Volume One

Learning of Face-Name Associations Using Errorless And Effortful Processes For People With Dementia.

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ABSTRACT

Recent studies have shown the effectiveness of errorless learning principles in memory rehabilitation for people with dementia, whilst studies with people with Korsakoff's Syndrome support effortful methods. However, some effortful methods may elicit errors, so there may be a trade-off relationship between effort and error. The present study compares, in a within-subjects design, the efficacy of four different learning techniques that vary in the extent to which errors are minimised and the degree to which effort is required. The techniques (vanishing cues, forward cues, target selection, paired associate) were used to teach both previously familiar and novel face-name associations to ten people with a diagnosis of early-stage dementia. Best results were achieved in the procedures that elicited most errors whilst learning (forward cues, target selection). It was argued that these procedures also incurred more cognitive effort, thus leading to deeper levels of processing, compared to more passive or shallow processing involved in paired associations and vanishing cues. Recall was also better following cued recall and recognition tasks compared to free recall, which suggested that learning in dementia is facilitated with support at encoding *and* retrieval. There has also been much debate in current literature as to whether implicit or explicit memory, or both, facilitates interventions using errorless learning. This study aimed to explore this by assessing both implicit and explicit memory for the stimulus items. There was no correlation between recall using implicit and explicit memory tasks, which suggested success on explicit memory tasks might not be due to implicit memory, but this interpretation was challenged. Multiple single case analyses also highlighted the heterogeneity of learning in dementia and emphasised the importance of integrating interpersonal and social factors when developing successful individually-based cognitive rehabilitation techniques.

Chapter One

INTRODUCTION

1.1 Importance of memory rehabilitation for people with early-stage dementia.

Dementia has been defined as 'a clinical syndrome characterised by loss of function in multiple cognitive abilities in an individual with previously normal (or at least higher) intellectual abilities and occurring in clear consciousness' (Whitehouse, Lerner, & Hedera, 1993). One of the most frequent diagnoses of dementia is Alzheimer's disease, followed by vascular dementia, or a mixture of the two types. In the early stages of both of these types of dementia, one of the main problems experienced by people are memory difficulties (Brandt & Rich, 1995). This decline in cognitive function can have a major impact on the quality of life experienced by the person with dementia, as these memory difficulties may lead to increased levels of anxiety and depression, and subsequent withdrawal from society. Such an affective response may also result in the memory difficulties seeming worse, producing 'excess disability' (Reifler & Larson, 1990); thus the focus of cognitive rehabilitation should be consistent with the person-centred approach advocated by Kitwood (1997). The stress and strain that such problems can have on practical aspects of everyday life also impacts on family caregivers, and this emphasises the need for psychosocial intervention for those in the early stages of dementia.

Early detection of dementia is thus important in order to utilise the best combination of psychological interventions available at such a valuable time in order to promote better management of the symptoms of dementia. Such interventions may also be combined with medication to enhance outcome, as acetylcholinesterase inhibitors are a class of drugs that have demonstrated a temporary decrease in the rate of decline of symptoms associated with AD (Newhouse, Potter, & Levin, 1997). It is therefore of clinical interest to develop the design of such clinical interventions, to help with some of the everyday memory problems experienced by people with dementia. In doing this one needs firstly to explore the parameters that will maximise residual memory functioning, and secondly, to consider how this knowledge can be applied in everyday clinical practice.

Memory rehabilitation for people with dementia has progressed a long way over the last couple of decades, with much research into the deterioration of memory. This research has discovered that some components of memory remain relatively spared in Alzheimer's disease (AD), especially in the early stages, and thus deterioration in memory is not a global phenomenon (Greene, Baddeley & Hodges, 1996). Explicit memory is divided into episodic memory (memory for personally experienced episodes and events) and semantic memory (knowledge about the world). Unlike explicit memory, which refers to conscious recollection of past experiences, implicit memory refers to the automatic acquisition of verbal and nonverbal knowledge or skills in the absence of conscious recollection of the circumstances in which learning has taken place. This distinction between explicit and implicit memory has received its strongest support from the studies of amnesic patients (Schacter, 1987). Evidence indicates that much information that cannot be accessed on direct tests of explicit memory, as demonstrated in free recall and recognition tests, is available on indirect tests of implicit memory (performance in the absence of conscious awareness) such as word fragment completion (Schacter, 1987). It is episodic memory that appears to deteriorate in early stage AD, but some components of implicit memory are relatively spared (Greene, Baddeley & Hodges, 1996).

Although the primary memory deficit in dementia is one of episodic memory, there can also be some breakdown in semantic memory for some people in early AD, producing some difficulties in naming for both objects and people (Perry & Hodges, 1996). Substantial impairment has been found on tests of naming and identification of famous faces (Wilson, Kasniak, & Fox, 1981; Beatty, Salmon, Butters, Heindel, & Granholm, 1988; Hodges, Salmon, & Butters, 1991), which reflects the everyday experience of forgetting names for people with AD. Experimentally derived strategies designed to enhance learning may therefore also be particularly beneficial for people with AD. Furthermore, not recalling names of those around you can be socially embarrassing and cause distress (as reported by VJ in Clare, Wilson, Breen, & Hodges, 1999) but once learnt, the face-name associations do not change. In contrast to news issues, for example, which need regularly updating, the information-processing demands for face-name associations are relatively static which thus lends itself to the application of specific techniques. Once learnt these techniques may also be guided by a relative or carer to continue the process of learning in other situations where necessary, such as acquiring new face-name associations when moving house or day centre.

Recent studies have also shown that despite such extensive memory deficits, learning is possible in dementia. Implicit learning demonstrations of both classical and operant conditioning of responses have been shown (Camp et al., 1993; Burgess, Wearden, Cox, & Rae, 1992), although, for explicit learning to be successful, appropriate support for memory must be provided for learning. When discussing memory in terms of encoding, storage and retrieval, beneficial effects in explicit learning have been shown by giving support at both encoding and retrieval (Bäckman, 1992), when participants physically enact the target task at encoding (Bird & Kinsella, 1996), when multiple sensory modalities are involved at encoding (Karlsson et al., 1989), or when conditions at encoding are compatible with retrieval cues, in accordance with the encoding-specificity principle (e.g. categorising 'carrot' as a vegetable at encoding, then saying 'it's a kind of vegetable' at retrieval) (Herlitz & Viitanen, 1991). Further evidence suggests that if appropriate support is given to those with dementia at encoding, then once information has been learnt, it may be retained over considerable periods (Clare, Wilson, Carter, Hodges, & Adams, 2001).

Current debates in relation to the parameters that maximise residual memory functioning include questions about the most useful techniques and training methods and the extent to which these are applicable to new learning as well as re-learning. There are also current debates concerning which mechanism, either implicit memory or explicit memory, is utilised by such strategies. The present study will review current literature on these issues and explore the efficacy of such strategies in devising memory rehabilitation techniques for people with dementia. Finally, the rationale for the present study will be discussed.

1.2 Theoretical basis of memory rehabilitation for people with dementia.

In the quest toward greater understanding as to how cognitive rehabilitation interventions are eliciting positive outcomes, it is important to investigate how the brain is affected in early AD. The medial temporal lobe structures, namely the entorhinal cortex and hippocampus, are noted as the areas most affected in early AD (Braak & Braak, 1991). It is the hippocampal complex that plays an essential role in linking together cortical representations in order to establish new episodic and semantic memories, but over time, by rehearsal or reinstatement, such cortical connections may be established independent from the hippocampus, as postulated in long-term memory consolidation (Murre, Graham, & Hodges, 2001; McClelland, McNaughton, & O'Reilly, 1995). The hippocampal complex, as part of the medial temporal lobe structures, is mostly affected in early AD pathology and thus explains the profound episodic memory deficit in AD (Hodges, 2000) although evidence is emerging that the learning of new semantic facts may be supported by slower, non hippocampally dependent processes (Kitchener, Hodges, & McCarthy, 1998). It has been hypothesised (Clare, Wilson, Carter, Roth, & Hodges, 2002b) that some successful cognitive rehabilitation strategies may operate using this latter process, thus, for example in successful re-learning of face-name associations, links between phonological (name) and semantic (person-specific) representations may be slowly re-established in neocortical regions. Furthermore, new links may be established in this way to support new learning, although this may be achieved more reliably where the dementia is less advanced and pathology is confined to medial temporal areas, (Clare et al., 2002b). Clare et al. (2002b) also found no difference in learning outcome between medicated and non-medicated groups, although this analysis was based on small numbers and therefore should be viewed cautiously. As the acetylcholinesterase-inhibiting medication is thought to act to improve hippocampally-dependent memory processes, via a modulating effect on the medial temporal lobe, such evidence was also interpreted as the hypothesis that relearning of face-name associations was independent of hippocampal function (Clare et al., 2002b), or perhaps the medication was not effective.

Just as this latter hypothesis argues about the use or not of the hippocampus in consolidating semantic information, there has also been much debate about the involvement of explicit memory, as opposed to implicit memory, in cognitive rehabilitation techniques in dementia.

Interventions with dementia that involve explicit memory have been somewhat neglected due to the popular belief that dementia patients cannot use conscious processing to store and retrieve information (Camp, Foss, O'Hanlon, & Stevens, 1995). In contrast, interventions relying on unconscious learning processes to perform implicit memory tasks have been more widely accepted (Camp et al., 1995). Preserved implicit memory in mild to moderate dementia has been repeatedly demonstrated in tasks of perceptual repetition priming, where learning is measured by a change in speed or accuracy or bias toward a previously exposed stimulus, such as words (Keane, Gabrieli, Fennema, Growdon, & Corkin, 1991), fragmented pictures (Carlesimo et al., 1998), and unfamiliar faces (Winograd, Goldstein, Monarch, Peluso, & Goldman, 1999). Another domain of implicit memory that appears preserved is that of procedural memory, which is measured as improved accuracy or speed in the execution of a task or skill across repeated trials with patients not being able to recall experiences of previous sessions, such as mirror tracing (Gabrieli, Corkin, Mickel, & Growdon, 1993), and jigsaw puzzle assembly (Poe & Seifert, 1997). Evidence of preserved conceptual priming in AD, however, is not consistent. Here the prime is conceptually (e.g. categorical example required, bird-?) or semantically (e.g. related words apple-pear) related to the target word. Some results suggest normal priming (Nebes, Martin, & Horn, 1984) and others suggest major deficits (Martin & Fedio, 1983). One possible mechanism that would explain these contrasting results is that of a generalised disturbance in attention, arousal, or activation, which could lead to an inability to activate an otherwise intact representation in semantic memory at a level that would be sufficient to support long-term priming (Salmon & Heindel, 1992). However, traces may still be sufficiently activated to manifest intact priming over very short (e.g. 500 milliseconds) delay intervals, as in Nebes et al. (1984), allowing 'automatic' information processing (Salmon & Heindel, 1992).

Such evidence of preserved implicit memory functions have fuelled memory rehabilitation initiatives to adapt approaches that take advantage of such residual functioning to support AD patients in relearning old information or learn new information. Current research and debates regarding which techniques maximise residual memory functioning for people with dementia will now be reviewed.

1.3 Methods and techniques of memory rehabilitation.

1.3.1 The principle of errorless learning.

Errorless learning (EL) is based on the prevention of errors during learning and is thus a principle that can be applied to various techniques in cognitive rehabilitation. EL was first described in the animal literature by Terrace (1963) who successfully used the method to teach pigeons to distinguish between a red and a green key. The pigeons were able to learn the discrimination without pecking the 'wrong' (non-rewarded) key, a task that had previously been thought impossible. In this context, keeping initial errors to a minimum during the learning phase (EL) has been shown to enhance acquisition of domain-specific knowledge compared to trial and error learning (errorful learning (EF)) with people who have learning disabilities (Jones and Eayrs, 1992), schizophrenia (O'Carroll et al., 1999) and brain injury (Baddeley & Wilson, 1994). Baddeley and Wilson (1994) proposed that learning conditions that allow guessing elicit more errors than those that do not. This is disadvantageous for memory-impaired individuals, as in dementia, as they depend more on their intact implicit memory thus these errors are likely to be repeated and strengthened because implicit memory cannot distinguish correct from incorrect responses. By eliminating errors the strongest response will be the correct response. In their study, amnesic patients were required to learn a list of words in two conditions: in the errorful (EF) condition they were asked to guess the target word in response to the word stem in the errorless (EL) condition the correct word was given with the word stem. Participants gave better test performance under the EL condition compared to the EF condition. This appeared to confirm the utilisation of implicit memory in learning.

Such claims have fuelled much research and debate as to whether implicit memory does in fact underlie the beneficial effects of these techniques and thus whether these methods can facilitate the acquisition of novel associative knowledge. As in Baddeley and Wilson (1994), Hunkin, Squires, Parkin, and Tidy (1998) found that memory-impaired participants showed better cued recall *and* free recall following a word stem completion task when learning was facilitated by an EL method rather than an EF method. Although Hunkin et al.'s (1998) study involved participants with amnesia, their subsequent theories about the use of implicit or explicit memory in learning with people with memory difficulties are of interest in this debate. Hunkin et al (1998) point out that free recall is a well established measure of explicit memory, so if memory-impaired participants rely on their implicit memory, as Baddeley and Wilson (1994) postulate, perhaps explicit responses depend on implicit memory, or information acquired by implicit memory is transferable for subsequent access by explicit memory (Hunkin et al., 1998). Alternatively the benefits of EL might reflect residual explicit memory. Hunkin et al. (1998) extended this study to investigate whether this EL advantage was due to implicit memory. They compared performance on a word-stem cued recall test (explicit measure) and a word fragment completion test (implicit measure) and found no correlation between these tasks. Implicit memory was observed following both EL and EF learning in the fragment completion tests, but there was no indication that enhanced performance in the EL condition on cued recall could be accounted for by implicit memory. Furthermore, the extent of priming was no greater for recalled items than non-recalled items in the cued recall test. Hunkin et al. (1998) thus concluded that such evidence was inconsistent with the proposal that implicit memory underlies the advantages shown in EL. Nevertheless, Hunkin et al. (1998) do admit that this conclusion does rest on the assumption that word-stem cued recall *is* an explicit measure, and word fragment completion *is* an implicit measure. An alternative theory could be that both word stems and word fragments depend on implicit memory, but that processing demands were different for these two tasks. However, they refute this argument as they felt that there needed to be a total dissociation between the procedures used in these tasks to uphold this theory, and there was no evidence to support this (Hunkin et al., 1998). They therefore conclude that better performance following EL must reflect residual explicit memory.

1.3.1.1 The use of errorless learning principles in dementia.

There have been only a few recent studies, to the best of my knowledge, that have specifically addressed the beneficial effects of the errorless learning principle with people with AD, but evaluations of these interventions in early-stage AD showed positive outcomes that could not be attributed to general changes in cognitive functioning or behaviour (Clare et al., 1999; 2000; 2001; 2002b; Winter & Hunkin, 1999).

Winter and Hunkin (1999) applied the errorless learning principle in isolation to ER, a 66 year-old female with clinical diagnosis of probable AD of mild severity. Ten photographs of famous people that ER could not name or provide any background information for, were presented one at a time in random order, twice a day, for four days. Each time a photograph was presented ER was invited to unfold a piece of paper underneath the photo and read aloud the name of the person printed on the paper and asked to remember it. Before and after each training session ER was given a cued recall test and asked to name the person given but was encouraged not to guess by giving her a 'don't know' option. On the last test session ER was able to name 6 out of the 10 faces although only 2 faces were consistently named. As an interesting aside to this study it was also commented that ER improved in her ability to recall additional semantic information about the famous people in the set she had been learning. Although this study may be considered as demonstrating that the errorless learning technique can be used to aid re-learning, this technique was not compared with any other technique, which makes it difficult to infer whether errorless learning is a more or less efficacious method for AD people when learning.

Nevertheless, other studies confer with the view that learning is facilitated by EL for memory impaired (MI) people and that this is supported by the use of implicit memory. Evans et al. (Evans et al., 2000) compared the effectiveness of EL methods and trial-and-error methods for a variety of tasks with MI (head-injured) people: face-name learning, route learning and programming an electronic organiser. There was no advantage of EL for route learning or programming the organiser, but there was some advantage of EL for face-name associations, when participants were cued with a photograph of the face and the initial letter of the name, or were trained using an imagery technique. By linking the face with the initial letter of the name in the imagery technique, it was proposed that subsequent presentation of the face alone would then facilitate recall of the name as it would act as a perceptual cue for the name. As they also found that those with more severe memory impairment had more of an advantage using the EL method, they concluded that these individuals relied more on implicit memory. However, as Hunkin et al. (1998) have noted, this assumes that letter cues elicit implicit memory and the image does act as a perceptual cue for the first letter of the name, but such a loading on implicit memory cannot be upheld with any certainty. This method of learning, using the initial of the name as a cue when learning, is also not practical for every day use where it is likely that cues will not be present.

Furthermore, Evans et al. (2000) suggest that EL may only be beneficial for tasks where implicit memory can be used to strengthen pre-existing associations and may not be so useful for tasks that require explicit memory, such as novel association learning (Evans et al., 2000). Studies using EL principles show relearning of previously-known associations by people with dementia (Clare, Wilson, Breen, & Hodges, 1999; Clare et al, 2000; Clare et al, 2001) but Squires, Hunkin and Parkin (1997) have also shown an advantage of EL method over an EF method in teaching novel word associations in memory impaired participants. The participants were invited to think of links between the unrelated words in each word pair. Eight word pairs were presented three times followed by a two minute break before presenting them a further three times. Cued recall test were given immediately and after a 30 minute delay.

The same advantage was replicated by Squires et al (1996) using taught novel picture paired associates with a severely amnesic patient, thus demonstrating that EL can be used to teach novel associations. However, if one considers that novel association learning by normal participants can occur under conditions which promote effortful *and* automatic aspects of memory (Reingold & Goshen-Gottstein, 1996) then in results by Squires et al (1996), EL could be facilitating either explicit or implicit memory for associations, or both. Further work needs to be done to investigate novel learning and re-learning in dementia, and to evaluate the nature of the memory processes underlying EL.

1.3.2 The method of vanishing cues.

EL is also applied in techniques such as spaced retrieval and vanishing cues, which seem to require little expenditure of cognitive effort, and is thought to exert its effects by means of priming (Landauer & Bjork, 1978; Glisky, Schacter, & Tulving, 1986). In studies with amnesic patients cognitive and neuropsychological research has revealed that despite a severe deficit in consciously recollecting prior episodes, they exhibit robust repetition priming when cued with word fragments or word stems and thus exhibit some preservation of implicit memory processes (Komatsu, Kato, Wakamatsu &

Kashima, 2000). Glisky et al. (1986) devised a *method of vanishing cues* that utilised this robust repetition priming effect in learning trials. Here the participant is given as many letters or cues as he or she needs to produce a verbal target response. Letters are added (forward cueing) or taken away (vanishing cues or backward chaining) depending on the person's ability to recall the target information. So if the participant fails to produce the target at the first free recall stage, letters may be added until he comes up with the correct answer. On the subsequent trial the person is given the answer in form of the word stem that produced the target answer on the previous trial but minus one letter. Letters are withdrawn as learning progresses. This method has been used successfully with AD patients in learning names and professions of staff (Van der Linden & Juillerat, 1998).

Glisky and Delany (1996) modified the method of vanishing cues to incorporate Baddeley and Wilson's (1994) errorless learning technique by discouraging guesses. In this method participants are first given the intact presentation of the target word; letters were then withdrawn across learning trials until the participant can produce the target in the absence of any letter cues. At each stage the participant was asked not to guess. Using this method to teach face-name associations to a head-injured patient (Wilson et al., 1994) and an amnesic patient (Glisky & Schacter, 1988) demonstrated positive outcomes for this technique.

However, limitations of the use of errorless learning principles with techniques that use fading cues have been observed (Jones & Eayrs, 1992; Walsh, 1985). Walsh (1985) compared errorless and trial-and-error procedures on a conditional discrimination test with people with learning disabilities. EL worked very well when the task was a very simple one requiring only a simple response. When the task required paying attention to multiple stimuli, then EL in this complicated task was not as successful as trial-and–error learning. Walsh concluded that 'under certain conditions fading techniques are not able to provide optimal conditions for learning a given task' (Walsh, 1985). Furthermore where errorless prompting procedures are used, overdependence on their availability may lead to difficulties in subsequent learning recall when they are removed, and generalisation of behaviours acquired through errorless methods may thus prove difficult too (Jones & Eayrs, 1992). With such limitations observed in EL it is thus of interest to explore the efficacy of EL and the fading cues technique in more detail for people with dementia.

1.3.2.1. The use the vanishing cues method in errorless learning in dementia.

A number of studies illustrate that the use of vanishing cues may not be as beneficial as other techniques for learning face-name associations in AD, (Thoene & Glisky, 1995; Clare et al., 2000). When looking at the application of vanishing cues for learning with a patient with mild dementia, Thoene and Glisky (1995) found the vanishing cues procedure less effective than the use of a visual-imagery based mnemonic strategy and verbal elaboration for learning face-name associations.

A multiple single-case experimental design with early-stage AD patients (Clare et al., 2000) used material with direct practical relevance (e.g. names of fellow members of a support group) and combined the EL with several strategies including *mnemonic* (i.e., verbal elaboration based on a distinctive feature) together with *vanishing cues* and *expanding rehearsal* (otherwise known as *spaced retrieval* (Landauer & Bjork, 1978) and adapted for people with dementia (Camp, Foss, O'Hanlon, & Stevens, 1996; Camp & Foss, 1997)) where names were tested after short but gradually increasing time intervals. If an item is not recalled, there is a return to the previous interval at which retrieval was successful, followed by a re-exposure to target information. Participants using this combined method of learning showed significant improvement on target measures and maintained this improvement six months later. In contrast to other participants in this study, participant C relearned different sets of names of famous persons using each strategy in isolation, comparing each with the efficacy of a *forward cueing* technique. Improvements in free recall tests were most marked for the mnemonic strategy and expanding rehearsal. Forward cueing was also more effective than vanishing cues method. At follow-up all strategies, except vanishing cues, maintained improvements in free recall tests.

These latter two studies (Thoene & Glisky, 1995; Clare et al., 2000) support the view that is consistent with Cohen's theory (Cohen, 1990) that face-name associations are similar to unrelated paired-associates, and names are processed as nonwords. Since experimental studies have failed to find priming effects for nonwords and unrelated paired-associates in AD patients (e.g. Alberoni, Magni, Imbornone, Farina, & Mariani, 1998), vanishing cues in isolation may not be as suitable as techniques that utilise residual explicit memory for learning face-name associations. Furthermore, (Hunkin & Parkin, 1995) found that the rate of learning of computer vocabulary with memory-impaired individuals was similar for vanishing cues and EF methods, thus concluding that vanishing cues was an explicit task that could not utilise implicit memory, and that individuals were using explicit residual memory for both vanishing cues and EF methods. This evidence seems to refute the claims that EL and vanishing cues depend upon implicit memory.

Clare and her associates (Clare et al., 1999; 2000; 2001; 2002b) investigated the errorless learning principle in combination with several other strategies to develop individualised training programs for people with early AD. Clare, Wilson, Breen and Hodges (1999) described an intervention with VJ, a 72-year-old man with early AD, which used an EL teaching program to learn the names of eleven members of his social club over a period of 21 sessions (2 sessions per week). The photographs were presented using a combined training approach, using a *mnemonic* strategy (i.e., verbal elaboration based on a distinctive feature), combined with the *vanishing cues* method (Glisky et al., 1986) where each photo was presented with its name (EL) whilst gradually reducing the letters provided for each name on each successful trial until eventually recall was required in the absence of any letter cues. This method was also combined with the use of *expanded rehearsal,* where names were tested after short but gradually increasing time intervals, as previously described. In this study a criterion for recall after 10 minutes was established – the predetermined time intervals for retrieval were 30s, 1, 2, 5, and 10 minutes. According to Camp and Foss (Camp & Foss, 1997) successful retrieval after a 5-10 minute interval indicates long-term storage of information has been achieved. A number of mildly and moderately affected AD patients have also been able to learn and retain information, such as face-name associations, for up to several months using this method of expanded rehearsal (Camp et al., 1996). The combined method of EL with expanded rehearsal, mnemonics, and vanishing cues was successful in teaching VJ all the names, which he maintained over a period of nine months, and the learning generalised to identification of the people in his club.

VJ's success was supported by daily practice in this latter study but a further report by Clare et al (2001) noted what happened to this knowledge for a further 2 years after practice had stopped. In the first year, there was a minimal decline, with a mean score of 80% correct, with a more moderate decline in year 2, with a mean score of 71%, a level which was still significantly above initial baseline. Ratings made by VJ and a relative also provided no evidence of negative affect, such as depression or frustration, resulting either from the initial intervention or from the subsequent follow-up; thus contrary to some critics (Rabins, 1996) there were significant long-term gains with no significant negative effect on well-being.

A further study by Clare et al. (2002b) extended the above findings using a controlled trial with twelve participants with early AD. By replicating the method used with VJ with this group of participants, training in previously known but forgotten face-name associations (famous faces or those of people from their social circle) produced a significant improvement in recall of trained items, but not of control items where participants were simply shown the face stimuli. The targets used were chosen by the participants themselves in order to maximise clinical relevance (Thoene & Glisky, 1995). Gains were well maintained at 6-month follow-up and scores remained above baseline levels 12 months after the intervention ended in the absence of practice. It was also interesting to note that results did not differ according to medication status (use of acetylcholinesterase inhibitors), and those who were more aware of their memory difficulties achieved better outcomes (as also described in Clare, Wilson Carter Roth & Hodges, in press). Again, contrary to claims by Rabins (1996), these interventions provided further support for the efficacy of EL principles with long-term gains with no adverse effects on self-reported well-being. Furthermore, studies by Clare and her associates (Clare et al. 2000; 2002b) have used individually tailored interventions, based on errorless learning principles to target everyday memory problems in real life settings (e.g. learning of names in a social club, support group, or personal information). Success of these interventions, for learning personal information, illustrates the practical applicability and thus clinical utility of EL for memory rehabilitation.

Although it appears unequivocal that the interventions in these latter studies (Clare et al., 1999; 2001; 2002b) illustrated the efficacy of the combined techniques, no comparison was made with other procedures, thus it remains difficult to address issues regarding the relative efficacy of EL. Clare et al. (1999; 2000; 2001) used the procedure of *vanishing cues* (Glisky et al., 1986) as a form of EL in conjunction with face-name *mnemonics* and *expanding rehearsal*, so it is impossible to infer which of these components contributed to the success of acquiring and maintaining information. Nevertheless, the research by Clare and her associates provides encouraging results for the use of EL in AD.

In order to further explore the efficacy of strategies in devising memory rehabilitation techniques with people with dementia, it thus becomes apparent from studies such as Clare et al. (1999; 2001) that it is necessary to investigate the evidence base for such techniques, and compare their relative efficacy in a controlled manner. Some single case studies have started to answer some of these questions, for instance Clare et al. (2003) compared expanding rehearsal with repeated presentation at regular intervals (both combined with a mnemonic strategy) to learn names of members of his support group. Both strategies were equally effective, which led to the suggestion that it was the effort of using a mnemonic strategy contributed to the success of these interventions, although this inference will be discussed in more detail later. Further work with participant C, (Clare et al., 2000) compared four different errorless learning methods (vanishing cues, forward cueing, expanding rehearsal, and mnemonic elaboration) to re-learn forgotten face-name associations. It was observed that both forward cueing (FC) and mnemonic elaboration were superior to vanishing cues (VC). It was argued that FC and mnemonics used more effortful processing thus producing superior gains compared to strategies relying on implicit memory, such as VC, which thus use more passive or shallow processing.

Thus errorlessness may not be the only important parameter when considering the efficacy of learning methods and other issues, such as the cognitive effort involved in generating the target when learning, may also aid subsequent recall and should be thus considered. The next section starts to explore some of these issues.

1.3.3. The use of effortful learning principles.

Craik and Lockhart (1972) suggested that the cognitive system is structured hierarchically and that operations are carried out by the system for the purposes of perception and comprehension: 'shallow' levels of analysis are concerned with sensory and physical aspects of stimuli, whereas deeper levels of analysis are progressively concerned with abstract, semantic and associative processes. Furthermore, it was suggested that deeper processing is associated with more durable traces. Since 1972, the position has been added to and modified in various ways and the importance of mental procedures was introduced by Kolers and Roediger (1984) as a general cognitive principle. Subsequently, Crutcher and Healy (1989) demonstrated that it was important that participants performed the necessary mental operations, or cognitive procedures, themselves to derive target answers, in order for the generation effect to display an advantage over a read condition. Such a generation effect was assumed to lead to deeper levels of processing and thus aid retention. More recently McNamara and Healy (1995) confirmed positive effects of generation with explicit memory tasks and tasks involving skill and knowledge acquisition. They found that when healthy participants performed simple and difficult multiplication problems, a generation advantage occurred only for the difficult, less familiar problems. In a second experiment McNamara and Healy (1995) also found a generation advantage using a mnemonic strategy to associate nonwords with nouns, and retain this knowledge over a week. They explained this advantage in terms of a procedural account of memory, according to which the essential factor for a generation advantage for learning new facts or skills is that cognitive procedures be developed during the learning process and that these procedures be reinstated at test. Here, they defined a cognitive procedure as a mental operation linking a stimulus to a response.

In attempting to delineate the factors that may enhance interventions for learning, Komatsu, Kato, Wakamatsu & Kashima (2000) investigated the effects of generation, which is assumed to require more effort and thus improve subsequent memory performance. However, generation may elicit errors so there may be a trade-off relationship between effort and error, both of which contribute to the effectiveness of memory rehabilitation. Nevertheless Komatsu et al. (2000) found no advantage of effortful (vanishing cues) over effortless learning (presenting paired associates) under the errorless condition with patients with Alcoholic Korsakoff's Syndrome but noted that their vanishing cues method had elicited errors.

Contrary to this, Riley and Heaton (2000) investigated techniques with head-injured patients and found that the amount of effort required in the technique should vary according to the difficulty of the item to be learnt and the memory ability of the learner. Similar to the method of vanishing cues, they used two techniques: Increased Assistance (IA) where the trials start without assistance or with the weakest prompt (e.g. one letter cue) and if the correct response is not given, the next prompt in the hierarchy is given (from weakest to strongest); and Decreased Assistance (DA) where the learner is given the strongest prompt until a pre-determined criterion of learning is achieved, then on each subsequent trial the next point down in the hierarchy is given (from strongest to the weakest). Again there is a trade-off between error and effort, but Riley and Heaton (2000) found that IA was more effective in learning names for those with better memories and easier items, and DA was more effective for those with poorer memories and more difficult items.

Although complex strategies involving the use of visual imagery have rarely proved beneficial for people with AD (Bäckman, 1992), more recent studies have found that patient's recall was facilitated when they engaged in semantic elaboration at encoding (Lipinska & Bäckman, 1997), and self-generated cues are more effective than experimenter-provided cues in assisting recall in AD (Lipinska, Bäckman, Mantyla, & Viitanen, 1994). Such studies are consistent with findings by Thoene and Glisky (1995) who found the vanishing cues procedure less effective than the use of a visual-imagery based mnemonic strategy and verbal elaboration for learning face-name associations.

A recent study by Clare, Wilson, Carter, & Hodges (2003), presented a single case intervention study in which a 66-year-old man, Bernard, with early stage AD learned the names of 13 members of his support group coupled with either expanding rehearsal or repeated presentation, or both, with an errorless learning paradigm. The mnemonic was chosen by generating associations between each photograph and name, and deciding which association may assist recall. The expanding rehearsal method involved presenting the face-name association and mnemonic, and then using the photograph as a prompt to test recall of the name after an interval of 30 seconds. After a correct response, recall was tested again after an interval that was double the length of the first, until 6 recall tests had been given. Bernard was asked not to guess, but to say 'don't know' if he was unsure (EL). On the small number of instances that an incorrect response was given, the name and mnemonic were presented again and the time interval for the next test was halved. The repeated presentation method was similar but all time intervals were set at one minute, and on the rare occasion that Bernard gave an incorrect answer, he was told the correct name and mnemonic. After training he achieved near ceiling performance, and improvements in recall maintained above baseline measures three months after he stopped practice.

The mnemonic strategy had been coupled with either one or both methods of repeated presentation and expanded rehearsal. Contrary to theories pertaining to the efficacy of expanded rehearsal (Landauer & Bjork, 1978) there was no added benefit between the conditions. Clare et al. (2003) thus postulated that the elaborative mnemonic strategy was the key factor in training, and this strategy exerted its effects through facilitating residual explicit memory. This latter statement will be discussed in detail in the context of the current debates regarding utilisation of implicit/ explicit memory processes in AD for learning. Nevertheless this study does appear to support the efficacy of elaborative processing, consistent with predictions regarding effort in encoding leading to deeper levels of processing (Thoene & Glisky, 1995). However, the mnemonic strategy was not conducted in isolation, thus it remains unclear how much expanded rehearsal and repeated presentation may have also equally contributed to the positive effect of the mnemonic strategy. In contrast, as noted previously, further work with participant C (Clare et al., 2000) who attempted to relearn forgotten face-name associations using four different errorless methods (vanishing cues, forward cueing, mnemonic elaboration and expanding rehearsal), found that both mnemonic elaboration and forward cueing produced superior gains. As these strategies were regarded as involving more effort in encoding the results were consistent with predictions that this effort would lead to deeper levels of processing (Thoene & Glisky, 1995), as opposed to vanishing cues, a strategy relying more on implicit memory with shallow processing.

Other studies with participants with memory impairments due to amnesia or brain injury have also suggested that cognitive effort at encoding may enhance subsequent recall, thus suggesting that these parameters are important factors within cognitive rehabilitation and should be explored further for those with dementia. Squires, Hunkin and Parkin (1997) conducted two experiments involving verbal association learning by people with memory impairments (amnesia/ brain injury) and compared EL with errorful learining (EF). In both experiments eight word pairs were presented three times followed by a two minute break before presenting them a further three times. A cued recall test was then given after a delay (one hour delay in experiment 1 and a 30 minute delay in experiment 2). In the first experiment the words were remotely linked (e.g. child – toy) but were unrelated in experiment 2 (e.g. piano – leaf). There was an advantage for EL in both these experiments but this was not sustained at the delayed cued recall in experiment 1. In contrast, EL was beneficial compared to EF for both immediate and delayed recall. It appeared that EL was more beneficial for novel association learning in the second experiment, compared to response set learning in the first experiment, which may have been regarded as an easier task. It was concluded that learning in experiment 1 was more passive as words were more intrinsically linked, associations were given to the participants, and they were merely asked to recognise the link and write them down. In the second experiment the participants were asked to generate an extrinsic link between the two words, which was assumed to require considerable effort, as the associations were novel, and thus this extra cognitive effort may have enhanced the strength of the memory.

It would thus be of interest to extend the parameters of current research and investigate the factors (effort and/or error) that promote positive outcomes in learning face-name associations with people with mild dementia.

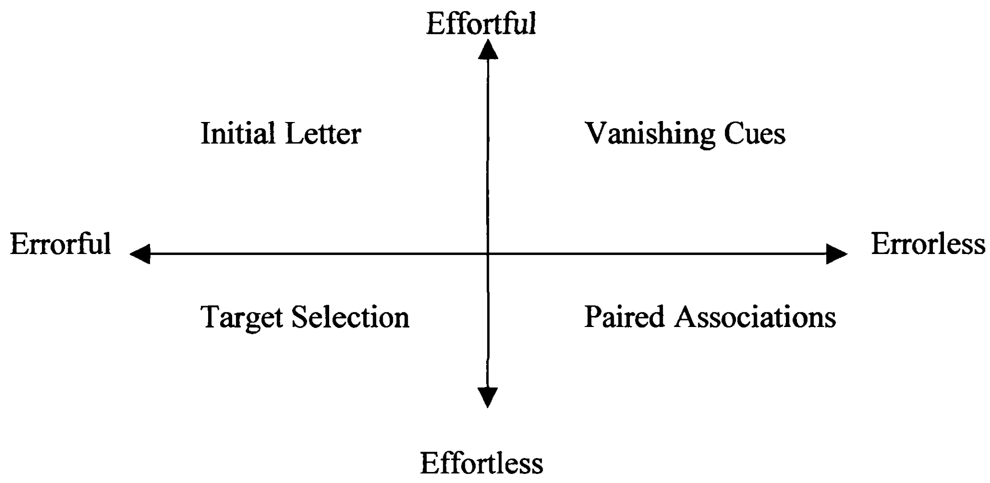
1.3.4 The combined use of errorless and effortful principles

According to research using the generation effect, evidence therefore suggests that errorlessness may not be the only important parameter when considering the efficacy of learning methods; other issues, such as the cognitive effort involved in generating the target when learning, may also aid subsequent recall, and should thus be considered.

Komatsu et al. (2000) varied both error and effort to produce four methods of learning (Figure 1). In the vanishing cues condition, each face was first shown with the complete

Figure 1:

Schematic representation of four training methods (Komatsu et al., 2000)



name and gradually letters were withdrawn in order from right to left on subsequent stages. In the paired associate condition, a pair of a face and a name was shown. Participants were asked to say the name aloud and associate it with the face. In the target selection condition, each face was displayed along with 5 names that consisted of the correct one and four distractors. Participants were asked to select the correct name and say it aloud. This was repeated until they said the correct one. In the initial letter condition, each face was shown together with the first letter of the surname. Participants were required to recall or to guess the name beginning with the cue letter. The correct surname was displayed after four incorrect guesses or after 25 seconds if four responses had not been made. The participants were asked to say the correct name aloud.

On the basis of previous studies (e.g. Baddeley & Wilson, 1994; McNamara & Healey, 1995; Riley & Heaton, 2000), Komatsu et al. (2000) hypothesised that errorless and effortful processes during training would produce superior learning of face-name associations for people with Alcoholic Korsakoff's Syndrome. They found that in post-intervention free recall, on presentation of the associated face, paired associate and vanishing cues conditions were both superior to target selection and initial letter conditions. However, the effort factor was found to have little effect on recall performance. On further inspection of their results they ascribed the lack of effect of effort was due to lower scores on vanishing cues compared to the paired associate method. This was consistent with previous research (Hunkin & Parkin, 1995; Thoene & Glisky, 1995), which led to the conclusion that vanishing cues was designed to enhance implicit memory, thus recall tests using tasks of explicit memory are not a good indicator of learning (Hunkin & Parkin, 1995). They also claimed it was unclear whether memory-impaired patients can preserve implicit memory for novel associations (Graf & Schacter, 1985). Furthermore, as proper names are regarded as nonwords, their associations with faces are hard to learn (Cohen & Burke, 1993). Further work needs to be done in this area to investigate these issues by using various methods to learn names of novel and familiar faces and assess outcome using both implicit and explicit tests. However Komatsu et al. (2000) also regarded their initial letter cue condition as effortful. This is debateable since the name was also given to the participant after 25 seconds if no response had been made, thus providing a more passive or 'effortless' learning trial. An alternative to this condition may be to use Riley and Heaton's (2000) Increased Assistance method to produce a forward cueing condition where each face is shown together with the first letter of its name. Participants are asked to recall or guess the name beginning with the cue letter. If the correct response is not given, the next prompt in the hierarchy (i.e. another letter of the name) is given until a correct response is given. If the last letter is given, the participant is asked to say the correct name aloud. This may thus involves more effort in generation, compared to Komatsu's et al's (2000) initial letter condition (McNamara & Healey, 1995) but may produce errors (Baddeley and Wilson, 1994).

1.4 Rationale for the present study.

The present study aims to identify the parameters (effort and/or error) that promote positive outcomes in learning face-name associations with people with dementia, but in doing so it is also important to identify methods that will be practically useful in day-to-day life. Cognitive rehabilitation should be generalisable to real life settings in order to have ecological validity and prove useful for people with dementia. Previous research, which compares EL with errorful methods that used forced generation of errors, may not be a true reflection of real-life learning. Further work with participant C (Clare et al. 2000), as described earlier, addressed this issue by comparing the benefits of different errorless methods that varied along the parameter of effortfulness. As both forward cueing (FC) and mnemonic elaboration were superior to vanishing cues (VC), it was argued that FC and mnemonics used more effortful processing thus producing superior gains to VC.

The present study aims to explore whether positive outcomes can be achieved in learning novel stimuli using similar methods (e.g. EL) shown to be successful in relearning previously-known associations and then identifying the parameters (i.e. effort and/or error) that promoted such positive outcomes. In order to delineate whether learning is facilitated by implicit or explicit memory, the present study will use tests of implicit (word fragment completion) and explicit memory (cued recall, visual recognition, and free recall) as baseline measures before the learning phase for both novel and familiar stimuli, to be compared with similar tests on completion of the learning phase. In this way one will be able to note whether implicit memory or explicit memory, or both, facilitate each learning method.

Studies have shown that delineating the factors that produce optimum conditions for cognitive rehabilitation gives valuable insight into the efficacy of certain procedures with those individuals, but these studies must be replicated in order to evaluate whether findings are generalisable. The present study will attempt to take this one step further in order to refine the specific techniques and explore which parameters are most effective for people with dementia. The present study will vary the parameters of effort and error using four methods (as in Komatsu et al., 2000), these being vanishing cues, paired associates, target selection, and in this case, forward cues. The present study addresses the following research questions:

- Is effective learning observed for people with dementia, in relation to both previously-known and novel information?

- Is learning facilitated more effectively using effortful and/or errorless methods and are new learning and relearning facilitated by the same, or different, methods?

- What is the nature of the memory processes underlying each learning condition? Is learning facilitated by implicit memory or explicit memory or both?

Chapter Two

METHOD

The present study evaluated the relative efficacy of four different approaches to learning novel and familiar face-name associations for people with early-stage dementia. Efficacy was also evaluated in terms of effects on implicit and explicit memory responses.

2.1 Participants.

Ten people with dementia, who attended a Memory Clinic, participated in the study. The Mini Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975) is routinely used in Memory Clinics as a dementia-screening test. The MMSE is a short (requires about 10 minutes) standardised assessment of cognitive function and is divided into two sections, the first requires vocal responses and covers orientation, memory, and attention; the maximum score is 21. The second part tests ability to name, follow verbal and written commands, write a sentence spontaneously and copy a complex polygon figure; the maximum score is 9. The total maximum score is thus 30 and is not timed. Participants were selected according to the following criteria, consistent with other studies of cognitive rehabilitation in early stage dementia (Clare et al, 1999, 2000, 2002b):

Inclusion criteria:

- medical diagnosis of probable AD, vascular dementia, or mixed AD and vascular dementia;
- minimal or mild AD, where minimal corresponds to a MMSE (Folstein, Folstein, & McHugh, 1975) score of 24 or above and mild corresponds to a MMSE score of 18-23;
- impairments predominately in memory, without widespread general intellectual impairment;
- absence of major psychiatric disorder;
- fluent in English;
- able to give informed consent.

Exclusion criteria:

- excluding Fronto-temporal and Lewy-body dementia as these have a different presentation of impairment.

Characteristics of the participants are shown in Table 1. MMSE scores were taken from existing records, within approximately two months preceding the study and within two months after completion of the study. The average interval between the first and second MMSE score was 6 months. Closer scrutiny of the results revealed that at the start of the study all participants were inaccurate on orientation (mostly date), and all except Steve could not recall three words said at the start of the MMSE test. Declines in scores for Ian, Joanne and Mike at re-test were all due to further decline in orientation, spelling backwards, recall of three words and copying a figure.

Table 1: Characteristics of participants

Participant	Age	MMSE Score* Before Study	MMSE Score* After Study	Dementia Type	Taking Donepezil?	Living with Carer?
Anne	84	27	28	Mixed	Yes	Yes
Paula	81	18.5	23	AD	Yes	No (on own)
Joanne	86	27	19.5	AD	Yes	No (on own)
Kate	77	25.5	28	AD	Yes	Yes
Helen	82	27	25	AD	Yes	No (on own)
Steve	80	28	28	Possible AD	Yes	Yes
Mike	76	26	20.5	Vascular	No	No (on own)
Harry	78	26.5	27	AD	Yes	Yes
Ian	86	22.5	20	AD	Yes	Yes
David	79	22.5	16	Possible AD	Yes	No (on own)

* Average interval between first and second MMSE Score = 6 months.

Table 2: Organisation of stimuli chosen in each set:

Set Number	Famous Faces	Novel Faces	Total	Condition
Set 1	3	3	6	(A) Vanishing Cues
Set 2	3	3	6	(B) Paired Associate
Set 3	3	3	6	(C) Forward Cues
Set 4	3	3	6	(D) Target Selection

2.1.1 Ethical considerations.

The present study was approved by the Local Research Ethics Committee for Barnet, Enfield and Haringey, North Central London Health Authority (see approval letter in Appendix A). As required, approval was also gained from the Medical Directors and the Consultant Psychiatrist from the day hospital from which participants were recruited. It was also important to consider the possible effect of the study on the participants involved. It was not envisaged that participants would find the study distressing but it was emphasised that time would be made available to discuss their thoughts throughout the present study. Close liaison with professionals at the day hospital also ensured that professional help and support was available if required.

2.1.2 Recruitment of participants.

Eleven patients from a day hospital within the North Central London Health Authority were chosen for the present study as they satisfied the selection criteria. One of these participants took part in an initial pilot study, thus the main body of research was completed by 10 participants. Participants and their next of kin were contacted and asked if they would like to take part in the study. The study was explained to both parties (see information sheet in Appendix B) and they had the opportunity to discuss this between themselves and with the manager of the day hospital. Having explained the study and checked that the participant understood what was involved, consent was obtained (see consent form in Appendix C).

2.2 Design.

The present study can be conceptualised as both a multiple single-case experimental design and a quasi-experimental pre-test post-test design. The former design involves each participant generating direct replications where each intervention is compared with each other. The latter design yields group data, allowing comparison of performance on implicit (word fragment completion) and explicit memory tasks (recall, cued recall and recognition trials) at baseline, post-intervention and follow up assessments for each condition.

Analysis of aggregated group data involved comparisons of initial and post-intervention scores, for implicit and explicit memory tasks, before and after all learning trials for each condition, using repeated measures t-tests or ANOVA as appropriate.

A correlational analysis was used (Pearson's product-moment correlation), as in Hunkin et al (1998), in order to assess whether there was a relationship between implicit (word fragment completion) and explicit (free recall, cued recall, recognition) responses.

Sample size for the present study was established on the basis of findings from Komatsu et al. (2000). That study showed a significant effect size for each of the four similar learning conditions, varying effort and error as in the present study, with only eight participants. Thus, it seemed reasonable to assume that there would be enough power to show similar effect sizes with a slightly larger number of participants in the present study.

2.3 Materials used in the learning task.

For each participant, a set of 24 black and white photographs was assembled. These were photographs of people taken from the Famous Faces Test (Greene & Hodges, 1996) or famous people taken from newspapers or magazines. Famous and non-famous people were also supplied from a set of stimulus items developed by Dr Rik Henson at the Institute of Cognitive Neuroscience, University College London.

Stimuli were chosen from the pool of photographs such that 12 were of famous people whom they recognised but had difficulty naming (famous people) and 12 were of people they did not know (non-famous people). It was decided, after the pilot study, to use only photographs of men. This reduced the possibility that variations in response might be influenced by gender biases in recall/recognition. The photograph sets for each participant were generated in order to match for nationality, and length of name. The non-famous faces were given names that matched in frequency and length with the famous faces chosen. First names were matched in frequency and length, using data from a study by Professor Robert Logie (personal correspondence). Surnames were matched in frequency and length by using a local telephone directory valid for the area the participants inhabited (see Appendix D for a list of names used).

In each case the 24 photographs were then divided into four sets of 6 items. Each set comprised 3 photographs of famous people and 3 of non-famous people. Each set was pre-assigned to one of the four learning conditions. Table 2 summarises the composition of the sets of stimulus items and their allocations to conditions.

2.4 Procedures.

The names were learnt using four learning conditions: Vanishing Cues, Forward Cues, Paired Associate and Target Selection. Learning was measured using three test modalities: Free Recall, Cued Recall and Recognition. These four learning conditions and four test modalities, and their corresponding scoring criteria, will be described first. Following this the pattern of presentation for each condition and test modality will be described.

2.4.1 The four learning conditions.

Participants were asked to learn the names of the faces under each of the following study conditions (Riley & Heaton, 2000; Komatsu et al., 2000):

1. In the paired associate (errorless and effortless) condition, a pair of a face and a name (first name and surname) was shown. Participants were asked to say the name aloud and associate it with the face.
2. In the vanishing cues (errorless and effortful) condition, each face was first shown with the complete name (first name and surname) and gradually a

letter was withdrawn in order from right to left on each name so that the number of letters shown decreased with each presentation until only the initial letter was presented. Participants were asked to recall the name by completing the target but not to guess. If no response could be produced, the preceding stage was shown. This was continued until a correct response was obtained. On all subsequent trials within a session, as well as between sessions, the next stage was that with one fewer letter than that at which the participants succeeded in the correct completion on the previous trial.

3. In the target selection (errorful and effortless) condition, each face was displayed along with 5 names (first name and surname) that consisted of the correct one and four distractors (taken from a separate pooled source) in a random order. Participants were asked to select the correct name and say it aloud. If they responded incorrectly they were asked to try again until they produced the correct answer.

4. In the forward cues (errorful and effortful) condition, each face was shown together with the first letter of its name (first name and surname). Participants were asked to recall or guess the name beginning with the cue letter. If the correct response was not given, letters were added one at a time until a correct response was obtained. Where the full name had to be presented, the participant was asked to say the correct name aloud.

2.4.2 The four test modalities.

Learning was assessed in four modalities (modalities 2-4 as in Clare, Wilson, Carter & Hodges, 2002b):

1. Free recall. The participant was shown a photograph and asked for the name of the person.
2. Cued recall. A photograph was shown with the request 'This person's name begins with [initials], can you tell me the name?'
3. Word fragment completion. Each name was presented in a fragmented form and the participant was asked to complete the fragment with whatever name came to mind (see examples in Appendix E).
4. Visual recognition. The task was to select which photograph matched the name from a set of three, including two distractors, one from the set of eight training items and one from another set. The three photographs were placed in front of the participant together with a card showing the name. The participant was asked to point to the photograph that matched the name.

The measures of learning were as follows:

- Number of items correctly named on each free recall trial in each phase of the study (measure of explicit memory). Two marks were awarded for each name (first name and surname).
- Number of items correctly named on each cued recall trial (a measure of explicit memory using facilitation by phonological cues).

- Number of items correctly named on each visual recognition trial (a less demanding explicit memory measure). Two marks were awarded for each name (first name and surname).
- Number of items correctly named items in word fragment trial (measure of implicit knowledge). Two marks were awarded for each name (first name and surname).

Any errors made whilst learning were also noted for each of the four learning conditions:

- In the paired associate condition, if the participant misread a name or responded to the picture incorrectly before reading the name given, then one error mark was given for each incorrect name (first name, surname).
- In the vanishing cues condition, one error mark was given for each incorrect name (first name, surname).
- In the target selection, every time an incorrect name was chosen, two error marks were given.
- In the forward cues condition, every time a name was guessed incorrectly (either first name or surname) one mark was given for each incorrect response.

2.4.3. Pattern of presentation.

Participants were asked to learn face-name associations under each of four different study conditions (forward cues, vanishing cues, target selection, and paired associate) in each session. The order of study condition was counterbalanced across participants. More specifically each session used 2 photographs from vanishing cues (1 known, 1 unknown), 2 from paired associate (1 known, 1 unknown), 2 from forward cues (1 known, 1 unknown) and 2 from target selection (1 known, 1 unknown).

Each face-name pair was initially tested in one free recall, one cued recall, one word fragment, and one visual recognition trial, to establish baseline performance. The intervention was carried out in training sessions held twice per week for 3 weeks. Sessions in any given week used 2 photographs (one famous, one non-famous) for each of the four study conditions, as described. These 2 face-name pairs were trained using three training trials for each condition. The pilot study showed that it was necessary to strike a balance between increasing the number of training trials but also restrict time in order to maximise motivation and concentration throughout the trials. Four training trials seemed to take too long (over one hour) so it was considered appropriate to use three training trials.

Thus each session trained a total of 8 face-name associations using four different training conditions (forward cues, vanishing cues, target selection, and paired associate), which were repeated three times. After each training session, post-session tests were completed. These comprised of free recall, cued recall, word fragment, and visual recognition trials. These latter tests were repeated at the start of the next training session as part of a delayed memory test.

Each week the procedure remained the same but two different photographs were trained in face-name pairs for each of the four training conditions. Thus each week 8 face-name pairs were trained over two sessions, so that a total of 24 face-name pairs (6 in each training condition) were trained in all (see Table 3). Thus 6 visits were required, spread over a period of 3 weeks, with each visit taking approximately one hour. As all 4 conditions were used in each visit, data on efficacy of learning for each condition was gathered on each visit. This increased the flexibility of data collection, allowing for sessions to be variably spaced if changes to the schedule were unavoidable. An overview is provided in Table 3.

Although there were some concerns that 8 items might be a lot for the participants to learn in six training trials over two sessions, Komatsu et al. (2000) found significant differences between the efficacy of the four learning conditions using a similar procedure with 6 items and only four trials with patients with Alcoholic Korsakoff's Syndrome, who had severe anterograde memory impairments.

On completion of the above procedure the participants were also offered a summary describing the method or methods that worked best for them and how to use this in practice. They were also given the opportunity to learn some more face-name pairs of their own choosing, using the method most successful for them. This was an extra component of the present study that the participants chose if they so wished. This not only increased the ecological validity of the study to the participant, providing real-life clinical benefits, but also extended the capacity of the present study as a multi-single case experimental design, allowing a further test of the efficacy of the identified approach. This will be followed up after submission of the present thesis.

Table 3: Summary of procedure.

	Session 1			Session 2		
WEEK ONE	Baseline Measures: Word fragment trial. Cued recall. Visual recognition trial. Free recall trial.	2 face-name pairs for each of conditions: Forward Cues, vanishing cues, target selection, paired associate. 3 learning trials.	Post-session tests: As for baseline measures	Pre-session tests: As for baseline measures	As in session 1. 3 learning trials.	Post-session tests: As for baseline measures
	Session 3			Session 4		
WEEK TWO	Baseline Measures: Word fragment trial. Cued recall. Visual recognition trial. Free recall trial.	2 face-name pairs for each of conditions: Forward Cues, vanishing cues, target selection, paired associate. 3 learning trials.	Post-session tests: As for baseline measures	Pre-session tests: As for baseline measures	As in session 1. 3 learning trials.	Post-session tests: As for baseline measures
	Session 5			Session 6		
WEEK THREE	Baseline Measures: Word fragment trial. Cued recall. Visual recognition trial. Free recall trial.	2 face-name pairs for each of conditions: Forward Cues, vanishing cues, target selection, paired associate. 3 learning trials.	Post-session tests: As for baseline measures	Pre-session tests: As for baseline measures	As in session 1. 3 learning trials.	Post-session tests: As for baseline measures

Chapter Three

RESULTS

The aim of the present study was to delineate the factors that produce optimum conditions for learning during cognitive rehabilitation interventions for people with dementia.

Within this key issues are:

1. The extent to which effective learning is observed for people with dementia, in relation to both previously-known and novel information.
2. Whether learning is facilitated more effectively using effortful and/or errorless methods and whether new learning and relearning are facilitated by the same, or different, methods.
3. Whether effective learning is achieved through using implicit or explicit memory, or both.

These issues will be explored using group analyses. Following this, data will be explored using multiple single case analyses in order to give valuable insight into the efficacy of certain procedures for specific individuals.

3.1 Was learning observed for the participants with dementia?

The items used in the present study were face-name associations. The faces had been selected on the basis that half the set of faces were famous but these familiar faces could not be named, and half the set of faces were new, having never been seen before by the participant. The names for all the faces were taught using four learning methods: Vanishing Cues, Forward Cues, Paired Associate and Target Selection, as described previously. Learning was measured using three test modalities: Free Recall, Cued Recall and Recognition. The exploration into whether learning was observed for people with dementia was first approached using all the items learnt. Following this, any differential effects of learning with respect to novelty, were explored by looking at learning for novel faces and famous faces separately.

3.1.1 Were significant overall learning effects observed at group level?

Baseline and post-intervention mean recall scores for the four learning methods for each of these test modalities are shown in Figures 2, 3 and 4.

Mean free-recall scores for all items for the group improved from baseline to post-intervention for each of the four learning methods, as seen in Figure 2. The marked improvement in performance was statistically significant for all four methods [Vanishing Cues: $t(9) = -2.580$, $p = .03$; Forward Cues: $t(9) = -3.922$, $p = .004$; Paired Associate: $t(9) = -3.446$, $p = .007$; Target Selection: $t(9) = -3.674$, $p = .005$, all two-tailed].

Mean cued recall scores for all items for the group also improved from baseline to post-intervention for each of the four learning methods as seen in Figure 3. Again, the marked improvement in performance was statistically significant for all four methods

Figure 2. Baseline and post-intervention mean recall scores for the four learning methods tested by free recall.

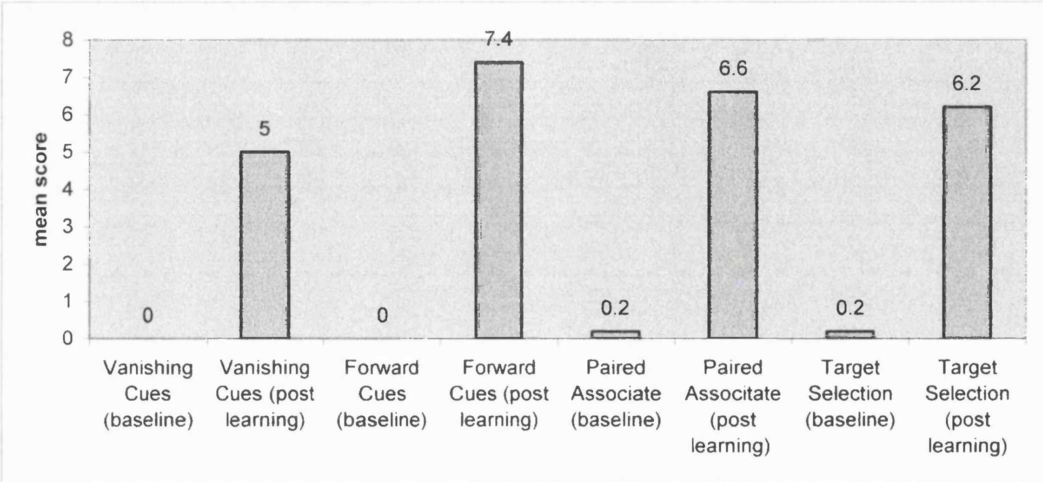


Figure 3. Baseline and post-intervention mean recall scores for the four learning methods tested by cued recall.

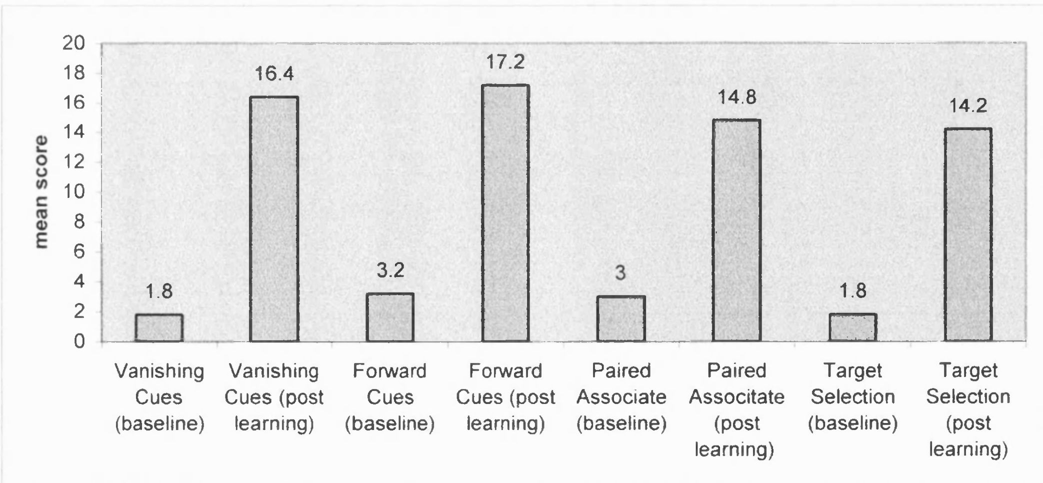
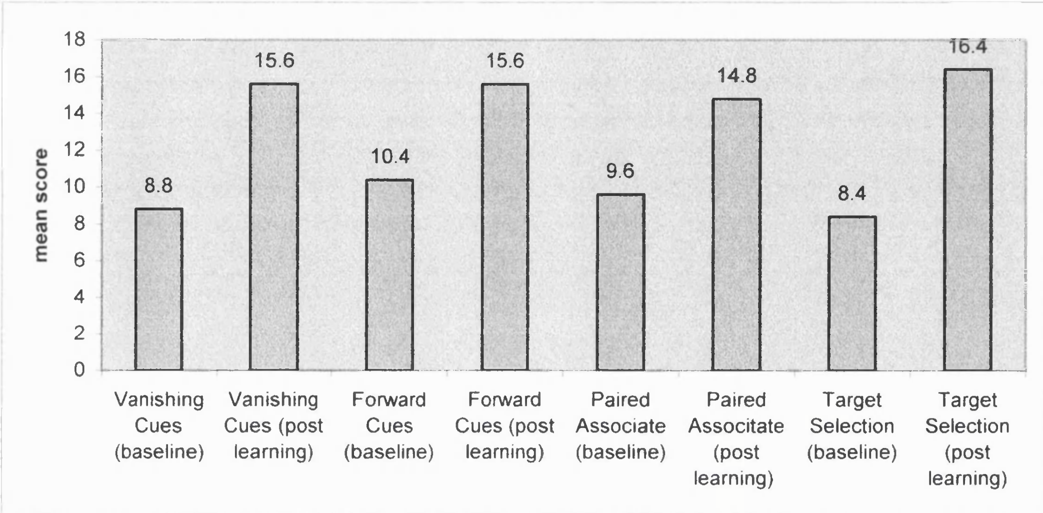


Figure 4. Baseline and post-intervention mean recall scores for the four learning methods tested by recognition.



[Vanishing Cues: $t(9) = -8.156$, $p < .001$; Forward Cues: $t(9) = -8.174$, $p < .001$; Paired Associate: $t(9) = -7.845$, $p < .001$; Target Selection: $t(9) = -7.980$, $p < .001$, all two-tailed].

Mean recognition scores for all items for the group improved from baseline to post-intervention for each of the four learning methods as seen in Figure 4. Once more, the marked improvement in performance was statistically significant for all four methods [Vanishing Cues: $t(9) = -3.431$, $p = .008$; Forward Cues: $t(9) = -3.881$, $p = .004$; Paired Associate: $t(9) = -3.545$, $p = .006$; Target Selection: $t(9) = -5.071$, $p = .001$, all two-tailed].

These analyses indicate that recall scores for all learning methods were significantly higher at post-intervention, thus each learning method was effective.

3.1.2 Is there a difference between re-learning and new learning?

In order to explore any variations in learning with respect to familiarity of the faces, the data for learning was divided into Famous Faces or Novel Faces. As noted previously, the famous faces used here had been selected because they were familiar to the participant but could not be named, and the novel faces had never been seen before by the participant. The names for all the faces were taught using four learning methods: Vanishing Cues, Forward Cues, Paired Associate and Target Selection, as described previously. Learning was measured using three test modalities: Free Recall, Cued Recall and Recognition. The variance between baseline and post-intervention mean scores for the four learning methods for each of these test modalities are thus analysed.

3.1.2.1 Using free recall to assess re-learning and new learning.

Mean free-recall scores for novel faces for all participants at baseline and post-intervention for each of the four training methods are shown in Figure 5. The improvement in performance was not statistically significant for any of the four methods [Vanishing Cues: $t(9) = -1.406$, $p = .193$; Forward Cues: $t(9) = -1.765$, $p = .111$; Paired Associate: $t(9) = -1.500$, $p = .168$; Target Selection: $t(9) = -1.000$, $p = .343$, all two-tailed]. These results reflected the difficulty participants had in retrieval of names for novel faces when using free recall as the test modality.

Mean free recall scores for famous faces for all participants at baseline and post-intervention for each of the four training methods are also shown in Figure 5. The marked improvement in performance was statistically significant for all four methods [Vanishing Cues: $t(9) = -2.750$, $p = .022$; Forward Cues: $t(9) = -4.841$, $p = .001$; Paired Associate: $t(9) = -3.934$, $p = .003$; Target Selection: $t(9) = -3.415$, $p = .008$, all two-tailed]. Gains in learning appear to be much higher with famous faces compared to novel faces when retrieval of names is tested using free recall. Prior familiarity, even in the absence of explicit recall at baseline, appears therefore to facilitate learning and/or subsequent retrieval. Such facilitation was also reflected in higher recognition baseline scores (see Figure 4). Thus it appears that all four learning methods are effective where

Figure 5. Mean free recall scores for all participants at baseline and post-intervention for each of the four learning methods with novel and famous faces.

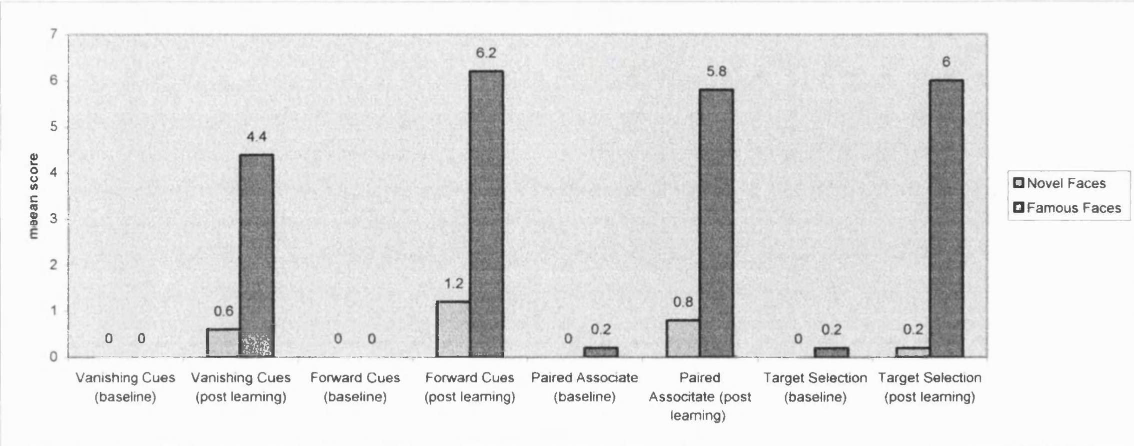
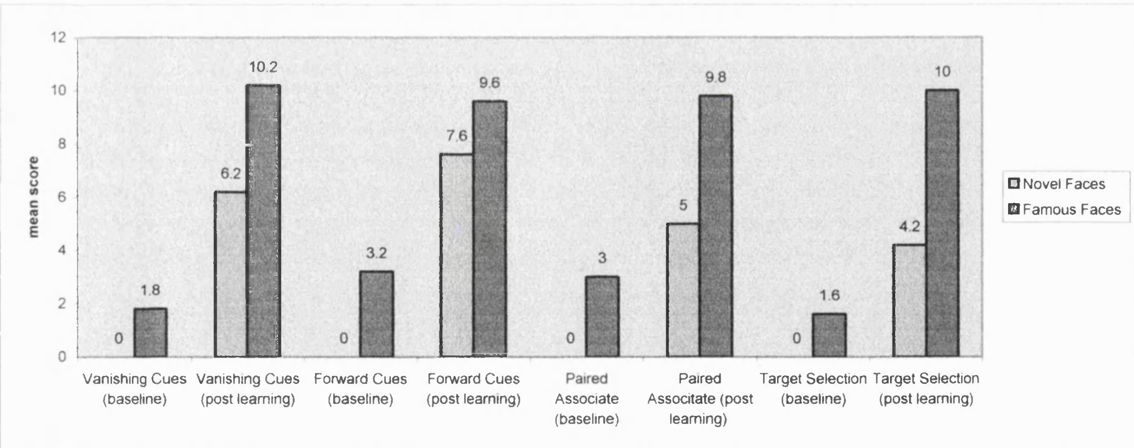


Figure 6. Mean cued recall scores for all participants at baseline and post-intervention for each of the four learning methods with novel and famous faces.



the association is already stored (although hard to access) but much less so for creating new associations.

3.1.2.2 Using cued recall to assess re-learning and new learning.

Mean cued-recall scores for novel faces for all participants at baseline and post-intervention for each of the four training methods are shown in Figure 6. The observed improvement in performance was statistically significant for all four methods [Vanishing Cues: $t(9) = -5.670$, $p < .001$; Forward Cues: $t(9) = -6.413$, $p < .001$; Paired Associate: $t(9) = -5.238$, $p = .001$; Target Selection: $t(9) = -5.161$, $p = .001$, all two-tailed]. Participants appeared to have a greater ability to retrieve names of novel faces when cued with initials, compared to free recall.

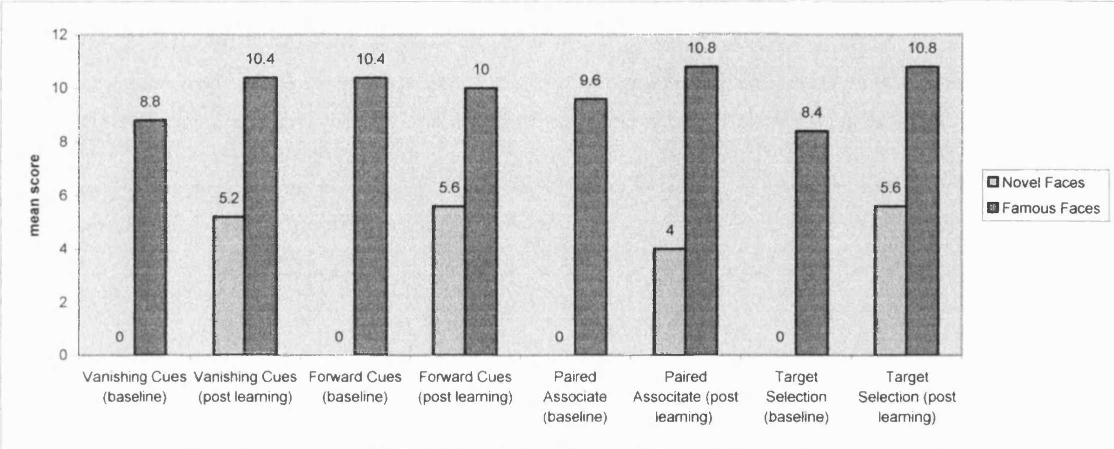
Mean cued-recall scores for famous faces for all participants at baseline and post-intervention for each of the four training methods are also shown in Figure 6. The marked improvement in performance was statistically significant for all four methods [Vanishing Cues: $t(9) = -10.804$, $p < .001$; Forward Cues: $t(9) = -4.951$, $p = .001$; Paired Associate: $t(9) = -6.053$, $p < .001$; Target Selection: $t(9) = -7.088$, $p < .001$, all two-tailed].

3.1.2.3. Using recognition to assess re-learning and new learning.

Mean recognition scores for novel faces for all participants at baseline and post-intervention for each of the four training methods are shown in Figure 7. Again, the marked improvement in performance was statistically significant for all four methods [Vanishing Cues: $t(9) = -3.545$, $p = .006$; Forward Cues: $t(9) = -4.118$, $p = .003$; Paired Associate: $t(9) = -3.000$, $p = .015$; Target Selection: $t(9) = -5.250$, $p = .001$, all two-tailed]. Participants also appeared to have a greater ability to choose the correct picture from a choice of three when given the name, compared to free recall.

Mean recognition scores for famous faces for all participants at baseline and post-intervention for each of the four training methods are also shown in Figure 7. The difference in performance between baseline and post-intervention recognition scores was not statistically significant for all four methods [Vanishing Cues: $t(9) = -1.177$, $p = .269$; Forward Cues: $t(9) = -1.000$, $p = .343$; Paired Associate: $t(9) = -1.964$, $p = .081$; Target Selection: $t(9) = -1.964$, $p = .081$, all two-tailed]. A lack of significant results is due to the fact that there was a ceiling effect for recognition for famous faces both at baseline and post-intervention, even though the items used were not explicitly recalled at baseline using free recall. Such results indicate that these famous faces were familiar to the participants prior to the present study.

Figure 7. Mean recognition scores for all participants at baseline and post-intervention for each of the four learning methods with novel and famous faces.



3.1.2.4 Summary.

Overall, these results reflected that participants had difficulty in retrieval of names for novel faces when using free recall as a testing modality. Gains in learning appeared to be much higher with famous faces compared to novel faces when retrieval of names was tested using free recall. Prior familiarity, even in the absence of explicit recall at baseline, appears therefore to facilitate learning and/or subsequent retrieval.

Participants appeared to have a greater ability to retrieve names of both novel and famous faces when cued with initials in cued recall, compared to free recall. Participants also appeared to have a greater ability to choose the correct picture from a choice of three when given the name, as in the recognition test, compared to free recall for both novel and famous faces. However the prior familiarity of famous faces also led to higher baseline recognition scores leading to less scope for improvement in these scores.

Although these results have indicated that there were gains in learning for people with Dementia, the relative efficacy of each of the four learning methods has yet to be explored. Furthermore, it is of interest to consider whether there any different patterns of efficacy in learning methods with respect to re-learning famous faces and learning new faces.

3.2 Are new learning and re-learning facilitated more effectively by different methods of learning?

A repeated measures ANOVA was used to examine whether each learning method resulted in different levels of learning, and whether patterns of efficacy were different for novel and famous faces, based on change scores (post-intervention score minus baseline), where within-subjects factors consisted of novelty (novel faces, famous faces), learning method (vanishing cues, forward cues, paired associate, target selection) and test modality (free recall, cued recall, and recognition). Data was initially screened for outliers and none were found, and all variables were sufficiently normally distributed as required for using analysis of variance statistics.

When considering all items together, there was no significant difference in learning across methods [$F(3,27) = 0.957$, $p=.43$]. There was a significant effect of test modality, reflecting a significantly higher improvement at post-intervention for cued recall compared to both free recall and recognition scores [$F(2,18) = 20.01$, $p<.001$]. However, as seen in Figures 2, 3, and 4, recognition scores were much higher than free or cued recall measures at baseline, thus leaving less scope for improvement to achieve optimum levels of performance. There was no method x test interaction [$F(6,54) = 1.036$, $p=.41$], and there was no method x test x novelty interaction [$F(6,54) = 1.075$, $p=.39$].

However, with regards to novelty, some different patterns of learning did emerge. Although larger gains were noted for famous faces (mean=4.733) compared to novel faces (mean=3.850), this difference was not significant [F(1,9) = 4.664, p=.059] indicating that learning methods were efficacious both for re-learning the names of famous faces and learning the names of novel faces. There was also a significant novelty x method interaction [F(3,27) = 4.144, p=.015] as illustrated in Figure 8. Here, for novel faces, the order of efficacy of treatment from best to least was: Forward Cues > Vanishing Cues > Target Selection > Paired Associate, but for famous faces the order of efficacy of treatment from best to least was: Target Selection > Vanishing Cues > Paired Associate > Forward Cues. There was also a significant novelty x test interaction [F(2,18) = 13.704, p<.001], as illustrated in Figure 9, which again indicates that learning appeared to be much higher with famous faces compared to novel faces when retrieval of names was tested using free recall. As noted previously, prior familiarity, even in the absence of explicit recall at baseline, appears therefore to facilitate learning and/or subsequent retrieval. Prior familiarity of famous faces also led to higher baseline recognition scores leading to less scope for improvement in these scores. Participants appeared to have a greater ability to retrieve names of both novel and famous faces when cued with initials in cued recall, compared to free recall.

Overall, the focus of this analysis showed that there was no significant variation in efficacy between each of the four learning methods for the group when *all items* were tested by free recall, cued recall and recognition. However, forward cues appeared to be the most efficacious method for learning *novel faces*, but target selection appeared to be the most efficacious method for re-learning *famous faces*.

Figure 8: Graph illustrating the efficacy of each learning method with respect to novel faces and famous faces.

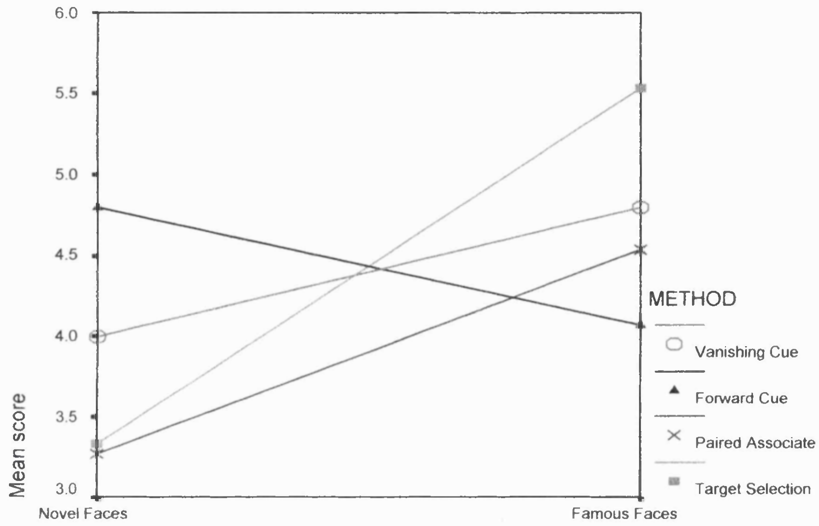
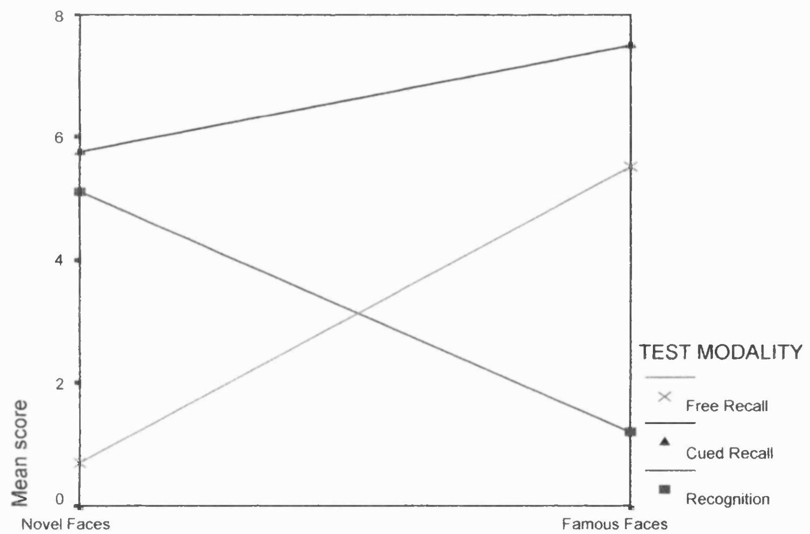


Figure 9: Graph illustrating learning tested by three test modalities for both novel faces and famous faces.



3.3 Is learning facilitated more effectively by errorless or errorful methods?

Throughout this present study, errors were made whilst learning. However, in the paired associate and vanishing cues methods, errors were kept to a minimum. Nevertheless, a minority of errors were observed. In the paired associate condition, if the participant misread a name or responded to the picture incorrectly before reading the name given, then one error mark was given for each incorrect name (first name, surname). In the vanishing cues condition, one error mark was given for each incorrect name (first name, surname), although the participant was encouraged not to guess.

Target selection and forward cues were the two methods that produced the most errors whilst learning, as illustrated in Figure 10. In the target selection, every time an incorrect name was chosen, two error marks were given. In the forward cues condition, every time a name was guessed incorrectly (either first name or surname) one mark was given for each incorrect response. A repeated measures ANOVA, where within-subjects factors consisted of Learning Method (vanishing cues, forward cues, paired associate, target selection) and novelty (famous faces, novel faces) indicated that both forward cues and target selection had generated significantly more errors throughout learning when compared to vanishing cues and paired associate methods, as there was a significant main effect of Learning Method [$F(3,27) = 26.446$, $p<.001$]. There was also a significant effect of Novelty, reflecting more errors generated whilst learning novel faces compared to famous faces [$F(1,9) = 48.381$, $p < .001$] and there was a significant Method x Novelty interaction [$F(3,27) = 23.767$, $p < .001$] where the technique of forward

Figure 10: The pattern of errors generated throughout the four learning methods.

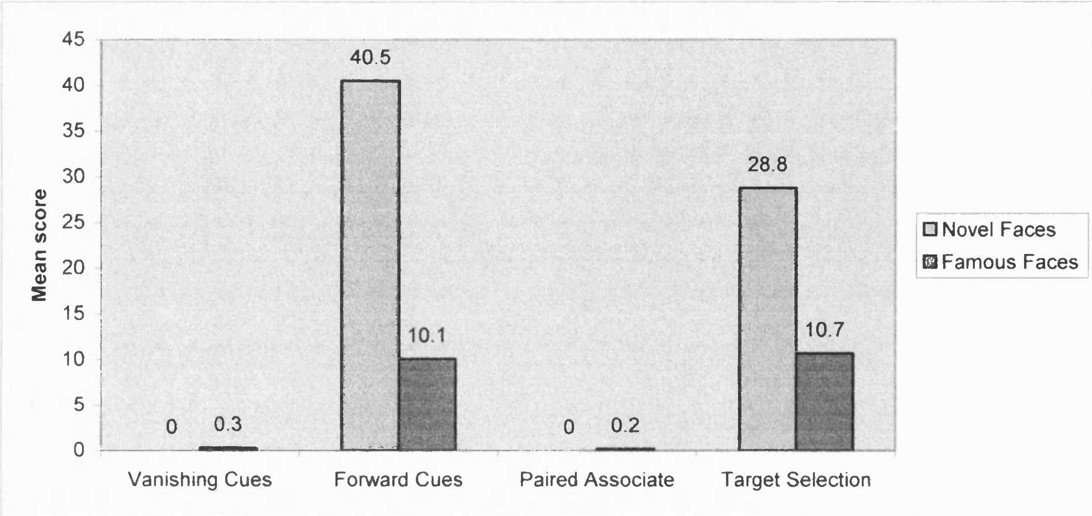
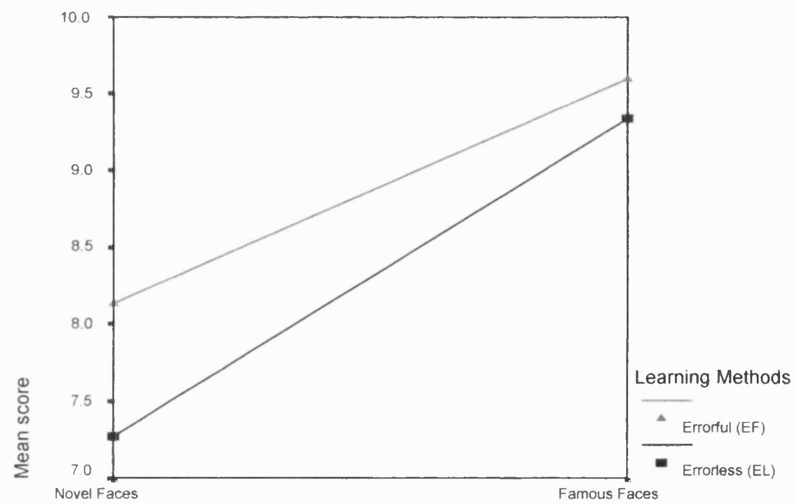


Figure 11: Effectiveness of EF and EL learning for novel and famous faces.



cues and target selection both allowed the generation of errors but this was even more pronounced for the forward cues method in the learning of novel faces.

As a result of this analysis, and target selection were both considered to be Errorful Learning techniques (EF) and vanishing cues and paired associate were considered to be Errorless Learning Techniques (EL). Previous results had noted forward cues and target selection had been the most effective methods for learning the names of novel and famous faces, respectively. It is thus interesting to note that the two methods that were the most effective, also involved the largest number of errors.

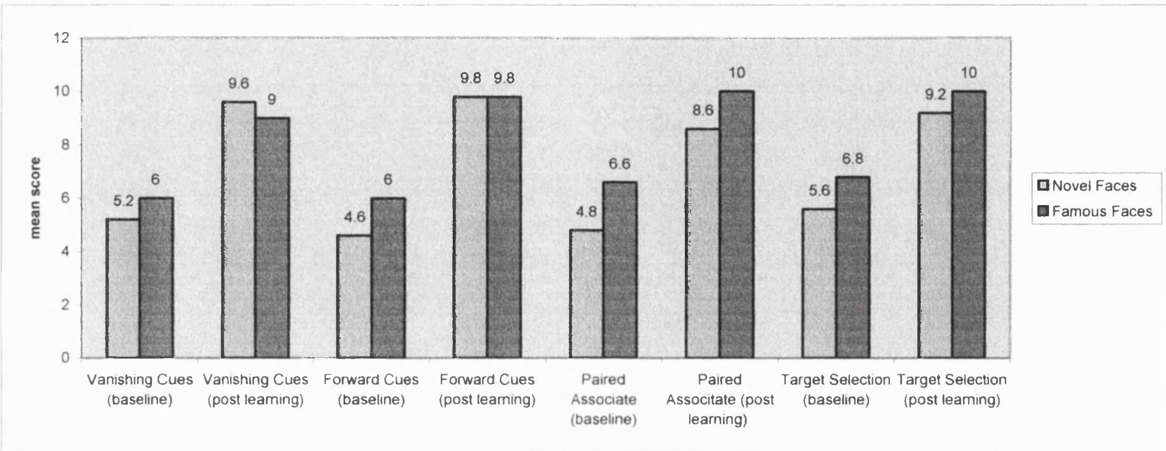
It was then of interest to explore whether collapsing the four learning methods into EL and EF learning methods resulted in identification of either of these learning methods as more efficacious than the other. To examine whether EL and EF learning resulted in different outcomes, a repeated measures ANOVA was used where within-subjects factors consisted of Learning Method (EF, EL), Test Modality (Free recall, Cued Recall, Recognition) and Novelty (Famous Faces, Novel Faces). As noted in the previous ANOVA, there was a significant main effect of Test Modality [$F(2,18) = 20.01$, $p<.001$], and a significant Test x Novelty interaction [$F(2,18) = 13.704$, $p < .001$], but no significant main effect for Novelty [$F(1,9) = 4.664$, $p = .059$] and no Test x Learning x Novelty interaction [$F(2,18) = 1.134$, $p=.344$]. With respect to EF and EL learning, results suggested that there was no significant difference in means for EF learning (mean score = 8.867) and EL learning (mean score = 8.3) [$F(1,9) = 1.733$, $p = .221$]. In contrast to the previous analysis there was no significant Learning Method x Novelty interaction

[F(1,9) = 0.234, p=.64] using EF and EL data, but closer inspection of the mean scores indicated that there was a trend that suggested EF Learning was more efficacious than EL for learning both Novel and Famous Faces, as illustrated in Figure 11 .

3.3 Exploration of whether learning methods operate through utilising implicit or explicit memory.

Preserved implicit memory was explored in a task of perceptual repetition priming, where learning was measured by a change in accuracy in completing word fragments. Fragmented names associated with the famous and novel faces were presented before and after each training session. Two marks were awarded for each correct name (two marks for the first name, and two marks for the surname). Figure 12 illustrates priming in word fragments in all methods from baseline to post-intervention for novel and famous faces. More priming is noted at baseline for all famous faces, which may suggest that benefits in naming these items, compared to novel faces, may be due to preservation of implicit memory from prior exposure to these famous names.

Figure 12. Priming effects in word fragments in all methods from baseline to post-intervention for novel and famous faces.



In order to assess whether implicit (word fragment completion) and explicit (free recall, cued recall, recognition) responses were likely to be based upon implicit memory, a correlational analysis was used. Pearson's product-moment correlation was used to explore the correlations between word fragment completion scores and the learning scores obtained from the three explicit test modalities (free recall, cued recall, recognition) as noted in Tables 4-6. Hunkin et al. (1998) had previously used this method of analysis to examine the relationship across participants between their test of word fragment completion (implicit test involving completion of a five or six letter word having been given the first two letters) and cued recall (explicit test). A Bonferroni correction was applied in view of the multiple comparisons, such that only *p* values of 0.017 or less were considered significant.

None of the correlations between word fragment completion and the three explicit tests (free recall, cued recall, recognition) in each of the four learning methods were significant for all faces (Table 4), novel faces (Table 5) or famous faces (Table 6). However, it must also be noted that the majority of explicit tests also do not have significant relationships with each other. Although one factor that may be contributing to this is the fact that the Bonferroni correction reduces the power of finding a relationship, it may also be due to the fact that the implicit/explicit distinction in the tests are not so straightforward. This will be discussed in more detail later.

Table 4: Correlations between scores for tests that utilise implicit and explicit memory for all faces.

	Word Fragments	Free Recall	Cued Recall	Recognition
For Vanishing Cues:				
Word Fragments	1.0			
Free Recall	-0.322	1.0		
Cued Recall	0.012	0.446	1.0	
Recognition	-0.497	0.289	-0.003	1.0
For Forward Cues:				
Word Fragments	1.0			
Free Recall	-0.323	1.0		
Cued Recall	-0.345	0.399	1.0	
Recognition	0.193	0.383	0.077	1.0
For Paired Associate:				
Word Fragments	1.0			
Free Recall	0.074	1.0		
Cued Recall	-0.057	0.703	1.0	
Recognition	0.378	-0.085	-0.028	1.0
For Target Selection:				
Word Fragments	1.0			
Free Recall	0.132	1.0		
Cued Recall	0.633	0.741*	1.0	
Recognition	0.228	-0.104	0.107	1.0

Bonferroni correction for multiple comparisons applied.
*$p < .017$

Table 5: Correlations between scores for tests that utilise implicit and explicit memory for famous faces.

	Word Fragments	Free Recall	Cued Recall	Recognition
For Vanishing Cues:				
Word Fragments	1.0			
Free Recall	-0.349	1.0		
Cued Recall	0.359	0.379	1.0	
Recognition	-0.479	0.008	-0.740*	1.0
For Forward Cues:				
Word Fragments	1.0			
Free Recall	0.164	1.0		
Cued Recall	-0.190	-0.032	1.0	
Recognition	0.231	0.538	-0.309	1.0
For Paired Associate:				
Word Fragments	1.0			
Free Recall	0.153	1.0		
Cued Recall	0.318	0.439	1.0	
Recognition	0.308	-0.552	-0.544	1.0
For Target Selection:				
Word Fragments	1.0			
Free Recall	-0.017	1.0		
Cued Recall	0.540	0.689	1.0	
Recognition	-0.071	-0.574	-0.319	1.0

Bonferroni correction for multiple comparisons applied.
*p < .017

Table 6: Correlations between scores for tests that utilise implicit and explicit memory for novel faces

	Word Fragments	Free Recall	Cued Recall	Recognition
For Vanishing Cues:				
Word Fragments	1.0			
Free Recall	-0.322	1.0		
Cued Recall	-0.166	0.598	1.0	
Recognition	-0.421	0.391	0.649	1.0
For Forward Cues:				
Word Fragments	1.0			
Free Recall	-0.323	1.0		
Cued Recall	-0.281	0.664	1.0	
Recognition	0.109	0.249	-0.066	1.0
For Paired Associate:				
Word Fragments	1.0			
Free Recall	0.074	1.0		
Cued Recall	0.058	0.652	1.0	
Recognition	0.539	0.144	0.210	1.0
For Target Selection:				
Word Fragments	1.0			
Free Recall	0.132	1.0		
Cued Recall	0.292	0.401	1.0	
Recognition	0.297	0.510	0.164	1.0

Bonferroni correction for multiple comparisons applied.
$^*p < .017$

3.5 Multiple single case analysis of learning trends for all for learning methods tested by free recall, cued recall and recognition.

The previous group analysis has indicated that although there may be a trend where EF learning methods produce better learning than EL methods, there are no significant differences in efficacy for each of the four learning methods on their own. However, the non-significant *group* results may mask *individual* results, where different people may learn more effectively with different methods of learning.

Graphs to illustrate learning trends tested by free recall, cued recall, and recognition, for all four learning methods for each participant, are shown in Figure 13. These individual graphs illustrate the trends for both famous and novel faces separately. With famous faces, both baseline and post-intervention scores are noted, but in the novel faces only post-intervention scores are noted, as all baseline scores were zero.

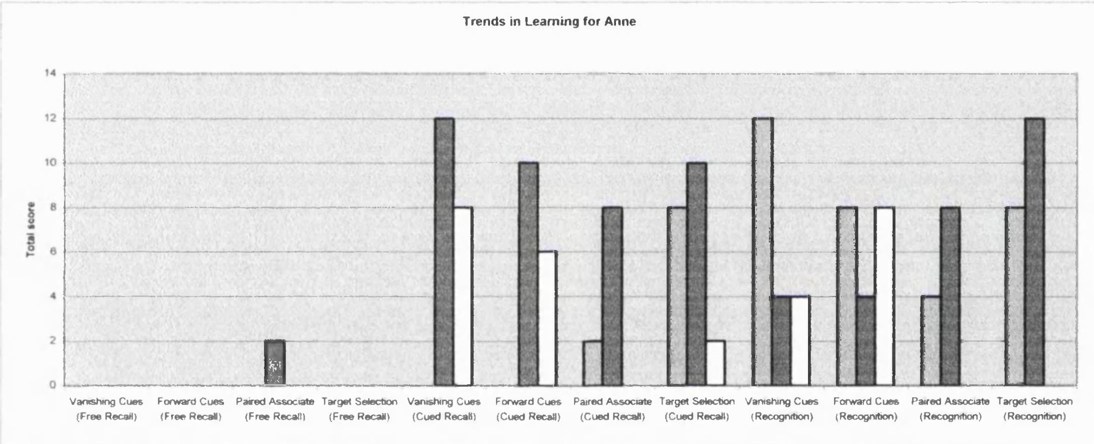
Figure 13: Graphs to illustrate learning trends tested by free recall, cued recall, and recognition, for all four learning methods for each participant.

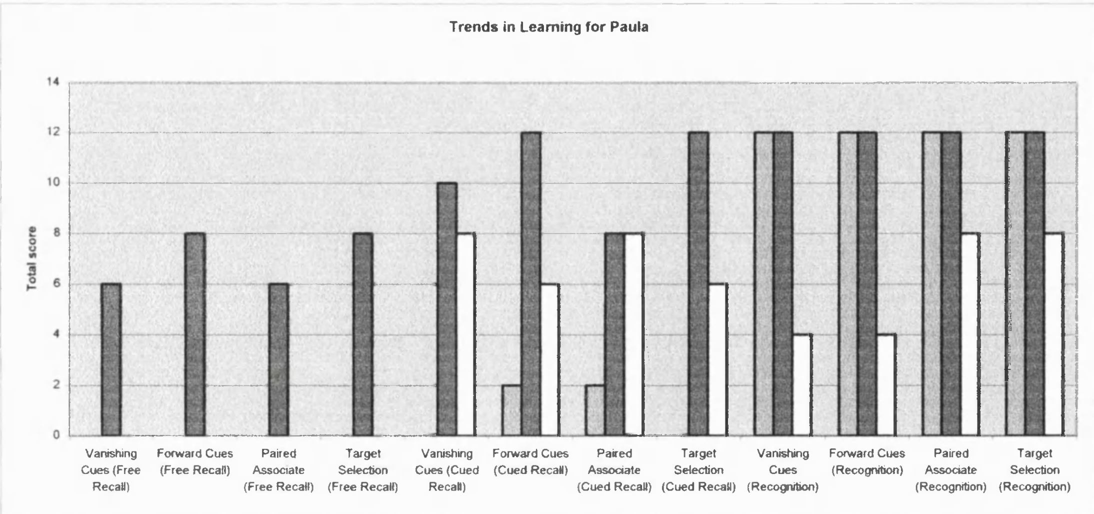
Legend for all graphs:

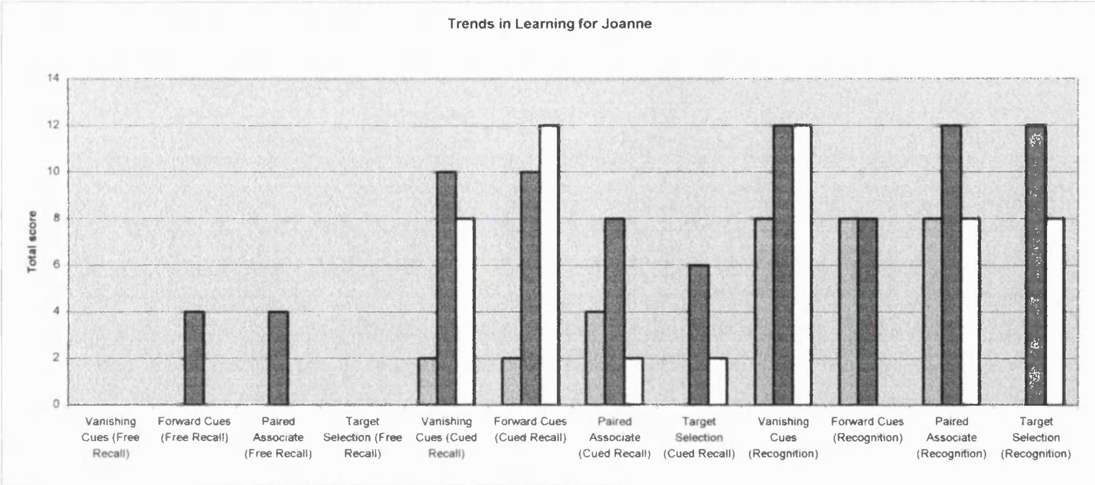
Baseline (Famous Faces)

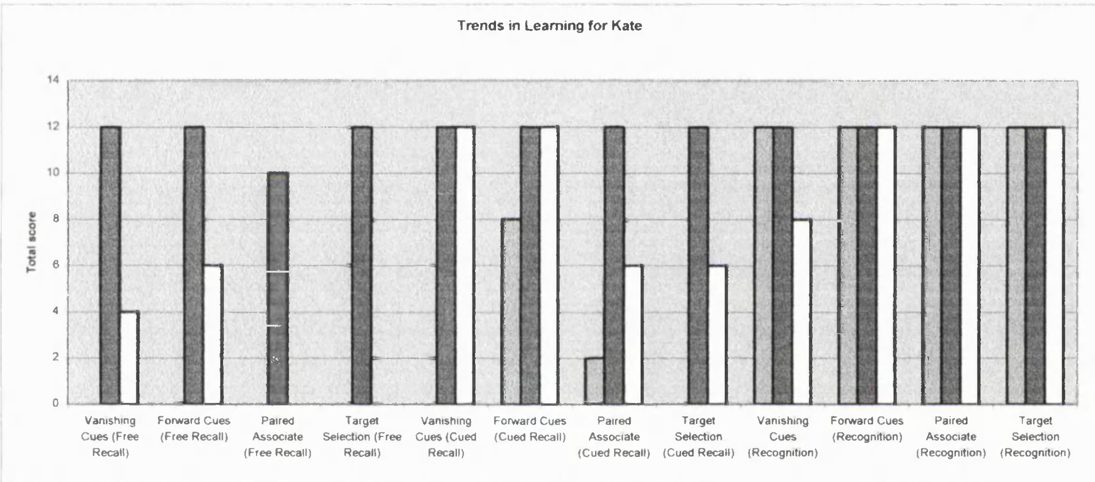
Post-Intervention (Famous Faces)

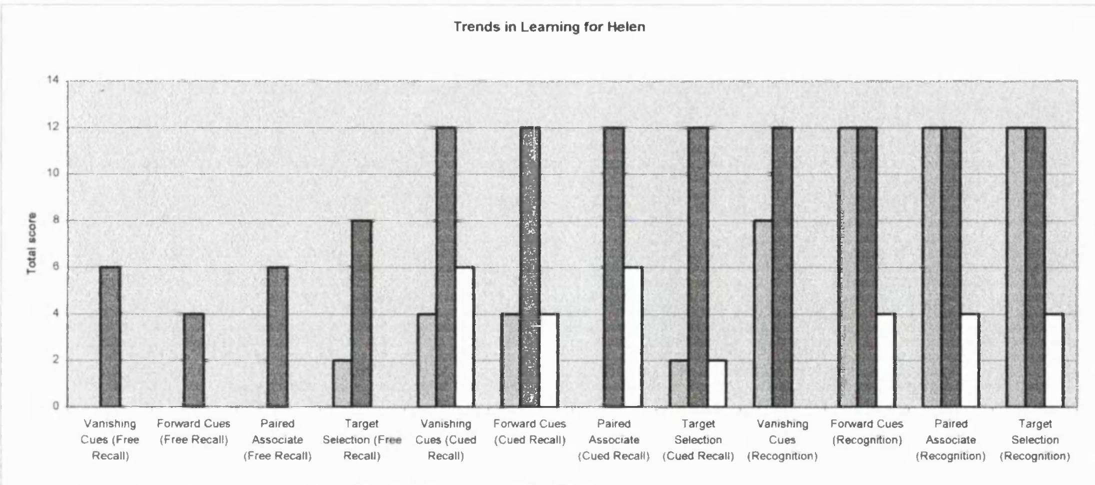
Post-Intervention (Novel Faces)

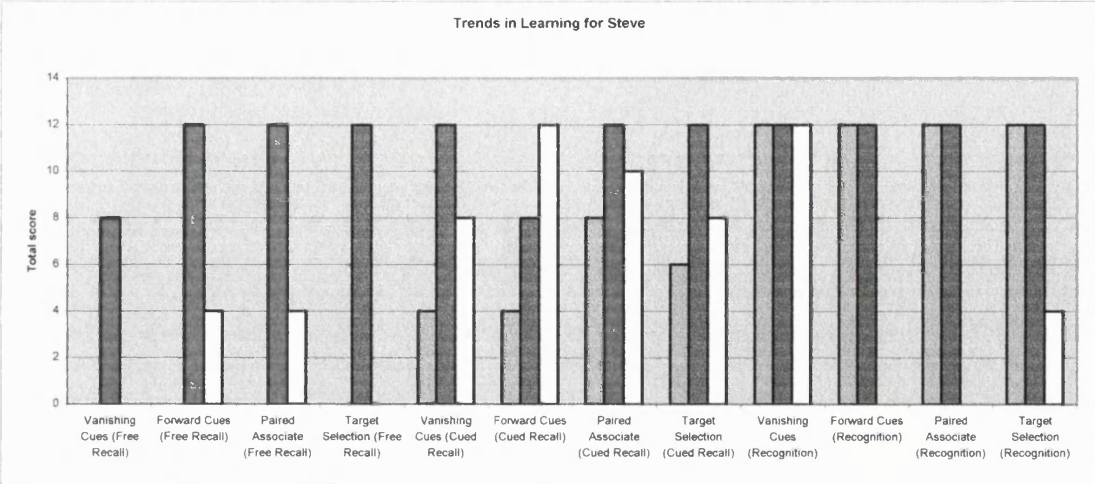


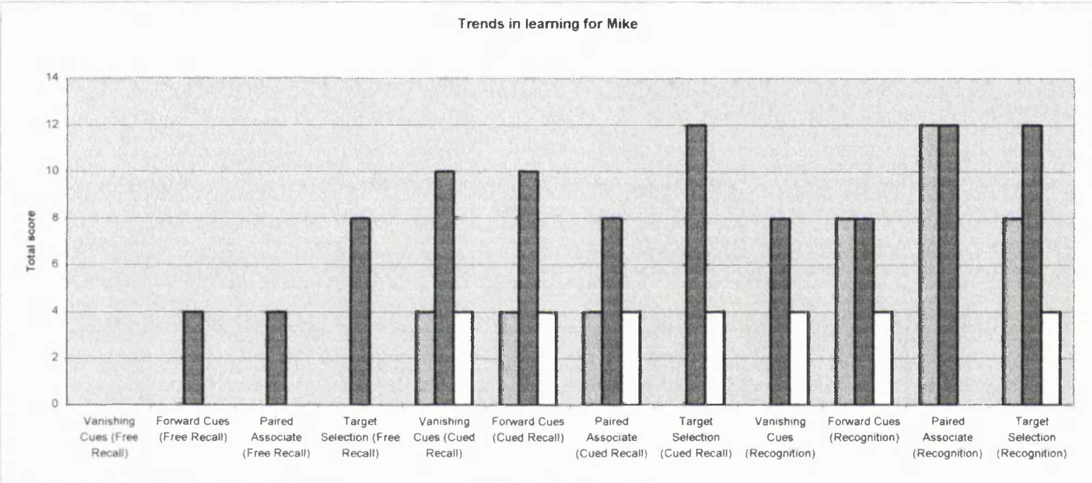


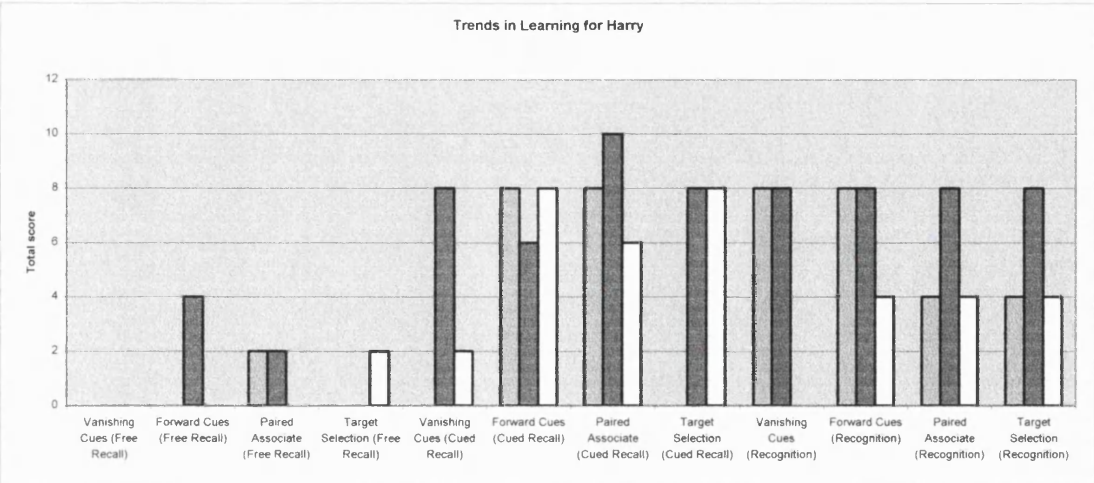

Trends in Learning for Joanne
Total score
0
2
4
6
8
10
12
14
Vanishing Cues (Free Recall)
Forward Cues (Free Recall)
Paired Associate (Free Recall)
Target Selection (Free Recall)
Vanishing Cues (Cued Recall)
Forward Cues (Cued Recall)
Paired Associate (Cued Recall)
Target Selection (Cued Recall)
Vanishing Cues (Recognition)
Forward Cues (Recognition)
Paired Associate (Recognition)
Target Selection (Recognition)

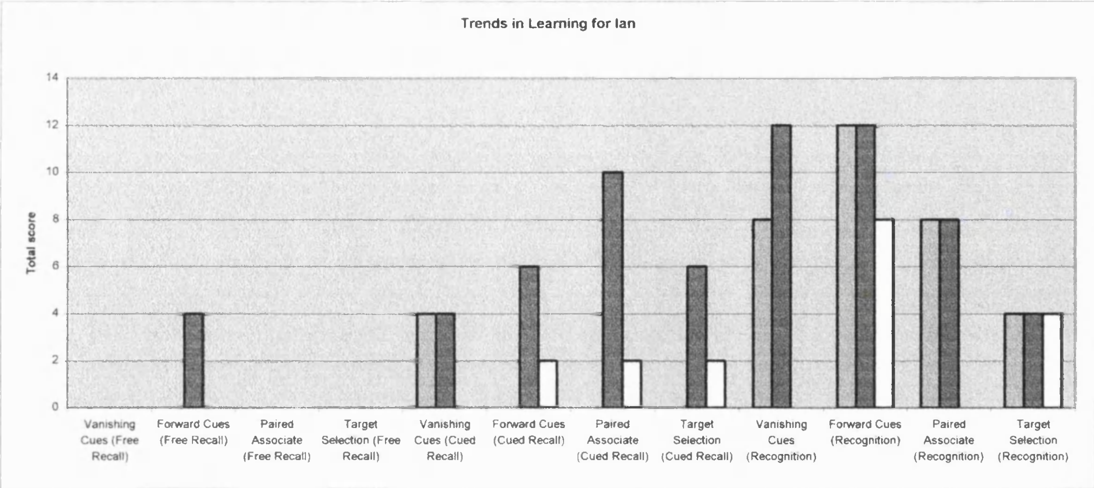

Trends in Learning for Kate
Total score
0
2
4
6
8
10
12
14
Vanishing Cues (Free Recall)
Forward Cues (Free Recall)
Paired Associate (Free Recall)
Target Selection (Free Recall)
Vanishing Cues (Cued Recall)
Forward Cues (Cued Recall)
Paired Associate (Cued Recall)
Target Selection (Cued Recall)
Vanishing Cues (Recognition)
Forward Cues (Recognition)
Paired Associate (Recognition)
Target Selection (Recognition)


Trends in Learning for Helen
Total score
0
2
4
6
8
10
12
14
Vanishing Cues (Free Recall)
Forward Cues (Free Recall)
Paired Associate (Free Recall)
Target Selection (Free Recall)
Vanishing Cues (Cued Recall)
Forward Cues (Cued Recall)
Paired Associate (Cued Recall)
Target Selection (Cued Recall)
Vanishing Cues (Recognition)
Forward Cues (Recognition)
Paired Associate (Recognition)
Target Selection (Recognition)


Trends in Learning for Steve
Total score
Vanishing Cues (Free Recall)
Forward Cues (Free Recall)
Paired Associate (Free Recall)
Target Selection (Free Recall)
Vanishing Cues (Cued Recall)
Forward Cues (Cued Recall)
Paired Associate (Cued Recall)
Target Selection (Cued Recall)
Vanishing Cues (Recognition)
Forward Cues (Recognition)
Paired Associate (Recognition)
Target Selection (Recognition)


Trends in learning for Mike
Total score
Vanishing Cues (Free Recall)
Forward Cues (Free Recall)
Paired Associate (Free Recall)
Target Selection (Free Recall)
Vanishing Cues (Cued Recall)
Forward Cues (Cued Recall)
Paired Associate (Cued Recall)
Target Selection (Cued Recall)
Vanishing Cues (Recognition)
Forward Cues (Recognition)
Paired Associate (Recognition)
Target Selection (Recognition)


Trends in Learning for Harry
Total score
Vanishing Cues (Free Recall)
Forward Cues (Free Recall)
Paired Associate (Free Recall)
Target Selection (Free Recall)
Vanishing Cues (Cued Recall)
Forward Cues (Cued Recall)
Paired Associate (Cued Recall)
Target Selection (Cued Recall)
Vanishing Cues (Recognition)
Forward Cues (Recognition)
Paired Associate (Recognition)
Target Selection (Recognition)


Trends in Learning for Ian
Total score
14
12
10
8
6
4
2
0
Vanishing Cues (Free Recall)
Forward Cues (Free Recall)
Paired Associate (Free Recall)
Target Selection (Free Recall)
Vanishing Cues (Cued Recall)
Forward Cues (Cued Recall)
Paired Associate (Cued Recall)
Target Selection (Cued Recall)
Vanishing Cues (Recognition)
Forward Cues (Recognition)
Paired Associate (Recognition)
Target Selection (Recognition)

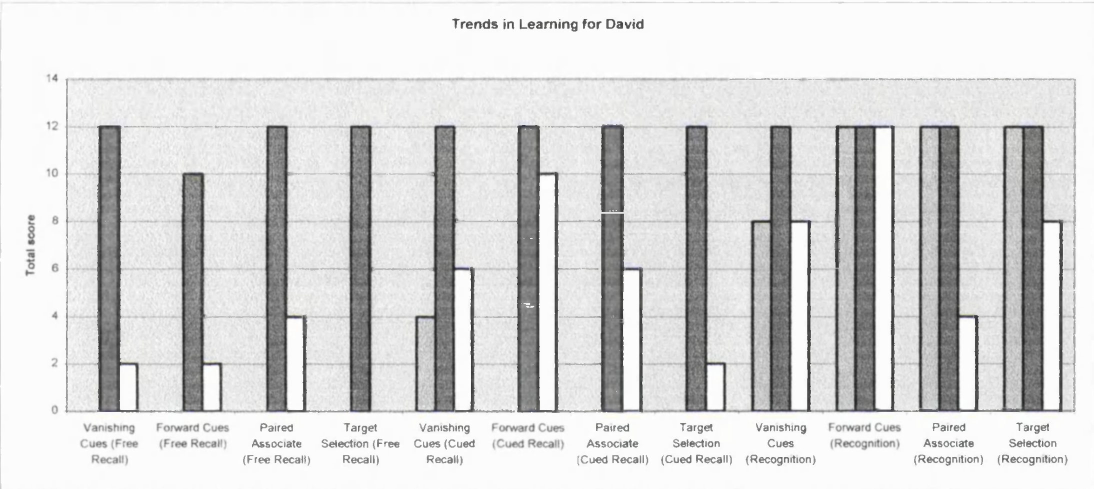

Trends in Learning for David
Total score
14
12
10
8
6
4
2
0
Vanishing Cues (Free Recall)
Forward Cues (Free Recall)
Paired Associate (Free Recall)
Target Selection (Free Recall)
Vanishing Cues (Cued Recall)
Forward Cues (Cued Recall)
Paired Associate (Cued Recall)
Target Selection (Cued Recall)
Vanishing Cues (Recognition)
Forward Cues (Recognition)
Paired Associate (Recognition)
Target Selection (Recognition)

Figure 13 illustrates that each person was able to learn the names of both famous faces and novel faces but, as noted in the group analyses, recall tended to be better for most when cued by the initials of the name. Also, in general, famous faces elicited higher recall scores than novel faces with ceiling effects for many post-intervention scores, thus prior knowledge may facilitate subsequent re-learning throughout all four learning methods. However, when considering trends on an individual basis, individual demographic characteristics are also noteworthy (see Table 1). With regards to variations in MMSE scores, all participants were inaccurate to some extent on orientation (mostly date), and all except Steve could not recall three words said at the start of the test. Further declines in scores, noted after the study was complete, were observed for Ian, Joanne and Mike, in the following areas: orientation, spelling backwards, recall of three words and copying a figure.

Since free recall of names, when presented with a face, is the most ecologically valid testing modality, success in this task is highlighted first. Most participants were able to identify famous faces somewhat better at post-intervention, illustrating the effect of prior knowledge once again. Kate, Steve and David were particularly successful at identifying famous faces, reaching ceiling effects for all three testing modalities at post-intervention. Furthermore, although free recall of novel faces at post-intervention elicited fairly low scores and with no particular pattern with respect to learning method, the participants that were most successful in this task were Kate, Steve, and David. From Table 1 it can also be noted that Kate, and Steve both maintained high MMSE scores throughout the study and each lived with their carer (spouse). They seemed to be aware of their memory difficulties but were supported by their carer, who helped to implement strategies to overcome their memory difficulties. Kate and Steve also appeared to have good affect, although mood was not tested explicitly in the present study. Although David did not obtain a high MMSE score at the end of the study, it must be noted that in the last week of testing his medication was changed and he appeared unwell at the time of the MMSE test, compared to his level of functioning throughout the study. In conjunction with this, his diagnosis of Alzheimer's disease was under review. Nevertheless, throughout testing he appeared to be motivated to do his best at learning the names and seemed to enjoy the sessions that he completed.

When considering responses tested by cued recall, most participants had ceiling effects for the retrieval of the names of the famous faces when given their initials. The exception to this pattern of response was Ian who achieved one of the lowest MMSE scores before and after the study, but also mentioned that he tended not to watch television very much and thus would not see faces of famous people as much as others may. Furthermore, he appeared to be very anxious about his experience of having memory difficulties and would often wish to talk about this repeatedly throughout the learning sessions. Both the distractions in learning and his anxiety about the awareness of his difficulties may have detracted from his ability to focus on the tasks. Ian also appeared less able than others to recall names of novel faces when cued. As with free recall responses to novel faces, Kate and Steve showed the most gains in cued recall for names of novel faces. David, Steve, and Joanne all showed a preference for forward cues method of learning names of novel faces when responses were tested by cued recall.

Kate showed most gains with both forward cues and vanishing cues. Anne preferred vanishing cues. Harry had most gains here when learning with the two EF methods, forward cues and target selection. Paula and Helen showed somewhat larger gains when using the EL methods of vanishing cues and paired associate learning. Ian and Mike showed equal gains independent of learning method for novel faces. In summary, most participants had ceiling effects for the retrieval of the names of the famous faces when given their initials in cued recall. Furthermore, 5 participants (50% of the group) showed that forward cues was one of their preferred methods of learning the names of novel faces when recall was tested using a cued recall task. Nevertheless, each person's scores also varied with their own pattern of efficacy gained from each of the four methods of learning.

When considering recognition tests most participants had ceiling effects for identifying the correct famous face when given the name and a choice of three faces. The two most notable exceptions to this were Harry and Anne. Although both Harry and Anne had high MMSE scores and lived with a carer, it appeared that Anne had an extremely supportive spouse and appeared aware but unconcerned of her difficulties. Her motivation to learn the faces also appeared lower than others, although she seemed to enjoy the task. Harry, on the other hand, did not initially recognise many famous faces due to 'a life of reading rather than watching television' and so the majority of familiar but unnamed faces to be learnt were taken from family photos. Although he expressed a wish to persevere with learning, he would often appear tired and low in affect throughout tests, especially when he realised a picture was a relative but could not name the person. He appears to be aware of his memory difficulties and to miss the enjoyment he used to get from reading books due to his difficulties in retaining information. When considering the ability to recognise the correct novel face from a choice of three, again Harry seemed to be poor at this. Helen also was weak at this task compared to others. Again, Helen appeared to be aware of her memory difficulties, and as she lived on her own, it seemed that these difficulties caused her a great deal of anxiety when she could not recall her routine for that day, who would visit, or when possessions could not be found in her house. This distress was also apparent when she could not recognise the faces, as she would comment on this throughout learning and recall. In contrast to this, Kate was exceptionally successful at recognising novel faces and, as noted previously, Kate had maintained a high MMSE score throughout the sessions, had good affect, and lived with a supportive carer (spouse). Other participants were all able to recognise novel faces but patterns of responses were lower and scores varied for each participant with respect to the method of learning, with no particular pattern emerging.

Chapter Four

DISCUSSION

The aim of the present study was to investigate the factors that produce optimum conditions for learning during cognitive rehabilitation interventions for people with dementia. The research was designed to address the following key issues:

- The extent to which effective learning is observed for people with dementia, in relation to both previously known and novel information.
- Whether learning is facilitated more effectively using effortful and/or errorless methods and whether new learning and relearning are facilitated by the same, or different, methods.
- Whether effective learning is achieved through using implicit or explicit memory, or both.

These issues were explored using face-name association where names of both famous and novel faces were taught using four learning methods: Vanishing Cues, Forward Cues, Paired Associate and Target Selection. Learning was measured using three test modalities: Free Recall, Cued Recall and Recognition. Group analyses and multiple single case analyses were used to explore whether learning was observed for people with dementia, with respect to the key issues noted. Results will be summarized, then discussed with respect to relevant literature, noting group analyses first, followed by multiple single case analyses. The limitations of this research will also be highlighted, along with their clinical implications. Future directions will also be proposed that suggests ways in which research may continue to explore the factors necessary for effective cognitive rehabilitation in dementia.

4.1 Summary of results.

Overall, results demonstrated that relearning the names of famous people and learning the names associated with novel faces were achieved by people with dementia. However, participants had more difficulty in retrieval of names for novel faces compared to famous faces, when using free recall as a testing modality. In comparison, retrieval of names for *both* novel and famous faces was more successful using cued recall and recognition tests. There was no significant variation in efficacy between each of the four learning methods when *all items* were tested by free recall, cued recall and recognition, thus each learning method was effective. However, forward cues appeared to be the most efficacious method for learning names of *novel faces* and target selection appeared to be the most efficacious method for learning names of *famous faces*. Both forward cues and target selection were classified as errorful methods on the basis of an examination of the number of errors generated during learning.

Baseline scores for identifying names of famous faces using word fragments were higher for famous names compared to novel names, which may be due to preservation of implicit memory from prior exposure to famous names. However, there were no significant correlations between performance on the implicit memory task of word fragment completion and the three explicit tests (free recall, cued recall, recognition) for each learning method for novel or famous faces. As word fragment completion was considered to be an implicit test, it may thus be proposed that gains in learning resulted from utilisation of residual explicit memory, rather than relying solely on implicit memory.

However, multiple single case analyses showed marked variations in learning for each participant. It was noted that with free recall, for instance, all those with higher scores lived with a supportive carer, and appeared to have good affect and motivation throughout the study. A holistic approach to cognitive rehabilitation will be discussed.

4.2 Patterns of effective learning explored by group analyses.

4.2.1 Is learning observed for people with dementia, in relation to both previously known and novel information?

Results demonstrated that although larger gains were noted for learning the names of famous faces compared to novel faces, this difference was not significant, indicating that the learning methods were efficacious both for relearning the names of famous faces *and* learning the names of novel faces. Thus, despite extensive memory deficits, learning is possible in dementia, as shown in previous studies (e.g. Clare et al., 2001; Bird & Kinsella, 1992, Camp et al, 1993). Participants had more difficulty in retrieval of names for novel faces compared to famous faces, especially when using free recall as a testing modality. Nevertheless, retrieval of names for *both* novel and famous faces was more successful when using cued recall and recognition tests, compared to free recall. Learning the names of famous faces may have been more successful due to the fact that prior familiarity, even in the absence of explicit recall at baseline, may have facilitated learning and/or subsequent retrieval. Such learning methods thus appear to be more effective where the face-name associations are already stored (although difficult to access) compared to learning new face-name associations. However, access to stored knowledge and newly learnt knowledge appears to be facilitated by cues, both in cued recall (where initials may cue correct recall of a name) and recognition (where presentation of the name may cue correct discrimination in a choice of three faces). This concurs with previous studies where preserved implicit memory in dementia is demonstrated in tasks of perceptual repetition priming (Keane et al, 1991; Carlesimo et al, 1998) and access to stored knowledge is facilitated by cues (e.g. Herlitz & Viitaten, 1991).

However, the contribution of residual explicit memory remains unclear as novel association learning was also evident. A problematic feature in discussing the nature of the underlying mechanisms involved in learning is that the terms 'implicit memory' and 'explicit memory' are sometimes used to describe experimental *tasks* (e.g. Hunkin et al., (1998) defined cued recall as an explicit task and word fragment completion as an implicit task) as well as memory systems and *processes* (e.g. Schacter (1987) described a dissociation between an implicit memory system and an explicit memory system). Thus, when memory impaired people, such as those with dementia, successfully recall novel face-name associations, a dilemma in interpretation occurs. Novel association learning was successful in the present study, particularly when using cued recall and recognition as testing modalities. If it is assumed that these testing modalities are explicit memory tasks, then equating this explicit task as a measure of explicit memory requires there to be some form of explicit memory that is not destroyed by dementia. In early-stage dementia evidence does suggest that explicit memory is impaired but not totally destroyed, but it has not been popular to emphasise this residual memory in research (e.g. Greene, Baddeley and Hodges, 1996). It has been more popular to suggest that explicit responses depend on implicit memory (Baddeley and Wilson, 1994) or information acquired by implicit memory is transferable for subsequent access by explicit memory (Hunkin et al., 1998). The debate concerning the underlying mechanisms involved in learning in dementia is clearly a complex one and needs further exploration.

It was postulated that errors in learning are a disadvantage for memory-impaired individuals as they depend more on their intact implicit memory which cannot distinguish between correct and incorrect responses thus errors are likely to be repeated and strengthened (Baddeley and Wilson, 1994). EL was thought to be beneficial only for tasks where implicit memory can be used to strengthen pre-existing associations and it was suggested that it may not be so useful for tasks that require explicit memory, such as novel association learning EL (Baddeley and Wilson, 1994; Evans et al., 2000). In contrast to this, Squires, Hunkin and Parkin (1997) and Squires et al. (1996) have demonstrated that EL can be used to teach novel association learning with memory impaired participants who have amnesic syndrome, as found in the present study with people with dementia. However, the problem in interpretation has arisen here once again because researchers (Evans et al., 2000; Squires et al., 1996) have equated explicit tasks with explicit memory processes leading, them to the conclusion that better performance following EL must reflect residual explicit memory.

These issues concerning the underlying mechanisms involved in learning, will be discussed in more detail later, but it is sufficient to conclude at this point that when *all items* were tested by free recall, cued recall and recognition, each learning method was effective. Furthermore, new learning was achieved for novel associations and relearning of old associations was successful. This is encouraging in terms of providing benefits for people with dementia by researching methods that facilitate cognitive rehabilitation. A crucial part of this process is thus to establish *which* factors within cognitive rehabilitation learning techniques actively facilitate learning.

4.2.2 Is learning facilitated more effectively using effortful and/or errorless methods and are new learning and re-learning facilitated by the same, or different, methods?

Results demonstrated that there was no significant variation in efficacy between each of the four learning methods when *all items* were tested by free recall, cued recall and recognition, and thus each learning method was effective. However, when learning the names of novel faces was separated from relearning the names of famous faces, different methods were shown to be more effective for each. Forward cues appeared to be the most efficacious method for learning names of *novel faces* and target selection appeared to be the most efficacious method for learning names of *famous faces*. Both forward cues and target selection were observed as errorful methods whereas vanishing cues and paired associate were considered to be EL methods. Thus it appears that errorful methods are more beneficial for learning face-name associations for people with AD.

Such results conflict with research where errorful learning is shown to be less beneficial for learning with memory impaired people than EL (Baddeley and Wilson, 1994; Evans et al., 2000). Errors in learning are thought to be a disadvantage for memory-impaired individuals as they depend more on their intact implicit memory which cannot distinguish between correct and incorrect responses thus errors are likely to be repeated and strengthened (Baddeley and Wilson, 1994; Evans et al., 2000). However a number of studies that used the errorless learning principle found that these methods might not be as beneficial for learning face-name associations in AD (e.g. Clare et al., 2000), as was observed in the present study. This is consistent with Cohen's theory (Cohen, 1990) where face-name associates and names are regarded as unrelated paired associates and nonwords, both of which fail to elicit priming effects in experimental studies with AD patients (Alberoni et al., 1998). Thus EL methods, as in vanishing cues, may not be as suitable for learning in AD as techniques that use residual explicit memory for learning face-name associations. Studies that have used vanishing cues with some success for learning face-name associations in AD have done so in combination with other methods such as mnemonics and expanding rehearsal (Clare et al., 1999; 2001; 2002b). However, by using combined techniques it is difficult to infer the relative efficacy that each of the components have contributed to the success of acquiring and maintaining information. Clare et al. (2003) compared expanding rehearsal with repeated presentation at regular intervals (both combined with a mnemonic strategy). The success of both strategies led to the suggestion that the effort of using a mnemonic strategy contributed to the success of these interventions. This supports the efficacy of elaborative processing and is consistent with predictions regarding effort in encoding leading to deeper levels of processing (Thoene and Glisky, 1995) although it remains unclear how much expanded rehearsal and repeated presentation may have also equally contributed to the positive effect of the mnemonic strategy.

The two EL methods used in the present study (vanishing cues and paired associate) were not as successful for learning face-name association for people with AD compared to errorful methods (target selection and forward cues). Errorlessness thus seems to be less of an important parameter when considering the efficacy of learning methods in AD, and other factors such as cognitive effort should be considered (Thoene and Glisky, 1995). Komatsu et al (2000) varied both error and effort to produce four methods of learning and found that their EL conditions (vanishing cues, paired associations) were superior to errorful conditions (initial letter, target selection) for learning face-name associations with people with Alcoholic Korsakoff's Syndrome. However, the lack of effect of the two effortful conditions (initial letter, vanishing cues) compared to the effortless methods (paired associations, target selection) was ascribed to lower scores on vanishing cues compared to the paired associate method. Results from Komatsu et al (2000) appear to support EL as more efficacious for learning face-name associations compared to effortful processes for Alcoholic Korsakoff's Syndrome, but the present study does not favour EL for those with dementia. So is it an increased amount of effort that facilitates learning in the present study? If one is to scrutinise the results of the present study and Komatsu et al.'s study with respect to effort then one must clarify what is determined by 'effort'. According to the effort hypothesis of the generation effect, it is the increased effort associated with generating a response that results in superior performance on retention tasks (McNamara & Healy, 1995). However, one problem with using this definition in experimental studies is that it is difficult to isolate the amount of effort used for a task whilst keeping all other variables constant that affect later recall. In Komatsu et al.'s (2000) study it may be debatable whether the initial letter condition was effortful as the name was given to the participant after 25 seconds if no response had been made, thus providing a more 'passive' or 'effortless' learning trial. An alternative used in the present study was forward cues (Riley and Heaton, 2000) where participants were encouraged to generate any name according to the letters revealed, starting with initials and increasing the number of letters until the correct name is generated. This was considered to be more effortful than Komatsu et al.'s (2000) initial letter condition.

However one may also question the amount of effort attributed to each learning method in this present study. Forward cues and vanishing cues were considered as 'effortful', whilst target selection and paired associations were considered as 'effortless' when designing this present study, based on Komatsu et al (2000) and Riley and Heaton (2000). For target selection, participants were given a face and five possible names.

They were asked to continue choosing a name until they chose the correct match. It is conceivable that this involved much more effort compared with the 'effortless' condition of paired association (where a face and named are simply presented together), and possibly more 'effort' than vanishing cues (where letters were removed from right to left on subsequent stages but if a name was not recognised a letter would be given thus no guessing was permitted) which was defined as 'effortful'. Thus it may be that the two errorful methods (forward cues and target selection) should also have been considered as the two most effortful methods in the present study. Benefits in learning may thus be due to *effort* required and this may outweigh the benefits of reducing errors. However, it appears that these issues rely heavily on subjective decisions based on observations, and possibly prior assumptions, by the researcher, as to the amount of effort used by the participant when processing information in each learning method. Future studies need to clarify such definitions if one is to determine which variables are most efficacious in learning face-name associations in dementia, and whether these can be replicated in other studies and generalised to real life settings.

Another important confounding variable is the amount of time spent on a task. To reduce errors in the vanishing cues and paired associate conditions, participants are presented with the name for both conditions (with subsequent removal of letters for the vanishing cues condition) and guessing is not allowed in either method. In contrast, more time is required to complete learning using forward cues and target selection as the participant has to generate possible names in forward cues and often guessed incorrectly in target selection. Benefits in learning in this present study may have been due to more processing time when learning. Perhaps time and effort are both important variables in learning, allowing deeper levels of processing (Thoene and Glisky, 1995).

Another issue that might be relevant, when considering variables that increase the efficacy of learning, is the extent to which methods focus attention on the *association* (the face-name link) rather than just the *name*. It has already been argued that both vanishing cues and paired association were considered to be more passive in this present study, and participants appeared to focus on just reading the name given. Forward cues required more effort, and participants seemed to look for 'clues' to complete the name by associating the name with the face given. Target association explicitly requires a link to be made between the face and names given in order to correctly choose a name from a choice of five. It may be that learning, in this present study, was better using forward cues and target selection, because these methods benefited from the focus of attention being on the association between the face and name when learning.

When considering important variables in learning, one must also consider both the process of learning and the tasks used in testing that learning (Jacoby, 1991). When learning the names of novel faces was separated from relearning the names of famous faces, different methods were shown to be more effective for each. Forward cues appeared to be the most efficacious method for learning names of *novel faces* and target selection appeared to be the most efficacious method for learning names of *famous faces*. It has been noted that forward cues and target selection may be considered as errorful, effortful and more time consuming, but what makes forward cues a better method for learning the names of novel faces and target selection a better method for famous faces? Forward cues could be regarded as the most effortful of the methods used and this may be necessary for learning new information in dementia. Target selection is the only method used where previous knowledge and familiarity of famous names could be used to select the correct famous name from a choice of five, by priming recognition, and possibly also discriminating the correct response by eliminating others that have been recognised. Giving a choice of answers may be more facilitative in relearning old face-name associations in dementia.

Furthermore, greater recall was achieved when participants were tested using cued recall and recognition, compared to free recall. Cued recall and recognition tests provide cues at the retrieval stage, which may also contribute to higher recall scores, according to the encoding-specificity principle (Herlitz and Viitanen, 1991). Cued recall provides initials which closely matches the first stage in learning names using the forward cues method, and recognition requires the choice of a face, having been given a name, which match similar processes used when learning in target selection.

Overall, it is likely that a combination of variables contribute to the efficacy of learning methods, and successful recall may also depend on which tests are used for retrieval. The present study supports previous studies where EL seems to be less of an important parameter when considering the efficacy of learning methods in AD, and other factors such as cognitive effort should be considered (Thoene and Glisky, 1995). These results are encouraging for cognitive rehabilitation as they support the view that learning is possible for people with AD when support is given at both encoding and retrieval (Bäckman, 1992). However, further work is required to clarify definitions of what is involved in effortful processing, isolate the factors that contribute to effective learning, and show that the effects are robust.

4.2.3 Is effective learning achieved through using implicit or explicit memory, or both?

A widely held popular belief that people with dementia cannot use conscious processing to store and retrieve information has led to a lack of research in this area, in comparison to interventions that rely on unconscious learning processes to perform implicit memory tasks (Camp et al., 1995). Preserved implicit memory in mild to moderate dementia has been repeatedly demonstrated in tasks of perceptual repetition priming (Keane et al., 1991; Carlesimo et al., 1998; Winograd et al., 1999). This experiment used the task of identifying fragmented names, in a word fragment task, as a measure that relies on implicit memory processes. An increase in perceptual identification of these names at post intervention was evident for all names in the present study. This supports previous findings of perceptual repetition priming in dementia (Keane et al., 1991; Carlesimo et al., 1998; Winograd et al., 1999) and may illustrate the use of preserved implicit memory processes. Results also demonstrated that baseline scores for identifying names of famous faces using word fragments was higher for famous names compared to novel names, which may be due to preservation of implicit memory from prior exposure to famous names. Priming effects were noted when more famous and novel names were identified at post-intervention.

However, there were no significant correlations between word fragment completion and the three explicit tests (free recall, cued recall, recognition) for each learning method for novel or famous faces. As word fragment completion was assumed to be an implicit test, it may thus be proposed that gains in learning were not facilitated by implicit memory, but may have utilised residual explicit memory. Although Hunkin et al. (1998) also found no correlation between word stem cued recall (explicit test) and word fragment completion (implicit test) and came to a similar conclusion regarding the use of residual explicit memory, there are a number of problems with this interpretation that are also of relevance to the present study. As noted previously, one problematic feature in discussing the nature of the underlying mechanisms involved in learning is that the terms 'implicit memory' and 'explicit memory' are sometimes used to describe experimental *tasks* as well as memory systems or *processes* (Jacoby,1991). The problem then arises from equating particular processes with particular tasks and then treating those tasks as if they provide pure measures of those processes. Hunkin et al. (1998) did consider the possibility that responses to both word stems and word fragments could both depend on implicit memory but that these tasks had different processing demands. However, they dismissed this on the basis that they had no evidence of such a dissociation and because another study (Rajaram & Roediger, 1993) had shown that patterns of performance on indirect tests of stem completion and fragment completion were similar following both visual and auditory studies.

It must also be noted that the majority of correlations between the three explicit tests (free recall, cued recall and recognition) were not significant. One factor that may be contributing to this is the fact that the Bonferroni correction reduces the power of finding a relationship. Although this may be improved if a larger sample was used, the lack of correlation may also be due to the fact that the implicit/explicit distinction in the tests are not so straightforward. For example, Cermak et al. (1996) have defined recognition memory as an implicit memory task, yet if this was so, the present study still shows no correlation between recognition scores and either other explicit tests (free recall, cued recall) or an implicit test (word fragment completion). Using a correlational analysis assumes that the implicit tests are a pure measure of implicit processing, and explicit tests are a pure measure of explicit processing. There may not be such a dichotomy. Rovee-Collier (1997) reviewed 25 years worth of work on the development of implicit and explicit memory during infancy and stated:

'evidence ... disputes claims that implicit and explicit memory follow different developmental lines and challenges the utility of conscious recollection as the defining characteristic of explicit memory. It seems unlikely that any simple dichotomy could adequately characterise a process as complex as memory' (p. 468) (Rovee-Collier, 1997).

Recall and recognition procedures might be capable of accessing either explicit or implicit functions. It may be possible that information may be learnt and retained using automatic/unconscious processing in AD, and this information may be automatically retrieved (implicit memory) via recall. Once activated, this information may be made available to conscious/working memory (explicit memory). Ostergaard, Heindel and Paulsen (1995) have suggested that 'seemingly unconscious cognitive processes can bias *explicit* (italics theirs) memory performance of AD…patients, whose memory is otherwise severely compromised' (p. 279) (Ostergaard, Heindel, & Paulsen, 1995).

An alternative perspective to discussing implicit-explicit *memory systems* (where each system is neuroanatomically and functionally distinct from each other (Schacter, 1987) would be to propose that the distinction reflects the *processing demands* of the different tasks on memory (Roediger, Weldon, & Challis, 1989). The processing approach argues that the majority of tests require either data-driven processing directed towards the surface features of items or conceptually-driven processing directed towards their deeper meaning. Although explicit tests *emphasise* conceptually-driven processes and implicit tests *emphasise* data-driven processes, these processes are assumed to be orthogonal to the implicit-explicit system distinction, thus it is also possible to develop implicit tests that are conceptually driven and explicit tests that are data-driven.

To overcome some of these issues a method of exploring the mechanisms underlying processes needed to be developed, which, firstly, did not assume one-to-one mapping between task and processes. Secondly, the within-task facilitatory effects of intentional and automatic memory processing must be taken into account. Finally, it must allow for the possibility of automatic components operating within an explicit recognition task (Jacoby, 1991). Jacoby (1991) has developed a process-dissociation procedure (PDP) to address these issues. The rationale underlying the procedure is that conscious control can be measured as the difference between performance when a person is trying *to* (e.g. trying to recall a word that appeared before: inclusion task) as compared with trying *not to* use information from a particular source (e.g. trying judge whether a word was seen before and thus exclude it from a task: exclusion task). For the procedure to be valid the estimates of conscious recollection (R) must be independent from estimates of automatic memory (A). Criticisms of this approach have challenged the independence assumption, again by noting correlations between R and A (Curran & Hintzman, 1997). Nevertheless, this has been shown to be a useful approach to examine the underlying processes used in learning with memory impaired participants (Torres, 2002). Torres (2002) used the process-dissociation procedure with EL and errorful learning (EF) (e.g. novel association pairs in word and picture format), and found more intentional memory in EL than EF, but automatic measures were similar in both. Torres (2002) concluded that the benefits of EL of novel association pairs by memory-impaired individuals is based on an explicit memory mechanism. The present study and other research (Thoene & Glisky, 1995; Clare et al., 2000) have not found an advantage of EL methods (e.g. vanishing cues) for people with dementia. However, the fact that novel association learning is achievable, and cognitive effort in learning may lead to deeper levels of processing (Thoene & Glisky, 1995), then one may tentatively hypothesise that PDP (Jacoby, 1991) may also find that benefits of learning in dementia may also be due to residual explicit memory. Future work needs to use this procedure to explore the underlying mechanisms involved in learning for people with dementia.

Overall, correlations used in the present study may not have been a useful method to study underlying mechanisms involved in learning. Even if relationships had been found between the measures of explicit and implicit memory, these would be difficult to interpret, and one must also consider that other confounding variables may have been involved. For example, there may have been item differences, such as familiarity of a name (although attempts were made to match novel and famous names according to frequency in a local telephone directory in the present study) that may lead to participant-item interactions whenever item differences are not equivalent across participants. Also, participant differences due to the heterogeneity of dementia, may arise where some may be more influenced by automatic memory or may even have more residual memory capacity related to others. Such confounding variables would produce biases in any correlational analysis. Furthermore, one may also then question the value of using group data, and consider the use of single case analyses to determine which methods are more efficacious for each individual.

4.3 Patterns of effective learning explored by multiple single case analyses.

Multiple single case analyses showed marked variations in learning for each participant. This individual variation provides some explanation to the fact that group analysis demonstrated no significant differences in efficacy for each of the four learning methods for all items (although there was a trend where EF learning methods produce better learning than EL methods). If cases are taken on an individual basis, however, further trends did occur. In exploring these trends, I will first of all consider those factors that appear to facilitate recall, and secondly, those factors that appear to be detrimental to recall, and lastly, relating these findings to those found in current literature.

Results demonstrated that free recall, the most ecologically valid testing modality, was a particularly difficult task for most participants after all learning methods, but all those with higher scores appeared to be aware of their difficulties, lived with a supportive carer (who helped implement strategies to overcome memory difficulties), and appeared to have good affect and motivation throughout the study. Most also had high MMSE scores (although David declined at the end of the study possibly due becoming ill and having a change in medication at the end of the study). These participants also had good cued recall and recognition of novel faces. When considering responses tested by cued recall (presenting participants with initials of the name) and recognition (identifying the correct face when given the name and a choice of three faces), most participants had ceiling effects for these tasks when items were famous faces. This concurs with previous studies where preserved implicit memory in dementia is demonstrated in tasks of perceptual repetition priming (Keane et al, 1991; Carlesimo et al, 1998) and access to stored knowledge is facilitated by cues (e.g. Herlitz & Viitaten, 1991). Furthermore 5 participants (50% of the group) showed that forward cues was one of their preferred methods of learning when recall of the names of novel faces was tested using a cued recall task. This supports previous research where beneficial effects in explicit learning were found when conditions at encoding are compatible with retrieval cues, in accordance with the encoding-specificity principle (Herlitz & Viitaten, 1991).

Nevertheless, each person's scores also varied with their own pattern of learning, each finding a variety of levels of benefit from all methods of learning.

When exploring those who were least successful at recall, Ian was noted to struggle most with the cued recall task. Ian also achieved one of the lowest MMSE scores before and after the study, reported not to watch television and may have been less familiar with famous faces compared to others, and his anxiety from the awareness of his difficulties may have detracted from his ability to focus on the tasks. Ian also appeared less able than others to recall names of novel faces when cued. Poor scores in recognising famous faces were noted for Harry and Anne, and poor recognition of novel faces were noted for Harry and Helen. Although both Harry and Anne had high MMSE scores and lived with their carer, it appeared that Anne was not as motivated to learn the names of the faces. She also had an extremely supportive spouse and appeared aware but unconcerned of her difficulties. Family photos were used with Harry in the majority of the present study (due to lack of any level of familiarity in famous faces due to 'a life of reading'), he appeared to be aware of his difficulties and he often appeared low in affect, especially when he realised a picture was a relative but could not name them. Helen also appeared to be aware of her memory difficulties, and it seemed that these difficulties caused her a great deal of anxiety.

Overall, factors that appeared to facilitate recall were: higher MMSE score, awareness of memory difficulties and implementing strategies to overcome them, living with a supportive carer, good affect, motivation, and being presented with cues to facilitate access to stored knowledge. In contrast, factors that appeared to be detrimental to recall were: lower MMSE score, lower levels of familiarity for famous faces (possibly leading to less priming throughout tasks), less motivation, unawareness of difficulties, awareness of difficulties when this led to anxiety or depression.

Although all these factors, except MMSE scores, were subjective observations throughout testing, and would benefit from explicit testing in future studies, they do highlight the heterogeneity of dementia and its emotional effects on each individual. This concurs with research that stresses the importance of taking into account individual factors such as awareness of memory difficulties, motivation and enthusiasm, beliefs and values, and psychosocial factors such as quality of marital relationship (Quayhagen & Quayhagen, 1989; Clare et al., 1999; 2000). Affective state, as an indicator of quality of life, has been largely overlooked in memory rehabilitation, however, recent research has shown that awareness of difficulties is significantly associated with the outcome of cognitive rehabilitation so that interventions may be most beneficial for people who demonstrate explicit awareness of their cognitive impairments (Clare, 2000; Clare, Wilson, Carter, Roth, & Hodges, in press). This relationship also remained robust when controlling for severity of dementia (Clare et al., in press). Due to such clinical implications, Clare and her associates have developed a scale (Memory Awareness Rating Scale; MARS) to aid assessment of awareness in dementia (Clare, Wilson, Carter, Roth, & Hodges, 2002a).

Some investigators have also emphasized the role of psychogenic denial and depression (Weinstein, 1991; Weinstein, Friedland, & Wagner, 1994), with denial hypothesized to protect against depression. However, Clare et al., (in press) found awareness was related to reduced self-report of depression for those with dementia, but greater carer report of behaviour problems in the person with dementia and carer self-report of self-depression. Observations in this present study found that those aware of their memory difficulties did better in the memory tasks (as in the study by Clare et al. (in press), but only if they seemed to be coping better with their difficulties. Support by a carer appeared to help, but with others their quality of life appeared to be more affected by dementia. One person had been an avid reader and seemed to be mourning the loss of ability and enjoyment in reading, and presented with low affect in the present study. Another person, living on her own, appeared highly anxious that her memory difficulties might affect her ability to cope independently. These latter two people did not perform well on the memory tasks. Another important variable for effective cognitive rehabilitation may thus be measures of awareness, in conjunction with some measure of the impact of dementia on quality of life.

It appeared from the present study that obtaining a higher MMSE score was related to better learning and recall. Riley and Heaton (2000) took this one stage further and noted that a forward cueing method was more effective for those with better memories, and vanishing cues was more effective for those with poorer memories. However, no such pattern was noted here. Nevertheless, the present study does highlight the need to consider people on an individual basis. It has been noted that there is considerable heterogeneity in both initial presentation and rate of progression in dementia (Bowen et al., 1997). Some individuals may initially develop mild cognitive impairment with difficulties in episodic memory, but these difficulties may not progress any further. This highlights the need for individual assessment, formulation and planning with needs varying in relation to neuropsychological profile and progression of cognitive impairments. Thus labelling a person with dementia is insufficient in establishing rehabilitation plans, which should be related to the individual needs of that person. Single case studies may be deemed more appropriate for developing and refining specific memory rehabilitation techniques.

4.4 Research Implications.

The present study showed that with appropriate support at encoding and retrieval (especially utilisation of cues), those with dementia can learn. Furthermore, new learning was achieved for novel associations and relearning of old associations was successful. When exploring the factors that may facilitate this learning it was found that EL might be less important than other factors such as cognitive effort (Thoene and Glisky, 1995). Further work may also find that it might be easier to generalise errorful learning strategies to real life settings compared to EL. EL may have generated a dependence on prompting to achieve correct responses (Jones & Eayrs, 1992), thus maintenance of the success in learning would be highly dependent on the efficacy with which a prompt is removed or faded out. Errorful procedures may not only be more effective but also more ecologically valid and generalisable to real life settings.

However, further work is required to clarify definitions involved in effortful processing, isolate the factors that contribute to effective learning, replicate these findings in further research, and illustrate how learning may be generalised to real life settings. Future research also needs to investigate the effectiveness of combining effortful learning with other features known to facilitate explicit retrieval, such as expanding rehearsal, a method where participants repeat back information they have been given at gradually increasing intervals (Camp et al., 1996; Camp & Foss, 1997). Clare and her colleagues (1999, 2000) used expanding rehearsal to teach face-name associations with AD participants. Recall was not only thought to be enhanced by expanding rehearsal, but benefits observed were maintained up to 9 months later. The present study did not incorporate follow-up data on the maintenance of learning achieved, an important factor in cognitive rehabilitation. Future work needs to incorporate follow-up data, which may also ascertain whether the rate of forgetting is different for various learning methods.

Overall, the correlational approach used in the present study may not have been a useful method to study underlying mechanisms involved in learning. Although Hunkin et al. (1998) had previously used this method of analysis to examine the relationship between their test of word fragment completion (implicit test) and cued recall (explicit test), the implicit/ explicit distinction may not be so straightforward. As in this present study, there may not be a one-to-one mapping between tasks and processes, so, for example, recall and recognition (explicit tasks) might be capable of accessing either explicit or implicit functions. Nevertheless, several factors point to the hypothesis that benefits of learning in dementia may be due to residual explicit memory: firstly, there was no EL advantage (a principle based on utilisation on preserved implicit memory (Baddeley & Wilson, 1995)); secondly, novel association learning was achieved (Hunkin & Parkin, 1995); and lastly, cognitive effort in learning may lead to deeper levels of processing (Thoene & Glisky, 1995). It would be interesting to use the PDP procedure (Jacoby, 1991) in future studies to explore the underlying mechanisms involved in learning for people with dementia. If residual explicit memory is shown to be an important factor in learning then this would emphasise the value of intervening with memory rehabilitation at an early-stage in dementia.

4.5 Clinical Implications.

It is important to consider how research findings may be incorporated into interventions for people with dementia. One may question the value of using group data, as averaging scores across all participants extinguishes the ability to identify differences in learning patterns for each individual. One should consider the use of single case analyses to determine which methods are more efficacious for each individual. The disadvantages of using group data, to hypothesise factors that would benefit group training in dementia, and advantages in exploring single cases, to establish individually designed interventions, are also reflected in two strands of interventions. Interventions in early-stage dementia have typically followed cognition-focussed approaches that involve either *cognitive training* or *cognitive rehabilitation.* Cognitive training involves guided practice on a set of standardized tasks that vary in difficulty according to severity of cognitive impairment. These training tasks aim to address specific aspects of cognition, such as memory, language, attention or executive function. In contrast cognitive rehabilitation involves individually-designed interventions which address everyday practical difficulties identified by the person with dementia and/or their caregiver (Clare, 2003).

To date, the main emphasis has been on cognitive training, but recent reviews (Clare, in press; Clare, Woods, Moniz-Cook, Orrell, & Spector, in press) demonstrate that evidence for the benefits of such approaches, compared to individually-based interventions, is weak, and any gains do not generalise well. Clare et al. (in press) carried out a systematical review of random controlled trials (RCTs) of cognitive training for people with early-stage dementia, which also identified a number of methodological limitations that apply to the group analysis in this present study. One limitation may be that of low statistical power due to small sample sizes, and thus it would be advisable to replicate studies with larger sample sizes. Insufficient duration and intensity of intervention may also be a limitation. One confounding variable that may have influenced the efficacy of forward cues and target selection may have been the greater time taken to complete these training methods. However, factors such as these may be difficult to overcome from a practical perspective, as increasing the number of participants and time involved in learning, pose practical difficulties. The present study required a substantial investment in time to complete, considering that about eighty one-to-one contacts were required, each taking approximately two hours and most being home visits to ensure regularity. In clinical practice, implementing such an approach would be very time consuming and professionals may be reluctant to integrate this into their busy clinical schedules. Time must also be given to deal with any emotional reactions that may arise in the course of rehabilitation interventions (Prigatano, 1999). Furthermore, if learning approaches are not individually tailored to the person then motivation to complete the training by the participant may also falter.

When considering how to overcome some of these difficulties, there appear to be two main components that need to be incorporated into peoples' care: firstly, there is the need to explore which learning method is most efficacious for the individual, and secondly, to incorporate those methods into everyday situations to help with daily memory difficulties. The present study highlighted the fact that it is the first stage in this process that takes considerable time for both professionals and participants. However, at this stage each participant is using all the learning methods, in an attempt to find which factors facilitate them most, so this stage could be manualised (or even computerised). Some professionals may be reluctant to incorporate this stage of cognitive rehabilitation into their busy schedules, but staff at the day Hospital (e.g. nurses) did state an interest in learning new ways to approach cognitive rehabilitation. Carers also seemed to be very keen in finding ways to help. Staff and carers could be trained to follow a manualised approach to using the learning methods and explore the factors that facilitate learning for the person with dementia. Once these factors have been identified, individually-tailored methods of learning could be taught with the person with dementia, who could practice these using personally chosen items at home on their own, or supported by a carer. Progress in learning, and any change in affect, could be monitored at the day hospital throughout this process.

Group analysis in the present study was useful in determining some factors that may facilitate learning in dementia. However, multiple single case analyses highlighted the heterogeneity in learning patterns for all participants and the need to consider the social and interpersonal context for effective rehabilitation. High MMSE scores appeared to facilitate recall, but other social and interpersonal factors that seemed to aid recall were also observed, namely: awareness of memory difficulties and implementing strategies to overcome them, living with a supportive carer, good affect and motivation. Although awareness seemed to facilitate learning, this appeared to be negated if coping strategies had not been implemented, and quality of life had reduced. Another important variable for effective cognitive rehabilitation in future work may thus be to use a measure of awareness (e.g. MARS: Clare, Wilson, Carter & Hodges, 2002a), in conjunction with some measure of the impact of dementia on quality of life. Outcome measures should also include social functioning and positive affect.

4.6 Conclusion.

The present study supports the view that people with dementia can benefit from various memory rehabilitation procedures and successful learning can take place given appropriate conditions and support. The findings in the present study are also valuable as they demonstrate that novel association learning was achieved (Hunkin & Parkin, 1995) but EL might be less important than other factors such as cognitive effort, the time taken whilst learning, and focusing on the face-name association whilst learning. All these factors may lead to deeper levels of processing (Thoene and Glisky, 1995). Such findings led to the proposition that residual explicit memory may facilitate learning, but as there may not be such a dichotomy between implicit and explicit memory it remains unclear whether explicit or implicit memory, or both, facilitated such learning. Work using the process dissociation procedure (Jacoby, 1991) may help to clarify this debate in the future.

Although this research must be regarded as a precursor to more extensive replication with further group studies, the importance of the individual must not be overlooked. The present study also gave valuable insight into the heterogeneity of participants with dementia, and how effective learning may be better achieved by those more aware of their difficulties, who have implemented coping strategies, have a supportive caregiver and are motivated to learn. A holistic approach is required which acknowledges the interactions between cognitive, emotional and motivational aspects of functioning, and integrates these within a social and interpersonal context. The present study emphasises the fact that research from group data can provide professionals with a range of tools to explore which factors may be important for learning for those with dementia. However, the challenge for the future would be to utilise this information to develop intervention protocols that are individualised, effective to specific needs and generalisable to every day life settings.

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Appendix A

Local Research Ethics Committee

Approval Letter

North Central London NHS
Health Authority

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Chair Marcia Saunders
Chief Executive Christine Outram

19 July 2002

Miss Josephine Dunn
Trainee Clinical Psychologist
Sub-Department of Clinical Health Psychology
University College London
Gower Street, London WC1E 6BT

Dear Miss Dunn

57 02 - Learning of Face-Name Associations Using Errorless and Effortless Processes for People with Dementia

Acting under delegated authority I write acknowledge receipt of your letter dated 8th July 2002 and the enclosed amendments and inform you that there is now no objection on ethical grounds to the proposed study. I am therefore happy to give you the favourable opinion of the LREC on the understanding that you will follow the conditions set out below:

Conditions

- You do not undertake this research in a NHS organisation until the relevant NHS management approval has been gained as set out in the Framework for Research Governance in Health and Social Care.
- You do not deviate from, or make changes to, the protocol without prior written approval of the LREC except where this is necessary to eliminate immediate hazards to research participants, or when the change involves only logistical or administrative aspects of the research.
- You send an interim report to this LREC in one year's time or when you have completed your research or if you decide to terminate it prematurely.
- You advise this LREC of any unusual or unexpected results that raise questions about the safety of patients taking part in the research.

Please quote LREC number 57/02 on any future correspondence.

With best wishes.

Yours sincerely

pp Susan Okamp (19/6/03)
Christine Hamilton
LREC Co-ordinator, Barnet Enfield & Haringey
North Central London Health Authority

Appendix B

Information Sheet

Sub-Department of Clinical Health Psychology
UNIVERSITY COLLEGE LONDON
GOWER STREET LONDON WC1E 6BT

TAKING PART IN RESEARCH

DOES THE EASE IN WHICH WE RECALL SOMEONE'S NAME DEPEND ON HOW THAT NAME HAS BEEN LEARNT?
WHAT IS THE BEST WAY FOR ME TO LEARN THINGS?

INFORMATION FOR PARTICIPANTS

You are invited to take part in a study, which will look at four different ways of learning people's names. Some of the techniques may be easier to use but they may not be the ones that help you most in remembering the names. Memory rehabilitation is relatively new for those with Dementia and not much is known about which are the best techniques to use. This study aims to find out what techniques are most useful and why. We hope that the information obtained will enable us to better understand the processes involved in helping memory difficulties for people with dementia and thus provide better support and rehabilitation programmes. We will also be able to give you information on which learning method you do best with. As an added extra you can try using this method to learn your own choice of names and see if this helps and is useful.

PROCEDURE

The study will take place over six sessions (approximately twice a week for three weeks) either at the [redacted] Day Hospital or I can visit you at home. These sessions will each last about 30 minutes and will involve learning names of 8 famous faces using four different methods. Thus 24 names will be learnt in total, and some faces may be more familiar to you than others to start with. You will be given feedback on which technique works best for you and also given the option to try this out for yourself.

CONFIDENTIALITY

All material will be held in confidence, and will only be used for research purposes. All results will be anonymous and treated confidentially. No-one who agrees to take part in the study will be identifiable in any research report, including the final report if the study is published.

TAKING PART IN THE STUDY

You do not have to take part in this study if you do not want to. If you decide to take part your GP and Consultant may be informed but you may withdraw at any time without giving a reason. You can also decide not to participate on any particular day if you do not want to, but still participate at a later stage. If you do decide not to take part, or withdraw at a later stage, this will in no way effect your treatment or support at the [redacted] Day Hospital or any other aspect of your care.

EFFECTS OF TAKING PART IN THE STUDY

It is expected that taking part in the study should be a pleasant experience. However, should you find any part of the experience distressing, professional help and support from the [redacted] Day Hospital will be made available to you.

FURTHER INFORMATION

If you would like to know more about the research project, or would like to contact the researchers, Jo Dunn & Dr Linda Clare, for any other reason, they can be reached at the address above. You may also call Dr Linda Clare on 02076791844, or Jo Dunn on 07905943654, or Ms Sue Okell, Clinical Psychologist at Chase Farm Hospital on 02089675988. This study has been approved by the Barnet & Haringey Health Authority Local Research Ethics Committee.

Appendix C

Consent Form

Sub-Department of Clinical Health Psychology
UNIVERSITY COLLEGE LONDON
GOWER STREET LONDON WC1E 6BT

Centre Number:
Study Number:
Patient Identification Number for this trial:

CONSENT FORM

Title of Project: **Learning of Face-Name Associations Using Errorless and Effortful Processes**

Name of Researcher: Josephine Dunn

Please initial box

1. I confirm that I have read and understand the information sheet dated .... for the above study and have had the opportunity to ask questions. ☐

2. I have had the opportunity to discuss the study with an independent person, (e.g. *relative/ advocate/* other *responsible* person). ☐

3. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. ☐

4. I am willing to allow access to my medical records but understand that strict confidentiality will be maintained. The purpose of this is to check that the study is being carried out correctly. ☐

5. I agree to take part in the above study. ☐

______________________	______________	______________________
Name of Participant	Date	Signature

I have explained the nature, demands and foreseeable risks of the above research to the participant.

______________________	______________	______________________
Name of Person taking consent (if different from researcher)	Date	Signature
______________________	______________	______________________
Researcher	Date	Signature

1 for participant; 1 for researcher; 1 to be kept with hospital notes

Appendix D

Famous and Novel Names

Table 6: Famous and novel names used in the present study (each matched by gender, length and frequency).

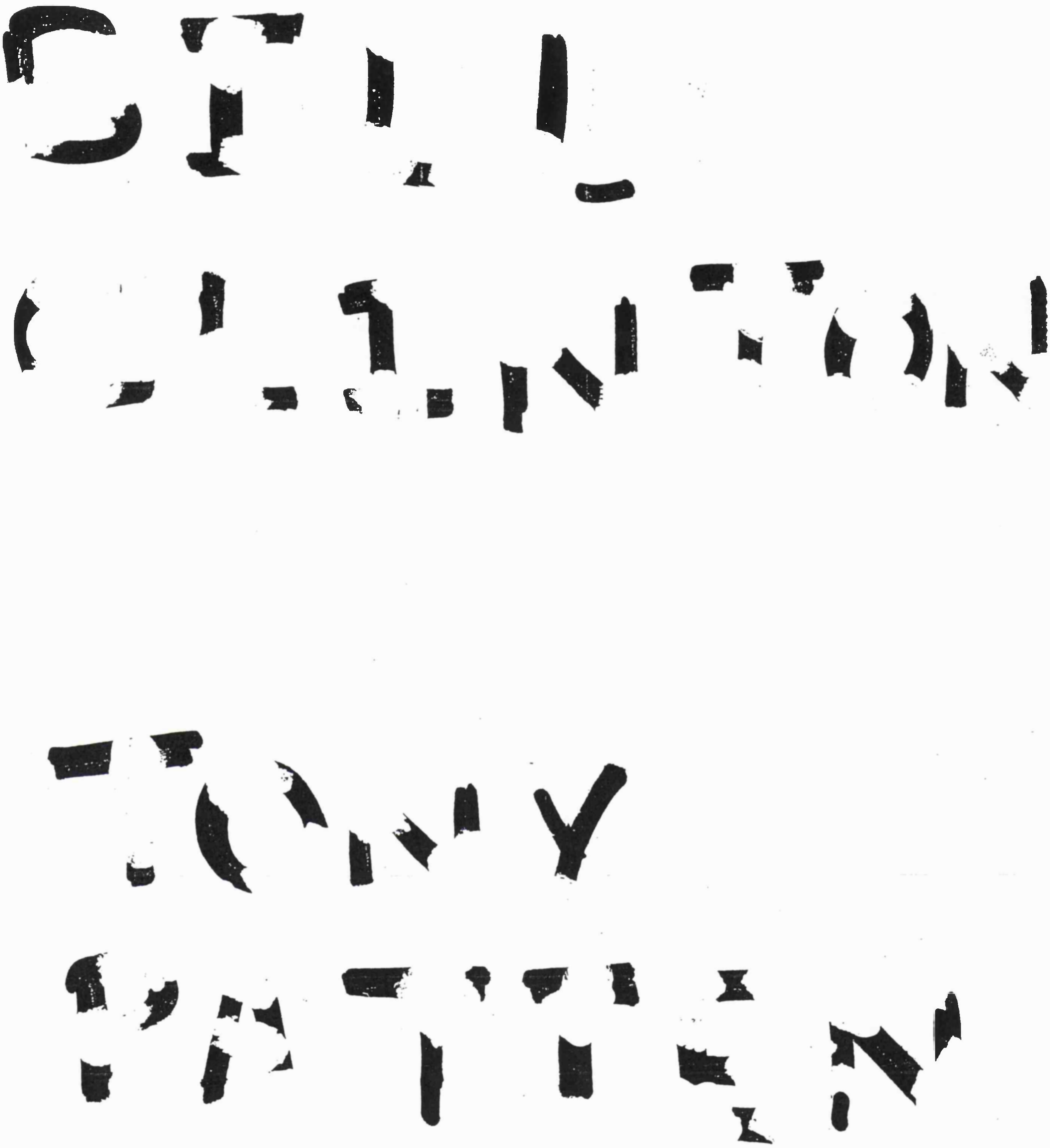
Famous Names	Novel Names
Albert Einstien	Duncan Gleason
Eric Morecombe	Nigel Needell
Ian Botham	Mark Hodder
John Major	Paul Newell
Neil Kinnock	Brian Sarman
Ronald Raegan	Douglas Maredan
Michael Barrymore	Graham Torrington
Terry Waite	Simon Lord
Jimmy Carter	Stephen Johnson
Gordon Brown	Derek Jones
Harold Wilson	Rodney Turner
Terry Wogan	Graham Ferrin
Michael Caine	Edward Grew
Steve Davis	Charles Hughes
Richard Branson	Jeffrey Chafer
Bill Clinton	Tony Patten
David Frost	Peter Leigh
Noel Edmunds	Sean Mullan
Gerry Adams	Andrew Hunt
Martin Clunes	Robert Graines
Chris Evans	Jack Thomas
Arthur Scargill	Justin Hutley
Sid James	Ben Morris
Michael Foot	Edward Bourke
Cliff Richard	Josh Sayers
Bob Geldof	Dave Kinlock
Tom Cruise	Jim Garson
Rohan Atkinson	Barry Preston
Michael Heseltine	Richard Edmondson

Appendix E

A Famous Name and a Novel Name

as a

Word Fragment


GILL
CLINTON
TONY
PATTEN