognitive correlates of self-recognition, rendering the mirror redundant. Even in the non self-referent game, the failure of self-recognition to impact on performance can be excused by the limits of attention. Preschool children have to work hard in the name switching task, leaving relatively few visual or cognitive resources to sustain objective self-awareness. Indeed, this observation suggests that within-task induction of self-awareness may be required to sustain an effect. Conversely, it is possible that the experimenter (an audience) was sufficient to induce self-awareness in this context. In support, children from both conditions commented on the difficulty of the game, and/or covered their mouths after making an error, implying that they were experiencing self-consciousness.

The observed performance differences between self- and non self-referent games are relatively difficult to interpret. The 3.5- to 4.5-year-olds were slower to give accurate answers for self-referent stimuli. Although this could be taken to imply that self-recognition was relatively difficult to inhibit, this interpretation does not tally with the accuracy scores. In explanation of this paradox, taking time over stimuli is sometimes associated with better performance in the day/night task. For example, Diamond, Kirkham & Amso (2002) found that making children listen to the ditty "Think about the answer, don't tell me" after each stimulus presentation dropped error rates to around 10%. Likewise, Gerstadt *et al* (1994) observed that within their age-group, 4.5-year-olds' accuracy increased as a function of response latency. Note though, children spent an equivalent amount of time other-processing in the self-referent and non self-referent task. For this reason, although self-interest may have skewed response latencies within the game, this factor is not of clear explanatory value for the decrease in accuracy for other-referent stimuli.

5.2 Experiment 8a

Why then, might other-processing be compromised within the self-referent game? One possibility is that self-focus increased the salience of the self-referent response rule. If the response "Say Spongebob" was primed, accuracy for other-referent stimuli would be selectively compromised. On this reading, self-focus results in preferential maintenance of the self-referent rule in working memory. If this were the case, we should see an advantage for self-processing even when inhibition is not involved. To assess this interpretation, Experiment 8a introduces a paradigm in which children must follow an arbitrary response rule for self and other-referent stimuli. For example, self-image now requires a response of "boat" and other-image a response of "cup".

This paradigm has previously been used to assess the level of inhibition required by the day/night task. Diamond *et al* (2002) first reported that accuracy and latency were improved in this control task relative to the original. Simpson & Riggs (2005a, 2005b) partially replicated this result, showing that when performance is relatively high, the significant difference between day/night inhibition and rule tasks is limited to response latency. Importantly, performance differences between rule and name switching tasks cannot be accounted for by working memory, and so are thought to arise from the need for inhibition. For this reason, Experiment 8 also presents the opportunity to validate our modification of the day/night design. Despite negative results for mirror exposure, Experiment 8a continues to monitor the contribution of this condition. To the extent that task demands are decreased, mirror self-recognition might have greater opportunity to take effect.

Method

Participants

Ninety-six children took part, 48 (24 3.5-year-olds: M = 43.5 months, SD = 2.6 months, range = 39 - 47 months; 24 4.5-year-olds: M = 56 months, SD = 3.3 months, range = 48 - 60 months) completed the self/other rule task; 48 (24 3.5-year-olds: M = 44.5 months, SD = 2.2 months, range = 40 - 47 months; 24 4.5-year-olds: M = 55.7 months, SD = 5.9 months, range = 48 -65 months) completed the other/other rule task.

Materials

Materials for the rule tasks were as described for inhibition tasks in Experiment 7.

Procedure

The procedure for all tasks was as described previously for the inhibition tasks. However, rather than being asked to switch naming responses, children in the self-referent and non self-referent rule tasks were instructed to say an arbitrary word in response to presentation of the pictures i.e., for self/Tigger say "Cup", for Spongebob say "Boat" (order counterbalanced).

Results

Accuracy

Table 5.3 shows that children of all ages were above chance in giving the correct response to all stimuli, regardless of task-type or self-awareness condition. Neither task-type (overall: $F (1, 88) = 0.02$, $p = 0.8$, $\eta_p^2 = 0.00$; Self/Tigger: $F (1, 88) = 0.1$, $p = 0.7$, $\eta_p^2 = 0.02$; Spongebob: $F (1, 43) = 0.01$, $p = 0.9$, $\eta_p^2 = 0.00$), age-group (overall: $F\ (1, 88) = 0.06$, $p = 0.8$, $\eta_p^2 = 0.01$; Self/Tigger: $F\ (1, 88) = 0.04$, $p = 0.8$, $\eta_p^2 = 0.00$: Spongebob: $F\ (1, 43) = 0.3$, $p = 0.5$, $\eta_p^2 = 0.004$) nor self-awareness condition (overall: $F\ (1, 88) = 0.1$, $p = 0.7$, $\eta_p^2 = 0.002$; Self/Tigger: $F\ (1, 88) = 0.3$, $p = 0.6$, $\eta_p^2 = 0.004$; Spongebob: $F\ (1, 88) = 1.2$, $p = 0.3$, $\eta_p^2 = 0.01$) had a main effect on accuracy. Nor was there any interaction involving these variables. Moreover, there was no within-task variation in accuracy ($F\ (1, 88) = 2.5$, $p = 0.1$, $\eta_p^2 = 0.03$), regardless of task-type ($F\ (1, 88) = 0.1$, $p = 0.7$, $\eta_p^2 = 0.001$), age-group ($F\ (1, 88) = 0.3$, $p = 0.5$, $\eta_p^2 = 0.004$), or self-awareness condition ($F\ (1, 88) = 1.4$, $p = 0.2$, $\eta_p^2 = 0.02$).

Table 5.3: Experiment 8a) response accuracy, split by task-type, stimuli-type, age-group and self-awareness condition

Self/other rule task

Accuracy	**Overall**	**Age-group**		**Self-awareness condition**	
		3.5-year-old	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=13.7 (86%), SD=1.6 (t (47) = 24.6, p < 0.01)	M=13.9 (87%), SD=1.8 (t (23) = 16.4 p < 0.01)	M=13.5 (84%), SD=1.4 (t (23) = 18.8, p < 0.01)	M=13.4 (84%), SD=1.8 (t (23) = 15.1, p < 0.01)	M=14 (89%), SD=1.4 (t (23) = 20.7, p < 0.01)
Self	M=6.7 (84%), SD=1.1 (t (47) = 17.2, p < 0.01)	M=6.9 (86%), SD=0.9 (t (23) = 16.2, p < 0.01)	M=6.5 (81%), SD=1.2 (t (23) = 9.8, p < 0.01)	M=6.7(84%), SD=0.8 (t (23) = 16.4, p < 0.01)	M=6.6 (82.5%), SD=1.3 (t (23) = 9.8, p < 0.01)
Spongebob	M=7 (87.5%), SD=1.2 (t (47) = 17.5, p < 0.01)	M=7 (87.5%), SD=1.3 (t (23) = 11.1, p < 0.01)	M=7 (87.5%), SD=1.1 (t (23) = 13.7, p < 0.01)	M=6.6 (82.5%), SD=1.4 (t (23) = 9.1, p < 0.01)	M=7.3 (91%), SD=0.8 (t (23) = 21.4, p < 0.01)

Other/other rule task

Accuracy	**Overall**	**Age-group**		**Self-awareness condition**	
		3.5-year-old	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=13.7 (86%), SD=1.6 (t (47) = 25.3, p < 0.01)	M=13.5 (84%), SD=1.6 (t (23) = 16.7, p < 0.01)	M=14 (89%), SD=1.5 (t (23) = 19.5, p < 0.01)	M=13.9 (87%), SD=1.8 (t (23) = 16.4 , p < 0.01)	M=13.6 (85%), SD=1.4 (t (23) = 20, p < 0.01)
Tigger	M=6.8 (85%), SD=1.1 (t (47) = 18.4, p < 0.01)	M=6.6 (82.5%), SD=1.2 (t (23) = 10.9, p < 0.01)	M=6.9 (86%), SD=0.9 (t (23) = 15.9, p < 0.01)	M=6.8 (85%), SD=1.1 (t (23) = 12.7, p < 0.01)	M=6.7 (84%), SD=1 (t (23) = 13, p < 0.01)
Spongebob	M=7 (87.5%), SD=1.2 (t (47) = 17.8, p < 0.01)	M=6.9 (86%), SD=1.2 (t (23) = 12.2, p < 0.01)	M=7.1 (89%), SD=1.2 (t (23) = 12.8, p < 0.01)	M=7 (87.5%), SD=1.3 (t (23) = 11.4, p < 0.01)	M=6.9 (86%), SD=1 (t (23) = 14, p < 0.01)

Latency

Table 5.4 gives the mean latency for accurate responses, task-type, stimulus type, age-group and self-awareness condition.

Table 5.4: Experiment 8a) accurate response latency, split by task-type, stimulus-type, age-group and self-awareness condition

Self/other rule task

Latency (secs)	**Overall**	**Age-group**		**Self-awareness condition**	
		3.5-year-old	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=2, SD=0.8	M=2.1, SD=0.8	M=1.9, SD=0.9	M=2.1, SD=0.8	M=1.9, SD=0.9
Self	M=2.1, SD=1	M=2.2, SD=1	M=2, SD=0.9	M=2.1, SD=0.9	M=2, SD=1.1
Spongebob	M=1.9, SD=0.9	M=1.9, SD=0.9	M=1.9, SD=0.9	M=2, SD=1	M=1.8, SD=0.7

Other/other rule task

Latency (secs)	**Overall**	**Age-group**		**Self-awareness condition**	
		3.5-year-old	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=1.2, SD=1	M=1.3, SD=1.1	M=1.2, SD=0.7	M=1.1, SD=1.1	M=1.3, SD=0.9
Tigger	M=1.2, SD=1.3	M=1.2, SD=1.6	M=1.2, SD=0.8	M=1.1, SD=1.6	M=1.3, SD=0.9
Spongebob	M=1.3, SD=0.9	M=1.4, SD=0.9	M=1.1, SD=0.7	M=1.1, SD=0.8	M=1.4, SD=0.9

There was a significant effect of task type on response latency (overall: $F(1, 78) = 25.6$, $p < 0.01$, $\eta_p^2 = 0.2$; Self/Tigger: $F(1, 78) = 15.8$, $p < 0.01$, $\eta_p^2 = 0.2$; Spongebob: $F(1, 78) = 15.6$, $p < 0.01$, $\eta_p^2 = 0.15$): children were significantly slower to respond to all stimuli types in the self/other rule task. Neither age-group (overall: $F(1, 78) = 0.8$, $p = 0.3$, $\eta_p^2 = 0.01$; Self/Tigger: $F(1, 78) = 0.4$, $p = 0.5$, $\eta_p^2 = 0.005$; Spongebob: $F(1, 78) = 1.1$, $p = 0.3$, $\eta_p^2 = 0.01$) nor self-awareness condition (overall: $F(1, 78) = 0.05$, $p = 0.9$, $\eta_p^2 = 0.00$; Self/Tigger: $F(1, 42) = 0.1$, $p = 0.9$, $\eta_p^2 = 0.00$;

Spongebob: $F(1, 78) = 0.1$, $p = 0.9$, $\eta_p^2 = 0.00$) had a significant main effect on response latency. There were no significant between-subject interactions involving these factors. However, responses latencies within the task did interact with task type ($F(1, 88) = 5.4$, $p = 0.02$, $\eta_p^2 = 0.06$). Children took significantly longer to give accurate answers for Self than Spongebob within the self/other rule task ($F(1, 41) = 4.9$, $p = 0.03$, $\eta_p^2 = 0.1$). In the other/other rule task there was no within-task variation in latency of accurate responses ($F(1, 41) = 1.3$, $p = 0.2$, $\eta_p^2 = 0.03$).

Comparison between Experiment 7 and Experiment 8a tasks

Task type had no significant main effect on response accuracy (overall: $F(3, 176) = 1$, $p = 0.4$, $\eta_p^2 = 0.02$; Self/Tigger: $F(3, 176) = 0.7$, $p = 0.9$, $\eta_p^2 = 0.01$; Spongebob: $F(3, 176) = 0.5$, $p = 0.6$, $\eta_p^2 = 0.09$). However, there was a main effect of task type on response latency (overall: $F(1, 161) = 11.4$, $p < 0.01$, $\eta_p^2 = 0.2$; Self/Tigger: $F(1, 161) = 13.4$, $p < 0.01$, $\eta_p^2 = 0.2$; Spongebob: $F(1, 161) = 7.2$, $p < 0.01$, $\eta_p^2 = 0.1$). Post-hoc Bonferroni comparisons indicated that the other/other rule task, but not the self/other rule task, was completed faster than both inhibition tasks.

Discussion

Although accuracy was similar, children were faster to respond in the rule task than the switching task, at least when self-reference was not involved. This is the same pattern of results as observed by Simpson & Riggs (2005a; 2005b), confirming that, like the day/night task, the other/other name-switching task requires cognitive processes other than working memory. Interestingly, the rule tasks also appeared to involve an element of inhibition. In addition to failing to select the correct arbitrary rule, children erred by naming self and other characters in the rule task. This confirms that the naming response is naturally pre-potent, strengthening the assertion that the name switching task relied on inhibition. However, contrary to the other-referent tasks; self-referent switching and rule tasks were indistinguishable in accuracy and response latency.

It is likely that the increased response latency associated with self-image confounded observation of a latency difference between self/other name switching and rule tasks. Despite equal task demands and accuracy, children took longer to complete the self-referent than non self-referent rule task. One explanation for the global increase in response latency is that self-focus motivated children to take care over task completion. This is in line with motivational aspects of objective self-awareness observed for adults. When task demands are achievable, as here for children, objective self-awareness has been shown to have a positive influence on performance (Duval & Wicklund, 1972). Conversely, it is possible that self-focus had a global interference effect of the type originally proposed for mirror effects. The continued lack of mirror effect, even in the non self-referent version of the rule task, appears to undermine these explanations. However, as noted, self-referent stimuli may be more effective elicitors of self-awareness where task demands prevent sustained attention to external stimuli (for example, mirrors).

5.3 Experiment 8b

Whatever the reason for increased response times in the self-referent tasks, establishing whether there are mechanistic differences between the name-switching and rule versions is important as they show a divergent pattern of results. Contrary to the switching task, the rule task indexes no within- or between-task differences in accuracy selectively affecting other-referent stimuli in the context of self-reference. This implies that the decreased accuracy for other stimuli observed in Experiment 7 is not primarily due to a self-referent bias in working memory. Rather, the performance differences may be related to inhibitory processes. To confirm this, and to empirically evaluate the role of self-representation in the rule task, Experiment 8b introduces a final control. Here, children are asked to respond with the same response set required in the switching task, but responses are rendered arbitrary by a change in stimuli.

Specifically, instead of responding to images of self and other, children are asked to respond to two patterns, relevant to the response set only by experimental rule. A version of this control was first introduced by Gerstadt *et al* (1994) to validate the original version of the day/night task, and was subsequently replicated by Simpson and Riggs (2005a). Using this task as a working memory comparator, Gerstadt et al (1994) and Simpson and Riggs (2005a) found differences in both latency and accuracy relative to the inhibition task. Importantly, experimentally induced self-focus will no longer be predicted to be a contributing factor. Nevertheless, to establish if cognitive self-recognition has an effect in this still simpler version of the game, half of the children were required to complete the task in front of a mirror.

Method

Participants

Forty-eight (24 3.5-year-olds: M = 42.4 months, SD = 3.5 months, range = 36 - 47 months; 24 4.5-year-olds: M = 54.7 months, SD = 5.2 months, range = 48 - 64 months) completed the abstract self/other rule task.

Materials

The abstract self-referent rule task used two monochrome pictures of a square, one containing a squiggle pattern and one a chequerboard pattern, of the same dimensions as the Polaroid images shown in Figure 5.1.

Procedure

In the abstract self-referent rule task the children were required to use a naming response for an abstract picture, introduced as follows “I have two pictures, one of squiggles and one of squares. When you see this picture (square/squiggle order counterbalanced) I want you to say “Me”, and when you see this picture, I want you to say “*Character name*” ”.

Results

Performance

There was no effect of age-group (overall: $F(1, 44) = 2.3$, $p = 0.1$, $\eta_p^2 = 0.05$; self-referent: $F(1, 44) = 0.06$, $p = 0.8$, $\eta_p^2 = 0.01$; other-referent: $F(1, 44) = 1.5$, $p = 0.2$, $\eta_p^2 = 0.03$) or self-awareness condition (overall: $F(1, 44) = 0.02$, $p = 0.8$, $\eta_p^2 = 0.001$; self-referent: $F(1, 44) = 0.06$, $p = 0.8$, $\eta_p^2 = 0.001$; other-referent: $F(1, 44) = 0.2$, $p = 0.6$, $\eta_p^2 = 0.005$) on response accuracy and no within-task variation ($F(1, 44) = 0.2$, $p = 0.6$, $\eta_p^2 = 0.006$). Likewise, there was no effect of age-group (overall: $F(1, 44) = 1.5$, $p = 0.2$, $\eta_p^2 = 0.03$; self-referent: $F(1, 44) = 1.9$, $p = 0.2$, $\eta_p^2 = 0.04$; other-referent: $F(1, 44) = 0.7$, $p = 0.4$, $\eta_p^2 = 0.02$) or self-awareness condition (overall: $F(1, 44) = 0.3$, $p = 0.6$, $\eta_p^2 = 0.007$; self-referent: $F(1, 44) = 0.07$, $p = 0.9$, $\eta_p^2 = 0.00$; other-referent: $F(1, 44) = 1.2$, $p = 0.3$, $\eta_p^2 = 0.02$) on response latency. Nor was there any within-task variation in response times ($F(1, 44) = 0.5$, $p = 0.5$, $\eta_p^2 = 0.01$). Finally, there were no significant interactions involving age-group and/or self-awareness condition with regards to response accuracy or latency.

Table 5.5: Accuracy and latency in Experiment 8b) abstract naming task, split by stimulus-type, age-group and self-awareness condition

Self/other abstract naming task

Accuracy	**Overall**	**Age-group**		**Self-awareness condition**	
		3.5-year-old	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=14.8 (92%), SD=0.9 (t (47) = 54.2, p < 0.01)	M=14.6 (91%), SD=0.9 (t (23) = 35.1, p < 0.01)	M=15 (94%), SD=0.8 (t (23) = 44.7, p < 0.01)	M=14.8 (92%), SD=0.8 (t (23) = 43.9, p < 0.01)	M=14.9 (93%), SD=1 (t (23) = 33.9, p < 0.01)
Self-pattern	M=7.3 (91%), SD=0.6 (t (47) = 40.9, p < 0.01)	M=7.3 (91%), SD=0.5 (t (23) = 28.7, p < 0.01)	M=7.4 (92%), SD=0.6 (t (23) = 28.7, p < 0.01)	M=7.4 (92%), SD=0.6 (t (23) = 28.6, p < 0.01)	M=7.2 (90%), SD=0.6 (t (23) = 28.7, p < 0.01)
Spongebob pattern	M=7.4 (92%), SD=0.7 (t (47) = 36.9, p < 0.01)	M=7.2 (90%), SD=0.7 (t (23) = 21.5, p < 0.01)	M=7.7 (96%), SD=0.5 (t (23) = 37.3, p < 0.01)	M=7.4 (92%), SD=0.6 (t (23) = 28.6, p < 0.01)	M=7.5 (94%), SD=0.7 (t (23) = 23.7, p < 0.01)
Latency	**Overall**	**Age-group**		**Self-awareness condition**	
		3.5-year-old	**4.5-year-old**	**Mirror**	**No mirror**
Overall	M=1.2, SD=0.5	M=1.3, SD=0.6	M=1.1, SD=0.5	M=1.2, SD=0.3	M=1.2, SD=0.7
Self-pattern	M=1.2, SD=0.6	M=1.4, SD=0.7	M=1.1, SD=0.4	M=1.2, SD=0.5	M=1.2, SD=0.7
Spongebob pattern	M=1.2, SD=0.6	M=1.3, SD=0.5	M=1.1, SD=0.6	M=1.1, SD=0.4	M=1.3, SD=0.7

Comparison between Experiment 7 and Experiment 8a) and b) tasks

Task type had a significant effect on response accuracy (overall: F (4, 220) = 5.4, $p < 0.01$, $\eta_p^2 = 0.09$; Self/Tigger: F (4, 220) = 3, $p = 0.01$, $\eta_p^2 = 0.09$; Spongebob: F (4, 220) = 5.5, $p < 0.01$, $\eta_p^2 = 0.09$). Post-hoc Bonferroni comparisons indicated that children were significantly more accurate in responding to the abstract rule task than all other tasks. Task type also had a significant effect on response latency (overall: F (4, 161) = 15.5, $p < 0.01$, $\eta_p^2 = 0.2$; Self/Tigger: F (4, 161) = 16.2, $p < 0.01$, $\eta_p^2 = 0.2$; Spongebob: F (4, 161) = 11.3, $p < 0.01$, $\eta_p^2 = 0.2$). Post-hoc tests indicated that all aspects of the self/other abstract naming task were completed more quickly than both switching tasks, and the self/other rule task. However, children took a similar amount of time to complete the abstract and the other/other rule task.

Discussion

Children were more accurate and faster to respond to abstract stimuli than they were to switch self/other naming responses or respond to rule to self-representative stimuli. Firstly, this confirms that the self-referent switching task involves similar challenges as the original day/night task. Secondly, it confirms the suggestion that repeated exposure to the self-image in the context of the game may have slowed response latencies. Response times in the abstract rule task (Experiment 8b) were similar to those in the non self-referent rule task (Experiment 8a). However, children responded faster here, where self-image was not available, than in the self-referent rule game (Experiment 8a). Crucially, as for the self-referent rule task (Experiment 8a), there were no within-task differences in performance in the abstract version of the rule task, regardless of the introduction of a mirror. It appears then, that the interference caused by self-recognition in Experiment 7 refers to the relationship between response stimuli and response set, not to response stimuli or response set alone.

Experiments 1, 5 and 6 indicated that self-recognition increases the saliency of self-referent stimuli relative to other-referent stimuli. However, contrary to the expectation that self-recognition would prime self-responses; Experiment 7 indicated that self-reflection made “Me” (or my name) a less likely response to both self- and other-referent stimuli. Why might this be the case? To the extent that children felt primed to self-recognise in Experiment 7, prioritisation of the rule “Don’t say me” might have been a reasonable inhibition strategy. However, it is not until the age of 5 years that children report explicit negation of to-be-inhibited responses in delay of gratification experiments, for example, maintaining the rule “Do not eat the chocolate”. Prior to this, children tend to focus on the salient stimuli (the chocolate) (Mischel & Mischel, 1983). This implies that such a sophisticated reduction of inhibitory requirements is unlikely. It is possible though, that a version of the “Not me” rule occurs implicitly.

From the perspective of self-other differentiation, switching self with other would appear equally incongruent, regardless of the direction of the switch. However, consider the possibility that objective self-awareness leads to events being judged in direct reference to the self. In this case, viewing Spongebob might induce the basic response “Not me”, essentially the opposite of the required response “Me”. As a result, incongruence would be relatively high. Although viewing the self would also induce the wrong response (“Me”), the to-be-remembered response would not be a negation of the initial reaction. Spongebob is not the opposite of “Me”. As a result the inhibition required would be comparable to the non self-referent game, where characters have equal cognitive precedence and are not considered opposites. This interpretation fits the current pattern of results. However, the lack of research in this age-range (identified at the outset of this volume) makes any suggestion of skewed emphasis in self-other differentiation speculative.

Adding to this difficulty, little research has assessed the impact of self-focus on similar tasks in adults. Experimentally manipulated self-awareness has been associated with increased response latencies for naming the colour of self-referential trait adjectives (Geller & Shaver, 1976; Higgins, Van Hook & Dorfman, 1988; Segal & Vella, 1990). However, rather than activation of the self-concept priming processing of self-relevant words, Green & McKenna (1996) demonstrated that this effect is driven by the negativity of the self-referent words chosen. The same effect was achieved by comparing performance for non self-referent negative words and emotionally neutral words. Providing further support for the role of emotion in this task, Higgins *et al* (1988) (replicated by Segal & Vella, 1990) found significant colour-naming interference for clinically depressed but not clinically normal participants. This led them to suggest that depressed participants’ negative self-schema functionally directed their attention. Indeed, modified Stroop tasks are commonly used to assess emotional biases in psychopathology (see Williams, Matthews & MacLeod, 1996). However, these results provide little insight into the non-emotional impact of self-focused attention.

It appears that only one study has used a Stroop task containing emotionally neutral self-referent stimuli. Mayer, Duval, Holtz & Bowman (1985) asked participants to colour name self-referent and non self-referent words matched for frequency of use, length and number of syllables (the words chosen were the same set as described for Eichstaedt & Silvia, 2005). Prior to this task, Mayer *et al* (1985) manipulated self-focus by telling some subjects that they had a very distinct astrological chart and others that the alignment of planets at their birth was quite common. Mayer *et al* (1985) reported that distinctiveness (intended to increase self-focus) was associated by an increase in reaction times. However, despite citing Geller & Shaver's (1976) original results as the inspiration for their task, Mayer *et al* (1985) do not offer comparison of the level of interference for self-referent versus other-referent words. The lack of information here, and in this research area generally, makes it difficult to predict how cognitive self-awareness might be expected to interact with Stroop performance.

This is regrettable, as the potential for assessing the impact of self-recognition in self-referent Stroop tasks is clear. In adults, literacy reduces the difficulty of confounding self-recognition with independent manipulations of self-awareness. Moreover, improved inhibition skills leave more attention resources available to maintain objective self-awareness during task completion. For this reason, a replication of Mayer *et al's* (1985) study (perhaps using first and second person pronouns) using the established mirror manipulation of self-awareness, and including the relevant analysis, would likely be fruitful. As in Experiment 7, a non self-referent control might help clarify the quality of interference arising from self-focus. For the purposes of direct comparison it would also be relatively simple to adapt the name-switching tasks for adults. Here, cartoon characters familiar to adults (for example, Homer Simpson) or well known celebrities, could provide a suitable other. As inspired by the SRE paradigm, for both adults and children it would ultimately be interesting to compare whether self-bias persists when comparing performance for self and intimate other.

There is also good reason to explore other established preschool versions of the Stroop task. The original colour-naming word task involves choosing between two competing responses activated by stimuli (colour, word meaning). However, only one response is activated by external stimuli in the name-switching task; the competing response is part of a learned response set. For this reason, the name-switching task relies to some extent on working memory. However, there are some developmental Stroop tasks which circumvent this requirement. For example, Prevor & Diamond (2005) asked children to name the colour of objects when colour was either congruent (for example, a yellow banana), incongruent (for example, a blue banana) or neutral (an object which could be any colour). As in the original Stroop task, children were significantly slower to name incongruent colours than congruent or neutral ones. Similarly, Hanauer & Brooks (2003) demonstrated that naming the colour of a square takes longer when presentation is accompanied by a colour as opposed to a non-colour auditory distracter. Finally, Wright *et al* (2003) have developed a Stroop task in which children have to name familiar animals, based on their body. Crucially, the animals' heads sometimes matched their body, sometimes belonged to another animal, and was sometimes omitted. Again, children were slower to name incongruent animals than congruent or impoverished ones.

Respectively, Wright *et al* (2003) or Hanauer & Brooks' (2003) tasks could be made self-referent by mixing self- and other-representations (my head on your body), or by presenting self and other-referent stimuli in association with incongruent auditory information. By running these tasks we could determine if the inhibition effect found in Experiment 7 could be replicated. Likewise, the impact of mirror exposure could be further explored by running an amalgamation of Prevor & Diamond (2005) and Mayer *et al's* (1985) paradigms. Here, latency to colour-name self- and other-owned objects in the presence and absence of a mirror could be illuminating. For the moment, it is clear that Experiments 7 and 8 are insufficient to establish the mechanism by which self-reference interferes with the inhibition of other-recognition. However, this chapter does corroborate with the previous chapter in indicating that self-recognition has a measurable and immediate impact on the cognitive processing of preschool children.

6. Self-reflection and the self in the future I

Previous chapters have largely focused on the cognitive impact of self-recognition. However, self-recognition also has a reliable behavioural impact. For example, in the mirror mark test of self-recognition, self-awareness prompts 2-year-olds to attend to their physical appearance. However, contrary to the large literature for adults, it is unclear if direct self-reflection causes preschool children to modify their behaviour in other ways. This is regrettable, as effortful behavioural control implies planning, and is one way to determine if the influence of objective self-awareness extends into the future. Having addressed the impact of self-recognition in the past and present, this is the remaining temporal aspect of the fully developed self. Beyond mark-directed behaviour, only one study has assessed the behavioural impact of mirror induced self-awareness on preschool children[15].

Beaman, Klentz, Diener, & Svanum (1979) recruited homeowners at Halloween to secretly observe the behaviour of groups of trick-or-treaters who were left alone with a bowl of sweets with the instruction to take only one. The trick-or-treaters were between the ages of one and 13 years. Half of the children were left in a room with a large prominent mirror, and the remainder in a room without. Beaman *et al* (1979) found a surprisingly low rate of transgression under these circumstances;

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[15] In addition to the study described for preschoolers, we know of two other studies designed to assess mirror effects in older children. Morin & Everett (1991) found that the mirror had no effect on 6-year-olds' positive or negative rating of pictures of animals and landscapes, leading them to suggest that objective self-awareness can not be induced in children. However, their expectation of an effect was based on Scheier & Carver's (1977) study, which indicated that men rated nude woman more attractive when objectively self-aware. It is not clear that Morin & Everett's (1991) paradigm is an appropriate analogue of this study. More convincingly, Froming, Allen & Jensen (1985) asked 5- to 8-year-olds to make donations to charity and found that whereas a mirror had no effect on their donations, the presence of an adult resulted in the 7- and 8-year-olds donating more. However, see Chapter 7 for further discussion.

only 70 of 363 children took more than their prescribed share. Nevertheless, children in the mirror condition were significantly more likely to follow their hosts' instruction than children in the no-mirror condition. As for adults then, the mirror seemed to encourage children to adhere to ideal standards of behaviour. The magnitude of the mirror effect increased with age, remaining significant for all but the youngest age-group, comprised of 1- to 4-year-olds. However, this result is difficult to interpret for a number of reasons.

Firstly, Beaman *et al*'s (1979) ecologically valid method leaves the study open to criticism regarding the control of experimental variables such as differences between homeowners, and the composition of the trick-or-treating groups. Secondly, the number of transgressions increased significantly with age, meaning that the developmental increase in the mirror effect could be explained by an increase in power attributable to subject number. Finally, it appears likely that the consideration of 1- to 4–year-olds as a homogenous group may have masked relevant developmental changes in self-awareness. Considerable changes in self-awareness occur in this period, most notably the onset of mirror self-recognition. Experiment 9 sought to remedy these problems, adapting Beaman *et al's* (1979) paradigm to provide a measurement of the influence of objective self-awareness on 3- and 4-year-olds' transgression of behavioural rules.

6.1 Experiment 9

As highlighted by Experiments 7 and 8, tasks with high attention demands potentially undermine mirror effects. In contrast, the mirror interacts with a relatively natural behavioural response in Beaman *et al's* (1979) study. Lewis, Stanger & Sullivan (1989) used a similarly simple measure to study self-conscious reactions to transgression. They placed a "surprise" toy on a table behind 3-year-olds, and then left the room for up to 5 minutes, asking the child not to look at the toy until they returned. Upon return the child was asked "Did you peek?". Although 29 out of 30 children had turned around to look at the toy (as monitored by a hidden video camera), 11 admitted to doing so, seven gave no reply, and 11 falsely denied it. This led Lewis *et al* (1989) to suggest that 3-year-olds are capable of masking their emotional expressions; indeed no facial or bodily responses (for example, averted gaze or fidgeting) differentiated deceivers from non deceivers. Although it is not clear if the children in this study were experiencing (and so masking) self-conscious emotion, the false denials suggest that children were aware that a rule had been transgressed. Experiment 9 sought to determine if exposure to a mirror would have any influence on preschool children's willingness to transgress and deceive in a similar situation.

Specifically, children were left alone with a box in the context of a game that required guessing what toy was inside. As in Lewis *et al's* (1989) study, children were explicitly told not to look in the box to reveal the toy until the experimenter returned. In this case, peeking at the toy required not only looking, but lifting the lid to the box. This modification was intended to ensure that transgressing involved overt and volitional behaviour, addressing Polak & Harris's (1999) concern that Lewis *et al's* (1989) 3-year-olds may not have explicitly monitored their looks. Immersing the opportunity to transgress within a competitive game was expected to offset any increased reluctance to peek due to the relatively explicit nature of transgression. Given preschool children's documented difficulties with response inhibition (Gerstadt *et al*, 1994; Jones *at al*, 2003), and the high rate of transgression found by Lewis *et al* (1989), peeking was expected to be common. However, following the interpretation of response latency in delay of gratification paradigms (Mischel, Shoda & Rodriguez, 1989), latency to transgress can be considered indicative of children's efforts to control such behaviour. As introduced by Polak & Harris (1999) in investigation of the level of deception implied by Lewis *et al's* (1989) study, we also built into the game an opportunity for children who falsely denied looking to maintain their deception. Resuming the game after the interval, the experimenter gave children a misleading clue as to the contents of the box. In order to conceal their transgression from the experimenter, deceivers would have respond in accordance with the misleading clue.

A within-subjects design was chosen to control for children's natural capacity or tendency to inhibit or deceive; as for memory capacity, these competencies being subject to individual differences (Kochanska, Coy & Murray, 2001). Children played the game three times, and on each occasion were left alone with the opportunity to cheat. To vary the conditions of self-awareness children sometimes played the game in front of a mirror. At other times, the mirror was turned around to conceal its reflective surface. Respectively, these conditions were expected to encourage high and low self-awareness. By leaving the children alone at the crucial moment, the problem of confounding mirror effects with audience-based induction of self-awareness was avoided. Nevertheless, it is possible that self-awareness arising from beginning the game in front of an audience (and even being left alone in an unusual situation) might undermine experimental manipulation of self-awareness. For this reason, a third condition was introduced. This condition aimed to experimentally lower self-awareness through deindividuation.

Deindividuation refers to a temporary loss of personal individuality which arises from attention being focused outwards and/or anonymity (Festinger, Pepitone & Necomb, 1952; Zimbardo, 1969; Reicher, Spears & Postmes, 1995). The effect of deindividuation on behaviour is the antithesis of objective self-awareness; as neither the self nor personal standards are salient, the cognitive self no longer exerts control (see Diener, 1977; Postmes & Spears 1996 for review). For example, Diener, Fraser, Beaman & Kelem, (1976) found that participants tested in the trick-or-treat paradigm breached the "one sweet" rule less often when the host asked them personal details about themselves before leaving the room. Likewise, Miller & Rowland (1979) found that literally masking identity by wearing a Halloween mask encouraged children to breach a "two sweet" rule when left alone. To determine if deindividuation would also influence transgression in Experiment 9, children were sometimes asked to wear a costume, and referred to by a generic term. Manipulating self-awareness in polar directions is likely to increase the chances of obtaining an effect. Moreover, the degree of matching between behaviour in the neutral self-awareness condition and either pole should allow clarification of the level of self-awareness inherent to the testing situation.

Method

Participants

Thirty children took part, including 15 3-year-olds (M = 37.9 months, SD = 3 months, range = 34 - 41 months) and 15 3.5- to 4-year-olds (M = 49 months, SD = 4 months, range = 44 – 59 months).

Materials

Materials included a box painted to look like a zoo (see Experiment 2, Figure 3.1), assorted model animals, a hat and waistcoat, a mirror (12” x 16”), and a stop watch. The game was video-recorded from an adjoining room by a confederate through a one way mirror, the reflective surface of which was shielded from the child by a curtain.

Procedure

Each child took part in three sessions, separated by one week. In the “self-aware” session children were referred to by name and played in front of a large mirror. In the “deindividuated” session only the non-reflective side of the mirror was shown, the child wore a costume, and was referred to as “Zookeeper”. In the “neutral” session only the non-reflective side of mirror was shown and the children were referred to by name. To control for order effects, the order of sessions was counterbalanced. The disguise was intended to promote anonymity and chosen in line with the game to increase children's engagement with the task, and thus their subjective self-awareness. As noted, previous research suggests that these factors are the antecedents of deindividuation. Although a mask would have been ideal in promoting anonymity, piloting showed that preschool children were uncomfortable with this disguise. In any case, previous research suggests that a change of clothing is sufficient for children to confuse their own gender (Gouze & Nadelman, 1980), i.e. an aspect of their identity.

During the guessing game, animals were covertly placed in the zoo box one at a time by the experimenter. After each placement, children were given clues to allow them to guess which animal was in the box (for example, "The animal in the box says moo!"). To ensure children had equal experience of success in the game (and therefore equal motivation to peek), clues persisted until children had guessed correctly. Only one child (the youngest tested) failed to offer reasonable guesses[16]. Having guessed, the children were permitted to open the box to reveal the animal. They were then asked to remove the animal from the box and allowed to retain it during the session. After three turns the experimenter put the final animal into box, but interrupted the game saying "The game is nearly finished so I need to get the tidy up box from next door. We can guess which animal is in the box when I come back, but don't look in the box while I'm gone, ok?". Children were required to respond in the affirmative (nodding or saying ok) before the experimenter left the room to ensure they were aware of the rule. To avoid varying the salience of the rule across conditions, the request not to look was always stated in this form (i.e. children's names were not included).

[16] This child never peeked, implying that she may not have engaged with the game. Fortunately, her failure to peek means that - as intended - for children who did peek, success in the game was constant.

The child was then left alone in the room for 90 seconds (timed by stopwatch). During this time, the experimenter stood out of view in the doorway of an adjoining room, where the tidy up box could be retrieved. From this vantage point, the experimenter could ensure that the child remained in the room and that any requests for the experimenter to return could be heard and heeded. A confederate filming the child during this period was instructed to alert the experimenter immediately if there was a non-audible situation which required early return. Early return was required on only three occasions, none of which required the intervention of the confederate. Post-hoc, video tapes were scored for a) whether the child looked in the box and b) latency to look in the box. On all of three occasions when an early return was necessary, the child had already peeked in the box, allowing them to contribute a valid latency score.

On re-entering the room and sitting down, the experimenter asked the child "Did you look in the box?". At this point the experimenter was blind to whether the child had actually looked in the box, and whether yes or no, answers were greeted neutrally. When the game resumed, however, the experimenter gave misleading clues about the identity of the animal in the box. Only when children have an answer in response to this clue, did the experimenter admit to her mistake and give an accurate clue for the animal in the box. Upon making a second response in accordance with the accurate clue, the child was allowed to reveal the animal. As in Polak & Harris (1999), the misleading clue meant that for children who did peek, full deception required not only denying looking, but initially responding in accordance with the misleading clue.

Results

Transgression

Twenty-five of 30 (83%) children transgressed on at least one occasion, and 69 of 90 (77%) opportunities to transgress were taken. Table 6.1 shows that children transgressed most in deindividuated, followed by neutral, followed by self-aware conditions. A non-parametric Friedman's test indicated a significant difference in transgression rates between conditions (X^2 (2, 30) = 6.7 p = 0.03). However, when conditions were paired independently, only the difference between self-aware and deindividuated conditions reached significance (Wilcoxon's test, Z = -2.6, p = 0.008). Chi-square analysis confirmed that children were equally likely to peek as not to peek in self-aware conditions (X^2 (1, 30) =1.3, p = 0.86). However, in neutral conditions children showed a marginal tendency toward transgression (X^2 (1, 30) = 3.3, p = 0.07), which became significant when deindividuated (X^2 (1, 30) = 8.5, p = 0.003).

Table 6.1: Experiment 9 transgression frequencies, split by condition

	Self-aware	**Neutral**	**Deindividuated**
Transgressed	N=16	N=20	N=23
Didn't transgress	N=14	N=10	N=7
Total	**N=30**	**N=30**	**N=30**

The majority of children behaved consistently across conditions; 14 always transgressed (six 3-year-olds, eight 3.5- to 4-year-olds) and five never transgressed (all 3-year-olds). However, as shown in Table 6.2, for the 11 children whose behaviour varied across conditions (four 3-year-olds, seven 3.5- to 4-year-olds) it was relatively rare for transgressions to occur when self-aware, and relatively common for them to occur when deindividuated.

Table 6.2: Experiment 9 individual transgression variations across conditions (+ transgressed, - did not transgress).

Subject	Self-aware	Neutral	Deindividuated
1	-	+	-
2	-	-	+
3	-	-	+
4	-	+	+
5	-	-	+
6	+	-	+
7	-	+	+
8	-	+	+
9	+	-	+
10	-	+	+
11	-	+	-
Total	**2**	**6**	**9**

To maintain an equal contribution of data from all children, those who did not peek were awarded the full latency of the waiting period (90 seconds). On average, children waited without transgressing longest under self-aware (M = 48 secs, SD = 40 secs), followed by neutral (M = 41 secs, SD = 37 secs), followed by deindividuated conditions (M = 29 secs, SD = 36 secs). A repeated-measures ANOVA suggested that latency to transgress significantly differed between conditions ($F(2, 56) = 4.3$, $p = 0.02$, $\eta_p^2 = 0.132$). Pair-wise Bonferroni comparisons attributed this result to children being significantly faster to transgress when deindividuated as compared to self-aware ($p=0.005$, $\eta_p^2 = 0.3$). However, as with transgression rates, neither self-aware nor deindividuated latencies significantly differed from the neutral wait period (self-aware: $p=0.97$, deindividuated: $p=0.32$).

Reflecting 3.5- to 4-year-olds' greater tendency to transgress, there was a main effect of age on waiting times ($F(1, 28) = 5.9$, $p = 0.02$, $\eta_p^2 = 0.17$). Three-year-olds waited on average 52 seconds (SD = 38 secs) before transgressing, whereas older children waited 26.5 seconds (SD = 33 secs). Crucially though, the difference in waiting periods between conditions did not interact with age ($F(2, 56) = 0.54$, $p = 0.58$, $\eta_p^2 = 0.02$); age-groups were analysed separately to confirm; however, this left insufficient power to index any effect.

Deception

Of the 25 children who looked in the box (ten 3-year-olds, 15 3.5- to 4-year-olds), 15 admitted it (eight 3-year-olds, seven 3.5- to 4-year-olds) and ten denied it. Of the deceivers, five children (all 3.5- to 4-year-olds) were able to conceal their deception by "guessing" in accordance with the misleading clue. For children who showed a capacity to deceive (eight of whom always transgressed), Table 6.3 shows that more did so in the deindividuated condition than in self-aware or neutral conditions; the same pattern held for maintenance of deception.

Table 6.3: Experiment 9 deception across conditions (10 deceivers)

Subject	**Self-aware**	**Neutral**	**Deindividuated**
1	Admission	Deception	Deception
2	Admission	Deception	Admission
3	Deception	Admission	Deception
4	Deception	Admission	Deception
5	Deception	Deception	Deception, M
6	Admission	Deception	Deception, M
7	Deception, M*	No peek	Deception, M
8	No peek	No peek	Deception, M
9	Deception, M	Deception, M	Deception, M
10	Deception, M	Deception, M	Deception, M
Total	**6 deceivers (3 maintained)**	**6 deceivers (2 maintained)**	**9 deceivers (6 maintained)**

***M = maintained**

Discussion

The majority of children had to be physically prevented from peeking before a guess was made in the context of the game. Moreover, when the experimenter left the room, the majority broke the stated rule and looked inside the box. This confirms that, as found in similar studies (Lewis *et al*, 1989; Polak & Harris, 1999), peeking was a pre-potent response. However, when the mirror was present children peeked less, and were slower to peek, relative to a no mirror condition where their identity was masked (literally through disguise and figuratively through generic labelling). To our knowledge this finding represents the first evidence that early self-adjustment arising from mirror self-recognition extends beyond mark-directed behaviour. Under conditions of high self-awareness, preschool children (like adults) show effortful behavioural control, aiming to conform to a salient standard. Moreover, in negating mirror effects, the anonymity-promoting condition provides perhaps the first evidence that preschool children (like adults) can be deindividuated.

Self-regulation in the neutral condition (no mirror, no disguise, own name used) fell between these extremes. Children tended to peek in the deindividuated condition (77%), and tended towards peeking in the neutral condition (67%). By contrast, children in the mirror condition showed no bias toward transgression (53%). However, the latency to transgress was quite similar across self-aware and neutral conditions (48, 40 seconds respectively); here, the deindividuated condition became the relative outlier (29 seconds)[17]. One possibility is that, in addition to indexing inhibition, response latencies reflected caution. On this reading, children in disguise may feel less vulnerable to being caught in the act of peeking due to their anonymity. In the neutral and self-aware conditions, this protection was absent. Conversely, it may be that the disguise was interpreted as providing justification to peek ("I am the zookeeper therefore the zoo is mine"). Johnson & Downing (1979), observed a similar result for adults', finding that Ku Klux Klan costumes induced aggression, whereas nurses' costumes did not. However, preventing children from peeking during the game would have undermined any stereotypical expectations they may have had of their costume. Moreover, neither interpretation can easily explain why the high self-awareness condition is the relative outlier in terms of transgression rates. More

[17] This pattern held when considering the data of children who always transgressed (13 seconds waited in self-aware and intermediate condition, 6 when deindividuated), when removing the results of children who never transgressed (40 seconds self-aware, 31.5 seconds intermediate, 16 seconds deindividuated), or when considering latencies for transgressions only (12.4 seconds self-aware, 13 seconds intermediate, 6.2 seconds deindividuated).

importantly, the contributions of high and low self-awareness were not independently observable, confirming that one condition cannot be singled out as driving the effect.

The lack of differentiation between neutral and experimentally manipulated self-awareness conditions is positive in that it confirms that the mirror effects do not stem from low-level distraction from the to-be-inhibited behaviour (for example, looking in the mirror rather than in the box). However, in failing to mimic either of the experimentally manipulated self-awareness conditions, performance in the "neutral" condition confirms that the testing situation has complex implications for self-awareness. As highlighted in Chapter 5, high task demands may sustain subjective self-awareness. Focus on non self-referent factors in Experiment 9 (on the box/the game) might also promote this state. Conversely though, an unfamiliar audience and/or task might promote objective self-awareness. These factors have the potential to vary within the task (with attention) or between individuals, making it difficult to identify baseline conditions for comparison. For this reason, it may be necessary to experimentally control antecedents of both objective and subjective self-awareness to obtain an effect. This may be particularly important in developmental studies, where the unfamiliarity and dominance relations within the testing situation are likely to promote self-consciousness, and task demands are likely to be relatively high.

Confirming that preschool children have the capacity to deny a misdemeanour (Lewis *et al*, 1989; Polak & Harris, 1999), 30% of children falsely denied peeking on at least one occasion. Notably, the majority of children who deceived looked in the box on all three occasions, revealing a consistent tendency toward deception. Cole & Mitchell (1998) also found individual differences in deceptive ability in 4- to 5-year-olds. Interestingly, they found that children's capacity to tell a convincing lie was related to family background. Specifically, for children raised by a single parent, parental stress predicted their capacity for deception. This result highlights the possibility that in addition to developing inhibitory control, children's social environment may contribute to transgression/deception rates. This finding is interesting as it confirms that deceptive behaviours are related to socially learnt rules. This opens the possibility that individual differences in children's social values/upbringing might allow finer prediction of their behaviour when manipulating self-awareness. For example, Talwar, Lee, Bala, & Lindsay (2002) found that 3- to 7-year-olds' moral evaluation of concealing transgression (most stated this was "wrong") did not predict whether they later did so. However, as reported by Carver (1975) and Diener & Wallbom (1976), it may be that personal social values are only predictive of behaviour when the self-focus is activated.

There was no interaction between age and latency to transgress between conditions. This implies that manipulating self-awareness had an effect on the self-regulatory behaviour of children as young as 3 years. However, 3-year-olds' lower rates of transgression prevented more thorough investigation of this factor. The finding that older children transgressed more often is interesting as it contradicts previous observations of developmental improvement in the inhibition of pre-potent responses (for example, Gerstadt *et al* 1994; Jones, Rothbart & Posner, 2003). However, Beaman *et al* (1979) also found that transgression increased with age. A plausible explanation for this reversal is that, rather than being less able to inhibit, 3.5- to 4-year-olds might better appreciate the experimenter's inability to witness or detect their transgression[18]. This explanation, relating to theory of mind, gains support from the pattern of deception observed.

Only 20% of 3-year-olds who peeked denied it, compared to 53% of 3.5- to 4-year-olds. A third of older deceivers proved capable of maintaining deception, feigning ignorance of the animal inside the box by answering in accordance with a misleading clue. This result replicates Polak & Harris (1999), who found only a minority of their 3.5-year-olds to be capable of this form of deception. In both studies, children were motivated to guess correctly, making it likely that this form of deception involved further inhibition. This may have been relatively challenging for younger children. Moreover, as noted by Polak & Harris (1999) the motivation for feigning ignorance requires second-order false belief understanding: the child has to infer what an adult will infer from their response. For this reason, it is unlikely that children will fully conceal deception at above-chance levels prior to the age of 6 or 7 years. Indeed, Talwar, Gordon & Lee (2007) have recently confirmed that 7- to 11-year-olds' capacity to maintain deception in this paradigm is significantly related to performance in second-order false belief tasks. This raises the possibility that limited evidence for maintenance of deception found in the current study was based on simpler processes. For example, it is possible that for some children, the experimenter's clues are the

[18] Interestingly, Burton & Mitchell (2003; Study 3) found that although by around 6 years children appreciate that they are the authority on interior aspects of self-knowledge (for example, "Who knows best what your secrets are?"), 5-year-olds often cite their parents as the authority. However, 5-, 6- and 7-year-old children appreciated that the unfamiliar experimenter had no (or relatively little) access to such knowledge. This result is relevant for two reasons. Firstly, it would be interesting to determine if preschoolers' are also capable of making distinctions between self, familiar and unfamiliar others' access to interior knowledge. One possibility is that younger children consider adults omnipotent regardless of familiarity, explaining why 3-year-olds in the current study were relatively reluctant to transgress or attempt to conceal transgression. Secondly, 5-year-olds tendency to cite their parents as "knowing them best" might indicate the level to which parental figures are included in the self-concept early in development. As noted, this social 'extension' of the self has the potential to be measured in the SRE paradigm (see Bennett & Sani, 2008).

most salient stimuli to guide responses. This could occur either because the animal in the box was revealed some time before, or because "guessing" in accordance with clues was perceived to be the purpose of the game. In support of the latter explanation, deindividuation - intended to increase subjective engagement with the game - was associated with an increased tendency to maintain deception.

Although the reduced sample size (N = 10) precludes full elucidation of the relationship between verbal deception and self-awareness, the data suggest an effect. Of the children who verbally deceived, 90% peeked and then denied it in the deindividuated condition, 75% in the neutral condition, and 67% in high self-awareness condition. The finding that fewer children falsely denied looking when self-aware might be interpreted, in line with Lewis *et al* (1989), as arising from a sense of guilt. Admitting to the transgression could be a reparative behaviour. Conversely, the decreased tendency to peek and verbally deceive when the mirror was present might reflect the fact that "someone" was watching. Bateson, Nettle & Roberts (2006) have recently shown that displaying an image of eyes next to an honesty box significantly increased contributions to the coffee fund in an academic department. Note though, this effect still implies self-evaluation. Here, having been reminded of their objective status, people behave in line with public and/or personal standards of honesty. Interestingly though, Bateson, Nettle & Roberts (2006) suggest that neural responses to faces/eyes might elicit this effect on an automatic and subconscious level.

Children's increased tendency to verbally deceive in the deindividuation condition is also interesting. Reversing the interpretations offered for self-aware behaviour, it may be that children were less likely to evaluate their actions or feel guilt (about peeking or lying) when anonymous. Note though, denying a misdemeanour implies some level of self-preservation. For this reason, this explanation may not be sufficient. One intriguing possibility is that deindividuation promoted anonymity to the extent that peekers' negative answer to the question "Did you look in the box?" was considered veridical. On this reading, asking the children "Did the Zookeeper look in the box?" might have elicited more "yes" responses. Reduced accountability is a key feature of classic deindividuation theories (Festinger, Pepitone & Necomb, 1952; Zimbardo, 1969). Alternatively, it may be that making children a "character" in the game increased their engagement. In turn, this would increase the desire to reveal the contents of the box. As a result of increasing the strength of the pre-potent response, transgression would be relatively hard to resist. This explanation (emphasising subjective self-awareness) fits with our interpretation of the increase in maintenance of deception in this condition. However, it does not appear sufficient to explain the increase in denials; for this effect, some appeal to anonymity seems necessary.

In providing the first direct evidence for socially functional self-awareness in preschool children, Experiment 9 opens the debate on the processes underlying conscious self-regulation. As found for adults, variations in self-awareness have a measurable impact on children's social conduct. The next step is to determine a) if self-awareness has an impact on behaviour across a number of situations, and b) if the effect of self-awareness is consistent with key principles/processes. The prosocial impact of objective self-awareness in the current study implies that predictions derived from Duval & Wicklund's (1972) model may apply to preschool children. However, it is possible that self-awareness originally functions at a lower level than in adults. For example, one possibility is that preschool children react to self-awareness, not by adhering to internalised or standards of behaviour, but by heeding external standards. On this reading, the effect of the mirror is to highlight awareness of self as viewed by "other". Experiment 10 aims to further explore these prospects. Finally, although inhibition of a pre-potent response arguably requires forward planning, the role of the self as the agent of behaviour need not be explicit. For this reason, Experiment 10 is based on a paradigm in which explicit planning for the self in the future is key.

7. Self-reflection and the self in the future II

Debate concerning children's ability to mentally project the self into the future has a long pedigree (Hazlitt, 1805/1969). One of the first experimental methods developed to measure future-oriented behaviour was Mischel's delay of gratification paradigm (see Mischel, 1974, Mischel, Shoda & Rodriguez, 1989). In this paradigm children are asked to choose between a less attractive, immediate reward and a more attractive, delayed reward. If children choose to wait, the opportunity to capitulate and choose the immediate reward remains. Mischel's interest in this task was primarily in the waiting period, as he considered children's ability to wait for the more attractive reward a measure of self-control. However, Thompson, Barresi & Moore (1997) suggest that children's initial choice can be considered a measure of their ability to conceive of and connect with the self in the future. The idea here is that, only by acknowledging the continuity between current and future selves can children appreciate that choosing to delay is in their best interests. The delay of gratification paradigm then, has the potential to measure both effortful behavioural control and explicit planning for the self in future.

Moreover, there is reason to consider that manipulating self-awareness might interact with future-oriented behaviour for the self. As shown in Experiment 9, children delayed the gratification of revealing the contents of the box more often, and for longer, when they were encouraged to self-focus. One explanation for this finding is that the mirror led children to evaluate (and conduct) themselves according to a salient behavioural standard, thus avoiding internal or external reprimands. The advantage of the delay of gratification paradigm over the method used in Experiment 9 is that the motivation for self-regulation is self-imposed. Having made the choice to wait, children who are self-aware should have an investment to stick to this standard, avoiding internal dissonance. For this reason, combining delay of gratification and mirror effect paradigms has the potential to elucidate whether children's experience of self-awareness is self-contained, drawing on internalised standards.

Early studies of future-orientated choice for self found no evidence of developmental progression in the preschool years, with the consensus that children under the age of 5 years tended to choose the immediate reward (Toner, Holstein & Hetherington, 1977; Schwarz, Schrager & Lyons, 1983). However, more recently, researchers aiming to link delay of gratification with theory of mind have argued the case for significant developments between the 3rd and 4th year. In these studies children are asked to make a future-orientated decision three times, with one point earned for each delayed choice (Thompson, Barresi & Moore, 1997; Moore, Barresi & Thompson, 1998; Lemon & Moore, 2007). To control for the difficulties of inhibition, demonstration of the ability to delay gratification is not required. Using this method, Thompson, Barresi & Moore (1997) provided the first evidence to suggest that 3-year-olds were more likely to opt for immediate self-rewards than 4- and 5-year-olds. Lemon & Moore (2007) replicated this result for 3- and 4-year-olds. Likewise, Moore, Barresi & Thompson (1998) reported marginally significant differences between 3.5- and 4.5-year-olds. In all cases, the younger preschoolers performed below chance (mean choice for delay approximately 1) in selecting delayed rewards. In contrast, the older preschoolers performed at chance (mean choice for delay approximately 1.5).

It appears then, that recent attempts to explore the development of self-projection provide little evidence for such a capacity in preschoolers. However, it is not clear that 3- and 4-year-olds fail to consistently make future-orientated choices due to a lack of reference to the self in the future. Rather, their failure may be a consequence of their well established difficulties in inhibition.[19] As recognised by Thompson, Barresi, & Moore (1997), the second component of the delay of gratification task provides an index of this. Although 3- and 4-year-olds who choose the desired reward before being informed of the delay can subsequently delay gratification, they can do so only for shorter periods than older children (Mischel, 1974; Mischel & Ebbesen, 1970; Mischel & Moore, 1973; Moore, Mischel & Zeiss, 1976; Mischel & Mischel, 1983). Arguably though, the choice stage still requires inhibiting the pre-potent response to take the reward offered now, the only difference being that the opportunity to capitulate is not presented. In support of this interpretation, Lemmon & Moore (2001) demonstrated that when preschool children were offered "simple" future choices, for example, "Would you like one sticker or two stickers at the end of the game?", both 3- and 4-year-olds consistently preferred the larger reward. Crucially, making such choices removes the conflict between current and future selves, and therefore the need for inhibition.

Reminiscent of the debate concerning self-conservation, Lemmon & Moore (2001) suggest that without conflict we cannot be sure that children's choices refer to the needs of the future self or to their current desires. Indeed, they find that although the DSR task correlates with future-orientated choices involving a choice between

[19] Repeated questioning might also contribute to preschoolers' difficulty: in the studies reviewed, children were asked to make no fewer than 12 (linguistically similar) decisions in one session. The abundance of rewards (minimum 12 stickers, maximum 24 stickers) might also have decreased motivation to wait.

immediate or delayed rewards, performance on this task does not correlate with simple future orientated choices. However, as discussed in Chapter 1, Povinelli, Landau & Perilloux's (1996) paradigm is not a problem free test of the extended self. Both the DSR task and the standard delay of gratification task require the ability to choose between current reality (which is pre-potent) and a conflicting representation of non-current reality. This equates both tasks with the requirements for demonstrating an understanding of false belief, a capacity which does not begin to emerge until the 4th year. Moreover, neither task can account for the disparity between performance and linguistic reference to the extended self. Despite performing poorly in DSR and delay of gratification tasks, three-year-olds have an established ability to talk about themselves in the past (Fivush, Haden & Adam, 1995) and make plans for the self in the future (see Atance, 2008 for review).

7.1 Experiment 10

Lemmon & Moore's (2001) concern that reference to the self in simple future-orientated choices may be limited to the present is reasonable, even in the context of linguistic self-projection. However, it is not clear that the choice component of the delay of gratification avoids the inhibitory demands inherent to the waiting period. This suggests that Thompson, Barresi & Moore's (1997) decision to omit the demonstration of self-control is unwarranted. Importantly, in line with the distinction between transgression and latency to transgress in Experiment 9, it is likely that this behaviour has the potential to provide a richer measure of the strength of children's self-projection. What the proceeding review makes clear, however, is that preschoolers are unlikely to self-impose delay of gratification. As noted, it is this "meta" aspect of self-control which can be expected to vary with self-awareness. To circumvent this problem, Experiment 10 aims to test children's ability to delay gratification in a paradigm designed to make the initial choice relatively simple, but the ability to sustain that choice increasingly hard.

Rather than present children with a "simple" future-orientated decision or the standard delay of gratification choice, Experiment 10 used a combination of these choice types. Specifically, children were asked if they would prefer to complete half of a task and gain one reward, or all of a task to gain two rewards. As a result of neither choice resulted in an immediate reward, the level of inhibition required by the initial decision would be relatively low. However, to the extent that "sooner" is a more pre-potent response than "later", an element of conflict is maintained. Moreover, asking children to complete the task in line with their decision allowed the standard delay of gratification question to be included. On reaching the half way point, children were told "you can stop now and get one toy, or keep going and get two toys at the end of the game". Importantly, previous research suggests that when preschoolers' are engaged in an instrumental task they are able to delay gratification for longer than in a passive wait period (Peake, Hebl & Mischel, 2002). In order to test the hypothesis that delay of gratification would interact with self-awareness conditions then, preschoolers in our sample were given every opportunity to choose to delay and to physically delay gratification.

In addition to completing the task for self, children were also asked to complete the task for an unfamiliar child. As noted by Thompson, Barresi & Moore (1997) and Moore, Barresi & Thompson (1998), making the most attractive choice for other likely involves an element of empathy. For this reason, this extension has the potential to reveal children's cognitive and emotional investment in other minds. Moreover, the role of empathy in making choices for other can be made more explicit by asking children to choose between shared and non shared rewards. For example, Thompson, Barresi & Moore (1997) and Moore, Barresi & Thompson (1998) asked 3- to 5-year-old children to choose between one sticker for self now, or one each for self and partner later. Here, children could gain the reward immediately, or wait so that the other would also benefit. Perhaps due to their difficulties in making delayed choices, children performed relatively poorly in these trials. However, by asking children to work to earn smaller or larger rewards for other, and giving the opportunity to capitulate as the cost to self grows (with time spent on other), Experiment 10 aims to provide a less demanding test of prosocial behaviour. Of current interest, children's prosocial choices in such situations can be expected to interact with self-awareness, as altruism is a socially valued moral standard.

There is evidence for a positive impact of self-awareness on empathy and helping in adults. For example, Gibbons & Wicklund (1982) and Mayer, Duval, Holtz & Bowman, (1985) demonstrated that, provided the need for assistance was made salient, the presence of a mirror promoted offers of help in an experimental context (for example, helping a confederate who was struggling to work a cassette player). Similarly, Greenberg (1983) found that adults made self-aware by the introduction of a mirror perceived any inequality in payment between themselves and a fellow participant unfair. Predictably though, the control group perceived overpayments made to other as being significantly more unfair than overpayments made to self. More recently, Abbate, Isgro, Wicklund & Boca, (2006) have provided ecologically valid evidence to suggest that mirror-induced self-awareness promotes both perspective-taking and prosocial behaviour in adults. The authors stopped students in an Italian University campus, asking them to choose which of two postcards to send to a friend from Britain, one written in Italian, and other in English. To assess helping behaviour, they also asked the students if they would post the card for them. Answering these questions in front of a mirror led to significantly more students choosing the appropriate postcard (written in English), and expressing willingness to mail it.

However, although mirror self-recognition has been correlated with prosocial behaviour and empathy (Johnson, 1982), only two studies have directly linked levels of self-awareness with prosocial behaviour in children. Froming, Nasby, & McManus (1998) asked 11-year-olds to anonymously donate some of the rewards they had been given for completing a task to classmates. Self-awareness was manipulated by having children answers questions about themselves (high self-awareness) or non self-referent objects such as cars (low self-awareness). In line with the findings for adults, Froming, Nasby, & McManus (1998) found that 11-year-olds donated significantly more tokens (redeemable for toys) to others when made self-aware. Likewise, Froming, Allen & Jensen (1985) asked 5- to 9-year-old children to donate sweets to their peers, manipulating self-awareness by sometimes having children make their donations in the presence of a mirror or an adult. They found that although the mirror had no effect, older children made donated more sweets when they had an audience.

This result led Froming, Allen & Jensen (1985) to suggest that children may not appreciate the social value of altruism until middle childhood; even then the decision to be altruistic may require external reinforcement. However, preschool children show spontaneous altruism in other situations (Johnson, 1982; Zahn-Waxler *et al*, 1992; Eisenberg *et al*, 1996). Moreover, Experiment 9 demonstrated that when the rule for behaviour was made salient, even 3- and 4-year-olds showed mirror effects. One possibility is that the cost of altruism in Froming, Allen & Jensen's (1985) study - donating own sweets – was too high for younger children. In support of this interpretation, younger children donated significantly fewer sweets than older children across all conditions. For this reason, the reduced material cost of altruism in the current paradigm (donating time to complete the task) might allow preschoolers to show an effect. However, attracted by the simplicity of Froming & colleagues' (1985; 1998) measure, the opportunity for material donation was also provided.

At the end of the game, children were given the chance to donate some of the rewards gained for participating to the unfamiliar child. Rather than asking children to donate toys they had earned, which were few and hard won, children were given the opportunity to share some stickers with the other. Importantly, this gave children the opportunity to be altruistic without the conflict of delay, a factor with which previous research suggests they have difficulty. Together with children's willingness to work for the unfamiliar child, this measure might be expected to show a positive effect of self-awareness. Finally, self-awareness was manipulated not only in the manner reported in Experiment 9, but with an additional condition. Specifically, some children completed the tasks in front of a mirror while in disguise and referred to by a generic term. Mixing deindividuation and self-awareness conditions was intended to clarify the relative contribution of these effects.

Method

Participants

A total of 96 children took part, including 48 3-year-olds (M = 38.7 months, SD = 2.5 months, range = 33 - 41 months) and 48 3.5- to 4-year-olds (M = 53 months, SD = 5 months, range = 43 – 61 months). Twenty-four additional 3- and 4-year-olds took part in piloting.

Materials

Materials for the task included a magnetic fishing rod and 18 wooden sea-creature shapes; two animal puppet toys and six stickers per child were also available. Toys were stored in a large box. Polaroid photographs of unfamiliar children (one male, one female) were used to represent other. A mirror (12" x 16") was used to manipulate self-awareness and the costume for the deindividuation condition was a yellow sou'wester hat and cagoule.

Procedure

Children completed the game under one of four conditions. These were intended to induce high self-awareness, to deindividuate, to provide a neutral context and to simultaneously promote self-awareness and deindividuation. In self-aware and neutral conditions, children were referred to by name and played the game in front of the reflective and non-reflective side of a mirror, respectively. In the deindividuated condition, children were asked to wear a costume, referred to as "Fisherman", and the non reflective side of mirror was shown. In the "mixed" condition children were treated as in the deindividuated condition but played the game in front of the reflective side of the mirror.

Children were told they were going to play a fishing game in which they had the chance to win toys for themselves, and another (unfamiliar) child, who didn't have any toys. The unfamiliar child was represented in a Polaroid photograph, and introduced as Mary or Billy. To minimise children's identification with these characters, children were always asked to win toys for the child of the opposite gender. For each child there were two trials, one for self and one for other. At the start of each trial (order counterbalanced) the children were told if they completed the game by picking up all of the fish they would earn two toys for themselves/*other* but if they stopped halfway they would earn only one. Children were shown the box of available toys and asked: "Do you want to win one toy or two toys for yourself/Billy/Mary?". After children's decisions had been recorded the box was closed, as previous research suggests that visual access to rewards during the wait period decreases self-restraint (Mischel & Ebbesen, 1970).

When children had picked up half of the fish, the experimenter interrupted the game, saying, "You can have one toy (for Mary/Billy) now, or you can keep going until you've finished the game and get two toys (for Mary/Billy)". The game was designed to be dull but with a clear goal so that the children had to "work" for their reward. At a moderate pace, completing each game took approximately three minutes. Piloting showed that when asked to pick up "some fish" to gain a toy, children (N =

12) typically picked up 4 fish before requesting the toy. When the reward was not anticipated (N = 12), children typically picked up nine fish. This confirms that children lacked the intrinsic motivation to collect all 36 fish (18 for self, 18 for other) (and replicates the established finding that offering rewards decreases intrinsic motivation, Deci, 1971).

Children were allowed to choose the toys earned for self from the box immediately after ending the trial. Likewise, at the end of trials for other, the child was allowed to pick and put aside toys for other, with reassurance that they would be delivered to Mary/Billy. Finally, children were given the opportunity to share their reward for participating by donating some stickers to the unfamiliar child. The experimenter said "Here are six stickers. You can keep them all, or you can give some to Billy/Mary". Six stickers were chosen to ensure that the reward was sufficiently large to be shared, yet small enough for each sticker to be considered valuable.

Results

Simple delay of gratification and self-control

Only four (three 3-year-olds, one 3.5- to 4-year-old) children chose to work towards the smaller reward for self; however, 21 (13 3-year-olds, eight 3.5- to 4-year-olds) chose this option for other. Of the 91 children who chose to work towards the larger reward for self, 92% succeeded (41 3-year-olds, 43 3.5- to 4-year-olds). By contrast only 69% (22 3-year-olds, 30 3.5- to 4-year-olds) of the 75 children who chose this option for other succeeded. No child chose a smaller reward for self or earned fewer toys for self than earned for other. A Wilcoxon's test confirmed that the self was at a significant advantage in terms of both choices ($Z = -4.1$, $p < 0.001$) and success in gaining the larger reward ($Z = -3.8$, $p < 0.001$).

Children chose to earn the smaller reward for other most in the deindividuation ($N = 9$), followed by neutral ($N = 5$), followed by mixed ($N = 4$), followed by self-aware ($N = 3$) conditions. Chi-square analysis indicated that this skewed distribution was not significant (X^2 (3, 96) = 5, $p = 0.2$). However, the pattern did approach significance when conditions were collapsed into mirror present/mirror absent categories (X^2 (1, 96) = 2.9, $p = 0.07$).

Of the children who chose to work towards a larger reward for other, the most success occurred in self-aware ($N = 17$), followed by mixed ($N = 15$), followed by neutral ($N = 11$) and deindividuation ($N = 9$) conditions. Again, this skewed distribution was not significant (X^2 (3, 75) = 3.4, $p = 0.3$), but approached significance when conditions were collapsed into mirror present/mirror absent categories (X^2 (1, 75) = 3.2, $p = 0.06$).

Toys earned

Children earned significantly more toys for self ($M = 1.9$, $SD = 0.3$) than other ($M = 1.5$, $SD = 0.5$) (Repeated-measures ANOVA F (1, 88) = 57.8, $p < 0.001$, η_p^2 = 0.4). This factor significantly interacted with age (F (1, 88) = 3.8, $p = 0.04$, $\eta_p^2 = 0.4$), with younger children (self $M = 1.9$, $SD = 0.3$; other $M = 1.4$, $SD = 0.5$) showing a larger self-related bias than older children (self $M = 1.9$, $SD = 0.3$; other $M = 1.6$, SD =

0.5). Self-bias also interacted significantly with condition ($F (3, 88) = 3.1$, $p = 0.03$, $\eta_p^2 = 0.1$); as shown in table 7.1, children showed the largest self-bias in the deindividuation condition, followed by the neutral, mixed, and self-aware conditions.

Table 7.1: Experiment 10 toys earned for self and other, split by condition

Condition	**Mirror**	**Toys earned**		**Self-bias (self – other)**
		Self	**Other**	
Self-aware	present	M=1.9, SD=0.3	M=1.7, SD=0.4	M=0.2
Mix	present	M=1.9, SD=0.3	M=1.6, SD=0.5	M=0.3
Neutral	absent	M=1.8, SD=0.5	M=1.4, SD=0.6	M=0.4
Deindividuated	absent	M=1.9, SD=0.3	M=1.3, SD=0.5	M=0.6

To determine if self-bias was driven by an increase in rewards for self and/or other, a between-subjects ANOVA was run. Age had a small effect on the number of rewards earned for other ($F (1, 88) = 4.1$, $p = 0.046$, $\eta_p^2 = 0.04$) but not for self ($F (1, 88) = 0.09$, $p = 0.7$, $\eta_p^2 = 0.01$). Likewise, condition had an impact for other ($F (3, 88) = 3.9$, $p = 0.039$, $\eta_p^2 = 0.09$), but not for self ($F (3, 88) = 0.3$, $p = 0.8$, $\eta_p^2 = 0.01$) (see table 7.1 for means). Post-hoc comparisons showed that although the analysis lacked power, the difference between deindividuated and self-aware conditions approached significance ($p = 0.09$). Collapsing conditions into a mirror/no mirror category confirmed that children earned significantly more toys for other when their self-reflection was present ($M = 0.25$, $SD = 0.4$) than when it was absent ($M = 1$, $SD = 0.5$) ($F (1, 94) = 7.4$, $p = 0.008$, $\eta_p^2 = 0.07$).

There was a significant interaction between condition and age ($F (3, 88) = 3.1$, $p = 0.03$, $\eta_p^2 = 0.1$). As shown in Figure 7.1, and confirmed by separate multivariate analysis, 3-year-olds' ($F(1, 88) = 5.9$, $p = 0.002$, $\eta_p^2 = 0.3$) but not 4-year-olds' ($F(1, 88) = 0.1$, $p = 0.9$, $\eta_p^2 = 0.007$) behaviour towards other varied in accordance with condition. Again, post-hoc comparison lacked power to differentiate between conditions, however, when the conditions were collapsed, the presence of the mirror resulted in a significant increase in the number of toys 3-year-olds earned for other ($F(1, 46) = 16.2$, $p < 0.001$, $\eta_p^2 = 0.3$). As noted, 4-year-olds were generally more successful in earning the maximum number of toys for other. It seems likely that (as in Experiment 5), this ceiling effect is responsible for the unexpected reversal in developmental effects.

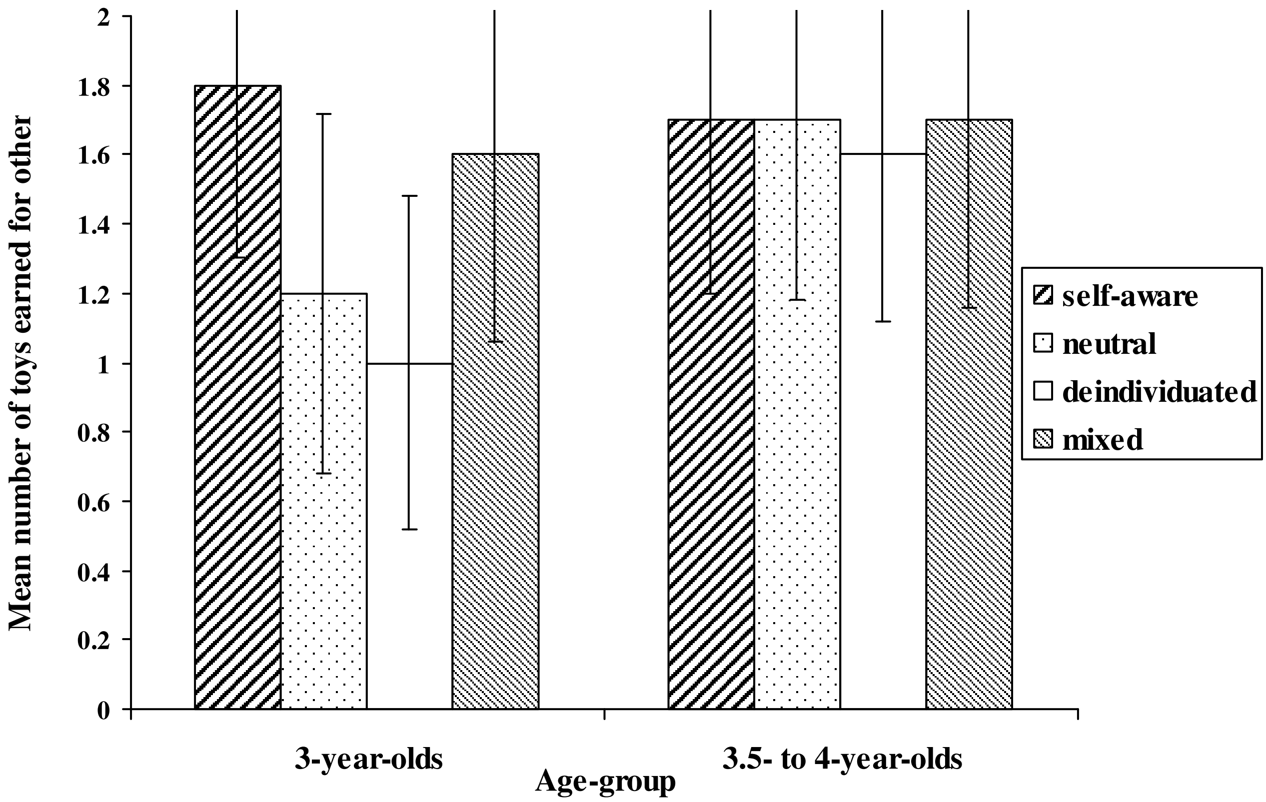

Figure 7.1: Experiment 10 toys earned for other, split by age-group and condition

Stickers shared

Children took significantly more stickers for themselves (self: M = 4.7, SD = 1.9; other: M = 1.3, SD = 1.9: $F (1, 88) = 121$, $p < 0.001$, $\eta_p^2 = 0.6$), regardless of age ($F (1, 88) = 0.7$, $p = 0.4$, $\eta_p^2 = 0.008$). However, this self-bias interacted with condition ($F (3, 88) = 4.7$, $p = 0.004$, $\eta_p^2 = 0.1$), as shown in table 7.2, children showed the largest bias in deindividuated, followed by neutral, self-aware, and mixed conditions. As for toys earned, the change in bias was clearest when comparing mirror present (M self-bias = 2.3, SD = 1.8) and mirror absent (M self-bias = 4.6, SD = 1.5) conditions ($F (1, 92) = 11.8$, $p < 0.01$, $\eta_p^2 = 0.1$). Supporting the suggestion that 4-year-olds' superior performance in earning toys for other may have precluded condition effects, there was no interaction between age and condition ($F (3, 88) = 1.7$, $p = 0.2$, $\eta_p^2 = 0.05$) on this measure.

Table 7.2: Stickers allocated to self and other, split by condition

Self-awareness condition	**Mirror**	**Stickers allocated**		**Self-bias (self – other)**
		Self	**Other**	
Self-aware	present	M=4.4, SD=1.6	M=1.6, SD=1.6	M=2.8
Mix	present	M=3.9, SD=2.1	M=2, SD=2.1	M=1.9
Neutral	absent	M=5.1, SD=2.2	M=0.9, SD=2.2	M=4.2
Deindividuated	absent	M=5.5, SD=0.9	M=0.5, SD=0.9	M=5

Finally, controlling for age, previous success in gaining a larger reward for other was positively correlated with the number of stickers donated to other ($r^2 = 0.3$, p

< 0.001). However, there was no relationship between delay of gratification for self and the number of stickers donated ($r^2 = 0.16$, $p = 0.1$).

Discussion

The mirror was associated with an increase in prosocial behaviour; when the mirror was present 3-year-olds worked to earn larger rewards for other, and 3- and 4-year-olds donated more stickers to other. This result held even when other experimental conditions masked children's identity. As might be expected, it appears that children asked to wear a disguise in front of a mirror felt self-conscious. The interesting result is that this self-consciousness led, as it does for adults, to socially valued behaviour. Children may have perceived the experimenter's request for them to complete the task for another child who had no toys as setting a standard for altruism. However, even if mirror-induced altruism arose from increased salience of this implicit standard, the children behaved as though self-evaluative. Together with Experiment 9, this result implies that self-awareness has a functional effect on behaviour in the preschool years. Confirming that the effects of deindividuation are not due to children's stereotyped understanding of the character, dressing as a fisherman resulted in children catching less fish for other than when not in costume. Moreover, deindividuation had a similarly negative effect when the Fisherman was asked to share stickers, an activity for which the stereotype provides no guidance.

Notably, self-awareness appeared to have no influence on children's ability to delay gratification for self. As noted, this result would have confirmed that self-awareness leads children to evaluate themselves according to self-generated standards of behaviour. In turn, this would imply that children experience self-awareness as described for adults in Duval & Wicklund's (1972) model. It is plausible that self-awareness initially leads to increased salience of external standards before the process becomes fully internalised. However, Experiment 10's lack of effect does not allow such a conclusion. Aside from this negative result requiring replication, children in this sample appeared very successful in choosing to delay and subsequently delaying gratification for self. Preschoolers' typically poor performance in similar tasks (Toner, Holstein & Hetherington, 1977; Schwarz, Schrarger & Lyons, 1983; Thompson, Barresi & Moore, 1997; Moore, Barresi & Thompson, 1998; Lemon & Moore, 2007) makes it questionable whether the paradigm included a sufficiently challenging task of delayed gratification. Recall that the absence of mirror effects in 4-year-olds' completion of the other-referent task might be attributed to their high rate of completion. The lack of mirror effects in self-referent task completion (in which 3- and 4-year-olds' performance was equivalent) can be similarly explained.

The delay of gratification task was designed to facilitate 3- and 4-year-olds' performance, providing a basis to measure mirror effects. In the experiment closest to the current procedure, Peake, Hebl & Mischel (2002) asked 4- and 5-year-olds to work to achieve a preferred reward. In one condition, children were told the reward was contingent on feeding marbles to a toy bird until it was full. Filling the bird took approximately 15 minutes, but children could signal to the experimenter before this time if they wished to desist and gain the less preferred reward. In their second study, a less engaging version of this task was introduced; here the marbles had to be sorted into two buckets according to colour. Peake, Hebl & Mischel (2002) do not report how many children completed these tasks. However, implying that success was relatively high, mean delays were 12 and 8 minutes respectively. Although this result predicted success in Experiment 10's 3-minute task, explicitly offering children the opportunity to choose between immediate and delayed rewards was expected to temper success. Moreover, Kanfer, Stifter & Morris (1981) reported very low rates of task completion for unfamiliar others in a similar 15-minute task. For this reason, and for practicality, a less time-consuming procedure appeared necessary.

Interestingly, the current results suggest that engaging in an instrumental task facilitated not only the length of the delay (time taken to pick up 9, versus 18 fish), but children's ability to inhibit their desire for the pre-potent reward. Ninety-five percent of the sample chose to complete the task when interrupted and offered an immediate reward. Confirming that this was related to a plan to gain the preferred reward, piloting showed that no children completed the task when the reward was absent or non-contingent on the task. This result is welcome in that it implies that 3- and 4-year-olds, when supported, choose to act in the interests of the self in the future. Seventy-eight percent of children were similarly adept at making plans for other in the future. Although performance was relatively modest in previous research, Thompson, Barresi & Moore, (1997) and Moore, Barresi & Thompson, (1998) also found that success in delaying reward for self and other was similar. It appears then, that children can equate their own desires with the likely desires of others, and act accordingly. However, why was delay of gratification for self and other substantially less demanding than in the standard choice task?

One possibility is that the task distracted children from ideating about the reward, decreasing the pull of immediacy. Thus, a less engaging task may reinstate some of the difficulty necessary to induce self-awareness effects. In support, the majority of children had to be physically interrupted, having their fishing rod revoked, in order to listen to the experimenter's suggestion that they stop early. Another possibility, also supported by children's unwillingness to be interrupted, is that seeing all the fish in the bucket became the pre-potent aim. Again, this would decrease the pull of the immediate reward. This effect could be suppressed by lengthening the task, or choosing a task where progress could not be easily tracked. Alternatively, keeping the waiting period passive (and therefore more challenging) might facilitate an effect. Following Peake, Hebl & Mischel (2002), children might be asked to state their preference for a smaller or larger reward before being informed of the contingent delay. Although it is not clear if the decision to wait can be considered self-imposed in such a paradigm, the motivation to delay would still be a matter of self-interest. Here, the effect of manipulating self-awareness might be to vary the perceived relevance of the waiting period to the self. To the extent that children's self-recognition is time-limited (as implied by Povinelli, Landau & Perilloux, 1996) self-focus might be expected to increase in the salience of current desires, compromising performance. Conversely, in highlighting a self removed, the mirror may encourage working towards the best self-referent outcome.

Finally, as in other paradigms (Experiment 9, this volume; Johnson, 1982, Zahn-Waxler, *et al*, 1992; Eisenberg *et al*, 1996), there was evidence for individual differences in children's demonstration of prosocial behaviour. Children who earned more toys for others showed a smaller self-bias in sharing stickers than children who worked less for others[20]. Again, this result raises the possibility that children's behaviour in mirror conditions could be compared to their explicit rating of similar behaviours. Indeed, Froming, Nasby & McManus (1998) found that the number of prosocial trait words 11-year-olds judged self-descriptive mediated whether the mirror had the expected effect of increasing donations to other. This interaction confirms that 11-year-olds take their cue to act from an existing self-schema when made self-aware. Thus, in determining whether preschoolers act in a personally valued fashion when made self-aware, one could determine whether their self-evaluation refers to internalised or external standards of behaviour.

To summarise, Experiments 9 and 10 make clear that situational levels of self-awareness increase preschoolers' adherence to explicit and implicit rules for "good" conduct. This implies that, as found for adults, 3- and 4-year-olds' self-reflection leads to self-evaluation, which leads to self-control. Moreover, Experiment 10 provides evidence that preschoolers' self-awareness has a prospective impact on their behaviour. Not only did 3- and 4-year-olds act in line with their future interests, they explicitly valued a delayed reward over an immediate reward, at least when permitted to work instrumentally towards it. In other words, when the situation facilitated a tangible link between current and future selves, children acted as though aware of this connection. It is not clear whether preschoolers appreciate more distal (or conflicting) aspects of their future selves. However, such connections arguably have more to do with the capacity for imagination than the capacity for self-awareness. Unlike past and present selves, the future self is an expectation, not yet a reality.

[20] The lack of relationship between delay of gratification for self and sharing implies that this result was not due to the need for inhibition abilities. However, given the high rate of success in the current paradigm (implying low inhibitory demands), this conclusion is preliminary.

8. The executive self in development

This thesis investigated the functional role of self-recognition in preschoolers' cognition and behaviour. Evidence was provided to suggest that self-recognition had a measurable impact on preschoolers' performance in tasks requiring memory, attention, inhibition, and planning. As each of these capacities come under the rhetoric of "executive function" one might consider the mediating role of self-consciousness as evidence for the self as the ultimate executer of behaviour. The current chapter begins by presenting the main findings of the thesis, summarising evidence that self-recognition leads to cognitive and behavioural self-regulation. Ultimately, the research presented leads to the inference that functional experience of the self as a continuous entity is established early in the preschool years. The chapter ends by offering suggestions for future research aimed at further elucidating our understanding of the executive self in 3- and 4-year-olds.

8.1 Is "I" the boss of "me" in preschoolers?

In recognising aspects of ourselves in the environment we make a cognitive connection between external and internal self-representation. Experiment 1 indicated that even where self-reflection is proprioceptive (as in when we perform an action) or ambiguous (as when we match our gender or age-group to some external stimulus), a cognitive connection to the self-system can be made. Moreover, by virtue of connection to the self, material considered self-referent at encoding has priority at retrieval. This mnemonic advantage has been repeatedly demonstrated for adults (for review see Symons & Johnson, 1997; Englekamp, 1998), and occasionally for school age children (Pullyblank *et al*, 1985; Baker-Ward, Hess & Flannigan, 1990; Summers & Craik, 1994; Millward *et al*, 2000; Sui & Zhu, 2005; Bennett & Sani, 2008), but not for preschool children. However, Experiment 1 indicated that by the age of 4 years, children showed a recognition advantage for actions which had been performed by self or modelled by a self-referent character.

Extending this result, Experiment 2 showed that preschool children can make active links between the self-system and otherwise neutral stimuli, by encoding ownership information for novel objects. Three- and 4-year-olds maintained ownership information for up to a week after encoding. Observational research implies that children as young as 2 years behave as though they have accurate representations of object ownership (Levine, 1983; Ross, 1996; Hay, 2008; Eisenberg-berg *et al*, 1979; Eisenberg-berg, Haake & Bartlett, 1981). However, experimental research has failed to demonstrate conclusively that this knowledge is non-associative (Fasig, 2000). Experiment 2 provides novel evidence to suggest that preschool children maintain cognitive representations of object ownership which are open to explicit expression. There was some tendency for children to show mnemonic bias for self-owned stimuli. However, perhaps due to the use of self as comparator, both self-owned ("mine") and other-owned stimuli ("not mine") were well remembered. In replicating the results of Experiment 2, Experiment 3 demonstrated that maintenance of ownership information is unrelated to self-conservation as measured by Povinelli, Landau & Perilloux's (1996) delayed self-recognition task. The likely reason for this is that the DSR task measures children's capacity to infer something about the past self from new information. On the contrary, the ownership task required children simply to express an autobiographically organised memory.

Together, Experiments 1 to 3 indicate that implicit (Experiment 1) and explicit (Experiments 2 and 3) self-reflection has a functional impact on children's memories for past events. Experiment 4 indicated that personal identity also has a strong pull in determining the focus of attention in the present. When children were asked to recognise objects that had been presented adjacent to an external self-representation of the self, 4-year-olds encountered relative difficulty, and 3-year-olds failed to recall the connection between self and object. Experiments 5 and 6 reversed this effect, demonstrating that when to-be-remembered objects were visually and verbally integrated with self- and other-photographs, short-term memory for self-referent material was superior. Provided the memory task was sufficiently demanding, this mnemonic bias was significant for both 3-year-olds (Experiment 5) and 4-year-olds (Experiment 6), confirming that children as young as 3 years show a self-reference advantage. However, due to the lack of a non self-referent control task, and the short retention period, it was unclear whether this bias was primarily traceable to top down differences in the amount of attention given to self-photographs, or to a lasting cognitive connection between the stimuli and the self-system.

Suggesting that self-focus is at least sometimes the mediator of mnemonic self-bias, Experiments 5 and 6 demonstrated that when faced by a mirror at encoding, children could remember relatively few objects that were associated with others by virtue of a second person pronoun (for example "He bounced the *ball*"). This implies that self-focus has the potential to interfere with the processing of stimuli that are objectively non self-referent. In support, Experiment 7 indicated that preschoolers found it harder to switch naming responses for photographs of self and familiar other, than to switch naming responses for photographs of two familiar others. The processing of other-referent stimuli appeared particularly difficult in this context. This wasn't due to children taking less time over other-referent stimuli, or prioritising the self-referent rule in working memory (Experiment 8); rather, there seemed to be something about the need to falsely self-recognise that compromised children's responses for other.

Experiments 9 and 10 provided evidence to suggest that self-exposure has a reliable impact on behavioural control. Given the opportunity to cheat during Experiment 9's guessing game, preschoolers cheated less and waited longer before cheating when they played the game in front of a mirror, than when they played the game as a "zookeeper" and the mirror was absent. Likewise, in Experiment 10, 3-year-olds worked harder to gain toys for an unfamiliar child when the mirror was present, than when it was absent and they were in disguise. Four-year-olds appeared motivated to work for other regardless of external manipulations of self-focus. However, both 3- and 4-year-olds showed significantly more altruism in their distribution of stickers between self- and other- when faced with their mirror image.

The self-regulation involved in Experiments 9 and 10 was based on a moral standard. As described for adults in Duval & Wicklund's (1972) model, self-exposure appeared to lead preschoolers to compare the current self to an ideal standard for behaviour. Thus, preschoolers implicitly acknowledged that their current behaviour would have positive or negative (subjective) implications for the self in the future. In Experiment 10, preschoolers also made an explicit choice to delay gratification in order to gain a larger reward in the future. However, contrary to the mnemonic and attention biases associated with self-focus in Experiments 1 to 8, the outcome of self-exposure in a social context was not always promotion of children's own interests. Rather, self-exposure led to an increase in prosocial behaviour. In other words, self-exposure led children to cognitively accommodate the perspective of other.

The current research confirms that self-reflection has a reliable impact on preschoolers' cognitive and socio-cognitive processing of events, and their resulting behaviour. To place this in the context of previous research, this represents perhaps the strongest evidence to date that self-recognition has <u>direct</u> cognitive and behavioural consequences for preschoolers beyond self-labelling and mark-directed behaviour. Moreover, although preschoolers' self-conscious emotions were not measured, self-focus led to morally commendable behaviour in social contexts. This confirms that in becoming self-conscious, children develop a social conscience. Together, these results suggest that preschool children behave as though they are reflective agents, as described by Duval & Wicklund's (1972) theory of objective self-awareness. Not only was self-awareness reliably induced by external representations of the self (Experiments 1 to 8); children behaved as though self-exposure led to self-evaluation (Experiment 9 and 10).

Consideration of what these results imply for the agentive "I" and the descriptive "me" highlights the futility of separating these aspects of the self. Self-reflection led to agentive control of memory (Experiments 1 to 3), attention (Experiments 4 to 6), and cognitive and behavioural inhibition (Experiment 7 to 10). This implies that preschool children are entitled to the claim "I am the boss of me". However, the contribution made by the "me" self was far from superficial. The agentive impact of the "I" self was only apparent, as predicted by Duval & Wicklund (1972), when situational factors highlighted key aspects of self-knowledge ("me"). For this reason, the executive interaction of the agentive "I" and the descriptive "me" can be considered reciprocal.

8.2 Suggestions for future research

Experiments 1 to 6 confirm that preschool children have the potential to implicitly and explicitly tag events as self-referent. However, the mechanistic basis of the self-reference advantage in memory has not been adequately dealt with, either here, or in previous research. Specifically, there are at least two candidates to support cognitive self-bias in memory; an elaborated self-concept (superior encoding and retrieval for self) and self-focus (selective encoding for self). However, previous research with children (Pullyblank *et al*, 1985; Baker-Ward, Hess & Flannigan, 1990; Summers & Craik, 1994; Millward *et al*, 2000; Sui & Zhu, 2005; Bennett & Sani, 2008) and adults (see Symons & Johnson, 1997) has largely ignored the contribution of self-interest to the effect. As noted, interference arising from selective self-focus can be controlled by asking participants to process self- and other-referent stimuli in separate sessions. However, the role of self-focus in the self-reference advantage arguably deserves more thorough investigation. One possibility is that early self-reference effects, measurable whilst the self-concept is under construction, are initially driven by self-focus. Later, the elaborated self-concept might "take over" the effect.

Despite Piaget's (1953/1977) influential assertion that preschool children are egocentric, there is very little research concerning the cognitive impact of young children's tendency to self-focus. Experiments 7 and 8 employed a modification of the Stroop paradigm in an effort to determine if self-focus had a selective impact on preschoolers' attention. The results implied that self-exposure led to interference for other-referent processing. However, self-recognition was an integral part of the effective paradigm (Experiment 7), meaning that inducement and indexing of self-focus were inseparable. This is disappointing, as an independent test of self-focused attention would be of practical value, providing a "manipulation check" in paradigms which aim to experimentally induce self-awareness. One potential way to check levels of self-awareness would be to measure children's latency to recognise pixelised images of owned versus not-owned objects. If experimental manipulation in self-focus had an effect, the contribution of familiarity could be discounted. Alternatively, provided the manipulation check was introduced after the main task, determining if self-awareness condition had an impact on children's latency to recognise their own pixelised face might provide a relatively simple measure of self-focus.

Even without an independent manipulation check, the coherent pattern of results in Experiments 9 and 10 strongly implied that self-reflection mediated children's behaviour in social contexts. However, the internal process which led to this self-control was not fully elucidated. As noted, it was not clear whether children's mirror-prompted self-regulation was based on evaluation of self in comparison to others' standards, or own standards. One way to explore this question is to measure the effects of self-focus in situations where the standard for behaviour is set by the child. For example, in delay of gratification paradigms children are asked how they wish the situation to proceed, providing a clear statement of their goals. Interaction between children's stated or demonstrated investment in a standard (for example, "it's good to share") and their mirror/deindividuated behaviour might be similarly illuminating. The process of socialisation assumes that children initially learn to behave according to external rules, before internalising standards. However, it would be interesting to determine if this dissociation can be empirically demonstrated in development, and if so at which point children make the transition.

Finally, Experiments 9 and 10 tested Duval & Wicklund's (1972) suggestion that self-reflection leads to self-control in terms of avoiding behavioural transgression. However, where avoidance of transgression is not possible, avoidance of self-focus should become the default goal. Previous research suggests that preschool children experience self-conscious evaluative emotions (Heckhausen, 1984; Stipek, Recchia & McClintic, 1992; Lewis, Alessandri & Sullivan, 1992, Kochanska et al, 2002), and prototypical reactions include appearing to seek or withdraw from external attention (Heckhausen, 1984; Stipek, Recchia & McClintic, 1992). However, it is not clear if children avoid or seek elicitors of self-focused attention when attempting to regulate their experience of self-conscious emotion. This flexibility would represent a relatively sophisticated strategy, as, although other people are sometimes as effective elicitors of self-consciousness as the self, they are relatively easy to withdraw from.

8.3 Concluding remarks

The current research confirms that inferring the concept of self from the consequences, i.e. characterising the self as an executive function, is potentially a useful methodology. The major advantage of this approach is that it allows the self to be considered as a whole entity, as it is naturally experienced. Although theories of the self as a mature system are well established (for example, Duval & Wicklund, 1972; Higgins, 1987; Carver & Scheier, 1998; Duval & Silvia, 2001), the dominant approach in developmental psychology has been to consider aspects of “I” and “me” in relative isolation. Prior to infancy, the child’s capacity to experience the agentive “I” is celebrated (see Neisser, 1988); however, with the onset of mirror self-recognition (“me”) the agentive “I” is largely forgotten. Certainly, it is necessary for children to “step out” of subjective experience of the self to develop a fully functioning personal identity. However, it should be recognised that subjective engagement with the self is not only an important formative aspect of identity, and of mirror self-recognition (as implied by the importance of contingency), it is a continuing aspect of identity. In focusing on the onset of explicit self-awareness, the field ignores the organisational, volitional, and emotional contribution of the “I” self in providing this experience. The response to Povinelli, Landau & Perilloux’s (1996) task of delayed self-recognition should not be to train children to pass; it should be to question why the self must be stripped of all subjectivity to demonstrate that it is a cognitively reflective system.

9. References

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