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Divided attention selectively impairs memory for self-relevant information

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Abstract

Information that is relevant to self tends to be remembered more than information relating to other people, but the role of attention in eliciting this ‘self-reference effect’ is unclear. The present study assessed the importance of attention using an ownership paradigm, which requires participants to encode items under conditions of imagined ownership by themselves or another participant. Previous work has established that this paradigm elicits a robust self-reference effect, with more ‘self-owned’ items being remembered than ‘other-owned’ items. Attentional resource availability was manipulated using divided attention tasks at encoding (Expt.1) and during a subsequent Remember-Know recognition test (Expt. 2). A significant self-reference effect in Remember responses emerged under full attention conditions, but dividing attention at either encoding or test eliminated the memory advantage for self-owned items. These findings are discussed in relation to the nature of self-referential cognition and the importance of attentional resource input at both encoding and retrieval in the creation and manifestation of the self-reference effect in memory.

Keywords: self, memory, attention, ownership, Remember-Know

Divided attention selectively impairs memory for self-relevant information

The influence of the self on attentional processes has long been recognised by psychologists (see Bargh, 1982). Since the ‘cocktail party effect’ was first described more than fifty years ago (Cherry, 1953; Moray, 1959), many studies have established that humans are equipped with a mechanism that enables self-relevant information to be attended to rapidly and reliably (e.g., Bargh, 1982; Brédart, Delchambre, & Laureys, 2006; Gray, Ambady, Lowenthal, & Deldin, 2004; Moray, 1959; Shapiro, Caldwell, & Sorensen, 1997; Sui, Zhu, & Han, 2006; Tong & Nakayama, 1999; Turk, Van Bussel, Brebner, Toma, Krigolson, & Handy, in press). The tendency for self-cues to capture attention is clearly advantageous, as information that is coupled with self is likely to be of greater personal importance than material linked with other people. Reflecting this potential importance, information associated with self also elicits a robust memory advantage (the ‘self-reference effect’ (SRE) on memory - for review see Symons & Johnson, 1997). The question of interest to the current inquiry is whether there is a link between these two features of self-referential material. Specifically, is the memory advantage associated with self-referential encoding dependent on the attentional resources recruited by self-cues?

Self-referential memory effects have been explored through a variety of experimental manipulations. The most widely-used paradigm requires participants to explicitly evaluate target trait words in relation to self or others (e.g., Conway & Dewhurst, 1995; Klein & Kihlstrom, 1986; Klein & Loftus, 1988; Rogers, Kuiper, & Kirker, 1977; Symons & Johnson, 1997). However, paradigms that do not require the direct evaluation of the self- or other-concept can also reveal a self-referential advantage. For example, Turk, Cunningham and Macrae (2008) showed that co-presenting self-images with stimulus words produced higher subsequent word recognition scores than co-presenting stimulus words with images of another person. Creating a self-relevant encoding context can also elicit this pattern of memory performance (Cunningham, Turk, & Macrae, 2008; Van den Bos, Cunningham, Conway, & Turk, 2010). Cunningham et al. (2008) showed that items encoded under conditions of imagined self-ownership were more likely to be recognized than items encoded as owned by another person. Further, Cloutier and Macrae (2008) showed that mere self-involvement at encoding (i.e., picking an outcome by blind selection) enhanced recollection of the outcome. These studies suggest that explicit self-evaluation at encoding is not essential to elicit an SRE; rather, a simple association between self and a stimulus at encoding is sufficient to enhance memory.

This finding is somewhat discordant with the standard cognitive account of the SRE, which relies on the application of self-knowledge at encoding to create an elaborate representation, organised within the self-concept and therefore more easily retrieved (see Klein & Kihlstrom, 1986; Klein & Loftus, 1988; Symons & Johnson, 1997). While there is a great deal of empirical evidence that elaboration and organisation both contribute to SREs elicited by the trait-evaluation paradigm, this account is more difficult to apply to the non-evaluative self-referential memory effects described above. This theoretical gap could be bridged by consideration of the importance of attention at encoding. Given the attention capture known to follow perception of self-cues (as illustrated, for example, by Moray’s cocktail party effect), it seems highly plausible that attention will be attracted by self-referential encoding contexts, such as owning objects and making outcome choices. This should elicit elaborate memory representations (i.e., enriched through the formation of semantic, pictorial, or affective associations) and increase subsequent recognition and recollection (Conway & Dewhurst, 1995; Conway, Dewhurst, Pearson, & Sapute, 2001).

Importantly, Van den Bos, Cunningham, Conway and Turk (2010) found that memory for items encoded in a self-referential context shows features of elaboration. In Van den Bos et al.'s study, self-relevance was ascribed to stimuli through imagined, hypothetical ownership. Participants were required to sort items into 'self-owned' and 'other-owned' baskets on the basis of a colour cue, before being given a surprise memory test in the form of a two-step Remember-Know task. Participants were instructed to respond 'Remember' if they recognised an item from the encoding phase and had a specific recollection of having seen the item (typical of elaborative encoding – Gardiner, 2008). A 'Know' response was to be given if participants recognised the item from the encoding phase, but only on the basis of a strong feeling of familiarity. Results showed a self-reference effect (i.e., better memory for self-owned than other-owned items) in Remember responses only, indicating that the effect was underpinned by elaborative memory representations. This finding echoes previous work using non-ownership paradigms demonstrating that a self-reference effect emerges only in Remember responses, leading to the SRE being renamed the 'self reference recollection effect' (SRRE – Conway and Dewhurst, 1995; Conway et al., 2001).

The elaboration of incoming material tends to be an effortful process, requiring attentional resources (Gardiner, Gregg, Mashru, & Thaman, 2001; Gardiner

& Parkin, 1990; Yonelinas, 2001). Thus Remember-Know studies (e.g., Gardiner & Richardson-Klavehn, 2000) have found that dividing attention at study drastically reduces recognition accompanied by recollective experience (Remember responses) but not recognition accompanied by strong feelings of familiarity (Know responses). Elaborative self-referential memory representations (e.g., of self-owned objects) are therefore likely to depend on the application of attentional resources at encoding, to a greater extent than similar representations linked with other people. Van den Bos et al.'s (2010) ownership study employed full attention conditions, so it was not possible to determine whether the ownership effect depended on the availability of attentional resources. The current inquiry will redress this by manipulating attentional resource availability to determine whether limited resources have a selectively deleterious effect on self-referential memory biases.

The current inquiry

Participants were asked to sort items under conditions of imagined self- and other-ownership with full or divided attention (DA), before completing a Remember-Know recognition test. Under full attention conditions, a standard ownership effect in memory (i.e., self owned > other-owned) was expected in Remember responses. As memory for self-owned items is likely to be driven by attention-dependent elaborative encoding, DA should reduce or eliminate the ownership effect. Two levels of DA (easy and difficult) were employed to determine whether the self-memory bias is proportionately affected by resource availability.

Experiment 1

Effects of Divided Attention at Encoding

Method

Participants and Design

Thirty undergraduate students (18 females, mean age 19.3 years) from the University of Aberdeen took part in the experiment in return for course credits. All participants had normal or corrected-to-normal eyesight. Participants gave informed consent in accordance with the guidelines set by the University of Aberdeen's Psychology Ethics Committee. A two-factor mixed design was employed, with one between-subjects factor (Attention: full attention, easy DA, difficult DA) and one repeated-measures factor (Ownership: self-owned, other-owned).

Stimuli and Apparatus

The stimulus set comprised 108 photographic images of grocery items (e.g., food, electrical items) adapted from online supermarket databases. The images (250 x 250 pixels/72 pixels per inch) were presented on a white background. The stimuli were divided into three equal sets (36 items) that were matched for item type, word length, and syllabic length. The use of these sets as self-owned targets, other-owned targets and foils at recognition was counterbalanced across participants. The experiment was programmed using E-prime version 1.1 experimental software (Psychology Software Tools Inc., Pittsburgh, PA).

Procedure

Encoding phase

Participants were tested individually and were seated at a PC laptop and monitor. Each participant was told that they were taking part in a shopping experiment and that they had to imagine that they and a fictitious other student ("John") had each won their own basket of shopping items. They were then given instructions for the encoding phase (see Figure 1 for a schematic representation of the tasks). A blank screen was presented with a shopping basket in each of the two bottom corners, one coloured red and the other blue. Participants were informed that either the red or blue basket was theirs (i.e., 'self-owned'), and were asked to imagine that everything that went into that basket belonged to them. The other basket, along with its contents, was designated as belonging to John (i.e., 'other-owned'). The colour of the self-owned basket and onscreen location of the red and blue baskets (bottom left or right) were counterbalanced across participants. In the encoding phase a shopping item was presented in the centre of the screen for 1500ms, after which a red or blue coloured border appeared around the item and remained for a further 1500ms. Participants were instructed to use labelled buttons on the keyboard to assign the item to the red basket if the border was red, or in the blue basket if the border was blue. The next item was presented after an interstimulus interval of 500ms. Presentation order of the self-owned and other-owned items was randomised by the computer.

Participants were also informed that they would be presented with a series of numbers onscreen during the ownership task. A number was presented beneath the shopping item for the duration of its 3000ms presentation. After every six trials, a number-related question was presented, with a response box in which participants could type their answer. All participants were presented with the same numbers, but were presented with different questions depending on the attention condition to which they had been assigned. In the difficult DA condition, participants were prompted to report the preceding six digits in the order in which they had been presented. In the easy DA condition, participants were asked to report how many even numbers had been presented in the preceding six digits. In the control condition (full attention), participants were asked to ignore the digits presented alongside the items, and instead copy a 3-digit number presented with the response box. All participants were told that it was very important to perform well at both the sorting task and the digit task.

Test phase

At the start of the test phase, participants received instructions for responding to a two-step (Old-New followed by Remember-Know-Guess) recognition memory test (Gardiner & Richardson-Klavehn, 2000). These instructions took 5 minutes on average, depending on the amount of explanation required by the participant. Seventy-two previously seen items and 36 unseen distractors were presented individually in the centre of the screen in a random order. Items were presented for 2000ms, during which time a response had to be made. Participants were told to use labelled buttons on the keyboard to respond 'yes' if they recognised the item from the encoding phase and 'no' if they did not. If a 'yes' response was selected, they were asked to specify the basis for their response. If they could consciously recollect having seen the item and could retrieve any information about this event (e.g., they could remember what they thought at the time) they were instructed to press 'Remember'. If recognition was based purely on the basis of a feeling of knowing that the item had been presented, in the absence of being able to recollect any further details, they were instructed to press the ‘Know’ button. Lastly, if their ‘yes’ response had been a complete guess, they were instructed to press ‘Guess’. The Experimenter checked whether the instructions were understood by asking participants to explain the difference between the three response options in their own words. She made sure that participants did not regard the Remember and Know response options as ‘sure’ and ‘unsure’, respectively. When the recognition test was completed, participants were debriefed and thanked for taking part.

[FIGURE 1 ABOUT HERE]

Results and Discussion

Participants’ hit rates and false-alarm rates were calculated by computing the proportion of previously presented items correctly or incorrectly recognised, respectively (Table 1). In a paradigm with only two response options (Remember and Know), these responses are mutually exclusive: Know responses are instructed to be given only for items that have failed to trigger any recollective experience. It is not possible for participants to indicate a situation where they experience remembering and knowing for a particular item. Therefore, Know experiences are likely to be underestimated relative to Remember experiences. When a Guess category also is included, as in this experiment, the Remember and Know response options are technically no longer mutually exclusive. However, in the current experiments participants did not often use the Guess option (overall Guess rate was 1.5%), suggesting that, in practice, mutual exclusivity of Remember and Know responses still may be an issue. To solve this problem, we applied Yonelinas and Jacoby's (1995) independence correction for Know responses, namely:

$$\text{Independent Know} = \text{Know} / (1 - \text{Remember}) \qquad (1)$$

These Independent Know responses will be referred to as I-Know responses in the results section. False-alarm rates were then subtracted from hit rates for each response type (Remember and I-Know) to correct for response bias. Note that there was no separate false-alarm rate per ownership condition.

[TABLE 1 ABOUT HERE]

Remember responses

The corrected Remember hit rates were submitted to a two-factor (Attention x Ownership) mixed analysis of variance (ANOVA), which showed a main effect of Attention, $F(2,27) = 4.92$, $MSE = 0.055$, $p = .015$. No main effect of ownership was observed, $F(1,27) = 2.73$, $MSE = 0.006$, $p = .110$, but the interaction between attention and ownership was significant, $F(2,27) = 11.96$, $MSE = 0.006$, $p < .001$. Single-factor (Attention) ANOVAs confirmed that, as predicted, memory for self-owned items was significantly reduced by DA, $F(2,27) = 8.964$, $MSE = 0.032$, $p = .001$, with significant differences between full attention and difficult DA, ($M = .34$, 95% CI [.14, .54]) and between easy DA and difficult DA, ($M = .20$, 95% CI [-.00, .40), but not between full attention and easy DA, ($M = .14$, 95% CI [-.06, .34]). In contrast, there was no effect of attention on memory for other-owned items $F(2,27) = 1.713$, $MSE = 0.028$, $p = .199$. Further, repeated measures (Ownership) ANOVAs revealed a significant ownership effect in the full attention ($F[1,9] = 10.410$, $p = .010$) and easy DA ($F[1,9] = 6.143$, $p = .035$) conditions, but a reversed ownership effect in the difficult DA condition, $F(1,9) = 8.532$, $p = .017$.

I-Know responses

The corrected I-Know hit rates were submitted to a two-factor (Attention x Ownership) mixed ANOVA, which showed no main effects of Attention, $F(2,27) = 0.953$, $MSE = 0.045$, $p = .398$ or Ownership, $F(1,27) = 0.181$, $MSE = 0.012$, $p = .674$, and no significant interaction between the two, $F(2,27) = 0.966$, $MSE = 0.012$, $p = .393$.

The Remember and Know responses elicited in the full attention condition replicated Van den Bos et al.'s (2010) finding that ownership effects are observed in recognition accompanied by recollective experience, but not in recognition accompanied by feelings of 'just knowing'. That this finding did not emerge (and indeed, was reversed) while participants were completing a difficult divided attention task suggests that ownership effects only occur when sufficient attentional resources are available. It seems plausible that attentional resources are required to produce elaborative memory representations of self-owned items, which was not possible under conditions of serious resource depletion.

This finding fits neatly with the attention-capturing features of self-relevance cues. These cues indicate that information is likely to be of personal importance and worthy of attention and the information is likely to be stored effectively in memory. What the results of Expt. 1 suggest is that the first of these features provides a base for the second; without sufficient attention being directed towards self-referential cognition, a self-memory bias is unlikely to be supported.

An interesting question is whether encoding processes are the only stage at which attentional resource availability is important in the creation of self-referential memory effects. In particular, it is also possible that processes at retrieval could be affected by divided attention. Memory in general tends to be less affected by DA manipulations at retrieval than at encoding (e.g., Baddeley, Lewis, Eldridge, & Thomson, 1984; Craik, Govoni, Naveh-Benjamin, & Anderson, 1996). However, dual-process studies have shown that DA at retrieval impairs recollection-based recognition more than recognition based on familiarity (Dodson & Johnson, 1996; Gruppuso, Lindsay, & Kelley, 1997; Jacoby, 1991; Mulligan & Hirshman, 1997; also see Yonelinas, 2002), because the retrieval of memory associations takes time and attentional resources.

Fernandes and Moscovitch (2002) provided neuropsychological support for these behavioural findings. They showed that DA has a stronger effect on memory performance when retrieval is more dependent on strategic processes mediated by the prefrontal cortex (an area critical for recollection-based recognition), and on associative cue-dependent processes like source memory. More recently, Skinner and Fernandes (2008) found further evidence for the selective effect of DA on Remember responses and in addition showed that DA at retrieval may lead to more Remember false-alarms. Ageing-studies also have examined the role of attention in recollection-based retrieval. In particular, it has been suggested that the attentional processes of older adults are less effective due to changes in the frontal lobes, leading to a decrease in the amount of recollective experience (Davidson & Glisky, 2002; Prull, Dawes, Martin, Rosenberg, & Light, 2006). Familiarity-based retrieval, on the other hand, is relatively preserved in older adults (Norman & Schacter, 1997; Park, 2000).

As Expt. 1 confirmed, self-owned items are more likely than other-owned items to lead to Remember responses (see also Conway et al., 2001; Van den Bos et al., 2010). It is therefore possible that dividing attention during retrieval would selectively impair these recollective processes, eliminating the self-referential ownership effect. A second experiment was designed to test this prediction.

Experiment 2

Effects of Divided Attention at Test

Method

Participants and Design

Thirty undergraduate students (16 females, mean age 19.9 years) from the University of Aberdeen took part in Experiment 2 in return for course credits. All participants had normal or corrected-to-normal eyesight. Participants gave informed consent in accordance with the guidelines set by the University of Aberdeen's Psychology Ethics Committee. A two-factor mixed design was employed, with one between-subjects factor (Attention: full attention, easy DA, difficult DA) and one repeated-measures factor (Ownership: self-owned, other-owned).

Procedure

The procedure exactly followed that of Experiment 1, with the exception that no digits were presented at encoding; rather, the number task was presented during the recognition memory test. During the recognition task, digits were presented underneath the shopping items for the 2000ms duration of the item presentation. Following the procedure of Experiment 1, after every six items, a question and response box were presented onscreen. Participants were given either a difficult DA task (recall digits in order), an easy DA task (note how many even numbers were presented) or full attention task (copy an onscreen 3-digit number). It was emphasized that the digit task and the recognition task should receive an equal amount of effort.

Results and Discussion

As in Experiment 1, participants' hit rates and false-alarm rates were calculated by computing the proportion of previously presented items correctly or incorrectly recognised, respectively (Table 2). I-Know responses were calculated as in Experiment 1. False-alarm rates were then subtracted from hit rates for each response type (Remember and I-Know) to correct for response bias. The overall number of 'Guess' responses was again low (1.8%), and these were not included in the analysis.

[TABLE 2 ABOUT HERE]

Remember responses

As in Experiment 1, the corrected Remember hit rates were submitted to a two-factor (Attention x Ownership) mixed ANOVA, which showed no main effect of attention, $F(2,27) = 0.367$, $MSE = 0.070$, $p = .696$, or Ownership, $F(1,27) = 1.878$, $MSE = 0.006$, $p = .182$, but a significant interaction between the factors was observed, $F(2,27) = 3.414$, $MSE = 0.006$, $p = .048$. Single-factor (Attention) ANOVAs per ownership condition showed that the effect of attention did not reach significance for either the self-owned (F[2,27] = 0.941, MSE = 0.045, p = .403) or other-owned items (F[2,27] = 0.099, MSE = 0.031, p = .906). However, repeated-measures (Ownership) ANOVAs showed that the attention by ownership interaction arose because a significant ownership effect was observed in the full attention condition, F(1,9) = 7.500, p = .023, but not in the easy DA (F[1,9] = 0.667, p = .435) or difficult DA (F[1,9] = 0.002, p = .965) conditions.

I-Know responses

The corrected I-Know hit rates were submitted to a two-factor (Attention x Ownership) mixed ANOVA, which, as in Experiment 1, showed no main effect of Attention, F(2,27) = 1.152, MSE = 0.058, p = .331 or Ownership, F(1,27) = 1.744, MSE = 0.010, p = .198, and no interaction between the factors, F(2,27) = 0.836, MSE = 0.010, p = .444.

In Experiment 2, a self-memory bias was observed under full attention conditions, replicating previous work using the shopping paradigm (e.g., Van den Bos et al., 2010) and the findings of Experiment 1. In contrast to Experiment 1, no main effect of attention was observed, which is in line with Baddeley et al. (1984) and Craik et al. (1996), who argued that encoding processes may be more affected by divided attention than retrieval. Nevertheless, while memory performance in general remained high, the self-memory bias disappeared with easy and difficult divided attention manipulations, showing that the memory advantage of self-owned items was no longer present under these conditions. This strongly suggests that the depletion of attentional resources impaired the retrieval of rich, elaborate item representations of self-owned items.

General Discussion

The two experiments in the current inquiry assessed the importance of attentional resources in the production of self-referential memory advantages. In both experiments, it was found that when participants' attention was not divided between tasks, a standard 'ownership effect' (i.e., better memory for self-owned over other-owned objects) emerged in Remember responses, replicating previous ownership research (Van den Bos et al., 2010) and supporting the idea of the self reference recollection effect (SRRE – Conway & Dewhurst, 1995; Conway et al., 2001). Consistent with the SRRE, no effects of ownership were observed in Know responses. This pattern of memory performance augments the evidence that self-referential encoding triggers the formation of a rich, elaborative memory representation, relative to the encoding of material about other people (Klein & Loftus, 1986; Symons & Johnson, 1997).

The current study has shown that the formation of these rich memory representations was not impaired by a relatively easy divided attention (DA) task, indeed, an ownership effect was present under these conditions. However, participants completing a difficult divided attention task during encoding showed a significant reduction in remember responses for self-owned items, to the extent that the ownership effect was reversed (Expt. 1). This finding provides an important contribution to what is known about self-memory biases, as it demonstrates that incorporating existing self-associations into the memory traces of self-relevant items requires attentional input. To our knowledge, the present study provides the first demonstration that the self-reference effect in memory relies on attentional input. Interestingly, memory for other-owned items was not affected by dividing attention at either encoding or test, suggesting that there was relatively little elaboration of other-owned items taking place even under full attention conditions.

Given the theoretical importance of enhanced encoding processes, relatively little empirical work has focused on differences in retrieval processes between self- and other-relevant information. However, the current inquiry suggests that self-reference effects are also supported by attention demanding processes at retrieval as completing a difficult DA task at test eliminated the ownership effect in (Expt. 2). This result is in line with the findings reported in the attention literature that, at retrieval, remembering is more impaired by DA than knowing. It seems somewhat counterintuitive that a recognition process should require attention, as the act of recognising is usually experienced as an instantaneous event. Nevertheless, previous research (e.g., Fernandes & Moscovitch, 2002) has demonstrated that not all recognition processes follow this route. In particular, the retrieval of elaborative information, for example semantic or pictorial associations created at encoding in response to self-cues, may require attentional resources and processing time to be correctly recognised (Fernandes & Moscovitch, 2002). Given this requirement, it would be interesting to analyse Remember reaction times at test, to see if responses to self-owned items were longer than those to other-owned items. This could not be achieved in the present inquiry because a response deadline was employed at test, but future research addressing this issue may prove useful.

The novel demonstration in the current inquiry that attentional input (at both encoding and recognition) is crucial for the elicitation of self-reference effects casts new light on the potential links between the ways in which the self impacts on cognition. In particular, the link between the reliance on attention for self-reference effects, and the well-known attention-capturing effect of self-cues (e.g., the cocktail party effect – Moray, 1959; see also Bargh, 1982) is an interesting theoretical angle. The two effects could be causally related, as attention-capture by self-cues could be the mechanism by which elaborative encoding and successful retrieval is initiated. Cues relating to other people that do not attract the same degree of attention could, as a result, fail to benefit from these memory-enhancing processes - thus dividing attention has little effect on memory for other-relevant information. Alternatively, the two effects could simply operate in parallel; people may engage in elaborative encoding and attentional input at retrieval in a relatively deliberate way, because this is critical for ensuring that personally important information is not lost, without a reliance on the incidental attention-capturing effects of self-cues. While more work is required to distinguish between these accounts, the finding that attentional resources underlie self-reference effects in memory provides a significant step towards understanding the mechanisms the drive the impact of self on cognition.

In conclusion, the current inquiry has shown that the processes that underlie the formation of elaborative memory representations in response to self-cues require attentional resources. In addition, attentional processes at retrieval play an important role in the manifestation of ownership effects. Elaborative memory representations may have been created for self-owned items at encoding, but these do not enhance memory performance unless sufficient resources are available at retrieval.

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Figures

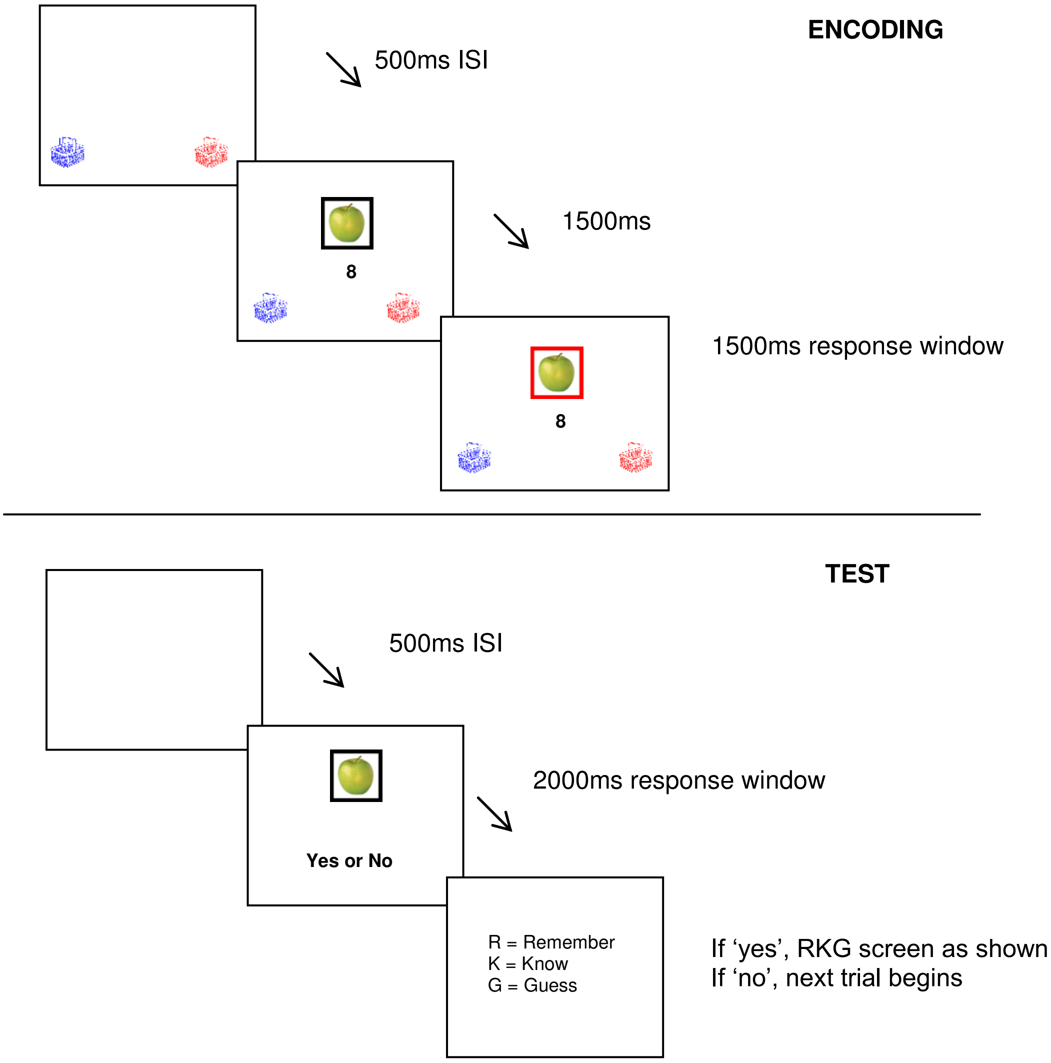

Figure 1: Schematic representation of Encoding and Test phases in Expt. 1.

Tables

Table 1. Mean uncorrected hit rates and false-alarm rates in Experiment 1

		Attention					
		Full		**Easy DA**		**Difficult DA**	
		S	**O**	**S**	**O**	**S**	**O**
R HTR	$\bar{X}$	.64	.53	.53	.44	.31	.41
	SD	.19	.16	.16	.20	.18	.17
R FAR	$\bar{X}$	.05		.06		.05	
	SD	.04		.06		.05	
K HTR	$\bar{X}$	.13	.14	.18	.24	.24	.19
	SD	.10	.06	.05	.12	.06	.09
K FAR	$\bar{X}$	.05		.09		.10	
	SD	.03		.07		.06	

Note. HTR = hit rates; FAR = false-alarm rates; S = self; O = other

Table 2. Mean uncorrected hit rates and false-alarm rates in Experiment 2

		Attention					
		Full		**Easy DA**		**Difficult DA**	
		S	**O**	**S**	**O**	**S**	**O**
R HTR	$\bar{X}$	.61	.514	.52	.55	.56	.54
	SD	.18	.195	.21	.18	.25	.15
R FAR	$\bar{X}$	.02		.04		.04	
	SD	.01		.04		.03	
K HTR	$\bar{X}$	.07	.07	.18	.19	.14	.12
	SD	.06	.05	.10	.09	.10	.08
K FAR	$\bar{X}$	.06		.06		.07	
	SD	.05		.05		.06	

Note. HTR = hit rates; FAR = false-alarm rates; S = self; O = other