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# An Investigation into the Learning and Memory Processes of Children with Moderate Learning Difficulties: Under which conditions do MLD children use learning and recall strategies?

by

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**Dawn B. Male, August 1992**

# Abstract

Studies into the recall performance of children with moderate learning difficulties (MLD) have consistently and repetitiously shown that, where strategies are needed, these children perform deficiently when compared to typical children of the same age.

The present study challenges these findings by demonstrating that MLD children *can* spontaneously engage in active and effective strategic behaviour, providing that the task requirements are effective in eliciting these skills.

The notion of "Task Authenticity", as perceived by the memorizer, is presented to explain why some tasks, and not others, are effective in eliciting strategies already at the disposal of the MLD memorizer.

Further study of the notion of "Task Authenticity" from the perspective of the memorizer reveals a taxonomy of authentic features which, when incorporated into recall tasks, will be effective in prompting the employment of mnemonic strategies to aid recall. Six factors are identified: real-world relevance, personal relevance, concrete materials, practical engagement, sensory appeal and game format.

Findings from the final phase of the study, which compares spontaneous strategic employment by MLD subjects across authentic

and non-authentic tasks, support and extend previous findings which indicated that MLD subjects *were* capable of spontaneously engaging in active and effective strategic mechanisms for authentically-perceived tasks, but not for tasks of a discrete, de-contextualised or rote-type nature.

The practical implications of these findings are discussed in the final chapter and a classroom-based instructional model is proposed.

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# An Investigation into the Learning and Memory Processes of Children with Moderate Learning Difficulties

## Introduction

The present study focuses on the learning and memory processes of children with moderate learning difficulties (MLD) and aims to investigate under which conditions MLD children *spontaneously* will adopt learning and recall strategies.

The aim of investigating *conditions* for strategic employment in MLD children may be viewed with scepticism, since the literature reviews which follow this first chapter will indicate that previous research has been consistent in demonstrating that the failure *spontaneously* to employ learning and recall strategies is one index or property of children with learning difficulties.

## Organizational Scheme: The Chapter

A logical prerequisite for the task of investigating memory and learning processes is the establishment of an adequate definition of the terms. Similarly, since the study is couched within an information processing framework, the need for an overview of the theory is indicated and is therefore included in this introductory chapter.

A statement of difficulties specific to the learning and recall processes of MLD children will also be made, together with a statement of approach of the present study.

Finally, by way of orientation, an outline of the organizational scheme of the study as a whole concludes this first chapter.

Let us begin, however, by describing the children.

## Moderate Learning Difficulties Defined

The focus of the study is on those children who, until a decade or so ago, would have been labelled "educationally subnormal", "remedial", "slow-learners" or "backward". In America they are described as being educable mentally retarded (EMR).

The Warnock Report (1974), mindful of the growing unease concerning the labelling of children by handicap, recommended the abolition of the existing categories into which "special" children had hitherto fallen and proposed instead the generic concept of "learning difficulties". The report went on to recommend that learning difficulties should be distinguished between mild, moderate and severe, with the latter two groups approximating broadly to the existing special school population. Whilst acknowledging that there will be considerable overlap between the groups, it is with this middle group - those described as having moderate learning difficulties - that this study is concerned.

In psychological terms, the notion of moderate learning difficulties is associated with a relative deficit in general intellectual functioning or, when defined according to test score, a measured intelligence quotient (IQ) which falls two standard deviations below the population mean. Children described as having moderate learning difficulties, therefore, would have a tested IQ of about 70 or less. In practice, within the special school population such children's tested IQs usually fall within the 55 - 70 range.

According to enquirers such as Robinson and Robinson (1970) the schedule of development in children with moderate learning difficulties is delayed, therefore the MLD child will perform more like a younger, intellectual peer than a same-age typical[1] peer. Thus, in addition to IQ differences, children with moderate learning difficulties of a given chronological age (CA) are characterized by having a lower mental age (MA) than typical children of the same CA.

Whilst psychometric descriptions of MLD children have defined them in IQ terms, in performance terms MLD children are associated with a relative lack of success in the areas of memory and learning, particularly in relation to the recall of school-type tasks.

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[1] The descriptor "typical" is used throughout the study to indicate an absence of learning difficulties, in preference to the more frequently used descriptor "normal".

## Memory and Learning Defined

For the purposes of the present study, the terms "memory" and "learning" are thought to be intimately related and inseparable. This notion of the inseparability of memory from other higher mental processes has, according to Brown (1975), an "honourable history" which pre-dates the conception of psychology as a science and which is endorsed and reaffirmed by enquirers such as James (1890) through to Flavell (1985). A synthesis of the beliefs of these enquirers is that human memory is a convenient descriptive term for a collection of cognitive processes which may be distinguished from other higher mental processes only by the belief that the memorizer is reconstructing the past and for which "learning" is sometimes a good synonym.

The three forms of knowledge which have been studied under the general rubric of "memory phenomena" offered by Brown (1975) and referred to as *"knowing"*, *"knowing about knowing"* and *"knowing how to know"* provide useful conceptual notions by means of which to structure the initial stages of the present investigation.

## Stages of Memory

At the simplest level, memory can be conceived as including three stages: encoding, storage and retrieval. *Encoding* refers to the acquisition of the original input, the registration of experience through sensory receptors, and its initial coding by the central

nervous system. *Storage* involves holding, or retaining, information which has been encoded; retaining is the process by means of which the effects of learning persist through time. *Retrieval* refers to finding or gaining access to material which has been stored; retrieval is the process by means of which the effects of past learning manifest themselves in the present. Retaining and retrieving are implicit in learning. No retaining can occur in the absence of learning, since without learning there would be nothing to retain. Similarly, retaining is a necessary pre-condition for retrieving, since without it there would be nothing to retrieve. Thus, memory could be considered to be what makes learning, or the acquiring of skills and knowledge, profitable.

## Information Processing Theory

In order to acquire skills and knowledge the learner (or memorizer) is required to be much more than a passive receiver of information. Information processing is a theoretical and practical framework which takes into account the stages of the memory-learning process, together with the active and constructive role of the learner. It describes the attainment of concepts and reasoning skills in terms of how information is acquired, organized, stored, retrieved and used.

Although the stages of information processing are not directly observable, researchers and theoreticians have isolated and defined the component parts that underlie information processing theory.

An analysis of the stages is typically given in flow-chart form. Illustrative of this is the Atkinson-Shiffrin model summarized below.

## The Atkinson-Shiffrin Model

Atkinson and Shiffrin (1968) proposed an explicit analogy between human minds and digital computers. The model (shown schematically in Fig. 1) begins with a distinction between structural features of memory and control processes.

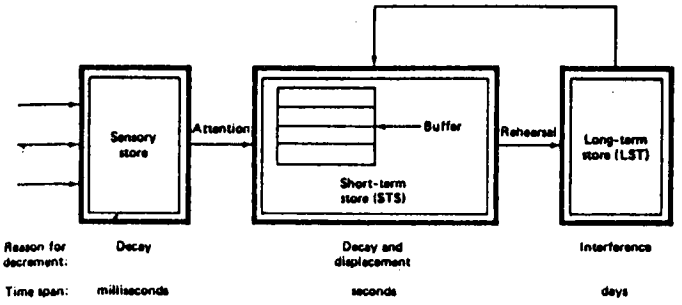


**Fig. 1**
**The Atkinson-Shiffrin Model**
**(from Robinson & Robinson, 1970, p. 287)**

Structural features (akin to the hardware of a computer) define the parameters within which information can be processed at a particular stage. They consist of the basic architecture of memory and the fixed operating characteristics of each system within it. As such, they are considered to be inborn, inflexible and constant across individuals. Memory architecture, according to Atkinson and Shiffrin, includes sensory store and the short- and long-term stores.

Control processes (akin to the software of a computer system) are viewed as learnable, flexible and variable across individuals and are thought to influence the workings of all three stores, subject to each store's structural limitations.

In the Atkinson-Shiffrin model information is assumed to pass through a series of "boxes" or "stores" before it can be committed to permanent memory. Incoming information first enters the sensory store, which features a large capacity but from which information is rapidly lost. The sensory store registers the information, but only that to which the memorizer attends passes into a short-term store (STS), where a small amount of information can remain for a relatively short time (about thirty seconds) before being lost through fading or decay, unless a deliberate attempt is made to maintain it (for example, by means of rehearsal).

According to the model, the STS contains a buffer mechanism capable of handling only a few items of information. Of the material retained in the buffer, some passes into long-term store (LTS), some is displaced and some decays. The longer the information remains in STS and/or the better it fits with material already in LTS, the more likely it is to be transferred to LTS and to be remembered permanently. Thus, incoming information is heavily dependent on the efficiency of the coding processes brought to bear upon it in order that it can be readily tagged and related to the meaningful organization existing in LTS.

In the Atkinson-Shiffrin model no provision for true forgetting or the erasing of information in the LTS is made. Whether the material is retrievable from LTS, however, depends upon a number of factors. These include the effectiveness of the coding system under which it was stored in the first place and the appropriateness of the environmental conditions under which the memorizer tries to remember.

## Learning and Memory Processes of MLD Children: A Statement of Difficulties

Whilst the Atkinson-Shiffrin model is essentially a "memory" model, it will be noted that it might serve equally well as a "learning" model: the two areas in which children with moderate learning difficulties have consistently and repetitiously been shown to demonstrate deficiencies. In seeking to account for this deficiency enquirers have made use of the distinction between the structural features of the memory system and the associated control processes described above.

Structural features, it will be recalled, are fixed and unchangeable, whilst control processes are optional and voluntary. As such, control processes are susceptible to training, whilst structural features are not. Thus, if a deficiency responds to training, control processes are assumed to be implicated. If a deficiency does not respond to training, however, the inference is that structural differences are implicated (e.g. Campione and Brown, 1977).

Whilst early approaches emphasized structural deficiencies in MLD children, a review by Campione and Brown (1977) reports that no structural deficiencies have been demonstrated clearly and thus the research evidence remains non-confirmatory.

Contemporary approaches, however, have produced a plethora of evidence to demonstrate that differences in learning and recall performance between MLD and typical children are attributable, at least in part, to a failure on the part of MLD children spontaneously to utilise memory system control processes for tasks where it would be appropriate to do so.

Consistent with the control process (or strategy) deficit notion are the results[2] from training studies which indicate that many of the learning and recall deficiencies of MLD children are at least partially remediable. In research terms these results have provided the rationale for the proliferation of strategy training studies witnessed in recent times.

Whilst the results of the training studies appear encouraging, several major problems are indicated: only very intensive, task-specific and explicit training is effective, durability is not impressive, generalization is rarely achieved and initial MLD-typical differences, whilst being reduced, are not eliminated.

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2 Reviewed in a subsequent section.

## The Approach of the Study

Whilst accepting that differences between MLD and typical subjects are observed mainly when some active strategy is needed, it is with the characterization of the MLD child as failing *spontaneously* to utilise strategies that the present investigation is at variance and proposes instead the notion that the MLD child *can* spontaneously employ learning and recall strategies which are effective in *eliminating* differences *providing that the task requirements are effective in eliciting these skills.*

The aim of the study, therefore, is to identify the conditions under which children with moderate learning difficulties spontaneously will employ the range of strategies *already* at their disposal. A necessary prerequisite, of course, will be to demonstrate that MLD children *can* spontaneously use strategies.

## Organizational Scheme: The Study

The study is divided into two parts. Part 1 of the study aims to fulfil a scene-setting role and comprises a selected overview of the developmental memory and metamemory literature, followed by a review of the MLD memory strategy employment and training literature.

Part 2 comprises a case study, followed by the research study itself, which in turn is divided into five phases. These five phases are

described in greater detail in the introduction to Part 2 of the study. First, an overview of the developmental memory literature.

# Chapter 2: The Development of Memory An Overview of the Literature

*(i) The Development and Training of Rehearsal as a Strategy*

*(ii) The Development and Training of Organization as a Strategy*

*(iii) The Development and Training of Elaboration as Strategy*

*(iv) The Development and Training of Study Strategies*

*(v) The Development and Training of External Mnemonic Strategies*

*(vi) The Method of Loci*

## The Development of Memory: An Overview of the Literature

According to Eysenck (1984) there is overwhelming evidence to suggest that the ability to retain information increases considerably during the years of childhood. Similarly, Ornstein and Naus (1978) maintain that one of the most consistent findings in the field of memory development is that older children recall more than younger children. Kail (1979), meanwhile, encapsulates these notions in the phrase:

"... put quite simply, memory develops." (page 2)

The consistency of the finding that the ability to remember develops over time prompts the question: "What develops?" In reply, Siegler (1983) proposes that:

"The ... frequently cited answer to the question "What develops?" is strategies." (page 167)

Similarly, Harris (1978) notes that:

" ... one could claim that there really is no change during development in the basic capacity of memory. Instead, as children get older, they put their memory systems to work in a more strategic fashion." (page 133)

Thus, according to the research literature, age-related increases in memory performance are seen to be mainly a function of the development of strategic behaviour.

## The Development of Mnemonic Strategies

Unlike the notion of human memory, where problems of definition persist, when it comes to defining mnemonic strategies a fair degree of consensus appears to have been reached.

Flavell (1977) defined strategies as a range of highly conscious, deliberate and planful activities a person may voluntarily carry out as a means to various mnemonic ends, whilst Brown (1975) maintains that strategies are voluntary, purposeful moves made by an individual in an effort to enhance some desired mnemonic outcome. Ashman and Conway (1989), meanwhile, propose that a strategy is a conscious or automatic cognitive act that enables information to be stored in, or retrieved from, memory whilst Schneider and Pressley (1989) suggest that strategies are potentially conscious and controllable activities which are intended to achieve cognitive purpose such as comprehending or memorizing.

In short, mnemonic strategies are about "knowing how to know" (Brown, 1975) or "learning how to learn" (Deshler and Schumaker, 1986) and are employed to facilitate the attainment of various mnemonic goals (Naus and Ornstein, 1983).

Brown (1975) maintains that there exists a hierarchy of strategies from simple processes like rote rehearsal to elaborate attempts to extract or impose meaning and organization on unorganized and meaningless stimulus material. Below, a selection of studies which

typify the research literature into the most frequently examined strategies of rehearsal, categorization and elaboration are considered. Study strategies, the method of loci and the employment of external mnemonic strategies will also be examined briefly.

## The Development and Training of Rehearsal as a Strategy

Rehearsal - viewed as perhaps the simplest strategy that can be used as a deliberate memory aid - is a process by which information in short-term memory is continually "refreshed" by means of verbal repetition, either overtly or covertly, of the to-be-remembered stimuli (Dempster, 1981). The importance of rehearsal is twofold: firstly, it maintains information in short-term memory by ensuring a high level of activation and, secondly, it facilitates the transfer of information to long-term memory. Without rehearsal, material may quickly be lost from short-term memory.

According to Kail (1979), rehearsal can take many forms; the simplest form would be a type of repetitive inner speech involving the overt naming of a single stimulus ("3-3-3"), graduating to the intermediate form of the cyclical naming of a set of stimuli ("3-6-8, 3-6-8") and the even more complex form of generating associations for a stimulus and then repeating both the association and the stimulus ("3-6-8 is my telephone code, 3-6-8 is my telephone code"). Similarly, Craik and Lockhart (1972) have suggested there are at least two types of rehearsal. The first type, called maintenance rehearsal, involves simple repetition of the stimuli (the "3-3-3" cited

above) whilst the second type, called elaborative rehearsal, involves creating elaborate codes for the stimuli before repetition (the "3-6-8-is my telephone code" cited above).

Components which make up an act of verbal rehearsal are the ability to recognize, vocalize and repeat stimulus names quickly, fluently and accurately and the ability to keep constant track of where one has been and where one is going in the execution of the rehearsal plan. Measures used to investigate the rehearsal process include inter-item pause times during the learning of a list; labial movements measured either by electromyographic recordings or by a trained lip-reader; overt rehearsal (with the subject being required to rehearse aloud); and the primacy effect[3] in serial position curves.

Using a lip-reading of semi-covert verbalization technique, Flavell, Beach and Chinsky (1966) showed that the likelihood of a subject spontaneously rehearsing increased sharply during childhood, with rehearsal being seen with some regularity at about seven years of age. In the Flavell et al. study, children aged 5, 7 and 10 years were shown seven pictures of common objects. The experimenter (a trained lip-reader) pointed in turn to up to five pictures which the child was then required to recall after a fifteen second delay; rehearsing the names of the objects during the delay would presumably aid recall. Two findings emerged: firstly, the older children remembered the pictures better than the younger children

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[3] Expanded on in a subsequent section of the present study.

and, secondly, the number of children who spontaneously rehearsed during either immediate or delayed recall increased with age. Thus, 10% of 5-year-olds, 60% of 7-year-olds and 85% of 10-year-olds showed detectable verbal rehearsal.

Using the same procedure with 6-year-olds (a transitional stage at which some children would be expected to have developed a tendency to rehearse and some would not) Keeney, Cannizzo and Flavell (1967) found that children who spontaneously rehearsed recalled more than children who did not. Similarly, in terms of a rehearsal-recall relationship, Rundus (1970) found a positive correlation between overt rehearsal and free recall in adults, whilst Hagen (1971) reports that 5-year-olds tested in an induced rehearsal condition recalled more than those tested in a simple labelling condition.

After minimal instruction and demonstration by the experimenter, former non-rehearsers in the Keeney et al. (1967) study were capable of rehearsal and once induced to do so improved their retention accuracy to the level of spontaneous rehearsers. Surprisingly, when the experimenter ceased instructing, more than half of the former non-rehearsers abandoned the strategy and reverted to the status of non-rehearsers. Similarly, Hagen, Hargrave and Ross (1973) also noted that when the experimenter stopped prompting children to rehearse, their recall declined to the level of children who had never been taught to rehearse.

A qualitative analysis of the rehearsal activity of 8-, 11- and 13-year-olds conducted by Ornstein, Naus and Liberty (1975) demonstrated that the different age groups were rehearsing in quite different ways. The 8-year-olds, for example, tended to rehearse each to-be-remembered item as it was presented, either alone or with a few other items whilst the older subjects, in contrast, were more active, with several different items being intermixed in each rehearsal set. These differences are depicted in Table 1.

**Table 1**
**Typical Rehearsal Protocols**

| Word | 13-year-old | 8-year-old |
|---|---|---|
| Yard | yard,yard,yard | yard,yard,yard,yard |
| Cat | cat,yard,yard,cat | cat,cat,cat,yard |
| Man | man,cat,yard,man, yard,cat | man,man,man,man,man |
| Desk | desk,man,yard,cat, man,desk,cat,yard | desk,desk,desk,desk |

(From Ornstein et al., 1975)

Thus, when presented with upwards of three items, the typical 13-year-old is likely to rehearse all previously presented items together in each rehearsal set, whilst the typical 8-year-old tends to rehearse the item currently being presented either alone, or with only one other item. The authors conclude that older children have a tendency to intermix a relatively large number of items together, whilst younger children tend to rehearse each currently presented item in a limited context. The 13-year-olds in the Ornstein et al. study, for example, rehearsed a mean of 4.5 items whilst the 8-year-olds rehearsed a mean of only 2.5 items.

In a later qualitative analysis of the rehearsal patterns of 8- and 11-year-olds who had been trained to include three different items in each rehearsal set (the word currently being presented plus two earlier words), Naus, Ornstein and Aviano (1977) observed that the two groups met the experimental requirements quite differently. These differences are depicted in Table 2.

**Table 2**
**Typical Rehearsal Protocols for the Instructed Condition**

| Word | 11-year-old | 8-year-old |
|---|---|---|
| Apple | apple,apple,apple, apple | apple,apple,apple, |
| Hat | hat,apple,hat,apple, hat,apple | hat,apple,hat,hat, apple |
| Story | story,hat,apple, story,story,hat,apple | story,hat,apple, story,hat,apple |
| Dog | dog,story,hat,dog, dog,story,story,dog | dog,hat,apple,dog, hat,apple |
| Flag | flag,dog,story,flag dog,story,flag,dog,story | flag,hat,apple,flag, flag,hat |
| Dish | dish,flag,hat,dish, flag,hat,dish | dish,hat,apple,dish, dish,dish |

(From Naus et al., 1977)

Thus, after the initial three items, the 11-year-olds displayed more varied rehearsal sets by drawing items from the "pool" of words which have been presented, whilst the 8-year-olds tended to combine the presented word with the same two other items from the list - frequently the first two words presented. Furthermore, whilst the younger children's recall improved under the three-item strategy, age differences in recall were not totally eliminated. Naus et al. concluded that the experiment:

" ... provides clear evidence that rehearsal activity - in the sense of the number of unique items rehearsed together - is directly related to the children's recall performance." (page 80)

To summarise the rehearsal literature: rehearsal of older and younger children differs in quality as well as probability of occurrence; initially, rehearsal is largely absent from the child's repertoire and verbal rehearsal is rarely detected before seven years of age - even then it tends to be in a rudimentary fashion, with younger children appearing to rehearse in a less active fashion than older children; young children who do not spontaneously rehearse can be induced to do so but appear to fail to transfer the technique to new tasks or to maintain it over time; finally, in terms of a rehearsal-recall relationship, the data suggest that increases in rehearsal activity play a crucial role in explaining age differences in performance of free and serial recall tasks.

**The Development and Training of Organization as a Strategy**

Whilst rehearsal is a strategy which re-circulates material into primary memory, organization - a generic term used to subsume such headings as semantic grouping, category clustering or categorization - recodes material into a form which can easily be retained in long-term memory (Harris, 1978).

Viewed as both a retrieval and a storage strategy, organization requires the memorizer to group the to-be-remembered words into taxonomic categories in order to store and recall the materials in an organized manner. In typical organization experiments children are asked to study experimenter-defined sets of taxonomically related words or pictures, usually presented in random order, and then to

recall the items from memory a minute or so later in a single trial of verbal free recall (Lange, 1978).

As a general principle, people tend to spontaneously group and categorize the objects they intend to learn; Bousfield, Cohen and Whitmarsh (1958), for example, found that the tendency to cluster to-be-remembered items into categorizable groups was a typical strategy used by adults to facilitate recall. According to Eysenck (1984), organization reduces the "endless diversity" (page 314) of Nature to manageable proportions. Of primary interest, in developmental terms, is at what age do children first display the tendency to search for categories inherent in the stimuli and the degree to which organization aids their recall. Studies by Moely, Olson, Halwes and Flavell (1969), Kobasigawa (1974) and Schneider (1986) are typical of the literature relating to the development of organizational processes in memory.

In the Moely et al. (1969) study, children aged from 5- to 11-years were shown a collection of pictures which included animals, furniture, vehicles, and articles of clothing, arranged at random in a circle with no two pictures from the same category adjacent. The children were told that they should study the pictures in preparation for free recall and that they could move the pictures if they wished. The results suggested that whilst the 10- to 11-year-olds spontaneously categorized stimuli as a mnemonic aid the 5- to 6-year-olds rarely did so. Thus, the data suggest that organizational techniques, whilst increasing with chronological age in a relatively

gradual and linear fashion, develop somewhat later than rehearsal strategies. Children in the study who were subsequently trained to use organizational strategies behaved in a way similar to those who have been trained to use rehearsal strategies: namely, when not induced to organize, they reverted to their previous non-organizational state. Thus, whilst children as young as five can be taught organizational techniques they rarely transfer these techniques to other tasks or maintain them over time.

Using children aged 6-, 8- and 11-years, Kobasigawa (1974) studied the employment of organizational strategies following prompting procedures to ensure that the subjects understood the categories. Twenty-four pictures which could be sorted into eight common categories served as the stimulus material. Each picture from a category (e.g. monkey, camel, bear) was placed with a larger picture which was associated with the category (e.g. a zoo with three empty cages); the experimenter emphasized that the smaller pictures "went with" the larger picture, but that the child only had to remember the smaller pictures. Recall was tested by showing the child the larger card which would serve as a prompt. Two main findings emerge: firstly, the number of children who spontaneously used the pictures increased from 33% of 6-year-olds to more than 90% of 11-year-olds, with 8-year-olds regularly using the category search strategy; secondly, the category search strategy was used more efficiently with increasing age. Thus, of those who used the strategy, recall increased from an average of eleven words recalled by 6-year-olds to 19.7 words recalled for 11-year-olds. In terms of efficiency, all 6-

year-olds and the majority of 8-year-olds who used the category search strategy used the prompt to recall one picture then progressed to the next prompt, whilst the 11-year-olds tended to search each category extensively before progressing to the next category.

Using similar methods to Moely et al. (1969) with 7- and 9-year-olds, Schneider (1986) noted that older children employed more categorical sorting during study time, they clustered more at recall and recalled more than younger children. Furthermore, highly associated lists produced more clustering than lower associated lists, whilst lower associativity especially penalized younger compared to older subjects. Similarly, Haynes and Kulhavy (1976), contrasting recall among 7-, 9- and 12-year-olds for high- and low-associate items, found superior organizational techniques for highly associated items at all age levels. Thus, on these occasions at least, procedures and materials were critical determinants of the quality and quantity of organization.

Anecdotal evidence from the Schneider study illustrates how two 9-year-olds employed different mnemonic techniques in order to meet the experimental requirement of picture recall: subject one generated test answers in a random order whilst subject two first recalled the four main category names and then thought about how six items had to be remembered for each of the main categories. This second subject began the recall task with one item from a category and only progressed to the next category when all six items

had been successfully recalled. Subject two (who employed the organizational technique) had perfect recall, whilst subject one (who attempted to recall items at random) performed below average for the group. Since the subjects did not differ in either intelligence or memory span in any other way, the author concludes that differences in memory performance in the experimental condition were due to different approaches to the retrieval task.

Other qualitative differences worth noting are that young children tend to use similarity or associative strength as the basis for their organizations whilst older children tend to use taxonomic relatedness (Flavell, 1970); young children divide lists into a greater number of categories (Worden, 1975) and, finally, young children's categories are less stable than older children's and tend to undergo considerable re-organization from one trial to the next (Moely, 1977).

## The Development and Training of Elaboration as Strategy

Whilst organization requires the memorizer to recognize understood relations among the stimuli s/he studies, elaboration (also described as subjective organization) requires the memorizer to impose organization in situations where no obvious connections exist. The memorizer must deliberately generate a memorable visual image, event or meaningful link. Hence, the elaboration process has also been described as the meaningful connections strategy (Bjork, 1970). In a typical elaboration experiment subjects are first presented with semantically and perceptually unrelated lists in a way that will

discourage them from actively interrelating the materials and are then subsequently asked for free recall. Elaboration is inferred if the subjects structure their recall identically on adjacent trials. Two such measures of elaboration are Tulving's subjective organization measure and Bousfield and Bousfield's inter-trial repetitions measure.

Studied under the heading of elaboration is the process described as chunking (Miller, 1956), which refers to the recoding of two or more nominally independent items of information into a single familiar unit. Thus, sequences of digits, for example, are chunkable since they appear frequently as telephone numbers, birth dates etc. Unlike rehearsal, chunking depends on knowledge of the stimuli and is thus a knowledge-specific strategy (Chi, 1978).

An example of chunking, in particular the efficacy of chunking as a mnemonic aid, is offered by Chase and Ericsson (1981) in their study of skilled memory. The study involved presenting a subject with a list of unrelated digits for the purpose of future recall. When the subject demonstrated perfect recall, the list was increased by another digit. For the first four days the subject appeared to be using verbal rehearsal as a mnemonic aid but on day five he reported using chunking to aid recall. The subject - who was a good long distance runner - used running times as a means of storing digits in a single familiar unit; thus, "3492" for example, would be stored as "three forty-nine point two - near world record". Further aids were employed (for example, ages, years and dates) over time

for lists of digits which could not easily be coded in terms of running times. By this method the subject's memory span was increased from 7 digits to 80 digits over an experimental period of two years.

In children, enquirers such as Lange (1978) have reported that subjects older than 12 generally show increasing amounts of chunking, whereas children between 5 and 12 show little or no inclination to chunk. Furthermore, Lange reports substantial correlations between amount of chunking and recall.

In developmental terms, older and younger children's uses of elaborative strategies differ in a number of ways. Paris and Lindauer (1976), for example, report that older children are more likely to elaborate than younger children; when younger children do elaborate their elaborations are more likely to involve active interactions ("The BOY kicked the BALL") rather than static interactions ("The BOY had a BALL"). Older children appear to benefit more from self-generated elaborations whilst younger children appear to benefit more from experimenter-generated elaborations (Reese, 1977).

On the whole, whilst aspects of improved recall in adolescent and adult subjects have been attributed to corresponding increases in elaborative techniques, elaboration appears to be a later-appearing strategy than either rehearsal or organization. Enquirers such as Shapiro and Moely (1971), for example, have reported that subjects aged 5- to 12-years typically show little, if any, inclination to

elaborate whilst Ornstein, Hale and Morgan (1977) have shown that elaboration scores are comparably poor among pre-adolescents. In common with rehearsal and organization, however, the development of elaboration appears to occur in a gradual and linear fashion and to be positively related to recall.

## The Development and Training of Study Strategies

Thus far, the studies described have involved the presentation and subsequent recall of discrete, rote-type items as opposed to connected, meaningful discourse. However, as Bransford et al. (1981) note, formal educational systems assign high priority to the individual's ability to learn from written texts and documents. In this section the focus is on the strategies which individuals may employ in order to understand, remember and subsequently utilise information gleaned from text.

A variety of evidence indicates that, with increasing age, children become more active, organized, and planful in their study behaviour, more likely to construct and employ efficient learning strategies, and more likely to exploit for mnemonic purposes whatever structure the materials afford (Masur, McIntyre and Flavell, 1973). According to White (1965) "planfulness", which refers to the child's spontaneous tendency to adjust his/er study behaviour to the requirements of the task, emerges during the period 5- to 7-years of age.

Rogoff, Newcombe and Kagan (1974) examined the tendency of children aged 4- to 8-years to adjust their study times of a set of forty pictures in accord with the length of time they believed they would have to remember the materials. Specifically, children were tested for recognition memory of the pictures under one of three delay periods: a few minutes, 1 day, and 7 days. The authors found that the tendency to adjust study time of a picture to the length of time one has to remember it is present in 8-year-olds but not in 4- to 6-year-olds; in other words, only the oldest children studied the pictures for a longer time when anticipating a longer delay. According to Rogoff et al. these findings are consonant with White's (1965) theorizing about the changes that characterize the "5-to-7 shift" and are in accord with the emergence of mnemonic strategies at 6- to 7-years of age.

In a similar study Masur, McIntyre and Flavell (1973) looked at the tendency of 7-year-olds, 9-year-olds and adults to adjust their study time to suit perceived item difficulty. Following a recall test and performance feedback, the 9-year-olds and adults exhibited a greater tendency to select for more study time those items not recalled on previous trials; in contrast, the 7-year-olds did not show a pronounced tendency to allot further study time to previously missed items. Only the adults benefited from the apportionment of additional study time, however, with the 9-year-olds performing as well when they studied items that they had previously answered correctly as when they studied items that they had previously missed. Thus, whilst the 9-year-olds appeared to be aware of the

benefits of additional study time, they were as yet unable to employ the strategy efficiently. The authors conclude that:

"The results of this study seem definitely to confirm the existence of some sort of developmental history with respect to the learning strategy under investigation." (page 244)

Brown and Day (1983) examined the ability of four groups of subjects (aged from 10- to 18-years) to employ different strategies for summarizing text. Strategies studied included deletion of inessential aspects of the text; use of a superordinates to replace a list of items ("furniture" to replace "table, chair, desk"); inclusion of the topic sentence from a paragraph in the summary; creation and inclusion of a topic sentence where one did not exist. The results indicated that virtually all subjects across all age groups could use the deletion rule effectively but there were large differences in the use of the remaining strategies. For example, 50% of 10-year-olds compared to 70% of 18-year-olds could use the superordinate rule; 30% of 10-year-olds compared to 60% of 18-year-olds could select topic sentences and 12% of 10-year-olds compared to 52% of 18-year-olds could create topic sentences. Thus, in this study, younger subjects were seen to be less skilful in their use of study strategies to create a summary of a text.

A final study to be considered here is research conducted by Brown and Smiley (1978) into the development of strategies for studying texts. According to the authors, extracting the gist of a message - whether oral or written - to the exclusion of nonessential detail is an essential information-gathering and communicative activity. Three

groups of subjects - young (10-year-olds), medium (12- and 13-year-olds) and old (16- and 17-year-olds) were asked to recall the gist of a 400-word story, having listened to the story while simultaneously reading it through. Following gist recall, subjects were given a printed copy of the story, note pads and pens and told they had a further five minutes in which they could undertake any activity they wished in order to improve their recall. After the five minute period had elapsed gist recall was again attempted. The results indicated that, whilst the young children did not improve their recall with extra study time, both the medium and old children did. Furthermore, the medium and older groups were more likely to improve their recall for the high level units, or main points, following additional study time. According to Brown and Smiley (1978), the reason children below about 12-years of age are unable to benefit from extra study time is because they lack either effective study strategies or the necessary insight into what are the important features of the text.

An analysis of the actual study strategies employed by the subjects in the Brown and Smiley (1978) study revealed that the number of subjects who spontaneously elected to take notes rose from 6% of 10-year-olds to 12% of 12- to 13-year-olds and 50% of 16- to 17-year-olds. Furthermore, whilst spontaneous note-takers in all age groups showed increased recall of the important units of the text, induced note-takers failed to benefit from the imposition of the strategy. Similarly, in terms of underlining, older children underlined more than younger children, with spontaneous underliners highlighting

(and subsequently recalling) more high level units. In contrast, induced underliners did so only when prompted, did not underline strategically and did not recall more as a result of the induced strategy.

Thus, in common with the rehearsal, organization and elaboration literature, the evidence again implies a gradual and generally linear trend in the development of study strategies, with children aged about twelve or over benefiting from the employment of such strategies in terms of enhanced gist recall or text summarizing performance. By way of contrast, younger children who have been induced to employ study strategies fail to benefit from the imposition of a strategy which they did not employ on their own volition.

## The Development and Training of External Mnemonic Strategies

Flavell (1977) notes that most of the things we remember in everyday life are meaningful, organized events; they are not isolated, largely meaningless "items" such as random sequences of digits or unrelated words. Thus far, the review of research into the development of mnemonic strategies has focussed on laboratory studies, but what of the development of strategies for dealing with real-life mnemonic undertakings?

Kreutzer, Leonard and Flavell (1975) asked children aged 5-, 6-, 8- and 10-years how they would set about remembering to attend a friend's birthday party and a skating party. For both instances the older children were considerably more resourceful and inventive in their suggestions. Thus, the older children suggested an average of 2.5 ways of remembering for the first instance and 2.95 for the second instance, compared to the younger children who suggested 1.35 ways of remembering for the first instance and 0.85 for the second instance. Similarly, in the same study, Kreutzer et al. (1975) asked the children to suggest ways in which they could help a friend to remember when a particular event had occurred. All of the older children compared to less than half of the younger children could suggest strategies that would help the friend to remember. An examination of suggestions for the employment of external mnemonics for the first part of the study (a note for the birthday party and using the skates for the skating party) revealed developmental changes similar to those noted for internal ("in-the-head") strategies. Thus, 20% of younger children and virtually 100% of older children suggested the note strategy, whilst 40% of younger children and 75% of older children suggested the skates strategy. By way of contrast, only 25% of older children mentioned using internal mnemonics such as deliberately thinking about the party the night before. Kail (1984), in a review of the study, is prompted to propose that:

> "... external mnemonics play a much greater role in children's attempts to remember than we had previously given them credit for." (page 17)

## The Method of Loci

Since the above strategy features in the research section of the present study, a brief description will be offered here.

The two main aspects of the method of loci are the list of known cues (loci) which take the form of memory images of sequentially related geographical locations, together with the use of visual imagery to relate the cue to the to-be-remembered item. The cue and the to-be-remembered item must interact in some way. Thus, a child who is asked to recall the names of all the other children in his/er class may attempt to do so by visualizing each pupil according to where he or she sits in the classroom. The effectiveness of the technique was demonstrated in a study by Ross and Lawrence (1968) where college students, using forty locations around a campus as the loci, averaged a recall score of 37.5 words out of a maximum 40 and 34 words after a day's delay. In a similar study where no recall instructions were given students averaged a recall score of only 10 words out of 25.

Several trends have emerged from the preceding examination of strategy development. Namely, the use of such strategies as rehearsal, organization and elaboration, together with the strategic employment of such study aids as the apportionment of study time, underlining, note-taking and the processing of relevant material to the exclusion of irrelevant material, becomes more frequent and more efficient with age. In general, this development occurs in a gradual and linear fashion. Children who use various mnemonic

strategies recall more than those who do not, but non-users can be induced to do so. Generalization (in terms of transfer of learning) or maintenance of these techniques remains elusive, however: a notion which will be elaborated on a subsequent section.

The ontogenesis of children's learning strategies has a relatively long history. It is only recently, however, that interest has focused on children's awareness of their own memory processes. Since enquirers such as Brown (1978) postulate a close interconnection between memory awareness and memory behaviour, a selection of the research literature relating to the general factors of planfulness, or metamemory (Flavell, 1971), will be considered in the next section.

# Chapter 3: Metamemory
# An Overview of the Relevant Literature

*(i) Identification and Differentiation*

*(ii) Mnemonic Self-Concept*

*(iii) Task Variable Awareness*

*(iv) Strategic Awareness*

*(v) Interaction Among Variables*

*(vi) Metamemory-Memory Behaviour Relationship*

## Metamemory: An Overview of the Relevant Literature

Before considering some of the relevant research into the development of metamemory in children and its status as a predictor of memory performance, the focus of the first part of the present chapter is a consideration of the conceptualization of metamemory.

Flavell (1971) defined metamemory as the individual's potentially verbalizable knowledge concerning any aspect of information storage and retrieval or, put more simply, metamemory is the individual's awareness of his/er own memory. Subsequently, Flavell and Wellman (1977) proposed a taxonomy of categories of memory knowledge which distinguished between "sensitivity" and "variables". The sensitivity category includes knowledge of when intentional mnemonic activity is required and when it is not, whilst the variables category is divided into person, task and strategy variables. Thus, according to Flavell and Wellman, the person variables concern the knowledge of one's own abilities and limitations as a memorizer, the task variables refer to the awareness that task demands can influence memory performance, whilst the strategy variables refer to the individual's knowledge of potentially employable memory strategies. Paris (1978) offers the additional category of knowledge about the context in which memory processing occurs. Thus, whilst accepting Wellman's (1983) assertion that the notion of metamemory is an imprecise psychological construct - a "fuzzy concept" - it is worth noting that there is never-the-less general agreement that most definitions of metamemory include the person, task and

strategy variables as well as sensitivity to those occasions when intentional retrieval, or preparation for it, is needed.

For the purposes of the present study, metamemory is taken to comprise:

a) **Identification and Differentiation**: an awareness of the need to remember, together with the ability to differentiate memorizing from other cognitive activities;

b) **Mnemonic Self-Concept**: a knowledge of one's current memory states together with an awareness of one's own capabilities and limitations as a memorizer;

c) **Task Variable Awareness**: an awareness of the effects of task variables on memory performance;

d) **Strategic Awareness**: a knowledge of which strategies are available and applicable.

## Identification and Differentiation

According to Appel et al. (1972) the young child is unable to differentiate a future-oriented memorization instruction from a present-oriented perception instruction and will thus treat both requests as an invitation to peruse the to-be-remembered material in an equally purposeless fashion. In a study of 4-, 7- and 11-year-olds under instruction to study items for future recall versus instructions to look carefully at the items, the 11-year-olds were clearly able to differentiate, both conceptually and behaviourally, between the two sets of instructions, whilst the 4-year-olds failed to differentiate either conceptually or behaviourally. Thus, the 4-year-olds in the study remembered equally well under the instruction to memorize as to "just look" whilst the older children remembered

significantly more when told to memorize than when told simply to look. The 7-year-olds, it was suggested, probably differentiated more clearly conceptually than behaviourally. In other words, they possessed some concept of the notions of memorize versus "just look" but were unsure of just what to do in each condition. The authors conclude that:

"... memory development in children consists, in part, of the progressive acquisition of both the basic idea of deliberate memorization and also of various specialized cognitive subroutines." (page 1380)

Wellman and Johnson (1979) studied 3- to 7-year-olds' comprehension of the mental verbs "remember" and "forget" and subsequently (1980) studied 4- and 5-year-olds' developing understanding of the mental verbs "remember", "know" and "guess".

In the earlier study each child was presented individually with a series of stories and asked to judge whether the characters in the stories had remembered or forgotten various articles. In each story the character could either see the object being hidden or not (presence/absence of previous knowledge). The results indicated that 4-year-olds were able to differentiate between the mental verbs "remember" and "forget" but attended to present performance alone; the 5- and 7-year-olds, however, whilst able to differentiate between the relevant mental verbs, also demonstrated an understanding of the implications of previous knowledge, with this knowledge being more advanced for "remember" than for "forget".

In the 1980 study Wellman and Johnson examined the young child's understanding of the different implications of the mental verbs "remember", "know" and "guess"; namely, that "know" requires some evidential basis whereas "guess" does not, whilst "remember" entails specific prior knowledge. Following a series of hidden object tasks, subjects were asked to locate the hidden object and then, depending on their answer to the first question, were asked whether they knew, remembered or guessed the object's location. In the case of both 4- and 5-year-olds, when they successfully located an object they subsequently answered that they had remembered its location - regardless of whether or not they had previous knowledge of the object's whereabouts. The 9-year-olds, however, demonstrated an understanding of the effects of such factors as prior knowledge on future performance. Thus, the authors conclude that the young child's comprehension of the mental verbs under discussion evolves gradually during the years of childhood and it is only in the early school years that children exhibit a clear understanding of the cognitive implications of the terms "remember", "know" and "guess".

## Mnemonic Self-Concept

As previously mentioned, mnemonic self-concept is taken to refer to knowledge of one's own capabilities and limitations as a memorizer, together with an awareness of one's current memory states; the so-called "tip-of-the-tongue" and the related "feeling-of-knowing"

phenomena are thus included within this category of memory knowledge.

In the case of knowledge about the self as a memorizer the research literature suggests that older children may have a more accurate conception of their own memory capabilities and limitations than do younger children. Flavell, Friedrichs and Hoyt (1970), for example, in a study of span prediction in serial recall tasks, asked 4- to 10-year-olds to predict their own memory span for pictures of familiar objects (to a maximum of 10 objects) and then subsequently assessed the child's actual memory span. The principal finding was that the younger children tended to overestimate their memory ability, with over half of the 4- to 6-year-olds predicting that they could remember the maximum 10 objects, whereas less than a quarter of the 7- to 10-year-olds did so. Furthermore, of the remaining "realistic estimators", the older children predicted significantly more accurately than did the younger children. In a replication of the Flavell et al. (1970) study but using only 5-year-olds Markman (1973) found that the children were equally unrealistic in their span prediction, with half of them estimating that they could recall a maximum 10 items in serial order. Similarly, Yussen and Levy (1975), in a study of span prediction in 4-, 8- and 20-year-olds, showed that young children have a tendency to overpredict their span recall but noted that this overprediction decreased with age; accuracy of span prediction thus increased with age, with adults being even more accurate than 8-year-olds. Furthermore, Yussen and Levy (1975) report that norm information improved the

prediction accuracy of 8-year-olds but failed to improve the accuracy of preschoolers. False norm information lowered the prediction of both 8- and 20-year-olds but only the oldest age group under-predicted their actual recall.

Within the class of ongoing, transient assessments an individual could make about his/er current memory state is the so called feeling-of-knowing judgement (F-O-K) and its manifestation the tip-of-the-tongue phenomenon (T-O-T). According to Hart (1965), a feeling-of-knowing state reflects a judgement that an unrecallable item is recognizable whilst Brown and McNeill (1966) define the tip-of-the-tongue phenomenon as an assessment that an item which is currently unrecallable is imminently recallable.

In Hart's (1965) feeling-of-knowing experiments subjects were first given a test of general knowledge recall (for example: "What sea does West Pakistan border?"). If the subjects were unable to answer they were then asked to rate on a six-point scale ranging from "definitely yes" to "definitely no" how likely it was that they knew or did not know the answer. Finally, the subjects were given a four-alternatives recognition test in order to establish whether or not they did in fact know the missing answer. Of those subjects who expressed strong feelings of knowing the answer, 75% of the answers were later correctly recognized whilst only 30% of the answers were later correctly recognized when subjects expressed a strong feeling of not knowing the answer. Hart (1965) concluded that:

"Even when unable to answer difficult questions people are not completely blank. Usually they have definite feelings about whether they know or do not know the absent answers." (page 208)

Thus, the experiment showed that the feeling-of-knowing phenomenon is a relatively accurate indicator of memory storage.

In a series of studies which complement and extend Hart's (1965) original experiments Blake (1973) reported a significant relationship between degree of expressed F-O-K and subsequent recognition of nonsense syllables, whilst Eysenck (1979) found that F-O-K judgements for a word's meaning accurately predicted subjects' performance on semantic differential and related word tasks. Similarly, Gruneberg and Monks (1974) found that Geography students recalled significantly more capital cities following cueing of items previously given F-O-K judgements than items given a "don't know" rating.

A final study into memory monitoring in adults to be considered here is the work of Brown and McNeill (1966) on the tip-of-the-tongue phenomenon. Subjects were first given dictionary definitions of rare English words and asked to supply the words defined. When subjects indicated that they were in a T-O-T state they were asked for details of the missing words such as the number of syllables or the first letter. The authors report that even when unable to recall the word itself subjects performed well above chance in recalling the number of syllables in the word or its initial letter. Subjects could also distinguish between words which were similar to the missing item and those which were not. These findings have subsequently

been supported by studies such as those by Yarmey (1973) who used pictures of famous faces as the stimulus.

As far as children are concerned, Cultice, Somerville and Wellman (1983) found that F-O-K judgements made by 4- and 5-year-olds were accurate predictors of subjects' subsequent recognition performance on tasks involving personal names of familiar and unfamiliar others. Thus, according to Cultice et al. (1983), even young children are able to monitor their memories with a significant degree of accuracy. Furthermore, the authors suggest that the children's ready acceptance of the notion of feelings-of-knowing attested to an awareness of individual memory limitations and capabilities and their potential for monitoring.

In terms of the development of the ability to monitor the state of an item within memory, Wellman (1977b) reported an increase with age in the ability of 5-, 7- and 9-year-old children to predict which unnamed items they would or would not be able to recognize the names for. Thus, 5-year-olds were somewhat better than chance at judging whether or not they felt they would be able to recognize an item's name among a set of alternatives, whilst 9-year-olds were extremely accurate. In terms of their ability to judge whether or not they had seen an item before, all age groups were equally accurate in their judgements and thus the 5-year-olds' poorer recognition predictions were due to a failure to use the relevant information rather than a lack of the information itself.

In addition to the above findings, Wellman (1977b) also noted an increase with age in expressions of apparent tip-of-the-tongue states. For example, when asked to name an item older children made comments like: "I know I know that, what is that, you know doctors use it, why can't I remember."

According to Wellman (1977b), the 9-year-olds in the study:

> "... were surprisingly often seized by apparent tip of the tongue experiences ... Often, ... they became agitated and frustrated with their inability to recall the name ... Kindergartners were much less prey to these obvious tip of the tongue experiences." (page 20)

Thus, whilst adults and school-age children are accurate in their tip-of-the-tongue and feeling-of-knowing judgements, there also appears to be clear developmental increases in this accuracy.

## Task Variable Awareness

With regard to children's awareness of the effects of task variables on memory performance, two classes of variables - stimuli characteristics and memory test characteristics - will be considered here. Differences in the ease of recalling familiar versus unfamiliar pictures would be an example of stimulus characteristics, whilst differences in the ease of recall versus recognition would be an example of memory test characteristics (Kail, 1984). Much of what is known about children's task variable awareness is gleaned from comprehensive interview data obtained by Kreutzer, Leonard, and Flavell (1975).

In an interview item concerning stimuli characteristics Kreutzer et al. (1975) tested 6-, 7-, 9- and 11-year-olds for the notion that paired associates composed of verbal opposites would be easier to remember than paired associates without strong inter-item relationships. Children were shown lists of paired associates (boy/girl, hard/easy, cry/laugh, black/white) with the explanation that "these words are opposites" followed by a list prefaced with the explanation "these words are people and things they might do" (Mary/walk, Charlie/jump, Joe/climb, Anne/sit). The children were then asked if one of the two sets of paired associates would be easier to learn than the other, and if so, why. Pairs of words were then added to the list judged easier to remember until the child judged the other set to be now easier. The majority of 6- and 7-year-olds in the study failed to recognize that paired associates composed of verbal opposites are easier to remember than paired associates without strong inter-item relationships. The 9- and 11-year-olds, however, did recognize the greater ease of learning the pairs of verbal opposites and could also explain why.

In terms of sheer quantity as a memory-relevant variable, studies by Wellman (1977a) and Yussen and Bird (1979) have shown that even 3- and 4-year-olds know that increasing the number of items makes a task harder and that a larger set of items is harder to memorize than a smaller set of items. This knowledge has a shortcoming, however, as demonstrated by the Kreutzer et al. (1975) study described above, in which virtually all of the 6- and 7- year-

olds immediately changed their opinions as to which list of paired associates would be easier to learn once additional items were introduced. For the younger children, the now shorter but previously judged more difficult list was considered to be easier to learn, whilst the 9- and 11-year-olds remained confident that a longer list of verbal opposites would be easier to learn than a shorter list of unrelated pairs. The older children judged seven pairs of antonyms, for example, as being easier to memorize than four unrelated pairs. Children as young as six, however, know that familiarity and perceptual salience can make items easier to remember, whilst spatial arrangement of items is irrelevant; thus, young children are aware that spreading items out would not make them easier to remember than presenting them close together (Kreutzer et al. 1975).

A study dealing with memory test characteristics - in particular children's sensitivity to differences in retrieval demands - was conducted by Speer and Flavell (1979) in which 5- and 7-year-olds were told a story about a pair of twins who were faced with the same memory problems but different retrieval demands. One twin, for example, was asked to recall the ingredients required to make a cake, whilst the other twin was asked to choose the ingredients from "all the things in the kitchen" (recognition). The children in the study were then asked which twin had the easier memory task. Of the 16 children of each age group tested, six 5-year-olds and nine 7-year-olds consistently selected the recognition task as the easier of the two tasks, with all nine of the 7-year-olds but only three of the 5-

year-olds being able to justify their answers. The authors thus conclude that the recall-recognition distinction appears to be established at an early age, although young children may not fully understand why recognition is easier than recall. Similar age trends were seen in a Kreutzer et al. (1975) study, which demonstrated children's developing awareness that it may become harder to recall one set of words if, before the recall requirement, you are asked to learn another set of similar words.

Two studies, one by Kreutzer et al. (1975) and the other by Myers and Paris (1978), looked at children's awareness of the fact that recall of the semantic gist of a story is easier than recall of the exact linguistic form. In the Kreutzer et al. (1975) study subjects were told of a hypothetical child who would be asked to recall a story s/he had heard, whilst the Myers and Paris (1978) study involved a hypothetical child who would be asked to recall a story s/he had read. Subjects were then asked whether recall of the semantic gist or recall of the exact linguistic form would be easier. In the Kreutzer et al. study (1975) just over half of the 6-year-olds compared with all the 11-year-olds understood that semantic gist was easier than exact linguistic form, whilst in the Myers and Paris (1978) study just over two-thirds of the 8-year-olds compared with virtually all of the 12-year-olds knew that semantic gist was easier than exact linguistic form. Thus, in both studies, there was seen a steady increase in the number of children who understood that recall for a story's gist is easier than verbatim recall.

A final study to be considered here is the previously cited study by Wellman (1977), which focussed on preschoolers' understanding of a variety of memory-relevant variables. Children aged 3-, 4- and 5-years were presented with an array of metamemory tasks and asked to decide which boy depicted in the stimulus materials had the harder memory task. Task stimuli comprised: Items (a boy studying 18 objects versus a boy studying 3 objects); Noise (studying in a noisy room versus studying in a quiet room); Age (a baby versus an adult); Help (studying alone versus studying with help); Time (studying for a short time versus studying for a long time); Drawing (remembering by looking versus remembering by drawing) and finally Cues (remembering without cues versus remembering with the aid of cues). Of the total number of correct responses given in the study, 24% were from 3-year-olds, 33% were from 4-year-olds and 70% were from 5-year-olds; there was therefore an increase with age in correct responses and a decrease with age in incorrect responses. In terms of order of emergence for correctly rating the stimulus pairs, of the total 38 subjects in the study, 31 correct responses were given to Items, 25 to Noise, 14 to Age, 14 to Help, 12 to Drawing, 10 to Time and 8 to Cues. Items and Noise, therefore, appear to be fairly early pieces of mnemonic knowledge, whereas Cues appears to emerge much later.

Similarly, the study by Yussen and Bird (1979), referred to previously, also showed that children were more accurate in their knowledge of the effects of length (of to-be-remembered lists) and noise than about age and time and that, overall, 6-year-olds were

more accurate than 4-year-olds. Thus, the results of both the Wellman (1977a) and the Yussen and Bird (1979) studies indicate that the aspects of metamemory under study develop with age in an ordered and systematic sequence and that much of a person's mnemonic knowledge for memory-relevant variables is formed by 6- or 7-years of age.

## Strategic Awareness

Strategic awareness refers to a knowledge of those mnemonic strategies which will be available, applicable and effective in augmenting mnemonic performance. Of interest here is whether young children are aware of the variety of strategies which are available to them and if they know that verbal rehearsal, for example, is an appropriate strategy for memorizing digits or that elaboration, say, is an effective strategy for recalling pairs of words.

Kreutzer, Leonard and Flavell (1975), cited earlier in the present study, asked children aged 5- to 10-years how they would set about remembering in a variety of circumstances (for example, asking them to think of all the things they could do to try to find a jacket they had lost while at school) and how they would help a friend to remember (for example, when a particular event had occurred). The older children in the study named an average of almost three strategies for remembering compared with an average of not quite one strategy by the younger children, whilst almost all the older children compared with less than half the younger children could name appropriate strategies to help a friend remember. Thus, the

older children in the study were more aware of appropriate strategies to aid recall, generally showed a greater sense of planfulness in their responses, and were considerably more resourceful and inventive than the younger children.

Justice (1986) examined the developmental changes in awareness of the relative benefits of the mnemonic strategies of looking, naming, rehearsal and categorization. Children aged 4- to 8-years were shown videotapes in which a female model was asked to remember a set of twelve categorizable pictures. Demonstrations were presented of the model grouping by category, repeating and rearranging at random, naming with no spatial rearrangement and looking with no spatial rearrangement. Children were then asked which strategy would help the model to "remember best". The 4-year-olds in the study judged looking to be most effective, followed by grouping, naming and rehearsal. The 6-year-olds, meanwhile, chose grouping as most effective, followed by looking, naming and rehearsal, whilst the 8-year-olds judged rehearsal to be most effective, followed by grouping, naming and looking. Tests of differences between correlated proportions indicated that 4-year-olds were more likely to choose looking than any of the other strategies, 6-year-olds showed no significant preference for any of the strategies, whilst 8-year-olds were more likely to choose rehearsal and grouping strategies than looking or naming. The authors thus conclude that strategic awareness appears to undergo important developmental changes during the early school years, with the lack of clear strategic preferences among 6-year-olds reflecting an emerging awareness of

mnemonic strategies. The failure of 8-year-olds to choose categorization as more effective than rehearsal prompts the authors to suggest that developmental changes in strategic awareness are incomplete by eight years of age.

In a similar study, Moynahan (1973) asked children aged 7-, 9- and 11-years to predict which of two sets of pictures (one categorized the other random) and two sets of coloured cards (one randomly arranged the other arranged with blocks of the same colours adjacent) would be easier to remember. In line with the findings of Justice (1986) cited above, the results indicated that knowledge of the facilitative effect of categorization on recall performance increases with age. Thus, despite giving evidence of being able to detect the categories, the 7-year-olds in the study were less likely than 9- and 11-year-olds to predict that the categorized materials would be easier to remember than the random materials. Tenney (1975) also found that young children could detect categories (for example, could supply "three other colours" when the experimenter's word was "blue") but were unable to comply when asked for "three other words that would be easy for you to remember along with the word *blue*". In contrast, when the older children were asked to supply three other easy-to-remember words to go with *blue* they spontaneously provided three other category members.

Pressley, Levin and Ghatala (1984) looked at how knowledge about the efficacy of two study strategies (repetition of words with meanings and associative elaboration) is gained and used by adults

and 11- to 13-year-old children. They were particularly interested in whether strategy practice would affect strategy selection. The authors assumed that learning (in this case lists of new vocabulary words) would be better with the elaboration strategy than with the repetition strategy. Subjects were assigned to one of two conditions - no practice or practice. Within the no practice condition subjects first received an explanation of the two strategies, with half the group being informed by the experimenter that the repetition strategy was the better technique, whilst the other half of the group were advised that the elaboration strategy was the better technique. Subjects were then asked which of the two strategies they would like to use in order to learn a list of vocabulary words. Subjects in the practice condition followed the same procedure as the no-practice condition subjects up to the point where the experimenter expressed his/er opinion regarding the relative efficacy of the two strategies. After hearing the recommendation, but before selecting a strategy, subjects were given a list of words to learn and were instructed to use repetition and elaboration on alternating items. No feedback was given following recall. Subjects were then given a second list to learn and were asked to select a strategy. Following strategy selection subjects in both conditions were asked their reasons for their strategy choice. They were then reminded of the strategy they had chosen and instructed to learn a further list of items. The results indicated that, whilst adults benefited from practice, children did not. Thus, following practice, adult subjects realized that elaboration was the more effective strategy despite what the experimenter may have said and therefore subsequently ignored the experimenter's

recommendation. Children, however, did not disregard the experimenter's inappropriate recommendation, even after practice. In a follow up study of the 11- to 13-year-olds, subjects were given explicit performance feedback before selecting a strategy for the final recall session. The results indicated that within the repetition-recommended condition children who received practice followed by performance feedback selected elaboration more frequently than did either subjects who practiced but received no feedback and subjects who did not practice. Thus, children who received accurate feedback following practice were able to disregard inappropriate advice and consequently adopt better learning strategies. That performance feedback was necessary to produce effective strategy with children but not adults indicates that:

> "... there is increased articulation of metamemory, cognitive actions, and metacognitive experiences with increasing age." (Pressley et al., 1984, page 286)

## Interaction Among Variables

In "real life" mnemonic undertakings several variables may contribute to the task difficulty and therefore a metamnemonically mature individual is likely to think of the previously cited categories of memory variables as interacting with - rather than being independent of - one another (Flavell and Wellman, 1977). An example of such an interaction is that between task and strategy variables (study time apportionment), and studies typical of the research into this area (i.e. Masur et al., 1973, Rogoff et al., 1974) have been considered in the previous section.

In terms of an interaction between the person and the task (in this case effort allocation) a study by Wellman, Collins and Glieberman (1981) suggests that young children's predictions of recall success are influenced more by effort than by number of items. In other words, the amount of to-be-remembered information plays a lessor role in their conception, whereas effort plays a greater role. Thus, when asked to predict the number of items that a pictured child would recall, 5-, 8-, 10- and 19-year-olds all considered both effort and quantity in their predictions, but young children were much more influenced by effort than by quantity. It was not until age 19 that subjects demonstrated an ability to weigh effort and quantity approximately equally. Meanwhile, Bisanz, Vesonder and Voss (1978), in a study into effort allocation following performance feedback, found that older children and adults use performance feedback for distributing processing effort for acquiring a list of paired-associates but younger children tend not to use it.

Finally, Wellman (1978) looked at children's ability to judge task difficulty as a result of variable interaction. Children aged 5- to 10-years were presented with pictures of one- and two-variable problems with three degrees of difficulty. Thus, an example of a one-variable problem with three degrees of difficulty would be pictures of a boy trying to remember 3, 9 or 18 items whilst an example of a two-variable problem with three degrees of difficulty would be a boy attempting to remember 18 items by looking, a boy attempting to remember 3 items by looking and a boy attempting to

remember 3 items by writing them down. Both 5- and 10-year-olds in the Wellman (1978) study answered one-variable problems accurately, but only 32% of 5-year-olds compared with 98% of 10-year-olds could answer the two-variable problems accurately. It would appear, then, that children learn about the implications of combinations of memory variables in a gradual and systematic way. Wellman (1978) concludes that:

"Children proceed from a lack of understanding of memory-relevant phenomena to acquisition of an array of certain separate facts, and only later develop a more complex interactive system of memory knowledge." (page 28)

## Metamemory-Memory Behaviour Relationship

As far as a metamemory-memory connection is concerned, enquirers such as Flavell and Wellman (1977) propose close interconnections between memory awareness and memory behaviour, whilst Brown (1978) suggests that:

"... one of the most persuasive arguments in favour of studying metamemory development is that there must be ties between what one knows about memory and how one goes about memorizing." (page 130)

Whilst acknowledging both the paucity of evidence in this area, together with the existence of studies which suggest only a tenuous relationship (e.g., Cavanaugh and Perlmutter, 1982), it is never-the-less worth noting that a number of studies (e.g., Wellman, 1983) have reported more substantial links between metamemory and memory behaviour. Schneider (1985), in a meta-analysis of approximately fifty studies which aimed to assess the metamemory-memory behaviour relation, suggests that the different levels of task

difficulty of the various studies seem to be mainly responsible for the heterogeneous findings of the literature. By way of illustration, a selection of the studies included in both the Schneider (1985) meta-analysis and in the present study, together with details of the metamemory-memory behaviour relationship, appears below.

**Table 3**
**Metamemory-Memory Behaviour Relationship**

| Author(s)/Classification | Metamemory-Memory Relationship |
|---|---|
| **Performance Prediction:** | |
| Flavell, Friedrichs & Hoyt (1970) (memory span in serial recall) | Significant at 7+ years |
| Moynahan (1973) (memory span in organized lists) | No significant correlation found* |
| **Effort and Attention Allocation:** | |
| Masur, McIntyre & Flavell (1973) (allocation of study effort: recall) | Significant for college students |
| Rogoff, Newcombe & Kagan (1974) (allocation of study effort: recognition) | Significant at 8+ years |
| Wellman (1977) (allocation of retrieval effort) | Significant at 8+ years |
| Brown & Smiley (1978) (sensitivity to prose gist) | Significant at 12+ years |

(* age group studied up to 11-years-old only)

Examples of studies included in the Schneider (1985) analysis but not included in the present study are those by Markham (1973; memory span prediction in serial recall tasks); Yussen, Levin, Berman and Palm (1979; memory span prediction for organized lists); Berch and Evans (1973; allocation of study effort) and Posnansky (1978; allocation of retrieval effort); in each case the findings of the cited studies concerning a metamemory-memory connection corroborate those detailed in Table 3 (above).

Thus, in terms of a metamemory-memory behaviour relationship, Schneider (1985) concluded from his meta-analysis that a close connection *is* found, even in young children when task requirements do not overload working memory (e.g., studies concerning performance prediction as well as studies assessing children's allocation of retrieval effort); when task requirements overload working memory, however, (e.g., when supraspan lists or prose texts are presented or when a combination of complex strategies is required to cope with the task demands) significant metamemory-memory behaviour relationships are unlikely to be found in young children. The role of metamemory in memory development, therefore, appears to change from the early childhood years to adolescence.

To summarise: metamemory is defined as an individual's awareness of his/er own memory and comprises the person, task and strategy variables. In common with the mnemonic strategy development literature, the evidence suggests that metamemory develops in a gradual and generally linear fashion. Even very young children have been seen to show some evidence of mnemonic planfulness, whilst older children demonstrate a growing ability to differentiate between memory tasks and to choose appropriate strategies in a variety of mnemonic contexts. As far as a metamemory-memory behaviour relationship is concerned, the strength of this relationship appears to depend on the type of knowledge and the behaviour studied.

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Thus far, the literature review has related to typical children only. In the light of the research interest of the present study (and to expand on the statement of difficulties made in the introductory section) the remainder of this first section will relate the learning and memory processes to children with moderate learning difficulties.

# Chapter 4: The Learning and Memory Processes of Children with Moderate Learning Difficulties

*(i) The Problem Re-Stated*

*(ii) Strategy Deficits in MLD Children: A Review of the Relevant Literature*

*(iii) Strategy Training in MLD Children*

*(iv) Memory Task Characteristics*

*(v) Strategy Training Techniques*

## The Learning and Memory Processes of Children with Moderate Learning Difficulties

### The Problem Re-Stated

It has been seen in the previous sections that the ability to remember increases significantly during the childhood years and that this increase is mainly a function of the development of strategic behaviour. Given, then, that children with moderate learning difficulties manifest deficiencies in a broad range of memory and learning tasks and yet are said to follow the same, albeit slower, sequence of memory development as do their chronological peers, it is not surprising that speculation regarding the precipitating cause of these deficits has focussed on the memorizer's inability *spontaneously* to generate mnemonic strategies. Thus, once again borrowing the computer analogy, it is the failure of MLD children to use efficiently and voluntarily the essentially intact memory control processes (the "software") which has been targeted for special attention.

Robinson and Robinson (1970) summarize it thus:

> "... the original notion of a defective short-term memory has been replaced by the notion of a deficiency in the use of spontaneous acquisition and retrieval strategies. Retarded individuals appear to use neither spontaneously, although they can be trained to do so." (page 295)

In the light of the (at least partially) remediable nature of MLD deficiencies, research efforts have consequently been couched in terms of training, maintenance and generalization of strategies. For enquirers such as Devereux (1982), for example, the child with

learning difficulties will need to be trained how to cluster, to elaborate on material, and to rehearse whilst Hallihan and Kneedler (1979), in similar vein, advocate the use of cognitive-behaviour modification procedures for the "treatment" of the child's inability to use task-appropriate strategies. According to Devereux (1982), however, such training is:

"... a monumental task and may take many years." (page 68)

The questioning of the basic assumption that the MLD child is an inefficient strategist who consistently fails *spontaneously* to generate mnemonic strategies, however, does not appear to be on the research agenda. Similarly, scant attention is paid to the possibility that, whilst this "failure" is freely demonstrated in laboratory-type tasks, a more "ecologically-valid" setting may elicit memory skills equal to those of typical children. The deficit hypothesis of the MLD memorizer remains confidently held: strategy training studies continue to proliferate whilst maintenance and generalization, it would appear, prove either extremely task specific or persistently elusive.

As previously stated, it is with this basic assumption, grounded as it is in the notion of the MLD child failing *spontaneously* to adopt strategies (and the research practices which stem from it) that the present researcher is at variance and suggests, instead, the notion that children with moderate learning difficulties *can* be active, strategy-oriented learners but may fail to be so as a result of a mismatch between child and task. In other words, the MLD child

does not need to be trained how to cluster, to elaborate on material, and to rehearse at basic levels because s/he can already do so, *providing that the memory task requirements are effective in eliciting these skills.* Thus, the proposal is for a more interactional model, with the emphasis being on task requirements matching certain child variables.

Possible consequences of rejecting the notion of the MLD child as a deficient strategist would be the cessation, in memory terms, of some potential "teaching failures" being ascribed the stigmatizing label of "learning difficulties", together with the necessary re-designing of memory and learning tasks so that they become potentially inclusive of *all* learners[4] .

The incentive for researchers and educators, it is suggested, is to direct research away from the elusive maintenance and generalization of trained strategies and to search instead for the conditions which allow the MLD child *spontaneously* to demonstrate the repertoire of strategies *already* at his/er disposal.

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As previously stated, studies investigating memory performance in children with moderate learning difficulties have reached essentially the same conclusion - namely, that the major problem for MLD children stems from a failure spontaneously to employ mnemonic

[4] This notion of designing learning and memory tasks which are potentially inclusive of *all* children will be addressed more fully in the research section.

strategies; the remainder of the present chapter, therefore, will comprise a review of the research literature into the MLD child's memory performance in a variety of recall tasks. Since the findings of these studies is a consistent and repetitious identification of the MLD child as a deficient strategist, the review will be a selective one.

A selection of strategy training studies will also be considered, with the emphasis in both cases being on a critical analysis of the nature of the task requirements.

## Strategy Deficits in MLD Children: A Review of the Relevant Literature

When older typical children and adults are required to recall a series of words, digits or pictures they tend to record a U-shaped serial position curve, indicating good recall for the initial and final items presented but relatively poor recall for the middle items (the so-called primacy and recency effect referred to in a previous chapter). Recall of the final items is assumed to be high because these items have not yet faded from short-term memory, whereas recall for the initial items is assumed to be high because of the use of rehearsal processes which have facilitated the transfer of items to long-term memory. As far as children with moderate learning difficulties are concerned, however, the data are consistent in showing that such children do not spontaneously rehearse in situations where it would be appropriate to do so. Typical of these studies are those by

Belmont and Butterfield (1969), Ellis (1970) and Brown, Campione, Bray and Wilcox (1973).

Ellis (1970) presented MLD adolescents with a series of digits exposed one at a time via a horizontal array of windows. Following display of all digits, a probe digit was presented and the subject was asked to indicate in which window the digit had appeared. Ellis (1970) found that the MLD adolescents in the study showed a strong recency effect but a much reduced primacy effect, whereas college students in the study showed an equally strong primacy and recency effect. Furthermore, increasing the time between digits enhanced the performance of college students but not of the MLD subjects. Ellis (1970) concluded that:

"We favour a rehearsal strategy deficiency hypothesis to account for the retardate-normal differences... It would appear that the retardate does not rehearse, even under spaced conditions, therefore his memory for items exceeding the limited capacity of primary memory is poor." (page 10)

Belmont and Butterfield (1969) used a modified form of Ellis' (1970) probe serial-recall task by allowing the subjects to study the set of digits at their own pace, the assumption being that the pause patterns demonstrated by the subjects would reflect the strategies being employed. The authors report that the stable pause patterns demonstrated by the college students indicated a cumulative rehearsal strategy, whereas the essentially flat pause patterns demonstrated by the MLD adolescents led them to infer that no active acquisition strategy was being employed. A follow-up study a year later (Belmont and Butterfield, 1970), using the same basic

experimental design, provided further evidence for the notion that MLD adolescents fail spontaneously to adopt a rehearsal strategy.

A final study in the rehearsal literature to be considered here is that by Brown, Campione, Bray and Wilcox (1973) in which MLD and typical adolescents were shown a total of sixteen pictures consisting of two items from one category, four items from each of two categories and six items from a fourth category. Subjects were then given a category (selected from clothing, foods, animals and vehicles) and asked to recall which items they had just seen from that category. Thus, probed with "clothing" the subject would need to respond with "hat". The assumption was that rehearsing subjects would simply need to refer to the set of four items being rehearsed and decide which one was, for example, an animal, whilst non-rehearsers would not have the items available in the rehearsal buffer and would therefore have to search through the set of animals and decide which one had been seen most recently. In this case accuracy would be greatest for the categories containing the fewest items. The results indicated that the MLD adolescents demonstrated the non-rehearsal pattern indicated above, whilst typical peers were unaffected by the increase in number of items; the authors thus conclude that the results were consistent with the notion that MLD adolescents are deficient in the spontaneous use of rehearsal strategies.

Taking the study a step further, Brown et al. proposed that if differences originally obtained in typical and MLD subjects were

attributable to differences in the employment of rehearsal techniques, then preventing typical subjects from rehearsing should result in poorer performance and recall patterns similar to those returned by MLD subjects.

In the second study typical subjects were divided into two groups; in one group subjects were allowed to study without restriction whilst in the second group subjects were prevented from employing a cumulative rehearsal technique. The results from this second experiment indicated that overall recall by the first group was high, with the pattern of recall being the same as that of strategy-trained MLD subjects, whilst the second (restricted) group of typical subjects performed like untrained, nonrehearsal MLD subjects, with poorer recall and accuracy levels varying with the number of items in the probed category. Thus, in the second Brown et al. study, MLD children could be trained to perform like typical subjects whilst, conversely, typical subjects could be induced to perform like MLD subjects.

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Whilst rehearsal is an appropriate mnemonic strategy when the amount of to-be-remembered information is small, when required to remember a supraspan amount of information then organisational strategies are more appropriate. Representative of the organizational literature is a series if studies conducted by Spitz (1966, 1973).

In the earlier study, in which MLD, typical age-matched adolescents and college students were asked to remember twenty randomly-presented words comprising five sets of words from four different categories, only the college students and typical adolescents showed evidence of spontaneous clustering, whilst the MLD adolescents showed no real evidence of the strategy. Similarly, in the later study, Spitz (1973) demonstrated that when presented with a series of digits containing different degrees of digit redundancy (e.g., the series 124124 would have a 50% redundancy rate) typical adults detected the digit redundancy whereas MLD subjects did not, thereby supporting the organisational deficit hypothesis.

In a series of follow-up studies, however, Spitz and others have demonstrated that it is possible to induce clustering in MLD subjects by presenting lists in blocked rather than in random order. Gerjuoy and Spitz (1966), for example, presented one group of MLD subjects with a random list for free recall, a second group with a blocked order list for free recall and a third group with a random list for organized recall (e.g. "Tell me all the animals you can remember"). The results indicated that the second and third groups recalled significantly more than the first group and also showed evidence of clustering, thus providing further evidence for the notion that the problem lies in the MLD subjects' inability *spontaneously* to use inherent organization, rather than an inability to use strategies *per se*.

As far as the use of elaborative strategies are concerned, a review of the MLD literature presented by Borkowski and Wanschura (1974) noted that, in line with the rehearsal and organisation literature, explicit and repetitious instructions to elaborate consistently result in improved performance, thus suggesting a lack of spontaneous strategy use. Similarly, MLD adolescents have been reported as being deficient in the spontaneous use of text organisation strategies (Smith and Friend, 1986), study time apportionment strategies (Brown and Campione, 1977), self-questioning summarization strategies (Wong et. al., 1986) and central task selection strategies (Dawson, 1977).

Thus, as indicated, a wealth of evidence exists to suggest that relative deficits in the memory performance of MLD children are due to the MLD child's deficient spontaneous use of task-appropriate strategies; as previously stated, this distinction is summarized in terms of a control rather than a structural deficiency.

## Strategy Training in Children with Moderate Learning Difficulties

It will be recalled that, since control processes are optional or voluntary, they are assumed to be modifiable and therefore amenable to training. This being the case, training MLD subjects to use strategies has been seen to reduce differences in memory performance between these and typical subjects.

A selection of relevant strategy training experiments are those by Belmont and Butterfield (1971, 1972, 1977), Brown, Campione and Murphy (1977) and Burger, Blackman and Tan (1980). The major research questions posed in these studies are: Can MLD children profit from strategy training? Will they maintain the trained strategy over time when task demands remain the same? Will they generalize training in response to changes in both the to-be-remembered material and the task demand?

Belmont and Butterfield (1971 and 1972) hypothesized that subjects with moderate learning difficulties would benefit from instruction in the employment of a rehearsal strategy for recall of a list of randomly presented digits, whilst the recall performance of typical subjects would suffer as a consequence of using only a rapid scanning technique. In the first part of the study, where all subjects were free to programme themselves, the typical subjects easily out-performed the MLD subjects, confirming the notion that typical subjects are spontaneous strategy users whereas MLD subjects are not.

The experimenter-imposed rapid scanning technique, however, had no effect on the recall performance of the MLD subjects, suggesting that they were already using this technique, whereas the recall performance of the typical subjects suffered greatly by using only rapid scanning. In contrast, the experimenter-imposed rehearsal strategy served to elevate the recall performance of the MLD group,

although not to the level of the self-programming group of typical subjects.

Furthermore, when allowed to return to self-programming, the MLD instructed subjects reverted to the levels set by their self-programmed uninstructed peers, causing the authors to note that the MLD subjects as a group:

"... were evidently throwing away a programme that had apparently benefited them." (page 174)

Further analysis of the MLD data indicated that, whilst not all MLD subjects actually benefited from the rehearsal instruction, some did not revert to pre-instruction method and accuracy but rather stayed within the typical range of recall accuracy. Thus, the authors learned that MLD subjects will retain an appropriate experimenter-trained mnemonic strategy (at least for the duration of the study) *if it works for them*, but will not if it does not.

In a follow-up study (Belmont and Butterfield, 1977) the authors set out to extend their earlier studies by including instruction on how to recall letters, as well as instruction on how to memorize in the first place. Thus, the training incorporated successively increasing attention to recall, over three methods, with the third method concentrating on the co-ordination between rehearsal during memorization and retrieval during recall. The results indicated that each method produced successively improved programmes, with the

final method producing MLD recall scores which came within 82% of those returned by typical subjects.

Thus, in the Belmont and Butterfield studies, strategy training was effective in reducing (*but not eliminating*) differences in memory performances between MLD and typical subjects, provided that it was specific, explicit and very extensive. Even so, differences within the MLD population indicate that unless a strategy works for the individual then maintenance will not be attained.

Burger, Blackman and Tan (1980) explored both maintenance and generalization of a sorting and retrieval strategy designed to facilitate recall and clustering by MLD and typical children. Subjects were first trained to employ a categorical sorting and retrieval strategy by using a 4x4 matrix grid to sort 16 pictures in a way they felt would help them to remember. Following a study period, the pictures were covered, recall was tested and explicit feedback was given. A systematic introduction to the relevant strategy was supplied and emphasis was placed on both the important task components and the value of the strategy. Multi-training sessions were conducted over several days. After six months, the identical testing procedures were used to gauge maintenance of the strategy. Generalization was tested by asking subjects to add any three "easy to remember words" to an experimenter-provided stimulus word. Once a 20-word list of five categories was compiled the list was randomized and recall tested. The maintenance and generalization data indicated that, after the six month interval, the sorting and

retrieval strategy was still maintained but no convincing evidence for the existence of generalization was found. Thus, although maintenance is seen to be a prerequisite for generalization, it does not ensure it.

A similar study by Bilsky, Evans and Gilbert (1972), in which individuals were trained to make use of the organization available in a categorized list, found some evidence of maintenance when the same materials were employed, but no such evidence when new materials were introduced. Furthermore, in studies where training has been less substantial the durability of trained strategies such as those described here has not been found (e.g. Jensen and Rohwer, 1963).

Finally, Brown, Campione and Murphy (1977), using two groups of MLD children (young group CA 9-years; old group CA 11-years) labelled as "unrealistic estimators", employed feedback techniques to train a span estimation strategy in the children. Having first ascertained that the MLD children tended to over-estimate their predicted recall, subjects were then shown a series of 10-item categorized and uncategorized lists of pictures and asked to estimate their recall. Following attempted recall the children received explicit feedback and their recall scores were made visible to them. This was repeated across ten trials for two days, with the estimated and actual scores being repeatedly reviewed by the experimenter and subjects.

Three posttests were then conducted - the first on the day following training, the second two weeks later and the third approximately a year later - which required the child to estimate memory span and then attempt recall of a series of 10 items. Category knowledge was also tested by asking the children to indicate which would be easier to remember, a categorized or a random set of items. Finally, children were asked to say if and why pictures from categories went together.

The results indicated that, following training in span estimation, the older children benefited from both implicit and explicit training, whereas the younger children benefited from explicit training only. Long-term (1-year) maintenance of training was found for older subjects, but younger subjects showed improvement only on the immediate test, and this was for the feedback group alone. Despite evidence to suggest that the tasks themselves were adequate tests of transfer, generalization to new, albeit highly similar situations, was described by the authors as a dramatic failure and they concluded that:

"Considerable time and effort will be needed in the search for the elusive evidence of generalization of training in retarded children." (page 210)

In sum, the mnemonic strategy training field of research has consistently demonstrated that very extensive, task-specific and explicit training is effective in reducing, but not eliminating, differences in memory performance between MLD and typical subjects. The durability of the training, however, is not impressive

and the MLD child frequently reverts to inefficient strategy use when liberated from instructional control. Furthermore, there is little, if any, evidence for transfer of training to different memory tasks.

Despite the fragility of training and the failure to eliminate MLD and typical differences, the research questions remain phrased in terms of modifying the child rather than the task. The stance adopted here is that if MLD children *can* demonstrate spontaneous and efficient strategy use in certain settings then, far from pursuing the elusive maintenance and generalization, the goal should be to ensure that the memory task requirements are effective in eliciting these skills.

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Of both applied and theoretical interest, of course, is why the MLD child does not adopt experimenter-imposed strategies, since they are effective in elevating memory performance.

Whilst the notion of MLD children "electing" to adopt strategies will be considered more fully in the research section of the present study, by way of speculation at this stage the present writer proposes that the MLD child may fail to adopt an instructor-imposed strategy simply because s/he chooses not to for reasons of one or more of the following: (1) the option of not doing so is more appealing or (2) the inducement to do so is not strong enough. Occasionally, the child may be so bemused by aspects of the memory task requirements (or by the behaviour of the experimenter) that s/he is simply distracted.

Bearing in mind points 1 and 2 (above), it is worth considering some examples of experimenter-designed memory task characteristics and some typical strategy training techniques.

## Memory Task Characteristics

Aspects of memory task characteristics will be considered numerically.

1. As far as the **form of stimuli** is concerned, in the laboratory setting the MLD child's employment of strategies is tested via rote recall of non-meaningful (frequently unappealing and possibly unfamiliar) stimuli such as digits, objects or letters in series:

"... black and white line drawings of common objects." (Torgesen, 1977, page 572)

2. The **mode of presentation** of the stimulus materials and/or the experimental surroundings may be of a style which is unlikely to be within the experience of the child:

"... pictures were ordered in sequences of seven objects and presented in a stimulus panel mounted behind a one-way mirror." (Torgesen, 1977, page 572)

"The experiment was conducted in a trailer laboratory... During the study period the subject sat at a table facing a one-way mirror, and the experimenter sat on the opposite side of the room near the apparatus." (Appel et al., 1972, page 1368)

3. Frequently, a bewildering array of **materials and apparatus** form part of the testing procedures:

"The apparatus included an AKG microphone (model D11-S), a Shure amplifier (model M-67), a Layfayette Instruments voice-activated relay, and a Sony Cassette tape recorder." (Burger, Blackman and Tan, 1980, page 374)

4. **Response modes** may be unfamiliar to the child:

"The subject was then asked to talk into the microphone. The experimenter emphasized that it was important to say only the requested words." (Burger, Blackman and Tan, 1980, page 375)

5. Finally, **testing procedures** may appear to the child to be at variance with his/er expectations for usual adult behaviour:

"Following the study period, during which the experimenter moved behind the apparatus and out of sight of the subject, the pictures were covered with a black cloth and recall was tested." (Torgesen, 1977, page 573)

(The present writer is able to speculate with some confidence as to the behaviour of the MLD child in the final example when expected to study a series of unrelated, meaningless items for future recall whilst the experimenter is out of sight behind some apparatus.)

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Children with moderate learning difficulties are powerfully influenced by the context and often fail to take sufficient note of the task; microphones, trailers and adults who hide may exert a persuasive "pull" on the child's attention and thus over-ride the essential aspects of the task. It may be that typical children are more able to "screen out" these distractions. Similarly, the "disembedded" (or context-free) nature of the recall tasks leaves the child unclear as to what s/he is meant to do and, more importantly, *why* s/he is meant to do it.

Donaldson (1978) notes that when tasks are embedded in a context with which adults are familiar they feel most at home: MLD children are no different. Thus, whilst recalling seven unrelated digits may be formally the same as recalling a seven-digit telephone number, it is never-the-less psychologically quite different. The inducement to remember a telephone number is clear, the reason for it is obvious, and the penalty for not remembering can be imagined. For the MLD child, however, recalling a series of unrelated digits may seem a perplexing and unrewarding task which is not worthy of cognitive effort; this notion of tasks being worthy of cognitive effort, from the perspective of the potential memorizer, will be expanded on in the research study itself.

## Strategy Training Techniques

As far as strategy training studies are concerned, typical techniques are to instruct the subjects exactly what to do, to illustrate the use of the strategy over a number of demonstrations, the subject and the experimenter then execute the strategy together for a sufficient number of trials to allow the subject to perform the strategy alone and, finally, to remind and prompt the subject throughout the sessions. This procedure would be repeated for a series of presentations across a number of days.

By way of illustration, Brown and Campione (1977), in a study involving MLD children ranging in age from 6- to 12-years, report

the procedures described below whilst training children to recall a number of 12-item lists of pictures.

On day one children were given a total of eight lists of twelve items to label, study and recall. This was repeated on day two, with children being given the "option" of choosing six items from each list for additional study. Days three and four were training days, during which time the children were given four lists of twelve items to recall. Following testing, the children were given back the recalled items plus an additional item, with the aim being to increase this number over a series of trials until the child could recall all twelve items. Days five and six were a replication of day two. No performance feedback was given. Throughout the period the children were repeatedly "warned" (the authors' choice of word) that the aim was to recall all twelve items in each list.

Apart from the sheer effort required by children as young as 6-years to study and recall large numbers of items over a period of days, the present writer proposes that the children were surely perplexed by the motives and intentions of adults who emphasize the importance of recalling all twelve items and then give back without explanation some, but not all, of the items to "do again". Furthermore, children who asked for all twelve of the items for further study (a reasonable request since this was the aim of the task) were told that "only six were allowed." Thus, on this occasion at least, it may be that the younger children's failure to be "dramatically strategic" or to benefit

from training was due more to flaws in the experimental design that to flaws in the child.

Given the unpalatable nature of the remedial "treatment", together with the "gloom-and-doom" prognosis posited by enquirers such as Devereux (1982), the present writer is not surprised to note that the MLD child will adopt a "school's out" attitude to experimenter-imposed strategies and will thus abandon them at the first opportunity.

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It could be said that those who have benefited most from being able to perform the type of decontextualized recall tasks cited in the description of recall task characteristics (namely the academics) are consequently inclined to set most store by this sort of activity. The incentive to shift the research emphasis is therefore lacking. The MLD child may, in fact, be demonstrating efficient strategy use which, because of the nature of the task, is overlooked or trivialized. Furthermore, it may be that whilst children in general possess a different view to adults of things-worth-remembering, the MLD child in particular is less skilled in deciding when it is propitious to sacrifice his/er own preferred things-worth-remembering for those which conform to "scholastic" expectations.

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To conclude: the available research evidence is consistent in demonstrating deficiencies in the spontaneous use of mnemonic

strategies in children with moderate learning difficulties. Strategy training studies indicate that some, but not all, MLD children can benefit from instruction, providing that it is of an extremely explicit and extensive nature. Transfer of training to new tasks has rarely been achieved and subjects frequently revert to inefficient strategy use when no longer under instructional control.

The present writer, however, proposes that MLD children are potentially active, efficient and planful learners who can demonstrate an impressive array of spontaneously generated mnemonic strategies - *providing that the memory task requirements are effective in eliciting these skills.*

The writer argues that the current research practices, based as they are on the notion of the MLD child as failing spontaneously to employ strategies, serve only to perpetuate this notion and proposes instead a major re-orientation in experimental approach which involves modifying the task requirements rather than the child.

# Chapter 5: The Research Problem
## A Case Study

## The Research Problem: A Case Study

### Introduction

Accepting the assertion that the inability spontaneously to employ mnemonic strategies is not something which an individual "has" (in the same way in which s/he might have measles), then it is worth considering the process by which a child may acquire the label of inefficient[5] mnemonic strategist.

Typically, the child is registered as a pupil in a mainstream school and then attempts to carry out the formal, hypothetical memory tasks defined by the institution as being the "desirable" and "normal" vehicles by which the mainstream pupil will fulfil his/er role expectations. The child for whom it is important that memory and learning tasks comprise concrete materials or are embedded within the supportive context of his/er own interests and personal experience is, in school terms, already well along the road to learning deviancy.

Within a different context however (for example, one which phrases its memory task requirements within a personally relevant frame of reference) the same child may be assigned to the specially valued role of "having a good memory" on the basis of his/er mnemonic performance.

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[5] In the present study *inefficient* strategic employment includes the non-spontaneous utilisation of strategies.

It is the contention of the present researcher, therefore, that it is the context which defines the child as an inefficient strategist rather than some within-child "condition". Most frequently, it would appear, the context is the school.

This case study is designed to illustrate and set into context the research problem and the approach of the study, as stated in the introductory section. The aim of the case study is to compare the mnemonic performance, across different learning environments, of a 14-year-old boy with moderate learning difficulties.

## Subject

Carl is 14 years 10 months and attends a "special" school for children with moderate learning difficulties, having previously transferred, at age 12, from a nearby mixed comprehensive school. He has had a history of learning difficulties since his primary school days, relating mainly to a reported "slowness" and/or inability to learn new material in the first instance and to retain and recall it in the second.

Despite additional "help" (most frequently in the form of more of the same in which he was already failing) the curricular demands of his comprehensive school served only to highlight Carl's range of learning difficulties. He was formally referred to the Psychological Service for a multi-professional assessment (under the 1981 Education Act) and subsequently "officially" acquired the status of a

pupil with moderate learning difficulties by means of a "Statement" of Special Educational Needs (SEN).

The Educational Psychologist's advice which constituted part of Carl's Statement reported that:

"Carl's responses to the verbal tests of the WISC-R suggest that he has marked difficulty in recalling information ... The verbal I.Q. of 71 indicates that, in respect to Carl's future, it would appear that his general educational progress will be significantly slower than that of his peers."

A second Psychologist (Clinical) reported that:

"On the McCarthy Scales of Children's Abilities Carl gained a General Cognitive Index of 70. On the verbal scale of this test Carl was clearly having difficulty in remembering words or using verbal concepts. His scores on the Schonell Memory Scale are significantly below average, and it is likely that he will need significant repetition in his work."

Extracts from Carl's mainstream school reports support the "official" view of Carl as boy with significant difficulties in remembering and learning:

"Carl needs to concentrate on his work as it is not of an acceptable standard. He needs to work harder to remember facts ..."

"Carl has not learned a great deal this year - he must have more confidence and "have a go". He must also sit down and read the instruction sheet himself and then try to remember what he has read."

"Carl must concentrate in lessons instead of daydreaming. He does not seem able to keep up with the lessons - mostly because he does not bother. In a withdrawal situation Carl is more able to remember simple facts and short instructions, mostly because he is made to."

"Carl can be rather dreamy in lessons. Of late he has become rude and truculent. He displays little interest in his school work."

"Carl has difficulty in finding and remembering the important points in the material presented."

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The academic reports refer frequently to Carl's poor memory and to his lack of inclination to work; nevertheless, no useful suggestions for future learning are offered (apart from exhortations to "do better") neither are alternative strategies suggested (apart from a comment on the apparent success of "withdrawal" as a teaching approach).

Clearly, Carl was having difficulty in remembering various curriculum materials, and yet the only reported advice he received from his teachers was to "try to remember" what he had read and to "work harder" to remember facts. It is worth noting that when MLD children report these same mnemonic tactics to the researchers they are inevitably labelled as inefficient strategists.

The PSE report (Personal and Social Education) notes that:

"Carl is keen to do well though he does not always have the skills to do so. We would see our Prevocational Course - with its emphasis on life skills etc. - as being an ideal long-term goal for Carl."

Clearly, the report-writers demonstrate no intention of modifying the curriculum in order to meet Carl's learning needs; instead, Carl was somehow expected to modify himself as a learner or to accept his assignment to the disesteemed status of "vocational" student.

Carl's special school teachers adopt a more individualised approach to pupil learning, and modification or differentiation of the curriculum is usual practice. Nevertheless, Carl is still described as having significant difficulties in learning and as being "disaffected" in relation to the curriculum. According to Carl's teachers, Carl will only

engage in an activity when it involves football - a particular interest of his. Apparently, even a tenuous link with the sport will engage his attention.

In the light of the researcher's contention that task materials should be designed to match certain child variables (in this case, subject interest) if they are to be effective in prompting spontaneous strategic employment, *football* was chosen as the "personally relevant" stimulus material with which to investigate Carl's employment of mnemonic strategies.

## Research Questions, Task Characteristics and Stimulus Materials

The case study will compare Carl's recall performance for personally relevant (PR) and laboratory-type (LT) stimulus materials. The recall tasks are designed to investigate:

1) How Carl rates himself as a memorizer for personally relevant, school-type and laboratory-type materials;

(2) Whether Carl spontaneously will employ mnemonic strategies in laboratory-type recall tasks where rehearsal, elaboration and categorization would be appropriate;

(3) The "enjoyment" rating which Carl assigns to memorizing laboratory-type material;

(4) If Carl does not use strategies, what he does in order to memorize material;

(5) Whether Carl is able to detect organization or opportunities for elaboration, even if he does not use the appropriate memorization strategy;

(6) Whether Carl spontaneously will employ mnemonic strategies in personally relevant recall tasks;

(7) The "enjoyment" rating which Carl assigns to memorizing personally relevant material.

Table 4 summarises the task characteristics and stimulus materials used to investigate the questions specified above.

**Table 4**
**Task Characteristics and Stimulus Materials**

| Task Number | Task Characteristics / Stimulus Materials |
|---|---|
| 1 | Mnemonic self-concept: (a) general (b) school-related (c) personally relevant. Rating scale: 1 to 10. |
| 2.1 | Free recall (random/personally relevant): 10 names of football players from different teams mounted on 30x5cm card. |
| 2.2 | Free recall (elaboration/personally relevant): 12 names of football players from four different teams, mounted individually on 5x5cm card; four colours (to correspond to team colours) mounted individually on 10x10cm card. |

## Table 4
## Task Characteristics and Stimulus Materials (cont.)

| Task Number | Task Characteristics / Stimulus Materials |
|---|---|
| 2.3 | Free recall (categories/personally relevant): 9 names of footballers from three different teams, mounted individually on 5x5cm card. |
| 3 | Enjoyment rating for personally relevant material. Rating scale: 1 to 10. |
| 4.1 | Free recall (random/laboratory-type): 10 common nouns mounted on 30x5cm card. |
| 4.2 | Free recall (elaboration/laboratory-type): 12 common nouns, three each beginning with either "R", "W", "B" or "Y", mounted individually on 5x5cm card; four colours ("Red", "White", "Blue" or "Yellow") mounted individually on 10x10cm card. |
| 4.3 | Free recall (categories/laboratory-type): 9 common nouns from three taxonomically related categories, mounted individually on 5x5cm card. |
| 5 | Enjoyment rating for laboratory-type material. Rating scale: 1 to 10. |

## Experimental Procedure

The study was conducted over one sitting in Carl's school. The researcher explained to Carl that she would like to talk to him about memory and that the information was to be used as part of a study.

It was explained to Carl that people find different things hard or easy to remember and that he may find some of the items easy to remember, but others might be hard. No mention was made of which particular items might be hard or easy.

Carl's teacher was asked to confirm that Carl could recognize and/or label the stimulus materials. Carl's basic literacy skills were reported to be good, therefore reading difficulties would not pose methodological problems. Nevertheless, all materials were labelled and/or read as they were presented.

The order of presentation of the research questions varied from the order described in Table 4 to avoid a practice effect for the personally relevant materials.

For all recall tasks a study-test procedure was utilised, whereby Carl was instructed to study the stimuli "until ready" with a view to future recall. Prior to the recall tasks he was familiarized with a study/cover/recall procedure and with the experience of studying "until ready".

Individual experimental procedures and method of equating tasks are described more fully in the results section.

Throughout the study the researcher asked Carl a series of open-ended questions of the type: "Tell me what you did to help you remember ..." and also made informal field notes on general experimental behaviour.

## Results

Tables 5 and 6 summarise the results of the various tasks described in Table 4. Since the research interest is focussed on Carl's response

to personally relevant versus laboratory-type tasks, the results of each type of task are grouped accordingly.

**Table 5**
**Mnemonic Self-Concept, Recall and Enjoyment Rating for Personally Relevant Tasks**

| Task | Number/Characteristic | Score | Accuracy (%) | Study Time (secs.) |
|---|---|---|---|---|
| 1c | Mnemonic self-concept | 10 | na | n a |
| 2.1 | Free recall (random) | 10 | 100 | 11 |
| 2.2 | Free recall (elaboration) | 12 | 100 | 23 |
| 2.3 | Free recall (categories) | 9 | 100 | 25 |
| 3 | Enjoyment rating | 10 | n a | n a |

**Table 6**
**Mnemonic Self-Concept, Recall and Enjoyment Rating for Laboratory-Type Tasks**

| Task | Number/Characteristic | Score | Accuracy (%) | Study Time (secs.) |
|---|---|---|---|---|
| 1a | Mnemonic self-concept (gen.) | 10 | n a | n a |
| 1b | Mnemonic self-concept (sch.) | 0 | n a | n a |
| 4.1 | Free recall (random) | 4 | 40 | 10 |
| 4.2 | Free recall (elaboration) | 3 | 25 | 11 |
| 4.3 | Free recall (categories) | 5 | 55.55 | 18 |
| 5 | Enjoyment rating | 0 | n a | n a |

As illustrated in Table 5 and 6, the most striking aspect of the data is the contrast between Carl's mnemonic performance for personally relevant versus laboratory type tasks.

From the results depicted above it can be concluded that Carl remembers better and enjoys tasks more when they are embedded in a familiar and relevant context than when they are "disembedded" and context-free. Furthermore, his mnemonic self-concept scores (at least in terms of PR versus LT tasks) appear to be an accurate estimation of his mnemonic strengths and weaknesses.

Individual experimental procedures and results will be discussed in greater detail below.

**Tasks 1a, 1b and 1c: How Carl rates himself as a memorizer.**

The assessment of Carl's mnemonic self-concept began with the general dimension "good at remembering". Carl was asked to indicate a point along a line in answer to the question: "How good are you usually at remembering?" The line measured 10cm long and it was explained to Carl that the far left was where people who were "not very good" at remembering would point, the middle was where people who were "okay" at remembering would point, and the far right was where people who were "very good" at remembering would point.

Initially, no reference was made to the context and Carl did not request contextual details. The two context-specific questions which formed part of the "good at remembering" dimension were: "How good are you usually at remembering things to do with football?" and "How good are you usually at remembering things you learn at school?"

Carl was allowed a number of practice trials using questions unrelated to memory.

Carl's rating was scored by measuring (in cms) the distance from zero of the point which he had indicated along the line, with zero being

taken to be the far left of the line. Thus, the smaller the number the lower the mnemonic self-concept.

## Results

Table 7 depicts Carl's self-ratings over three contexts.

**Table 7**
**Subject's Self-Rating of Recall Ability**

| Context | Rating |
|---|---|
| General | 10 |
| School | 0 |
| Football | 10 |

In terms of the non-specific and football questions, Carl displayed the tendency towards overly-positive self-evaluation noted in MLD subjects in an earlier study conducted by the present writer (Male, 1989). He is nevertheless selective in his responses and it may be assumed, therefore, that his judgement is based on an internal conception of himself. In the light of Carl's subsequent performance, the "10" rating assigned to the recall of personally relevant items was, in fact, an accurate one.

His "10" rating given to the non-specific question compared to the "0" rating given to the school context question suggests that Carl is aware of the difficulty he has in remembering school-type tasks, but that he is not yet ready to abandon completely a possible ego defensive coping strategy.

Subsequent discussions with Carl about the option of reconsidering any of his initial extreme ratings for more finely graded ones

revealed that, whilst he was capable of displaying the seriation skills required to place oneself along an ordinal scale, his intention nevertheless was to remain firmly committed to his initial rating system.

A similar tendency towards extreme ratings has also been observed by the present writer in other MLD children (Male, 1989).

**Tasks 2.1, 2.2 and 2.3: Whether Carl spontaneously will employ mnemonic strategies in personally relevant recall tasks.**

This research question was investigated using three different sets of stimulus materials and three different experimental techniques.

**Task 2.1: Free Recall (Random)**

The stimulus materials comprised a set of ten last names of famous British footballers, selected from a number of different teams, mounted in a continuous line on 30x5cm card.

Carl was told to: "Try to remember the list of footballers' names in the same order as you see here. You may look at the list for as long as you like. I will then cover it up and ask you to say the names back to me." The instruction to try to remember the names "in the same order", together with the "fixed" nature of the materials and the cyclical reading of them by the researcher was intended to encourage a rehearsal technique.

## Results

Table 8 depicts Carl's recall accuracy for ten random, personally relevant items.

**Table 8**
**Recall Accuracy for Random, Personally Relevant Items**

Number of items recalled: 10
Percentage accuracy: 100
Study time: 11 secs.

The serial order of recall is depicted below.

**Fig. 2**
**Serial Order of Recall of Personally Relevant Items**

| Order of Presentation | Order of Recall |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 7 |
| 8 | 8 |
| 9 | 9 |
| 10 | 10 |

Fig. 2 illustrates the efficient verbal rehearsal technique adopted by Carl - despite the relatively large number of items and the short study time. Carl's own description of his technique was:

"It was easy because I know all about football. I just looked at it, read it a few times in my head and said it. I nearly forgot Speedie *(the last name in the list)* 'cos he's about to retire, but I just remembered he came at the end."

### Task 2.2: Free Recall (Elaboration)

The stimuli totalled twelve footballers' names, comprising three each from four different teams, individually mounted on 5x5cm card, plus

four 10x10cm cards, one of each colour from red, white, blue, yellow to represent the actual colours worn by the players from the four different teams. The colour-matching approach was employed in order to encourage an elaborative mnemonic technique.

The twelve name cards were spread out at random, whilst the four colour cards were placed horizontally above the name cards. Carl was told: "I want you to try to remember all twelve cards in any order. Look at them for as long as you like and then I will cover them up. When I say "red" I want you to remember any three of the footballers' names in front of you, when I say "yellow" I want you to remember a different three names and so on for the blue and white cards until you have named as many of the players in front of you as you can remember." Carl was told that he could move the cards if he wished.

## Results

Table 9 depicts Carl's recall accuracy for twelve personally relevant items with elaborative potential.

**Table 9**
**Recall Accuracy for Potentially Elaborative, Personally Relevant Items**

Number of items recalled: 12
Percentage accuracy: 100
Study time: 23 secs.

Carl looked briefly at the cards, commented: "I know what this is," and moved players in sets of three under each of their corresponding team colours. He then declared himself ready, without requiring

study time. His order of recall corresponded with the four team colours represented. Thus, when given the prompt "blue", for example, Carl recalled all three players whose team colours were blue. When asked to described how he had remembered the items Carl recounted the efficient elaborative technique described below:

"I just put the players with their team colours ... like "Rush" goes with red, because he plays for Liverpool and that's their colour. When you said the colour I remembered which player I had. I could do all the first and second division like that."

### Task 2.3: Free Recall (Categorization)

The stimuli totalled nine different footballers' names, comprising three each from three different teams, individually mounted on 5x5cm card. The nine name cards were spread out at random. Carl was told: "I want you to try to remember all nine cards in any order. Look at them for as long as you like and then I will cover them up. You can move the cards if you like."

#### Results

Table 10 depicts Carl's recall accuracy for nine personally relevant, potentially categorizable items.

**Table 10**
**Recall Accuracy for Potentially Categorizable, Personally Relevant Items**

Number of items recalled: 9
Percentage accuracy: 100%
Study time: 25 secs.

Carl again looked at the cards for a few seconds, commented: "Easy - Crystal Palace, Everton and Arsenal." He then declared himself ready, without moving the cards or requiring study time. His order

of recall corresponded to the three teams represented, thereby indicating that he had used these categories to reduce nine items into three manageable mnemonic "chunks".

### Task 3: How much does Carl enjoy recall of personally relevant material?

The experimental procedure adopted in Experiment 1 was replicated for Experiment 3, with the exception that Carl was asked to indicate a point along a line in answer to the question: "How much did you enjoy this session?"

#### Results

Carl was unhesitating in indicating the furthest point right of the line (equivalent to a "10" score). His justification for his "10" score was:

"I like football and I'm good at remembering things about football. I could do loads more. I enjoyed that. It was like a game."

### Tasks 4.1, 4.2 and 4.3: Whether Carl spontaneously will employ mnemonic strategies in laboratory type recall tasks.

In line with the experimental approach adopted for tasks 2.1, 2.2. and 2.3, the research question was investigated using three different sets of stimulus materials and three different experimental techniques.

### Task 4.1: Free Recall (Random)

The stimulus materials comprised a set of ten common nouns mounted in a continuous line on 30x5cm card.

The experimental procedure adopted for task 2.1 was replicated for task 4.1.

## Results

Table 11 depicts Carl's recall accuracy for ten random, laboratory-type items.

**Table 11**
**Recall Accuracy for Random, Laboratory-Type Items**

Number of items recalled: 4
Percentage accuracy: 40
Study time: 10 secs.

The serial order of recall is depicted below. The symbol - indicates a missed item.

**Fig. 3**
**Serial Order of Recall of Laboratory-Type Items**

| Order of Presentation | Order of Recall |
|---|---|
| 1 | - |
| 2 | - |
| 3 | 4 |
| 4 | - |
| 5 | - |
| 6 | - |
| 7 | - |
| 8 | 1 |
| 9 | 3 |
| 10 | 2 |

Fig. 3 illustrates the random order of recall, with evidence of a weak primacy effect (item three recalled, but items one and two missed), a relatively strong recency effect (all terminal items recalled early) and no recall of middle items. Carl's own description of his technique supports a no-rehearsal conclusion:

"Well, I looked at it."

Prompted, he added:

"I read it."

### Task 4.2: Free Recall (Elaboration)

The stimuli totalled twelve common nouns, comprising three each beginning with the same letter, individually mounted on 5x5cm card, plus four 10x10cm cards one of each colour from red, white, blue, yellow to represent the same initial letters as the groups of nouns. Thus, "window", "wire" and "wool" could match the white square whilst "rope", "road" and "railway" could match the red square.

The procedure used for Experiment 2.2 was replicated, with the exception that "words" was substituted for "footballers' names".

### Results

Table 12 depicts Carl's recall accuracy for twelve laboratory-type items with elaborative potential.

**Table 12**
**Recall Accuracy for Potentially Elaborative, Laboratory-Type Items**

Number of items recalled: 3
Percentage accuracy: 25
Study time: 11 secs.

Carl spent some time looking at the array of words and then asked if he should move them under a colour the way he had for the football question. He was told that he could if he found this helpful. He then spent further time moving words at random under different cards

and subsequently re-arranging them. His final arrangement was random, with no apparent letter-colour correspondence.

Carl correctly recalled only two words on the first attempt - the third word was added at a later stage. The two correctly recalled words were matched (at random) to the first card called - the white card. For subsequent colour cards he was unable to supply an answer and would not even guess. Carl's own description of his technique was:

"I looked at them and tried to remember them."

He clearly found this task extremely difficult and was unable to employ any elaborative technique in order to aid recall - despite having had practice with a similar task only minutes before. When his attention was drawn to the fact that the task was very similar to the "football teams game" (as he described it) he refused to concede that they were in any way similar. When shown the groups of words matched with their corresponding colours he was able to detect that each word began with the same initial letter, but did not see this as having any relevance to the task or as being in any way similar to the personally relevant equivalent task.

Carl's earlier moving of the cards had apparently been an attempt to comply with his estimation of experimenter-expectations, since his self-reports of mnemonic behaviour did not indicate any goal-directed or planful motive.

## Task 4.3: Free Recall (Categorization)

The stimuli totalled nine different common nouns, comprising three each from three different categories (vehicles, clothes and animals) individually mounted on 5x5cm card.

The experimental procedure used for Experiment 2.3 was replicated.

### Results

Table 13 depicts Carl's recall accuracy for nine laboratory-type, potentially categorizable items.

**Table 13**
**Recall Accuracy for Potentially Categorizable, Laboratory-Type Items**

Number of items recalled: 5
Percentage accuracy: 55.55
Study time: 18 secs.

The serial order of recall suggests some evidence of a categorization technique, with the "animals" items being recalled third, fourth and fifth (items recalled first and second were unrelated). Carl's self-reported technique of: "I looked," does not support a categorization technique, however.

When asked if he could: "Put together the things that go together," he was nevertheless able to categorize all nine of the nouns. Thus, he could clearly detect the categories but appeared not see them as being a useful mnemonic aid.

## Task 5: How much does Carl enjoy recall of laboratory-type material?

The experimental procedure adopted in task 3 was replicated for task 5.

### Results

Carl clearly found himself with something of a dilemma on his hands. His attitude to the laboratory-type tasks was markedly different to the attitude displayed during the personally relevant tasks: he was less animated, more withdrawn and visibly lacking in confidence. And yet, out of apparent politeness, he was reluctant to admit that he had not enjoyed the session. In the end he compromised by pointing to the far left of the line (a "0" score) but qualifying it with: "But I'll do some more if you want."

### Discussion

Carl clearly viewed the personally relevant recall tasks as being practical empirical questions which demanded an answer; this being the case, he was willing and able *spontaneously* to employ his *existing* repertoire of highly efficient mnemonic strategies in order to aid recall. When presented with the formal hypothetical memory tasks typical of the decontextualized material so valued by the school system, however, Carl failed to find a reality and instead reverted to the role of inefficient mnemonic strategist. Furthermore, despite being able to detect organizational and procedural similarities in the relevant and laboratory-type tasks, he nevertheless failed to behave strategically when operating outside a familiar frame of reference.

Thus, in the case of Carl, the nature of the laboratory-type recall tasks was a powerful agent in determining his status as an inefficient strategist, thereby lending credence to the notion that a failure to employ strategies is an inevitable "symptom" of children with moderate learning difficulties.

Carl's mnemonic performance in personally relevant tasks, however, clearly supports the contention of the present writer that MLD children *can* use strategies providing that the task requirements are effective in eliciting these skills. "Inefficient memorizer" is therefore not a legitimate description of Carl, but a description of the role he was required to play within a particular learning environment.

# Chapter 6: The Research Study

*(ii The Research Study Part I: Metamemorial Functioning*

*(ii) The Research Study Part II: Recall Performance*

*(iii) The Research Study Part III: The Spontaneous Employment of Mnemonic Strategies*

*(iv) The Research Study Part IV: A Proposed Taxonomy of Authentic Features of Recall Tasks*

*(v) The Research Study Part V: Conditions Under Which MLD Subjects Spontaneously Employ Mnemonic Strategies*

## The Research Study

### Introduction

Whilst it has been seen that the data are consistent in confirming a negative association between moderate learning difficulties and the spontaneous employment of acquisition and retrieval strategies, observed mnemonic behaviour of "special" children has led the present investigator to call into question the assertion that children with moderate learning difficulties do not spontaneously employ mnemonic strategies to aid recall. The case study described in the previous section, for example, has indicated that modifying certain memory task requirements (in this case embedding the to-be-remembered material within a personally relevant frame of reference) is effective in eliciting a range of highly efficient memory skills *already* at the disposal of the MLD memorizer.

The demonstration of MLD children spontaneously employing learning and recall strategies, followed by an identification of the conditions under which they will do so, is the aim of the Research Study which follows.

### Organizational Scheme

The Research Study is divided into five parts. Part I of the Study considers metamemorial functioning of children with moderate learning difficulties, Part II compares the recall performance of MLD and typical children, Part III investigates strategic employment of

MLD children across a range of tasks, Part IV presents a taxonomy of "authentic" features of recall tasks and, finally, Part V compares strategic employment by MLD children across tasks labelled "authentic" and "non-authentic".

# The Research Study Part I

## The Research Study Part 1

## Metamemorial Functioning

Discussions in an earlier section concerning the existence of a metamemory-memory behaviour relationship concluded that a close connection is found, albeit dependent on the type of knowledge involved and the behaviour studied: Brown (1978), for example, hypothesizes that impoverished metamemory underlies children's failures to employ appropriate mnemonic strategies.

With the exception of some preliminary work by Brown and Campione (1977), however, there is a paucity of research aimed at assessing metamemorial efficiency in children with moderate learning difficulties. Since it is the contention of the present writer that metamnemonic beliefs direct mnemonic actions - and in the interests of gaining a holistic mnemonic picture of the child with moderate learning difficulties - various aspects of the metamemory of MLD and typical children will be considered and compared prior to the principal research study.

Specifically, when compared with the typical child:

1) Does the MLD child have an accurate awareness of his/er own mnemonic capabilities and limitations?

2) Can the MLD child recognize remembering and forgetting when they occur?

3) Does the MLD child have an accurate feeling-of-knowing?

4) Does the MLD child have an accurate awareness of the effects of various task, person and strategy variables on memory performance?

5) Does the MLD child have a knowledge of which strategies are available and applicable?

Given that research evidence has demonstrated that MLD children manifest deficiencies in a broad range of memory tasks, it would be reasonable to speculate that they would also perform poorly on a range of tasks designed to assess various aspects of their metamemorial functioning. Since the present investigator is proposing that memory task characteristics are a relevant factor in determining the efficiency (or otherwise) of the mnemonic performance of MLD children, however, it would also be reasonable to speculate that the same may be true for metamemorial functioning.

## The Sample

Participants were 40 children (20 MLD and 20 typical children) attending one of two schools situated in residential areas within an urban authority. All subjects were randomly selected from two different year groups within their respective schools. The MLD

group was selected from the borough's all age day special school for children with moderate learning difficulties and comprised 12 boys and 8 girls. IQ scores typically ranged from 50 to 75. No MLD children were included if there were indications of gross sensorimotor deficits or severe emotional disturbances. The typical group of children attended a mixed Primary school and comprised 9 boys and 11 girls.

Although no intelligence test scores were available for the typical children, they were judged to be of at least average intelligence (MA = chronological age) due to their placement in a mainstream setting and the absence of learning difficulties as indicated by their teachers. The mean chronological age of the MLD children was 12 years 6 months, whilst the mean chronological age of the typical group was 12 years 0 months.

The present investigator proposes that informed child consent is a relevant factor in terms of ethical research practices. Prior to participation in the study, therefore, all children in the appropriate year groups received an overview of the general research topic (i.e. memory skills) and were asked if there was any child who did not wish to participate. No typical child declined, whilst three MLD children (two boys and one girl) did decline. These three were therefore not included in the random selection.

Each group (MLD and typical) was tested in their respective schools in one sitting over two consecutive days. In order to ensure that a

one-sitting experimental design would not be too arduous for the subjects a pilot test was conducted with three MLD and three typical children, none of whom participated in the subsequent trials.

All subjects were tested individually in a quiet room seated at a table opposite the experimenter. Teachers of the MLD group were asked to confirm that all participants had acquired the basic skills necessary to attempt the tasks (e.g. recognise numbers up to 20). Pictures and words to be used in the study had been readily labelled or read by all subjects in the pilot study. The experimenter nevertheless also labelled or read the stimulus materials to all subjects as they were being presented in order to over-ride possible reading or labelling difficulties (for example: "Here is a list of nine words: train, bus, car ...") Because of the experimental requirements of question 3, no child "new" to the school was included in the study.

## Methodological Issues

Two approaches were used to assess MLD and typical children's metamnemonic judgements. The first was the presentation of memory problems or tasks about which the children were required to make metamnemonic judgements by selecting from a number of possible responses, whilst the second was a series of open-ended interview questions which required the children to justify or explain their metamnemonic judgements.

The present researcher acknowledges that a number of problems are inherent in any method used to assess knowledge about memorization processes, not least of which relates to veridicality of verbal reports. Attempts by the researcher to improve the adequacy of the self-report data included incorporating some of the suggestions made by Ericsson and Simon (1980), including (1) making the enquiry as soon as possible after the event; (2) minimizing the amount of probing; (3) where possible, avoiding "why?" questions, asking instead for simple descriptions or elaborations.

A second methodological problem - verbal ability - is inherent in all verbal report methods but, given the nature of the sample, is particularly pertinent to the present discussion. Attempts to circumvent and/or minimize the problem included:

(1) Wherever possible, memory problems were presented both aurally and visually;

(2) Permitted response modes included gestures (e.g. pointing);

(3) If appropriate, rank orders were used as a potential response mode, since prior experience had indicated that this was a mode with which most children were familiar and comfortable;

(4) Subject experimental behaviour was closely observed in order to supplement absent or impoverished verbal responses;

(5) Complexity of researcher verbal probes was closely monitored;

(6) Additional subject information was solicited following an apparently idiosyncratic verbal response;

(7) No subject was included where there were indications of specific speech or language disorders;

(8) The researcher attempted to create a context in which subjects felt willing and able to supply authentic verbal reports (e.g. subjects were assured that the interview was "private");

(9) Advice regarding stimulus materials and experimental procedures was sought from the subjects' teachers;

(10) Multiple assessment techniques were employed in an attempt to provide converging measures.

## The Tasks

**Question 1: Does the MLD child have an accurate knowledge of his/er own mnemonic capabilities and limitations?**

## Task 1
## Procedure

The assessment of the accuracy of MLD and typical children's knowledge of themselves as memorizers began with the general dimension of "good at remembering". The children were asked to indicate a point along a line in answer to the question: "How good are you usually at remembering?" The line measured 10cm long and it was explained to each subject that the far left of the line was where people who were "not very good" at remembering would point, the middle of the line was where people who were "in between" would point, and the far right of the line was where people who were "very good" at remembering would point. Subjects were allowed a number of practice trials using questions unrelated to memory.

The subjects' ratings were scored by measuring (to the nearest cm) the distance from zero of the point which had been indicated along the line, with zero being taken to be the far left of the line. Thus, the smaller the number the lower the self-evaluation.

The actual recall ability of the MLD and typical subjects was assessed by showing the subjects ten unrelated digits mounted on 30x5cm card and instructing them to study the numbers which a view to recalling them. Since a number of the experimental tasks would require the subjects to have a knowledge of studying with a view to future recall, all children were familiarized with the

study/cover/recall procedure on an initial practice trial involving ten pictures. Subjects were given two minutes study time.

## Results

Table 14 shows the MLD and typical groups' self-ratings and actual recall.

**Table 14**
**Estimated and Actual Recall: Digits**

| | MLD | | Typical | |
|---|---|---|---|---|
| | Estimated | Actual | Estimated | Actual |
| **Total** | 140 | 102 | 135 | 161 |
| **Mean** | 7.00 | 5.10 | 6.75 | 8.05 |

As expected, the typical subjects were more efficient in terms of their ability to recall 10 unrelated digits. In terms of accuracy of self-ratings, Table 14 indicates a general tendency on the part of the MLD subjects to overestimate their mnemonic ability. The majority (thirteen) of self-justifications for the ratings by typical children tended to refer to previous experiences. One child, for example, justified his "7" estimate with: "I can usually remember telephone numbers and they have seven numbers." Fewer (nine) MLD children referred to past experiences and a number (eight) used re-stating tactics ("Because I can.")

More specifically, Table 15 indicates the total number of subjects who either under- or overestimated their ability to recall, together with the number of subjects who were accurate in their judgements.

## Table 15
## Accuracy of Recall: Total Numbers per Group

| | Overestimate | Accurate | Underestimate |
|---|---|---|---|
| **MLD** | 13 | 0 | 7 |
| **Typical** | 1 | 6 | 13 |

The data show that no MLD child was accurate in his/er evaluation of his/er ability to recall ten unrelated digits, whereas 6 typical children were accurate. When inaccuracy occurred the pattern was different for MLD and typical children: 13 MLD subjects overestimated their ability whereas only 1 typical subject overestimated; 7 MLD underestimated their ability whereas 13 typical subjects underestimated. Thus, the picture is of a strong tendency on the part of the MLD subjects to overestimate their mnemonic ability and an equally strong tendency on the part of the typical subjects to underestimate their mnemonic ability. This is supported by the highly significant Chi square of 139.62 ($df = 2$; $p < .001$) using the typical children as expected values.

Interpretation[6] of the Chi square confirms that the MLD pattern of estimated recall departs significantly from that of the typical child, with the direction of the departure being for the MLD group to overestimate their accuracy. As suggested in Table 15 (above), the overestimate cell accounts for the preponderant proportion of the Chi square (Chi square = 132.25; $df = 1$; $p < .001$). The next highest contribution to the Chi square comes from the discrepancy in accurate estimates, with a Chi square of 5.04 ($df = 1$) being

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[6] Ref: J. P. Guilford and B. Fruchter, (1981), Fundamental Statistics in Psychology and Education. McGraw Hill.

significant at the 5% level. The groups do not differ significantly on their underestimates alone (Chi square = 2.33; df = 1; $p > .05$); nevertheless, the tendency for the MLD group to underestimate as compared to the typical group contributes somewhat to the overall result.

As illustrated in Study 2 (below), when asked direct questions the MLD children also saw themselves as being more efficient memorizers than typical children.

## Task 2
## Procedure

Seven statements of the type: "I am good at remembering things I have learned at school" were read to the MLD and typical subjects, who were then asked to respond either "True" or "False". Response patterns were varied so that a "True" response was as likely to endorse a desirable attribute as a non-desirable attribute. Subjects were allowed a number of practice trials in order to ensure that they understood the concepts of true and false.

## Results

A comparison of the self-ratings given by both groups on 7 memory points is illustrated in Table 16.

## Table 16
## Total Number of Children From Each Group Endorsing Memory Statements

| Memory Statement | MLD | Typical |
|---|---|---|
| Remember things learned at school | 14 | 18 |
| Remember important things | 9 | 15 |
| Teacher thinks my memory is good | 19 | 13 |
| Remember telephone numbers | 16 | 11 |
| Remember items on a shopping list | 18 | 11 |
| Remember to bring things to school | 7 | 11 |
| Better at remembering than my friends | 19 | 7 |
| | --- | ---- |
| **Total** | 102 | 86 |

In line with Study 1, the scores of the two groups as indicated in Table 16 appear to support a general tendency on the part of MLD children to overestimate their mnemonic ability as compared to typical children.

Table 17 illustrates the rank order, based on total scores, assigned to the seven variables for MLD and typical children.

## Table 17
## Rank Order of Memory Statements Endorsed

| Rank | MLD | Rank | Typical |
|---|---|---|---|
| 1= | Teacher opinion | 1 | Things learned at school |
| 1= | Compared with friends | 2 | Important things |
| 3 | Items on a shopping list | 3 | Teacher opinion |
| 4 | Telephone numbers | 4= | Telephone numbers |
| 5 | Things learned at school | 4= | Items on a shopping list |
| 6 | Important things | 4= | Bringing things to school |
| 7 | Bringing things to school | 7 | Compared with friends |

(note the significance of rho = 0.954 with 7 pairs of observations)

Whilst Table 17 appears to support the notion that MLD subjects continue to display a persistent tendency toward overly-positive self-evaluative mnemonic statements, the rank orders depicted

above clearly indicate that the children are nevertheless discriminating between the variables. They are therefore ready to concede that whilst they are less likely to be good at remembering "things learned at school", "important things" or "bringing things to school", they are nevertheless good at remembering items on a shopping list and telephone numbers. Furthermore, since the MLD children all attend a day special school for children with similar learning difficulties, their notion that they are better at remembering than most of their friends has a good chance of being realistic. Similarly, the MLD children's notion that their teachers have a high opinion of their mnemonic ability would be in line with the positive reinforcement style of teaching which is usually adopted within such "special" education.

Typical children are equally discriminating in their responses. Thus, whilst they recognize that they are usually successful in terms of remembering things learned at school or remembering important things (possibly one and the same thing for these children), the wider scholastic ability range found in a mainstream setting makes it less likely that they are better at remembering than most of their friends.

The researcher is now in a position to answer Question 1: Does the MLD child have an accurate knowledge of his/er own mnemonic capabilities and limitations?

**Despite a tendency to overestimate their mnemonic ability, judgements made by the MLD children under study were not random but were based on a consistent internal conception shared among themselves which appeared, in part, to be based on accurate prior knowledge of their own mnemonic performance.**

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**Question 2: Can the MLD child recognize remembering and forgetting when they occur?**

### Task 1
### Procedure

Prior to the task the researcher discussed with each child the meanings of the words "remember" and "forget". Previous experiences were referred to, including their experiences of remembering or forgetting various digits in task 1, question 1. The study did not proceed until the researcher had ensured that each child had an understanding of the terms. The assessment of MLD and typical children's ability to recognize remembering and forgetting began by simply asking the children to: "Tell me about a time when you remembered something," and "Tell me about a time when you forgot something."

### Results

Table 18 depicts the MLD and typical children's verbalized ability to report instances of remembering and forgetting.

**Table 18**
**Total Number of Children Who Could Accurately Report an Instance of Remembering and Forgetting**

| | Remembering | | |
|---|---|---|---|
| | MLD | Typical | Chi Square |
| Accurate | 3 | 20 | 29.39*** |
| Inaccurate | 17 | 0 | df=1 |
| | Forgetting | | |
| | MLD | Typical | Chi Square |
| Accurate | 9 | 20 | 15.03*** |
| Inaccurate | 11 | 0 | df=1 |

*** significant at the .001 level

As illustrated in Table 18, only three of the MLD group could describe accurately an occasion when they had remembered something. All three occasions involved practical activities ("Things for cooking", "My swimming trunks" and "Bringing in my homework"). Other MLD subjects either said they did not know an occasion when they had remembered something or gave inappropriate answers ("Do you know I had a bike?" or "Remembering is when you go into hospital").

All of the typical children could describe accurately an occasion when they had remembered something. These were predominantly (fifteen) examples of "in-the-head" remembering ("Revising before a test", "Remembering how to do maths problems with fractions" or "Remembering some of the Bengali words I have been taught").

Nine MLD children could describe accurately an occasion when they had forgotten something; these examples involved a majority of practical activities but also included some "in-the-head" instances of forgetting ("My shorts", "My trip money" or "When Mrs. Grant told me how to do my story").

The MLD child is more likely to be familiar with the experience of forgetting than of remembering - particularly in a school setting; this may account for the relatively greater ease with which the MLD children could describe an occasion when they had forgotten rather than when they had remembered something. Thus it may be that MLD children are highly dependent on personal mnemonic experiences of a particularly explicit nature - an explanation which could also account for the preponderance of practical mnemonic examples.

All twenty of the typical children could give an example of an occasion when they had forgotten something. Whilst these examples included some practical activities ("I forgot my trumpet for orchestra practice"), once again the majority (thirteen) tended to be of the "in-the-head" variety ("My times tables", "Spellings" or "My friend's 'phone number").

Highly significant Chi squares (29.39 for the "Remembering" dimension and 15.03 for the "Forgetting" dimension, $df = 1$, $p < .001$) confirms the difference between the groups.

## Task 2
## Procedure

Task 2 was designed to assess whether MLD and typical children could recognize remembering and forgetting in a hypothetical other.

Subjects were shown a total of eight line drawings mounted on 15x15cm card, each of which depicted children engaging in various activities (e.g. walking out of a room carrying a holdall, sitting at a desk with an open book, lying in bed with eyes closed). A story accompanied each drawing ("This boy / girl has been told to bring his P.E. kit to school. His kit is in the bag. He has picked up his bag and is now on his way to school"). After each story the subjects were asked: "Has the boy / girl in the picture remembered, forgotten or done something else?". Of the eight pictures and stories, three involved remembering, three involved forgetting and the remaining two involved doing something else. Teacher agreement of experimenter opinion regarding the correct response to each picture/ story was secured prior to testing and necessary adjustments were made. Order of presentation was random and "boy" or "girl" was used in the story to correspond with the gender of the subject.

## Results

Table 19 depicts the total and mean number of accurate remember/forget/other responses returned by the MLD and typical subjects.

**Table 19**
**Total and Mean Number of Accurate Remember/Forget/Other Responses**

| MLD | Remember | Forget | Other | Total |
|---|---|---|---|---|
| Total | 31 | 43 | 13 | 87 |
| Mean | 1.55 | 2.15 | 0.65 | 4.35 |

**Table 19 (cont.)**
**Total and Mean Number of Accurate Remember/Forget/Other Responses**

| Typical | Remember | Forget | Other | Total |
|---|---|---|---|---|
| Total | 51 | 53 | 33 | 137 |
| Mean | 2.55 | 2.65 | 1.65 | 6.85 |

As illustrated in Table 19, the MLD group correctly identified an overall mean of 4.35 cognitive activities out of a possible eight, whereas the typical group correctly identified an overall mean of 6.85 cognitive activities, again out of a possible eight. Negligible differences were observed between the groups for the variables "Remember" (a mean1.55 by the MLD subjects compared with a mean 2.55 by the typical subjects) and "Forget" (a mean 2.15 by the MLD subjects compared with 2.65 by the typical subjects) whereas the more finely grained "Other" variable appeared to be an area of relative weakness for the MLD subjects (a mean 0.65 by the MLD subjects compared with 1.65 by the typical subjects). In terms of rank order, both groups were most successful at identifying "Forgetting", but this tendency was stronger for the MLD group.

The researcher can now answer Question 2: Can the MLD child recognize remembering and forgetting when they occur?

**Over two tasks, the tendency is for typical children to be more accurate than MLD children in identifying remembering and forgetting. This tendency is not consistent, however, and significant differences are not always demonstrated. Furthermore, it appears that the**

**MLD child is more successful at recognizing forgetting than remembering, whereas the typical child appears to have no preference. The MLD child also has a tendency to cite practical rather than "in-the-head" instances of remembering and forgetting.**

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**Question 3: Does the MLD child have an accurate feeling-of-knowing?**

**Procedure**

Experimental procedure and stimulus materials similar to those employed by Cultice, Somerville and Wellman (1983) were used to investigate the memory-monitoring abilities of MLD and typical children. Subjects were shown a total of twenty 8x8cm colour photographs of children in their school, as close to their own age as possible, and asked to name them. Photographs were presented individually, with subjects being allowed to study them for as long as they wished. Photographs which were correctly named were placed face down next to the experimenter; unnamed and incorrectly named photographs remained face up next to the child. Either first names only or full names were accepted. Prior to testing, children were told why a photograph would be assigned to a particular place:

"I will put correctly-named pictures face down next to me. If you do not know the person's name or if you say the wrong name I will leave them face up and put them next to you."

## Results

Table 20 depicts the number of MLD and typical children who could correctly name photographs of their peers.

**Table 20**
**Ability to Name Peers: Total Number of Correct Responses**

| | Total | Mean |
|---|---|---|
| **MLD** | 274 | 13.7 |
| **Typical** | 254 | 12.7 |

As illustrated in Table 20, the MLD group correctly named an overall total of 274 pictures, whereas the typical group correctly named an overall total of 254 pictures, both out of a possible 400 pictures (20 pictures x 20 subjects). A "T" Test indicating that the difference between the groups was not significant (T = 0.22; df = 38) suggested that, on this occasion, MLD children were as efficient as typical children when required to name peers from photographs.

Unnamed or incorrectly named pictures were re-presented and children were told: "Look again at these photographs. Tell me if you think it is likely or unlikely that you could name the person if you also saw a list of children's names." Children were then required to respond "Likely" or "Unlikely" before being allowed to look at a register of names. They were asked to name the person in the photograph as soon as they felt able to. Even when children answered "Unlikely" they were still encouraged to peruse the list of names. MLD subjects were required to make a total of 126

judgements (400 possible - 274 correctly named), whereas typical subjects were required to make a total of 146 judgements.

Observation of the experimental behaviour of both groups indicated that MLD children responded in similar fashion to the typical children in that they accepted that it is possible to "know" an answer but temporarily to be unable to locate it in memory; many made spontaneous comments of the type: "Oh, I know him! Wait a minute... I saw him this morning..." whilst others smiled, put their hands to their mouth or head, looked around the room as if for inspiration, or frowned and looked pained as if "searching" their memories. Subjects would spend a considerable amount of time on this "searching" activity, with frequent requests to the experimenter to "Wait". When both MLD and typical children "knew" that they definitely could not supply a name, however, they rarely wasted time "searching" but tended instead to respond with an emphatic: "Don't know."

Accurate feeling-of-knowing judgements were considered to be those which demonstrated correspondence between feelings of knowing and subsequent naming performance. Table 21 depicts the total number of accurate positive feelings of knowing (a "likely" response followed by a correct naming) and accurate negative feelings of knowing (an "unlikely" response followed by a failure to name) returned by the MLD and typical subjects.

**Table 21**
**Total Number of Accurate Feeling-of-Knowing Judgements**

| MLD | | | Typical | | |
|---|---|---|---|---|---|
| **Positive** | **Negative** | **Total** | **Positive** | **Negative** | **Total** |
| 57 | 35 | 92 | 58 | 57 | 115 |

As illustrated in Table 21, MLD subjects made a total of 92 accurate feeling-of-knowing judgements and were therefore inaccurate on 34 occasions (126 correct responses - 92 accurate F-O-K judgements), whereas typical subjects made a total of 115 accurate feeling-of-knowing judgements and were inaccurate on 31 occasions. Therefore, not only were MLD children as efficient as typical children when required to name peers from photographs, they were also as efficient when required to judge whether or not they felt they would be able to name previously unnamed peers when allowed to peruse a list of names.

Thus, in answer to Question 3: Does the MLD child have an accurate feeling-of-knowing?

**The results from the present task suggests that MLD children are as efficient as typical children in their ability to name peers from photographs and to judge their own feelings of knowing for personal names. Furthermore, MLD children appear equally aware of the notion of monitoring individual memories for accessibility of a desired response and are able subsequently to allocate mnemonic effort appropriately.**

**Question 4: Does the MLD child have an accurate awareness of the effects of various task, person and strategy variables on memory performance?**

## Task 1

Task 1 comprised a series of metamemory problems designed to assess the subjects' awareness of the effects of various task variables.

### Procedure

The assessment of the accuracy of MLD and typical children's awareness of the effects of various task variables on memory performance was conducted by presenting the groups with a variety of stimulus materials (described below) and asking them which of two options would be easier to remember, or would they both be the same. Thus, the children's opinion as to the effects of number of items on recall performance (task 1a), for example, would be elicited by showing the groups two sets (one of seven items and one of four items) of 4x4cm black and white drawings of common objects (cow, bus, flower etc.) and asking them which set of cards would be the easier to remember, or would they both be the same.

Ease of remembering familiar versus unfamiliar material (task 1b) was tested by means of showing the subjects two list of words and asking them to make appropriate mnemonic judgements. An example of familiar material (List A) would be the word "water", whilst an example of unfamiliar material would be the word "epode"

(List B). All unfamiliar words were chosen on the basis that a) they were common nouns b) they were spelt phonetically c) they had the same number of letters as the familiar word with which they were paired.

For task 1c subjects were read a short story and simply asked whether it would be easier/the same to say it back to the researcher in the same words or in the subjects' own words.

Recall versus recognition judgements (task 1d) were elicited by describing a hypothetical situation in which two people were required either to recall or to recognize a list of ten common nouns. Subjects were shown the stimulus materials (described in Table 22) and subsequently asked to make an "easier to remember/both the same" judgement.

A brief schema of the task variables and experimental stimulus materials is provided in Table 22.

**Table 22**
**Task Variables and Stimulus Materials**

| Task Number | Task Variables | Stimulus Materials |
|---|---|---|
| 1a | Shorter versus longer list | List A: seven pictures of common objects. List B: four pictures of common objects. |
| 1b | Familiar vs. unfamiliar material | List A: seven common familiar words. List B: seven uncommon unfamiliar words. |
| 1c | Semantic gist vs. exact linguistic form | Short story. |

## Table 22
## Task Variables and Stimulus Materials (cont.)

| Task Number | Task Variables | Stimulus Materials |
|---|---|---|
| 1 d | Recall vs. recognition. | Set A: (1) List of ten common nouns. (2) List of fifteen common nouns, ten of which appeared in A(1). Set B: List of ten common nouns. |

The selection of words for each list was intended to minimize interitem clusterability; thus, no list contained two or more words which could be assigned to the same category.

## Results

Table 23 summarises the total number of judgements of "Easier to Remember" made by the MLD and typical children.

## Table 23
## Total Number of Judgements of "Easier to Remember"

| Task/Group | Accurate | Inaccurate | |
|---|---|---|---|
| **1 a** | **Shorter** | **Longer/Same** | **Chi Square** |
| MLD | 8 | 12 | 11.38**** |
| Typical | 19 | 1 | |
| **1 b** | **Familiar** | **Unfamiliar/Same** | p=0.24[7] |
| MLD | 18 | 2 | |
| Typical | 20 | 0 | |
| **1 c** | **Semantic Gist** | **Exact Form/Same** | p=0.02 |
| MLD | 15 | 5 | |
| Typical | 20 | 0 | |
| **1 d** | **Recognition** | **Recall/Same** | **Chi Square** |
| MLD | 2 | 18 | 7.28*** |
| Typical | 11 | 9 | |

[7] In all cases, where the smallest expected frequency was < 5, the Fisher Exact Probability Test was used (ref: Siegel, S. (1956), Nonparametric Statistics for the Behavioural Sciences. Kogakusha Ltd.)

df=1
**** significant at the .001 level
*** significant at the .01 level

Significant differences between the groups were found for the variables number of items, semantic gist/exact linguistic form and recall/recognition.

In terms of number of items, MLD children were as likely to consider a list of four objects to be as easy to recall as a list of seven items, with justifications for their judgements relating to the nature of the items rather than to numerosity. Thus, one MLD subject maintained that: "This list *(List A)* would be easier to remember because buses are easy things to remember but flowers *(List B)* are hard." Typical subjects, 19 of whom considered a shorter list easier to recall than a longer list, all justified their choices with references to number of items ("This set *(Set A)* has got seven things, but this one *(Set B)* has only got four.")

In terms of semantic gist versus exact linguistic form, the four MLD children who judged re-telling a story in the same words as the narrator to be easier than re-telling it in their own words did so on the basis that the person who told the story was likely to be an authority figure ("a grown-up" or "a teacher") and therefore, according to one MLD child: "You shouldn't change the words." Thus, the narrator became the significant factor for the MLD children, rather than the task requirements. Typical children, all of whom judged semantic gist to be easier than exact linguistic form, justified their responses with reference to the importance of retaining the gist

of a text, for example: "It's hard to remember *everything* someone says but if you say it in your own words you can put in the important bits and leave out the little bits."

In terms of a recall versus recognition distinction, MLD subjects who considered recall to be easier than recognition did so on the basis that a subject performing a recognition task would be required to look at a second list of items in order to identify previously seen items, whereas a subject performing a recall task would be required to look at only one list. Thus, according to one MLD subject: "He would have to look at two lots of things but the other one *(in the recall condition)* would only have to look at one lot." Typical subjects who considered recognition to be easier than recall tended to justify their choice with references to the second list acting as a "reminder" or a "trigger".

Significant differences were not seen for the variable familiar/ unfamiliar material. Thus, MLD subjects were as efficient as typical subjects in considering recall of familiar material to be easier than recall of unfamiliar and were able to justify their judgements appropriately, for example: "Things you know stay in your brain better than things you've never heard of."

## Task 2

Task 2 investigated the MLD and typical children's awareness of the effects of:

(a) Person variables (novice versus re-learner);

(b) Person/task variables (passage of time).

(c) Task/strategy variables ( [i] selection of items for further study and [ii] selection of appropriate additional study item).

## Procedure

### Task 2(a)

Children were re-presented with a list of twelve common words which they had been asked to memorize earlier in the day, reminded that they had seen and learned the words before and then asked: "Suppose I showed these words to you and to a friend who had never seen them before and let you both look at them for a little while. Who do you think would remember the most number of words - you or the friend who had never seen them before?"

### Task 2(b)

Children were reminded how many of the twelve words they had been able to recall following a study/cover/recall procedure and were then asked: "If I came back in a week's time and asked you to say as many of the words as you could remember, do you think you would remember more words than you did today, not as many words, or the same number of words?"

## Task 2(ci)

Children were again reminded how many of the words used in tasks 2 (b) and (c) they had remembered. They were shown which words they had forgotten and which words they remembered and were then asked: "If you wanted to try to remember more words than you did before, which words should you look at again - all of them, only the ones you remembered, only the ones you forgot or none of them?" The experimenter indicated the different groups of words/ options by pointing.

## Task 2(cii)

Children were shown two sets of words: set A comprised a list of nine taxonomically-related common nouns (bicycle, train, car, coach, plane etc.) mounted on 10x15cm card whilst set B comprised a list of three common nouns (tree, bus, dog) mounted on 5x10cm card. Subjects were then told: "A boy has been told by his teacher to learn a list of ten words but he has only got nine words in this list *(indicating list A)*. He may choose one of these words *(indicating set B)* to add to his list. Which word would be the best?" "Boy" or "girl" was used to correspond with the gender of the subject. Responses were scored either as appropriate or inappropriate, with "bus" being considered appropriate and "tree" or "dog" being considered inappropriate.

## Results

Table 24 depicts the total number of judgements made by the MLD and typical subjects for tasks 2(a), 2(b), 2(ci) and 2(cii)

## Table 24
## Total Number of Strategic Judgements

### Task 2(a)

| | Superiority of Learner | | | |
|---|---|---|---|---|
| Group | Re-Learner | Novice | Same | Chi Square |
| MLD | 11 | 8 | 1 | 6.29* |
| Typical | 18 | 2 | 0 | df=2 |

### Task 2(b)

| | Effects on Recall of the Passage of Time | | | |
|---|---|---|---|---|
| Group | Fewer | More | Same | Chi Square |
| MLD | 12 | 7 | 1 | 8.86* |
| Typical | 17 | 0 | 3 | df=2 |

### Task 2(ci)

| | Selection of Items for Further Study | | | |
|---|---|---|---|---|
| Group | Forgotten | All | Remembered | Chi Square |
| MLD | 5 | 13 | 2 | 6.07* |
| Typical | 12 | 8 | 0 | df=2 |

### Tasks 2(cii)

| | Selection of Appropriate Study Item | | |
|---|---|---|---|
| Group | Appropriate | Inappropriate | |
| MLD | 15 | 5 | p=0.02 |
| Typical | 20 | 0 | |

* significant at the .05 level

As illustrated in Table 24, significant differences between MLD and typical subjects were seen for all tasks.

In terms of superiority of learner, 8 MLD subjects considered a novice learner to be superior to a re-learner, whilst 18 typical subjects considered a re-learner to be superior to a novice learner. Typical subjects justified these judgements by referring to the effects of the previous experience of learning; for example: "You would probably remember some of the words from the time before and would only need to remind yourself." In contrast, the MLD subjects

appeared to be unable to deal with the notion of a hypothetical "friend" and many sought to import some form of personally relevant information into the context: "Do you mean Sonal?" (a "best" friend) or: "Which friend do you mean?" Attempts by the experimenter to encourage the MLD children to think in more general terms were met with either resistance or puzzlement, and the majority of responses supplied by the MLD subjects were done so with reference to a particular person. One MLD subject, for example, whose response indicated that he considered a novice learner to be superior to a re-learner, justified his choice with: "That's because David is older than me and he's a lot more brainier." For this particular child, his response may well have been "correct" in so far as David may indeed have been able to recall a greater number of words even with only one viewing and yet, in his effort to put meaning into confusion, he had supplied a metamnemonically "incorrect" response. It was only by giving the child the opportunity of justifying his response, however, that the researcher was in a position to know that the "incorrect" response was nevertheless based on some form of rational thinking. Thus, in being apparently unable to deal with the hypothetical and insisting on contextualising the task the MLD subjects may, in fact, be answering a different question to the one being asked.

In terms of the effects of the passage of time on recall performance, the seven MLD children who felt that they would remember more words over time either used re-stating tactics to justify their judgement ("I remembered them,") or offered overly-positive self-

evaluative judgements ("I'm good at remembering things.") Of the twelve MLD and seventeen typical children who felt that they would remember fewer words over time all held rationally justified opinions based on the effects of having to remember other things and a general notion of "decay" or "dilution" of memories. Thus, one typical child suggested that: "Having to think about other things would make the words gradually get fainter."

In terms of selecting items for further study, MLD children appeared to be significantly less adept at judiciously apportioning study time in such a way that previously unrecalled items were selected for further study. Thus, assuming choice of a forgotten item for further study to be a strategic choice, then only five MLD children compared with twelve typical children demonstrated appropriate strategic choice. Rational justifications were given by both MLD and typical subjects for selection of missed items, whereas justifications by both groups for selection of all items for further study tended to centre on "safety" reasons; an MLD subject, for example, suggested that by selecting all items for further study: "You'd be sure to get the hard ones." Of the two MLD subjects who selected previously remembered items for further study one did so on the basis that: "So I'd get them right again," whilst the other appeared to have made a random guess.

In terms of selecting additional study items, those MLD subjects who made appropriate choices were equally proficient - if occasionally less sophisticated - as typical subjects when justifying their responses. Thus, when justifying the selection of "bus" to accompany

"plane, train, car etc." an MLD subject offered: "Because they're all things you go in to get places," whilst a typical subject suggested: "They are all forms of transport." Overall, though, MLD subjects were significantly less efficient than typical subjects in selecting appropriate additional study items and those who selected inappropriate additional study items tended to justify their choice on the basis of personal relevance ("I've got a dog") rather than on the basis of taxonomic relatedness.

The researcher is now in a position to answer question 4: Does the MLD child have an accurate awareness of the effects of various task, person and strategy variables on memory performance?

**MLD subjects were significantly less efficient than typical children in terms of demonstrating an awareness of the effects on recall performance of a variety of person, task and strategy variables. In certain circumstances, for example, when asked to make a recall/recognition distinction or when asked to consider the relative degree of difficulty of shorter versus longer lists, MLD subjects displayed a tendency to centre on secondary or less relevant task characteristics to the detriment of primary or more relevant task characteristics. Furthermore, when striving to make sense of a hypothetical metamnemonic situation the MLD subjects appeared to import personally-relevant context which, whilst helping the child to move**

**from the unknown to the known, may also have limited the perspective of the task.**

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**Question 5: Does the MLD child have a knowledge of which strategies are available and applicable?**

## Procedure

In order to assess the MLD and typical children's knowledge of which mnemonic strategies are available and applicable subjects were presented with a series of memory "problems" and asked: "What's the very best thing you could do to help you remember these numbers/pictures/words/items?"

Table 25 summarises the task characteristics and the stimulus materials.

**Table 25**
**Task Characteristics and Stimulus Materials**

| Task Number | Stimulus Materials / Task Requirements |
|---|---|
| 1 | 10 digits in random order from 0 - 20 mounted on 5x30cm card |
| 2 | Hypothetical situation: 7 items on a shopping list |
| 3 | 9 common nouns/adjectives from three taxonomically related categories arranged in random order, mounted on 5x30cm card |
| 4 | 10 2x8cm black and white photographs of common items |
| 5 | Hypothetical situation: 4 items required for school the next day |

## Table 25
## Task Characteristics and Stimulus Materials (cont.)

| Task Number | Stimulus Materials / Task Requirements |
|---|---|
| 6 | 10 unrelated common nouns mounted on 5x30cm card |
| 7 | Hypothetical situation: 7 digit telephone number |

Stimulus materials for memory problems 1, 3, 4 and 6 were presented both visually and verbally with an appropriate introduction ("Here is a list of ten numbers. What's the very best thing to do to help you remember these numbers?") Hypothetical situations were read to the subjects for memory problems 2, 5 and 7, following which the subjects were again asked: "What's the very best thing you could do to help you remember?"

Thus, all children were required to make a total of seven strategy judgements in response to questions regarding what they considered to be the most effective way of remembering a variety of stimuli. The order of presentation of memory problems corresponded with the order depicted in Table 25.

Table 26 details the categorization of responses, together with an example of subject responses which typified the category.

## Table 26
## Categorization of Subject Responses

| Category | Example |
|---|---|
| Rehearsal (R) | "I would look at it and keep repeating it in order in my head." |
| Categorization (C) | "I would put all the ones together that go together - like all the colours." |

## Table 26
## Categorization of Subject Responses (cont.)

| Category | Example |
|---|---|
| Elaboration (E) | "I would make up a story about the pictures." |
| Write/Draw (W) | "I would write them down." |
| Authority (A) | "I would ask my mum to help." |
| Physical (P) | "I would put something by my bed the night before - like my sports bag." |
| Look/Think/Say (L) | "I would look at it." |
| Idiosyncratic (Id) | I'm not allowed to do that." |

For all children each strategic judgement made in relation to the seven individual memory problems proved to be mutually exclusive; that is, no child offered more than one way of remembering each memory problem. For the Idiosyncratic category (Id) children were given a second chance to respond and were only credited with an idiosyncratic strategic choice if they responded in like fashion for a second time.

## Results

Table 27 depicts the total number of strategy judgements made by MLD and typical subjects, together with the number of efficient and inefficient judgements per group. Efficiency versus inefficiency of judgement was determined by previously asking six subjects (all of whom were considered to be efficient strategists) which strategy they considered to be the most efficient for each memory problem. Strategies marked ~ are those which were judged to be the most efficient. Thus, for memory problem 1 (digits) all six subjects judged

rehearsal to be the most efficient strategy. Where two or more strategies are marked ~ a non-unanimous choice is indicated. Thus, for memory problem 5 (remembering items for school) responses were divided between "Write", "Physical" and "Authority".

**Table 27**
**Total Number of Strategy Judgements/Efficiency and Inefficiency of Judgements**

| | | Strategy | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Memory Problem | Group | R~ | C | E | W | A | P | L | Id |
| 1 (digits) | MLD | 2 | 0 | 0 | 3 | 0 | 0 | 14 | 1 |
| | Typ. | 19 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | | **Efficient** | | | **Inefficient** | | | **Chi Square** | |
| | MLD | 2 | | | 18 | | | 25.64**** | |
| | Typ. | 19 | | | 1 | | | df=1 | |
| 2 (shopping list) | MLD | 0 | 0 | 0 | 16 | 2 | 0 | 1 | 1 |
| | Typ. | 3 | 0 | 0 | 15 | 1 | 0 | 0 | 1 |
| | | **Efficient** | | | **Inefficient** | | | **Chi Square** | |
| | MLD | 16 | | | 4 | | | 0.00ns | |
| | Typ. | 15 | | | 5 | | | df=1 | |
| 3 (related words) | MLD | 1 | 2 | 0 | 4 | 1 | 0 | 12 | 0 |
| | Typ. | 1 | 17 | 0 | 0 | 0 | 0 | 2 | 0 |
| | | **Efficient** | | | **Inefficient** | | | **Chi Square** | |
| | MLD | 2 | | | 18 | | | 19.62**** | |
| | Typ. | 17 | | | 3 | | | df=1 | |
| 4 (photographs) | MLD | 1 | 0 | 0 | 3 | 0 | 0 | 16 | 1 |
| | Typ. | 12 | 0 | 6 | 0 | 1 | 0 | 1 | 0 |
| | | **Efficient** | | | **Inefficient** | | | **Chi Square** | |
| | MLD | 1 | | | 19 | | | 11.38**** | |
| | Typ. | 12 | | | 8 | | | df=1 | |
| 5 (items for school) | MLD | 0 | 0 | 0 | 12 | 4 | 3 | 0 | 1 |
| | Typ. | 0 | 0 | 0 | 13 | 2 | 5 | 0 | 0 |
| | | **Efficient** | | | **Inefficient** | | | **Chi Square** | |
| | MLD | 19 | | | 1 | | | 0.5ns | |
| | Typ. | 20 | | | 0 | | | df=1 | |
| 6 (unrelated words) | MLD | 1 | 0 | 0 | 3 | 0 | 0 | 15 | 1 |
| | Typ. | 14 | 0 | 3 | 0 | 0 | 0 | 2 | 1 |
| | | **Efficient** | | | **Inefficient** | | | **Chi Square** | |
| | MLD | 1 | | | 19 | | | 15.36**** | |
| | Typ. | 14 | | | 6 | | | df=1 | |

## Table 27
## Total Number of Strategy Judgements/Efficiency and Inefficiency of Judgements (cont.)

| | | Strategy | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Memory Problem | Group | R~ | C | E | W | A | P | L | Id |
| 7 (telephone number) | MLD | 5 | 0 | 0 | 13 | 1 | 0 | 0 | 1 |
| | Typ. | 9 | 0 | 0 | 11 | 0 | 0 | 0 | 0 |
| | | **Efficient** | | | **Inefficient** | | | | |
| | MLD | 18 | | | 2 | | | p= 0.24 | |
| | Typ. | 20 | | | 0 | | | df=1 | |

**** significant at the .001 level
n s not significant

As illustrated in Table 27, highly significant differences ($p < .001$) were found between the groups in terms of strategic judgements made in relation to task 1 (recall of digits), task 3 (related words), task 4 (photographs) and task 6 (unrelated words), with MLD subjects being significantly less efficient than typical subjects in demonstrating an awareness of which strategies are available and applicable to aid recall.

When required to make mnemonic judgements relating to the recall of discrete, rote-type and/or context-free items (as utilised in tasks 1, 3, 4 and 6) typical children demonstrated the ability, firstly, spontaneously to evaluate the nature of the to-be-remembered material and, secondly, to "select" appropriate strategies based on the evaluation exercise. Thus, when presented with a random array of digits (task 1), pictures (task 4) and words (task 6) the majority of typical children (19, 12 and 14 respectively) were able to mention a rehearsal-type mnemonic technique to aid recall. Similarly, when presented with related words (task 3), 17 typical children mentioned

an intent to cluster, thereby demonstrating an awareness of the benefits of making use of the organization inherent in the to-be-remembered material as a means of reducing randomness.

MLD children, by way of contrast, tended to select a "look/think/say" approach to memorizing with a view to future recall when required to make judgements relating to discrete, rote-type and/or context-free items. Thus, when presented with a random array of digits (task 1), pictures (task 4) and words (task 6) only 2, 1 and 1 MLD children respectively mentioned a rehearsal technique. Typical of the MLD responses for these tasks would be: "I'd look at them," "I'd think about them in my head," or "I'd say them." When prompted to expand on responses of this type, many of the subjects demonstrated how they would set about employing a "look/think/say" strategy by staring hard at the stimulus materials or by reading them aloud. When presented with related words (task 6) no MLD child mentioned an intent to cluster as an aid to recall.

On these occasions, therefore, the MLD children under study behaved precisely like the previously cited younger (4-year-old) typical children in the Justice (1986) study by electing "looking" as their modal strategy.

In an attempt to further clarify responses (and also to minimize the possibility of penalties being imposed because of difficulties in verbalizing strategic judgements) children who selected a "look/think/say" strategy were given a second opportunity to make a

judgement by being asked: "Is there anything else you could do to help you remember?" In all cases, subjects either re-stated their original strategy or offered more "intense" degrees of it. Thus, one MLD subject, for example, who had suggested a "look" strategy demonstrated how he would: "Look harder" by holding his eyes open wide with his fingers, whilst a second child tapped her forehead and said she would: "Think hard in my brain."

In order to assess whether failure to mention a categorization technique for task 3 (related words) was attributable to an inability on the part of MLD children to detect the taxonomic relations inherent in the list subjects were asked to: "Put together the things which go together." Of the 20 MLD subjects who failed to mention a clustering technique, 14 could identify at least some of the taxonomic relations present in the nine stimulus items. Thus, whilst MLD subjects did not lack the potential to reduce the randomness of the to-be-remembered material as a means of facilitating recall, it appears that they did not view this activity as being of any interest when it came to memorizing the items.

The results cited above complement, support (and, to some extent, extend) those of enquirers such as Brown and Campione (1977) who conclude that, compared with typical children, MLD children show a particular deficiency in the area of the efficient selection of a mnemonic activity appropriate to the task in hand.

It is the contention of the present researcher, however, that it would be inaccurate to conclude from these results that the MLD child "suffers" from impoverished strategic awareness in general or consistently behaves, metamnemonically speaking, like a younger typical peer, since certain memory tasks included in the present study elicited a very different pattern of responses. Thus, significant differences between the groups were *not* observed for task 2 (shopping list), task 5 (items for school) and task 7 (telephone numbers) and, on these occasions, MLD children were therefore able to demonstrate metamemorial awareness which was equal to that of their typical counterparts.

In terms of remembering items for a shopping list, for example, 16 MLD subjects compared with 15 typical subjects were able to suggest that: "Writing the things down" would be the best thing to do to remember the items. When asked to remember items for school, 12 MLD subjects compared with 13 typical subjects suggested writing, 4 MLD subjects compared with 2 typical subjects suggested referring to an authority ("I'd ask my mum to remind me") whilst 3 MLD subjects compared with 5 typical subjects suggested a physical prompt ("Get it ready the night before and put it next to my coat").

Furthermore, efficient metamemorial judgements made by the MLD subjects were not limited to the selection of external mnemonic strategies. When asked to suggest an appropriate strategy for remembering a telephone number, for example, 5 MLD subjects mentioned an efficient rehearsal procedure ("Keep saying it in your

head until you know it"), with these subjects being as likely to demonstrate an awareness of the benefits of "chunking" to reduce randomness as typical subjects. One MLD child, for example, described how she would rehearse the digits thus:

"The first three numbers are easy because they are the code, so say those together and then keep saying the last ones until you know them."

A further 13 MLD children, compared with 11 typical children, suggested that writing the telephone number down would be the "best thing" to do to help them remember. Thus, when required to make strategic judgements relating to the recall of meaningful items (in this case, telephone numbers) MLD children were able to make strategic judgements that were as efficient as those of their typical peers.

To answer the final research question in this first phase of the Research Study: Does the MLD child have a knowledge of which strategies are available and applicable?

**The present study suggests that, when required to make strategic judgements relating to the recall of discrete, rote-type and/or context free items, MLD children are significantly less efficient than their typical peers. When required to make judgements relating to the recall of meaningful and/or relevant items, however, MLD children can demonstrate strategic awareness that is equal to that of their typical peers.**

Several important trends regarding the metamnemonic functioning of MLD children have emerged from the present study which support and extend the findings from the case study. Namely, when operating within a personally relevant or familiar frame of reference MLD children *can* demonstrate metamnemonic skills which are equivalent to those of their typical counterparts. In the absence of context, however, they have a tendency to import it: a practice which may distort the perspective of the task. Hypothetical situations, in particular, appear to be an area of relative metamnemonic weakness for MLD children.

In terms of knowledge of their own mnemonic capabilities, MLD children's judgements frequently are not overly-positive or idiosyncratic, but are based on an internal conception of themselves formed as a result of their own prior experience.

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Part II of the Research Study will consider the *actual* mnemonic performance of MLD and typical children and will seek to discover whether (as was the case in this first phase of the Research Study) task requirements will be significant factors in determining performance.

# The Research Study Part II

## The Research Study Part II

### Recall Performance

As previously stated, enquirers into the memory processes of children with moderate learning difficulties have been consistent in suggesting that the likelihood of finding deficiencies in recall performance depends upon the amount of strategic employment required (e.g. Brown, 1974). Where strategies are needed differences in mnemonic functioning between MLD and typical subjects are readily observed.

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Since optimum recall of the various items which comprise tasks 1-10 of this second phase of the Research Study depends upon efficient strategic employment, it would therefore be reasonable to expect that MLD subjects would recall significantly fewer items than typical subjects. Given, however, that Part I of the Research Study indicated that task characteristics may be relevant factors in determining the efficiency of metamemorial functioning of MLD children, then Part II of the study will attempt to discover if the same may be true for aspects of mnemonic functioning - in particular, recall performance.

Thus, as previously stated, this second phase of the study will compare the recall performance of MLD and typical children across a range of memory problems comprising a variety of task characteristics. Of particular interest will be the notion of whether

item-relevance will be a significant determinant of recall performance.

## The Sample

Participants were the same two groups used for Part I of the Research Study who had previously been selected at random from a mixed Primary school and from an all age day special school for children with moderate learning difficulties. Five MLD subjects were not available for Part II, therefore each group comprised 15 MLD subjects and 15 typical subjects. In "shedding" five typical subjects, attempts were made to maintain previous age and gender balances. Thus, the MLD group comprised 9 boys and 6 girls with a mean chronological age of 12 years 5 months, whilst the typical group comprised 8 boys and 7 girls with a mean chronological age of 11 years 9 months.

## Stimulus Materials and Experimental Procedure

Each group was again tested in their respective schools in one sitting over two consecutive days, approximately four weeks after Part I of the Research Study. All subjects were tested individually, in the same quiet rooms, seated at a table opposite the researcher. Teachers of both groups were asked to confirm that the stimulus materials used for tasks 1-6 could be readily recognized, labelled and/or read by all subjects. Nevertheless, the researcher also labelled or read the materials for all subjects as they were being presented. Order of presentation of tasks corresponded with the order depicted in Table 28 (below).

A brief schema of the task characteristics and stimulus materials for tasks 1-10 is provided in Table 28. Examples of stimulus materials are given for tasks 2-6.

**Table 28**
**Task Characteristics and Stimulus Materials**

| Task Number | Task Characteristics / Stimulus Materials |
|---|---|
| 1 | Digit span: 9 digits in random order from 0-20 mounted on 5x30cm card. |
| 2 | Free recall (abstract): 9 unrelated "abstract" words (prepositions, conjunctions etc.) mounted on 5x30cm card. Example: because |
| 3 | Free recall (nouns): 9 unrelated common nouns mounted on 5x30cm card. Example: baby |
| 4 | Free recall (categories): 9 common nouns/adjectives from three taxonomically related categories mounted individually on 5x5cm card. Example: cup, plate, bowl |
| 5 | Free recall (real world relevance): 9 "shopping list" items mounted on 5x30cm card. Example: bread |
| 6 | Free recall (concrete): 9 concrete objects placed at random . Example: ball |
| 7 | Sentence completion (congruent): 9 congruent sentence completions. |
| 8 | Sentence completion (incongruent): 9 incongruent sentence completions. |
| 9 | Text recall (untitled): 7 questions, untitled passage |
| 10 | Text recall (titled): 7 questions, titled passage |

For tasks 1-6 a study-test procedure was utilised, whereby subjects were instructed to study the stimuli "for about a minute" with a view to future recall. Prior to this, subjects were reminded of the study/cover/recall procedure previously employed in the Research Study Part I and were re-familiarized with the procedure on an

initial practice trial. Subjects were also allowed to use the experimental stop-watch in order to see and experience "what a minute feels like". For task 5 (shopping list items) subjects were first asked: "Who usually does the shopping in your house?" Once a response had been proferred, subjects were told: "Here is a list of things he/she *(to correspond with their response)* wants you to buy."

Tasks 7 and 8 comprised two sets of paired associates which required the subjects to report the second part of the compound given the first. All nine compounds would be read to the subjects, following which the first item from each compound would be re-presented as a prompt. Compounds were designed to be either congruent or incongruent with subjects' real-world knowledge. An example of a pair which is congruent with real-world knowledge (used for task 7) would be "Fish swim", whilst a pair which is incongruent with real-world knowledge (used for task 8) would be "Trees run".

Stimulus materials for tasks 9 and 10 comprised two extracts of text of comparable length (67 words each) and containing the same number of key idea units (8 each). They were judged by the subjects' teachers to be comparable in terms of readability and complexity of subject matter. Teachers were also asked to confirm that subjects were familiar with a procedure which required them to listen to a passage of text with a view to future recall. Text used for task 9 was an untitled piece about the skin, whilst text used for task 10 was a titled piece about teeth. Neither extract contained the

subject word, but instead substituted appropriate pronouns or definite and indefinite articles. Thus, the opening sentence for task 9 (Skin) was: "The whole of our body is covered with it", whilst the opening sentence for task 10 (Teeth) was: "Each one is held in place by a root." Each extract was read to the subjects, who were then asked a number of questions which required them to recall idea units contained in the text. The final question for each extract was: "What is this passage about?" No question contained the subject word, and incorrect answers were not commented upon. Task 10 was preceded with: "This passage is about teeth. Listen carefully while I read it to you and then I will ask you some questions about it." No introduction was given for task 9, other than: "I'm going to read you a short passage and then ask you some questions about it. Listen carefully."

Throughout the tasks the researcher also made informal notes on the subjects' experimental behaviour.

## Results

Table 29 summarises the mean scores for the various recall tasks returned by the MLD and typical subjects.

**Table 29**
**Mean Scores for Recall Tasks**

| Group | Task Number | Mean | sd | 't' |
|---|---|---|---|---|
| MLD | 1 | 3.46 | 1.55 | 8.87*** |
| Typical | Digit Span | 7.80 | 1.08 | |

## Table 29
## Mean Scores for Recall Tasks (cont.)

| Group | Task Number | Mean | s d | 't' |
|---|---|---|---|---|
| MLD | 2 | 2.33 | 1.10 | 7.96*** |
| Typical | Free Recall (abstract) | 5.73 | 1.38 | |
| MLD | 3 | 3.53 | 1.24 | 8.03*** |
| Typical | Free Recall (nouns) | 7.33 | 1.27 | |
| MLD | 4 | 3.53 | 0.98 | 10.65*** |
| Typical | Free Recall (categories) | 7.73 | 1.16 | |
| MLD | 5 | 7.73 | 1.18 | 1.05 |
| Typical | Free Recall (shopping list) | 8.20 | 1.01 | n s |
| MLD | 6 | 7.13 | 1.06 | 1.91 |
| Typical | Free Recall (concrete) | 7.93 | 0.90 | n s |
| MLD | 7 | 6.40 | 1.10 | 2.51* |
| Typical | Sentences (congruent) | 7.93 | 1.20 | |
| MLD | 8 | 2.93 | 1.03 | 6.14*** |
| Typical | Sentences (incongruent) | 6.26 | 1.20 | |
| MLD | 9 | 2.20 | 2.36 | 3.69*** |
| Typical | Text Recall (untitled) | 4.93 | 1.62 | |
| MLD | 10 | 4.26 | 1.57 | 2.41** |
| Typical | Text Recall (titled) | 5.60 | 1.45 | |

df = 28
* significant at the .05 level
** significant at the .02 level
*** significant at the .001 level
n s not significant

As illustrated in Table 29, significant differences between the groups were found for the recall of digits ('t' = 8.87; $p < .001$), abstract words ('t' = 7.96; $p < .001$), nouns ('t' = 8.03; $p < .001$), categories ('t' = 10.65; $p < .001$), incongruent sentence completions ('t' = 6.14; $p < .001$), congruent sentence completions ('t' = 2.51; $p < .05$), titled text ('t' = 2.41; $p < .02$) and untitled text recall ('t' = 1.70; $p < .05$). Areas of recall equality between the groups (i.e. where differences failed to reach statistical significance) were observed for shopping list items

('t' = 1.05) and concrete items ('t' = 1.91). Equally note-worthy are the within-group similarities in terms of scores (see Appendix 2(ii) ).

## Discussion

### Recall of: Digit Span, Abstract Words, Nouns, Categories

Miller (1956) found that when subjects were required to remember a list of items they could normally recall about seven of them, plus or minus two. The results of tasks 1-4 in the present study therefore present no surprises: typical subjects recalled a mean of 7.80 digits, 5.73 abstract words, 7.33 nouns and 7.73 categories, whereas MLD subjects recalled a mean of 3.46 digits, 2.33 abstract words, 3.53 nouns and 3.53 categories. Thus, typical children outperformed MLD children on all occasions when required to recall discrete and unrelated or context-free items.

These findings complement and support the findings of a plethora of other studies in indicating deficiencies in the recall performance of MLD children when compared to their typical counterparts.

Examination of the behavioural observations recorded for the MLD group during the study periods appeared to support the strategic judgements made by the subjects in relation to tasks 1, 3, 4 and 6 of Question 5 (Research Study Part I), where they reported that the "best thing" to do to help them remember numbers and/or words would be to "look". Thus, for many MLD subjects, "about a minute" was too long a period in which to study the stimulus materials, since

"looking" takes only seconds. They therefore spent the rest of the study period engaging in unproductive study behaviour, such as looking around the room or talking to the researcher.

By way of contrast, the typical subjects were able to display appropriate study behaviour by remaining on task and engaging with the stimulus materials for the duration of the study period. Typical subjects' study behaviour therefore appeared to support their strategic judgements - made in relation to the previously cited tasks - that some sort of goal-directed mnemonic activity (e.g. rehearsal) is required for memory problems of this nature.

**Recall of: Shopping List Items, Concrete Objects**

As depicted in Table 29 (above) recall of shopping list items and concrete objects were areas of mnemonic equality between the groups, with differences between MLD and typical subjects failing to reach statistical significance - *despite the fact that efficient recall of both sets of items depends upon a degree of strategic intervention on the part of the memorizer.* Thus, on these occasions, the task requirements and/or the stimulus materials appeared to be effective in eliminating differences in recall performance between MLD and typical subjects. Furthermore, in recalling a mean 7.73 shopping list items and 7.13 concrete objects, the MLD subjects demonstrated the ability (and the inclination) to behave precisely like Miller's (1956) "normally" recalling subjects (i.e. those without learning difficulties.)

Given the comparative enhancement of recall performance, it is perhaps not surprising that behavioural observations of the MLD children indicated that, on this occasion at least, they had the ability and the motivation *spontaneously* to adapt their study behaviour to meet the mnemonic requirements of the tasks. Thus, just as differences in recall performance were eliminated, so too were differences in study behaviour: the MLD subjects presented as active, motivated and goal-directed learners, whose previously-noted off-task distractability was no longer in evidence.

It may be, therefore, that the frequently-cited tendency of MLD subjects to engage in inappropriate study behaviours (e.g. Torgesen, 1977) is more a reflection of an interaction between subject and task than a fixed, with-in child deficit which will endure across all tasks.

In this instance the concrete objects, for example, appeared to be especially effective in motivating the MLD subjects, and on several occasions the researcher had to restrain the subjects from overly-exuberant engagement with the items!

### Recall of: Congruent and Incongruent Sentence Completions, Untitled and Titled Text Recall

The rationale for conducting tasks 7, 8, 9 and 10 was one of spreading wide the research net: since MLD subjects were consistently shown to perform poorly across a broad range of memory tasks, it would be reasonable to speculate that they would

do likewise on tests of their recall of congruent and incongruent pairs and untitled and titled text - particularly since no task in this section appeared overtly to possess the factor of "embeddedness" (or relevance) which the researcher had suggested may be a significant determinant of recall performance.

Of interest, therefore, are the mean scores returned by the MLD subjects for task 7 (congruent sentence completions) and task 10 (titled text recall) which, although not areas of recall equality, nevertheless were areas of "good" mnemonic performance for these children (relative to their performance compared with typical peers and compared with their own performance on similar tasks). Possible reasons for this unexpected demonstration of relative recall expertise will be discussed in the concluding remarks (below).

## Congruent and Incongruent Pairs

Comparison of behavioural observations recorded for MLD and typical subjects during the presentation of congruent and incongruent compounds are of interest. During the presentation of congruent items (the recall of which both groups performed relatively efficiently) no differences were observed: all subjects treated the task "seriously" and generally displayed appropriate study behaviour. When presented with incongruent compounds with a view to future recall, however, (where MLD subjects performed poorly compared to their typical counterparts) clear differences in study behaviour was recorded: whilst MLD subjects displayed study

behaviour similar to their congruent compounds' study behaviour, typical subjects were clearly bemused or surprised by the nature of the stimuli. Thus, when given the compound: "Cows have wings" typical subjects tended to smile, look surprised or even ask the researcher if she'd "read it properly", whereas MLD subjects simply appeared to accept the idiosyncratic nature of the materials and may, as a consequence, have failed to adapt their study behaviour in order to take account of it.

Although strategic employment is the focus of Part III of the Research Study, the researcher nevertheless decided to further investigate the notion of MLD subjects apparently failing to adapt their study behaviour for the recall of incongruent pairs by asking both MLD and typical subjects what they did to help them remember the second item of each pair. Table 30 details the categorization of responses, together with an example of subject responses which typified each category.

**Table 30**
**Categorization of Subject Responses**

| Category | | Example |
|---|---|---|
| Imagery | (I) | "I pictured the two things together." |
| Listen | (L) | "I listened." |
| Connections | (C) | "I reminded myself that they go together in real life." |
| Idiosyncratic | (Id) | "They were funny." |

Table 31 depicts the total number of strategy judgements made by MLD and typical subjects in relation to the recall of congruent and incongruent pairs. Efficient strategy judgements (elicited from six

efficient strategists) were "Connections" for congruent pairs and "Imagery" for incongruent pairs.

**Table 31**
**Total Number of Strategy Judgements**

| Memory | Problem | Group | Strategy | | | |
|---|---|---|---|---|---|---|
| | | | I | L | C | Id |
| Congruent | pairs | MLD | 0 | 4 | 9 | 2 |
| | | Typical | 1 | 3 | 11 | 0 |
| | | | Efficient | | Inefficient | |
| | | MLD | 9 | | | 6 |
| | | Typical | 11 | | | 4 |
| | | | I | L | C | Id |
| Incongruent | pairs | MLD | 0 | 10 | 0 | 5 |
| | | Typical | 9 | 5 | 0 | 1 |
| | | | Efficient | | Inefficient | |
| | | MLD | 0 | | | 15 |
| | | Typical | 9 | | | 6 |

As illustrated in Table 31, congruent pairs elicited a high level of efficient strategy choices in both groups, whereas incongruent pairs elicited a high level of efficient strategy choices for typical subjects only. When confronted with apparently nonsensical material, typical subjects first checked the accuracy of the material with an authority (the researcher) and subsequently appeared to be aware that a different cognitive approach was indicated by electing, on the whole, to employ an imagery technique as a mnemonic aid.

By way of contrast, MLD subjects, in abandoning the connections strategy employed for congruent pairs, appeared to be aware that the stimulus material was "different" but did not appear to know how to encode it in the most efficient manner. On this occasion, therefore, the sheer "nonsense" element of the task did not act as a

trigger for adapting cognitive behaviour on the part of MLD subjects, whereas for the typical subjects it did.

Thus, not only did the researcher observe clear differences in study behaviour between the two groups, so too were differences in strategic employment reported by the subjects.

Failure to adapt cognitive behaviour has obvious consequences for the learner; in this case, the mnemonic price to be paid by MLD subjects was fewer items recalled than typical subjects who did adapt their cognitive behaviour and fewer items recalled in comparison to their own prior performance when cognitive behaviour was adapted appropriately. Of interest too (and also of practical relevance for the learning situation) is the MLD subjects' failure to clarify the nature of the incongruent material with an authority. Thus, an apparently high tolerance for nonsense material by MLD children (such as was demonstrated with the recall of incongruent pairs) may be a "symptom" of past scholastic experiences and a possible determinant of future academic "failures".

## Titled and Untitled Text Recall

As previously mentioned, recall of titled text was an area of relative mnemonic expertise for MLD children. Thus, when provided with a title, MLD children behaved in similar fashion to their typical peers and, on the whole, were able to supply answers which accorded with the idea units contained within the text.

Similarly, when confronted with untitled text, typical subjects were able to focus on the idea units within the extract and to respond appropriately. Even when unable to deduce that the subject of the passage was "The Skin", typical children were nevertheless still able to provide answers which were in accord with the factual information contained within the text.

MLD children, meanwhile, deprived of a title in which to "embed" the text, appeared to create their own frame of reference by means of importing context in the form of an "in-the-head" title and, having done so, subsequently answered all questions with reference to their imported title, rather than to the text itself. This individually selected frame of reference was most frequently a personally relevant one (for example, "Myself") and, as stated, appeared to act as a "setting" condition for the ensuing text.

The following responses of an 11-year-old MLD boy (preceded by the text itself) typifies those of other MLD subjects when asked to recall the idea units contained within the untitled text.

**Untitled Text**

The whole of our body is covered with it. In some places - such as the soles of our feet - it is very thick. In other places - for example, our eyelids - it is much thinner. It has three jobs to do. These are: protect the body against injury, keep germs out and help us to stay at the right temperature. All over it there are very fine hairs and tiny openings called pores.

**Subject Responses**

| Question | Answer |
|---|---|
| Where is it very thick? | "In the middle." (pointing to his stomach) |
| Where is it much thinner? | "Ankles." (showing the researcher his own) |
| What are the three jobs it has to do? | "Sweep, clean ... not sure." |
| What are the names of the tiny openings all over it? | "My eyes." |
| What is this passage about? | "Me." |

Thus, in once again insisting on contextualising apparently context-free material (in so far as the absence of a title is concerned), the MLD subject has provided a series of answers which are correct from his own viewpoint but incorrect from the perspective of the task. The set of responses above therefore serve to illustrate how the subject's imported title ("Myself") acted as a setting condition for the rest of the task and consequently over-rode the factual content of the text to the detriment of recall accuracy.

Of practical relevance, of course, is the need indicated here for those who work with MLD children to first check the child's interpretation of the gist of text.

Assuming task-embeddedness to be a significant determinant of recall performance, a possible explanation for the observed diminution of differences for congruent/incongruent sentence completions and titled/untitled text is that the congruence with real-world knowledge and the contextualising effect of a title are relevant factors in terms of achieving task-embeddedness from the perspective of the subjects. In other words, embeddedness may be achieved in more subtle ways than, say, the inclusion of concrete

items in recall tasks. The question of relevant factors for determining task-embeddedness will be the focus of Part IV of the Research Study.

To summarise some of the relevant trends which have emerged from Part II of the Research Study:

1. For some memory problems MLD subjects could spontaneously adapt their study behaviour to meet the mnemonic requirements of the task;

2. Concrete items in particular appeared to have strong motivational appeal for MLD subjects;

3. MLD subjects demonstrated a high tolerance for nonsense material - a learning style which may have implications for subsequent recall efficiency;

4. When deprived of context in recall tasks, MLD subjects tend to import context of a personally-relevant nature - a practice which may subsequently distort their perspective of the recall material;

5. Contextualising of tasks may be achieved in more subtle ways (for example, by providing a title) than was previously supposed.

The most significant trend to emerge from Part II of the Research Study, however, is that - contrary to previous research findings - on

certain tasks MLD subjects can demonstrate recall performance which is equal to that of their typical peers, *even on tasks where efficient recall depends upon efficient strategic employment.* Furthermore, this recall equality is demonstrated spontaneously and without recourse to experimenter-imposed training or prompting.

# The Research Study Part III

## The Research Study Part III

## The Spontaneous Employment of Mnemonic Strategies

The Research Study Part II indicated that, on some occasions, MLD subjects could demonstrate recall performance that was equal to that of their typical counterparts - *even on tasks where efficient recall depended upon efficient strategic employment.* Initial analysis of the subjects' mnemonic behaviour in relation to pairs which were congruent with their real-world knowledge (Research Study Part II: task 7) indicated that *both* groups were relying upon efficient strategic employment (in this case the use of elaborative techniques) to aid recall. The suggestion made, therefore, is that recall equality between MLD and typical subjects is achieved via the spontaneous employment of mnemonic strategies on the part of *both* groups.

This third phase of the study will attempt to discover whether, contrary to previous research evidence, MLD children *can* spontaneously employ mnemonic strategies to aid recall.

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In view of the fact that examination of subject responses for pairs which were congruent with their real-world knowledge indicated spontaneous strategic employment on the part of both MLD and typical subjects, it would seem reasonable to assume that the same may be true for the three remaining areas where recall equality and/or relative recall expertise was observed. Thus, Part III of the

study will examine subject responses with particular reference to the recall of concrete items, shopping list items and titled text.

Since the research focus is on the presence or absence of strategies, rather than on the nature of the strategies themselves, no qualitative analysis of facilitative mnemonic activity will be attempted, other than with reference to the so-called "primacy" and "recency" effect (elaborated on below).

## The Sample

Participants were the same 15 MLD subjects used for Parts I and II of the Research Study. Since this phase of the study was intended only as a prelude to a more detailed examination of strategy use, subjects were divided into three groups of five (subsequently referred to as G1, G2 or G3) and were required to participate in one out of three studies only.

Given that no sex differences in terms of general metamnemonic and mnemonic behaviour had previously been observed (or has been indicated in other research) subjects were therefore randomly assigned to one of the three groups without reference to gender issues. G1 thus comprised 4 boys and 1 girl with a mean age of 13 years 3 months, G2 comprised 2 boys and 3 girls with a mean age of 12 years 10 months and G3 comprised 3 boys and 2 girls with a mean age of 12 years 11 months.

## Stimulus Materials and Experimental Procedure

The third phase of the study took place approximately three months after Part II. Once again, subjects were tested individually in one sitting in the same quiet room seated at a table opposite the researcher. Teachers of the groups were asked to confirm that the stimulus materials to be used by G1 and G2 could be readily recognized and labelled by all subjects. In line with previous experimental procedures both aural and visual presentation modes were employed in respect of items used by G1. An aural mode of presentation only was employed in respect of items used by G2 and G3.

As previously stated, tasks were designed to test the employment of mnemonic strategies as an aid to the recall of concrete materials, shopping list items or titled text. Groups were assigned to recall tasks on a random basis; thus, subjects from Group 1 attempted recall of concrete items, subjects from Group 2 attempted recall of shopping list items, and subjects from Group 3 attempted recall of titled text. No item used in any of the three studies had previously been included in Parts I or II of the Research study.

Table 32 (below) summarises task characteristics and stimulus materials used for tasks 1-3 of the third part of the Research Study. Examples of stimulus materials are given for tasks 1 and 2.

## Table 32
## Task Characteristics and Stimulus Materials

| Task Number | Task Characteristics / Stimulus Materials |
|---|---|
| 1 | Free recall (category free/concrete): 10 unrelated concrete objects placed in a fixed grid. Example: doll, ship |
| 2 | Free recall (shopping list items): 10 items of food commonly found in a shop or supermarket. Example: pizza, crisps |
| 3 | Text recall (titled): 10 questions, personally-relevant titled passage |

Prior to testing all subjects were reminded of the routine of studying with a view to future recall or of listening with a view to answering text-related questions.

For task 1 a study-test procedure was utilised, whereby subjects were instructed to study the stimuli "for about a minute" with a view to future recall. Stimulus materials were 10 concrete items, chosen for their potential appeal to the subjects, set into a grid in order to prevent subjects from changing the order of presentation. Subjects were told: "Here are ten objects which I would like you to try to remember." All items were then labelled and simultaneously pointed to by the researcher.

For task 2 subjects were seated at a table on which had previously been placed a pencil and a small pad of lined paper. They were then told: "I am going to read you a shopping list. There will be ten things on the list. Listen carefully because I want you to try to remember them. When I have finished reading the list you have about a minute's study time before I want you to say it back to me. You can

use the paper and pencil if it will help." This introduction was followed by a pause, in order to allow subjects to ask any questions. If no questions were forthcoming, prompts were used of the type: "Do you understand what to do?" If any child had not spontaneously elected to make a list of items prior to studying s/he would be encouraged to do so. Items on the list were chosen because they were likely to be familiar to the children (crisps, beans, fish fingers etc.) and because they were either relatively easy to spell or were considered to be sufficiently phonetic for subjects to be able to recognize their own attempts at spelling. The order of presentation of items was intended to be a logical one which corresponded to the order in which items might be located in a shop (milk was listed next to butter, for example). Once the list had been read and subjects had written down the items, they were then given a minute's study time prior to recall.

Stimulus materials for task 3 comprised an extract of titled text containing 64 words and 10 key idea units. The first part of the title corresponded to the individual subject's name; thus, for Anna (one of the subjects in G3) the task would be introduced as: "I am going to read you a short passage. It is called 'Anna's School'. I want you to try to remember all of the rooms mentioned in the story." The passage then described the order of rooms on entering the subject's school via the main door to the end of the corridor, terminating in the computer room. Subjects were required to listen to the text with a view to recalling all 10 rooms from the hall to the computer room. Order of presentation of rooms in the text corresponded to the actual

layout of rooms in the subjects' school and were named either according to their function (the cookery room) or the teacher's name whose class it was. Thus, the passage began:

"There was once a girl called .... who went to a school in H.... called S.... school. Her/his school had lots of rooms. First there was the hall, then the quiet room, then Miss E's room ..."

On completion of presentation of the text subjects were asked: "Can you tell me all the rooms mentioned in the story?"

In each case a rehearsal technique was considered to be the most appropriate strategy to aid recall, with rehearsal being operationally defined as the cyclical naming of a set of stimuli - possibly following some other facilitative activity such as writing down stimuli labels.

It will be recalled from a previous section (Chapter 4: "Strategy Deficits in MLD Children") that non-MLD subjects and adults typically record a U-shaped serial position curve when required to recall a range of items, thereby indicating good recall for initial and final items presented (the primacy and recency effect) but relatively poorer recall for middle items. Recall of initial items is assumed to be high because of the use of rehearsal processes. MLD children, by way of contrast, tend to display relatively poorer recall for items presented early in the series - a characteristic attributed to their failure to rehearse. In the light of this, a direct measure used to investigate subject responses will be an examination of the serial position curves of each group, with special reference to the so-called primacy effect.

Other (indirect) measures include:

1. A series of open-ended interview questions such as: "Tell me what you did to help you remember," or: "Show me what you did to help you remember." Subjects would be credited with self-reports of strategic employment for responses which indicated planful and goal-directed mnemonic activity of the type: "I read them and then said them lots of times in my head";

2. Observation of study behaviour which would indicate strategy use (e.g. the presence of labial movements to suggest repetition of the stimulus materials, cyclical pointing to and/or "checking" of items or writing down the items in task 3).

The present investigator acknowledges the methodological difficulties inherent in the individual approaches described above. Measures taken to circumvent difficulties documented in Part I of the Research Study were, where appropriate, applied here. In addition, attempts were made to "dilute" specific difficulties by employing a range of assessment techniques, rather than relying one one possibly flawed technique, and thereby providing converging perspectives on the data.

## Results

Table 33, Table 34 and Fig. 4 summarise the results of the investigation into subject responses in relation to the recall of concrete items, shopping list items or titled text.

Table 33 depicts the number of items recalled per subject, the total and mean number of items recalled per group, the presence or absence of self-reports of individual instances of strategic employment and the presence or absence of individual instances of strategic behaviour - as observed by the researcher. Presence or absence of self-reports and strategic behaviour are indicated by + or - respectively.

**Table 33**
**Individual Subject Responses in Relation to the Recall of Concrete Items, Shopping List Items and Titled Text**

**Group 1: Concrete Items**

| Number of Items Recalled | | Self-Reports of Strategy Use | Observation of Strategic Behaviour |
|---|---|---|---|
| (S1) | 7 | - | - |
| (S2) | 9 | + | + |
| (S3) | 8 | + | + |
| (S4) | 7 | - | - |
| (S5) | 8 | + | + |
| | - - | - - | - - |
| Total | 39 | 3 | 3 |
| Mean | 7.8 | | |

**Group 2: Shopping List Items**

| Number of Items Recalled | | Self-Reports of Strategy Use | Observation of Strategic Behaviour |
|---|---|---|---|
| (S1) | 7 | + | + |
| (S2) | 7 | + | + |
| (S3) | 8 | + | + |
| (S4) | 7 | + | + |
| (S5) | 8 | + | + |
| | - - | - - | - - |
| Total | 37 | 5 | 5 |
| Mean | 7.4 | | |

**Group 3: Titled Text**

| Number of Items Recalled | | Self-Reports of Strategy Use | Observation of Strategic Behaviour |
|---|---|---|---|
| (S1) | 10 | + | + |
| (S2) | 9 | + | + |
| (S3) | 10 | + | + |
| (S4) | 9 | + | + |

**Group 3: Titled Text (cont.)**

| Number of Items Recalled | Self-Reports of Strategy Use | Observation of Strategic Behaviour |
|---|---|---|
| (S5) 10 | + | + |
| -- | -- | -- |
| Total 48 | 5 | 5 |
| Mean 9.6 | | |

Inspection of recall totals and means for all tasks reveals that overall mnemonic performance is high and thus replicates earlier experimental findings in the present study (Research Study Part II: Recall Performance). As anticipated, when required to recall concrete objects or shopping list items MLD subjects once again demonstrated that they are proficient, goal-directed memorizers for whom remembering is both desirable and possible: when observing the subjects' engagement with the stimulus materials the present researcher does not recognize the passive visual inspection or distracted off-task behaviour so frequently described in the research literature (e.g. Torgesen, 1982). In recalling a mean 7.8 concrete objects, 7.4 shopping list items and 9.6 idea units (out of a possible 10), MLD subjects were once again no longer distinguishable from the "normally" recalling children and adults described by enquirers such as Miller (1956) and thus ceased to be a discrete group characterized by poor recall ability.

Although the previous section cites recall of titled text as an area of relative mnemonic expertise for MLD children, the ease with which Group 3 recalled the idea units contained within the text was nevertheless unexpected. A possible explanation for their recall

excellence on this occasion lies within the nature of the text itself, in so far as the personally-relevant nature of the material, combined with the inclusion of a title, may have provided an enhanced contextualizing effect which, in turn, facilitated enhanced recall. Inspection of subject self-reports of strategy use supports this notion, and will be commented on below.

When asked to: "Tell me (or show me) what you did to help you remember," 13 out of 15 subjects were able to cite mnemonic behaviours which were construed by the researcher to be instances of strategic employment, whilst an equivalent 13 out of 15 subjects displayed study behaviour which was considered to demonstrate strategic employment. Typical of these is the following abridged "thinking aloud" protocol in which an MLD subject is preparing to recall shopping list items, having just been told she can use the paper and pencil to help her:

> Child: "Do you mean I can write the things down?"
> Researcher: "Yes, if you want."
> Child: "Could you say them slowly, then, 'cause I'm not a very good speller."

*(Child writes down each item in response to the researcher's list-reading. From time to time she checks a word until the list is complete and then counts the number of items).*

> Child: "I've got ten things. Is that right?"
> Researcher: "Yes. Now you've got about a minute to study the things on the list and then I'm going to ask you to try to remember them."

*(Child engages in clear reading/checking and self-testing behaviour, using her pencil to check items and silently naming them in a cyclical manner. Following recall, child is asked to describe what she did to help her remember).*

> Child: "This is what you do - watch - I've seen my mum do it. You write them down, then when you go into the shop you read your list like this

"butter, milk, soup..." and then you go and get them. If you forget, you can look at your bit of paper. I did it like my mum ... I tried to say them all without looking."

Thus, in relating the task requirements to actual shopping-behaviour, the child had appeared to use the real-world relevance of the stimulus materials to direct her strategic behaviour. In other words, she had identified the purpose of the task, had considered it worthy of mnemonic effort in terms of its authenticity, and had adapted her cognitive behaviour in order to maximise recall; in common with other G2 subjects she spontaneously elected to write down the stimulus items, thereby confirming the metamnemonic judgements made by MLD subjects in relation to an equivalent memory problem described in Part I of the Research Study. Furthermore, in demonstrating the repetition of several items together (butter, milk, soup), she had displayed an awareness of the facilitative effect of an expanded rehearsal buffer in terms of total number of items recalled.

For all subjects the shopping-list task was clearly a familiar and enjoyable activity, psychologically quite different from rote recall of discrete and unrelated items, which elicited a great deal of adult-like self-testing, checking and cyclical reading behaviours during the waiting period between stimulus presentation and actual testing for memory.

Similarly, the recall of the titled text used by Group 3 was an activity which also appeared to promote an intent to remember in all subjects and which was effective in prompting the spontaneous employment of mnemonic strategies as an aid to do so. In this case,

subject strategic behaviour during the presentation period tended to be characterized by labial movements and gestures (pointing) which indicated a "keeping track" approach to the to-be-remembered items. When required to recall the items (rooms in the school) all five subjects either gestured to indicate they were locating rooms in a mental "map" or used their fingers to "tick off" each room in turn. Once again, all subjects clearly enjoyed the activity and in doing so appeared to engage in it as much for its own sake as for the sake of achieving the external goal of item recall.

As far as motivational issues are concerned, the concrete objects used in task 1 were equally as effective in eliciting the exuberant response described in Part II of the Research Study (task 6) as the concrete items used in the same task; once again, the subjects displayed a strong intent both to engage with the items and spontaneously to offer various pieces of information regarding each one.

In the light of previous experimental experience, the researcher waited until each subject's interest (and commentary) had abated somewhat before attempting the recall task. Despite this enthusiasm, however, the total number of subjects who cited positive self-reports of strategy use, and in whom instances of strategic behaviour was observed, was lower than for other groups: a total of 3 subjects per category compared to 5 subjects per category for groups recalling shopping list items and titled text. Furthermore, when subjects were observed to engage in strategic behaviour it was considered by the

researcher to be a rather rudimentary rehearsal strategy, such as sheer repetition of stimulus items accompanied by some gestures to indicate "checking off" behaviour. Despite the reduced level of indirect strategic behaviours, however, consequent reductions in the number of items recalled was not observed. Similarly, inspection of serial position curves for the recall of concrete items (commented on below) does not support a no-strategy conclusion.

The employment of mnemonic strategies in relation to concrete objects will be further investigated in Part V of the Research Study.

At this stage the overall results from the indirect measures cited above provide firm support for the hypothesis that MLD children *can* engage in active and deliberate rehearsal strategies to aid item recall; inspection of the direct measures used to investigate subject responses - namely, serial position curves - further supports this notion.

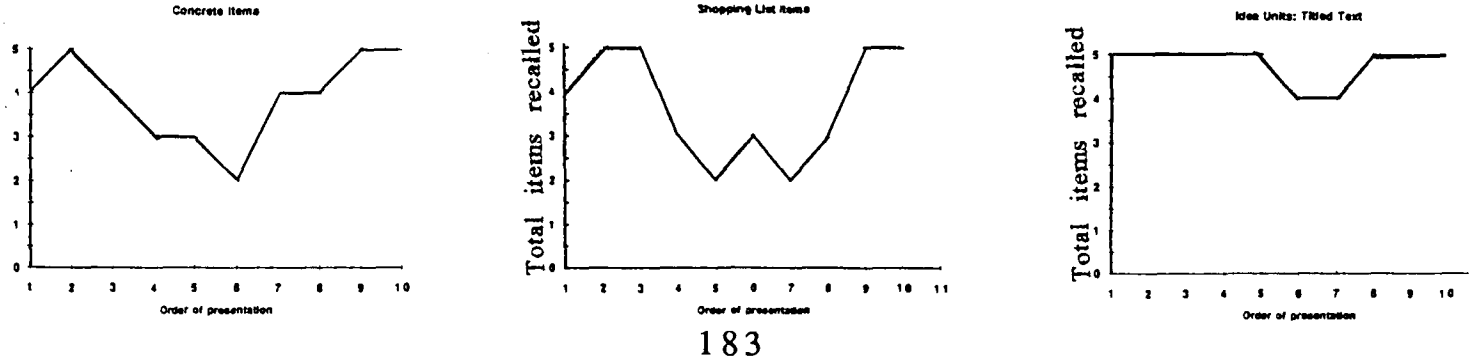
Table 34 depicts the total and mean number of initial and terminal items recalled per group; initial items were considered to be the first three items presented per series, whilst terminal items were considered to be the last three items presented per series. Fig. 4, meanwhile, depicts serial position curves (based on data from each group member) in relation to the recall of concrete items, shopping list items or titled text.

Table 34
Total and Mean Number of Initial and Terminal Items Recalled Per Group

| Group | Initial Items Recalled | | Terminal Items Recalled | |
|---|---|---|---|---|
| | Total | Mean | Total | Mean |
| G1 | 13 | 2.6 | 14 | 2.8 |
| G2 | 14 | 2.8 | 13 | 2.6 |
| G3 | 15 | 3.0 | 15 | 3.0 |

In terms of recall of initial and terminal items, the maximum total score per group would be 15 initial items recalled and 15 terminal items recalled (a mean of 3.0 per group). Groups 1, 2 and 3 recalled a mean 2.6, 2.8 and 3.0 initial items respectively and 2.8, 2.6 and 3.0 terminal items respectively. Whilst overall recall performance at both primacy and recency positions is high, as depicted in Table 34 and Fig. 4, it is the primacy portion of the serial position curve (where MLD children typically do not perform well) which is of particular significance to the present study. Thus, in demonstrating negligible differences between recall for initial and terminal items, more adult-like serial position curves are achieved; given that primacy memory is facilitated by the active employment of some sort of strategy for remembering, then this achievement may be attributed to the employment of the rehearsal strategies described above.

Fig. 4
Serial Position Curves: Groups 1, 2 and 3



In presenting data which support the notion that MLD children *can* spontaneously engage in active and effective rehearsal mechanisms to aid recall, the evidence cited here clearly challenges previous research findings which state that such children perform poorly on tasks which require the use of strategies for solution.

In the context of the meaningful stimuli utilised in the present study, MLD subjects presented as intrinsically-motivated and proficient learners who were capable of behaving in a task-adaptive and planful manner. Remembering, in this context, had a purpose to it which was clearly appreciated and understood.

It is the contention of the present researcher that it is this notion of "purposefulness", or authenticity, which prompts the spontaneous employment of mnemonic strategies in MLD subjects: the focus of Part V of the Research Study, therefore, will be an investigation into spontaneous strategic employment across a range of tasks, both authentic and non-authentic. As a pre-requisite to designing potentially authentic mnemonic tasks, however, it is first necessary to determine what makes a task authentic from the perspective of the subject: this will be the focus of Part IV of the Research Study.

# The Research Study Part IV

## The Research Study Part IV

### A Proposed Taxonomy of Authentic Features of Recall Tasks

Thus far, the evidence is that task authenticity, from the perspective of the subject, is a necessary precondition for the spontaneous employment of mnemonic strategies by children with moderate learning difficulties. Previous sections in the present study have indicated that authentic tasks include those which incorporate one or more of the following factors:

- concrete materials;
- real-world relevance;
- personal relevance.

The aim of Part IV of the Research Study is the documentation of a more complete taxonomy of authentic features which, when incorporated into recall tasks, will be effective in prompting the employment of mnemonic strategies to aid recall.

As previously stated, the view held by the present researcher is that a task is judged by the potential memorizer to be authentic when s/he considers it to possess a ***genuine purpose***, in terms of its recall requirement, and therefore to be worthy of strategy use for solution.

Whilst the taxonomy is intended to comply somewhat with Malone and Lepper's (1987) prescription that a good taxonomy is complete,

consistent and parsimonious, it should also be noted that it is not (and could not be) offered as exhaustive in terms of detailing a complete checklist of authentic task features.

Given that it is the memorizer who proclaims authenticity, it was decided to refer to the subjects themselves in the first instance in order to begin the investigation and subsequently to compare perspectives by seeking the opinions of their teachers.

## The Sample: The Pupils

Pupil respondents were 20 MLD subjects, ranging in age from 10 years 2 months to 14 years 10 months, with a mean age of 12 years 2 months. All participants were from the same school used throughout the study; some had previously participated in the study itself. In order to maintain a balance in terms of gender, all potential participants from a total of four chronologically grouped classes were first divided according to gender; 10 boys and 10 girls were subsequently selected at random from each gender group.

## The Sample: The Teachers

Teacher respondents were the 10 full-time members of staff (7 female and 3 male) at the day special school cited above. All teachers had at least one year's experience of teaching children with moderate learning difficulties, with the mean number of years' experience being five.

## Experimental Procedure

Testing took place approximately two months after Part III of the Research Study.

The investigation into both pupil and teacher responses comprised a number of separate phases, elaborated on in subsequent sections. By way of orientation, however, a brief outline of the separate phases follows:

**1) Identification of Memory Items:** All subjects were asked to list examples of items they (or their pupils) were good at remembering.

**2) Justifications**: Pupils were asked to say *why* they felt they were good at remembering particular items. Teachers were asked *what*, in their opinions, were the features of the items which made them memorable to MLD learners.

**3) Identification of Categories:** Justifications present in pupil responses were categorized and each category was identified as a potential authentic task feature.

**4) Analysis of Individual Memory Items (with reference to the presence or absence of authentic task features):** Each pupil memory item was scrutinised according to the number of categories under which it fell. In one case, for example, the

memorizer considered "Games" to be memorable because of the features real-world relevance and game format, whilst in the case of another memorizer "Games" were considered to be memorable because of the features visual appeal and practical engagement. Teacher memory items were compared, also with reference to the presence or absence of authentic task features.

### Identification of Memory Items: The Pupils

On this occasion, pupils were tested in class groups of five per group. Teachers of the pupils were asked to confirm that the subjects had acquired the necessary literacy skills to be able to respond to the task.

The task was introduced by the researcher, who asked the subjects to think about: "Things you are good at remembering". Subjects were encouraged to refer to their mnemonic performance across a range of contexts, rather than confine their selection to a specific context. They were then asked to indicate when they had thought of an instance. When all subjects had indicated in the affirmative they were asked to share their example with the rest of the group. Feedback in the form of informal comments was supplied by the researcher, with the aim of ascertaining whether or not all subjects understood the task requirements. Any subject who offered an apparently idiosyncratic response was given verbal prompts in order to ensure compliance with the experimental requirements. Subjects were encouraged to respond in global, rather than specific, terms and

clarification was sought if necessary. Thus, a pupil listing a series of digits to indicate that he considered himself to be good at remembering friends' telephone numbers was encouraged to use the appropriate generic label (i.e. "telephone numbers").

Once the researcher was sure all subjects understood the task they were then given a questionnaire headed: "Things I am good at remembering" and simply asked to: "Write down the things you are good at remembering." Prior to responding, subjects were told that spellings "didn't matter" or, if they preferred, they could either ask for help with spellings or could elect to represent their responses pictorially. No limits were imposed in terms of maximum and minimum number of items to be listed and subjects were thus allowed to write until they indicated completion.

### Identification of Memory Items: The Teachers

Prior to participation in Part IV of the Study all teachers were familiar with the general area of the research interest, therefore minimal introductory explanations were required.

With particular reference to Part IV, teachers were asked to respond to a questionnaire by listing examples of: "Areas in which, in your experience, your MLD children display memory skills over and above those which you would normally expect, given your knowledge of him/her as a learner."

## Justifications: The Pupils

On completion of the questionnaire pupils were interviewed individually, via a series of informal, open-ended questions, with a view to finding out *why* the pupil felt he or she was good at remembering particular items. All justifications were recorded by means of verbatim field notes, with clarification being sought where necessary. Pupils were free to provide as many, or as few, justifications for individual memory items as they wished.

## Justifications: The Teachers

Teachers were also interviewed individually following completion of the questionnaire, again via a series of open-ended interview questions, with a view to finding out what, in their opinions, were the features of the memory items they had cited which made them memorable to their MLD learners. In line with pupil experimental procedure, teachers were free to provide as many, or as few, justifications as they wished.

## Identification of Categories: The Pupils

In identifying categories of justifications present in pupil responses the criterion "salient features" was applied; one justification could therefore mention any number of potential categories. To aid clarity, an example of a pupil's memory item (elaborated on in interview), his justification and subsequent category identification of justifications (with rationale) is given below:

### Subject 20 (boy): "Things I am good at remembering"

#### Memory Item

"I'm good at remembering which car goes with which house number on my car washing round... so, if I've got to go to number 3, Byron Road, I know it's a blue Montego."

#### Justification

"You can see the car with the house in your mind - like if it's in the drive or parked outside - especially if it's a really good car, like a BMW. And I think it helps if it's your own round and you know how much you earn before you even get there."

#### Identification of Categories

Salient features were considered to be the mention of picturing the house/car /drive; references to "a really good car" (which, for this respondent, meant good looking) and references to it being his own round. These features would be identified and categorized as concrete materials (CM), sensory appeal (SA) and personal relevance (PR).

For the categorization exercise agreement was sought from an independent source. Further clarification of the categorization exercise is given in the results section.

## Analysis of Individual Memory Items: The Pupils and Teachers

Following the identification of the categories (subsequently referred to as authentic task features), individual pupil and teacher responses were scrutinised with a view to establishing the presence or absence of authentic task features. Once again, the criterion "salient features" was applied and agreement was sought from an independent source.

## Results

Since it is the memorizer who proclaims authenticity it is the pupil responses which are the initial focus of this results section.

### The Pupils: Identification of Memory Items

A total of five indecipherable, idiosyncratic or individually-repetitive pupil responses were discarded, leaving a total of 113 cited memory items (mean 5.65) in response to the statement: "Things I am good at remembering." These are depicted in Table 35 (below), abridged and modified for clarity where necessary.

**Table 35**
**Pupil Responses: "Things I am good at remembering"**

| Subject | Memory Item |
|---|---|
| S1 | People's names on T.V programmes |
| S1 | Pop songs |
| S1 | Shopping list |
| S1 | Games - like "Monopoly" |
| S1 | Friends' birthdays |
| S1 | Bringing things to school |
| S1 | Friend's telephone numbers |
| S1 | How to get to places |
| S1 | The scores of all our netball matches |
| S2 | Computer programmes |
| S2 | Electronic games, like Nintendo |
| S3 | Words of songs |
| S3 | Places I've been to before |
| S3 | All the names of Ninja Turtles |
| S3 | Computer games |
| S3 | Which newspaper each house gets on my paper round |
| S3 | Street names on my paper round |
| S3 | Words of records |
| S3 | T.V. programmes |
| S4 | Anything about my football team |
| S4 | Family names |
| S4 | Important phone numbers |
| S4 | All about "Neighbours" (T.V. prog.) |
| S5 | My favourite television programmes |
| S5 | Friends' and family birthdays |

## Table 35
## Pupil Responses: "Things I am good at remembering"(cont.)

| Subject | Memory Item |
|---|---|
| S5 | Shopping lists |
| S5 | Measuring in maths |
| S5 | How to get to places |
| S6 | Pop songs |
| S6 | Shopping for cookery lessons |
| S6 | Playing Bridge (card game) |
| S6 | Computer programmes |
| S6 | T.V. serials |
| S6 | Names of people I meet |
| S6 | Birthdays |
| S6 | Friends' telephone numbers |
| S6 | Finding my way to a place |
| S7 | How to play games |
| S7 | Names of people in my school |
| S8 | Names of records in the top 20 |
| S8 | Telephone numbers |
| S9 | Words of songs |
| S9 | Computer programmes |
| S9 | Girls' names |
| S9 | Names of people in my favourite groups |
| S9 | The book we're reading in class |
| S9 | Television programmes |
| S10 | Shopping lists |
| S10 | Family birthdays |
| S10 | Some films, like "Grease" |
| S11 | Scores in darts |
| S11 | Prices of things for my Saturday job |
| S11 | All the games Liverpool played |
| S11 | The foreign names of countries when they're on stamps |
| S11 | Some science experiments |
| S12 | What has happened in "Neighbours" |
| S12 | Words of songs |
| S12 | Friends' telephone numbers |
| S12 | How to get to places |
| S12 | Names of people I like |
| S12 | Things to do with football |
| S13 | Music |
| S13 | Arsenal players |
| S13 | Scores on computer games |
| S13 | Lists for the tuck shop |
| S13 | The Snooker World Championship |
| S13 | Grand Prix winners |
| S14 | Words of songs |
| S14 | Names and numbers of Pizzas in my job |
| S14 | Telephone numbers |
| S14 | What happened last in T.V. serials |
| S14 | Football scores |
| S14 | How to play computer games |
| S15 | Names of all the videos in our shop |

## Table 35
## Pupil Responses: "Things I am good at remembering"(cont.)

| Subject | Memory Item |
|---|---|
| S15 | Tactics in "Mazes" (computer game) |
| S15 | Football scores in Division One |
| S15 | How to get to places on the tube |
| S15 | Where things are in Waitrose |
| S15 | Words of records |
| S15 | When my favourite T.V. programmes are on |
| S16 | Important telephone numbers |
| S16 | All the stops on bus rides |
| S16 | "Neighbours" (T.V. prog.) |
| S16 | Records and groups |
| S16 | Football players and teams |
| S16 | Telephone numbers |
| S16 | Important times, like when school starts |
| S17 | Things to do with rugby, like the World Cup |
| S17 | Television programmes |
| S17 | Pop songs |
| S17 | Things on a shopping list |
| S17 | Birthdays |
| S17 | Friends' telephone numbers |
| S17 | How to get to places I've been to before |
| S17 | Board games |
| S17 | Roald Dahl books |
| S18 | The maths we are doing |
| S18 | Records |
| S18 | Favourite T.V. serials, like "Neighbours" |
| S18 | How to use different computers |
| S18 | How to make things in technology |
| S18 | Names of people in school |
| S18 | When we plan tactics in American football |
| S18 | American football cards |
| S19 | The words of records |
| S19 | Some television programmes |
| S20 | Pop records |
| S20 | Computer games |
| S20 | Which house has which car on my car washing round |
| S20 | What happened last in T.V. serials |
| S20 | Nintendo games |

Initial perusal of the list of memory items indicates a low incidence of "school-type" items and a high incidence of those items which the present study has shown to be areas of relative mnemonic strengths for MLD children (for example, shopping list items and telephone

numbers). The classification exercise depicted below (Table 36) confirms this notion.

**Table 36**
**Classification and Rank Order of MLD Memory Items**

| Memory Item | Total Number of Mentions | Rank Order |
|---|---|---|
| Music | 16 | 1 |
| T.V. | 15 | 2 |
| Sport | 14 | 3 |
| Micro-electronics | 11 | 4 |
| Telephone numbers | 9 | 5 |
| Places/Directions | 8 | 6= |
| Names | 8 | 6= |
| Dates/Times | 7 | 8= |
| Shopping list items | 7 | 8= |
| Employment-related | 5 | 10 |
| Games | 4 | 11 |
| Trends/Hobbies | 3 | 12 |
| School subjects | 2 | 13= |
| Action details | 2 | 13= |
| Books | 2 | 13= |

As illustrated in Table 36, memory items related to "music", "television" and "sport" were rated highly by the MLD learners in terms of things they were good at remembering (16, 15 and 14 mentions respectively, with the maximum possible number of mentions being 20), whereas items related to "school subjects" were mentioned by two MLD learners only. Furthermore, reference to Table 35 (above) and subsequently to Table 40 (pupil justifications) indicates that, when school-type subjects *were* mentioned (i.e. "the maths we are doing" and "measuring in maths"), they tended to be non-traditional in terms of content and/or form. Thus, in the case of the school-type memory items cited above, both (according to the memorizers) featured real-world relevance, concrete materials and practical engagement to account for their memorableness.

## Identification of Categories Present in Pupil Responses

By applying the criterion "salient features", initial inspection of pupil justifications for their "good" mnemonic performance in terms of their cited items indicated that a significant number contained one or more of the categories already considered to be included in the proposed taxonomy of features of authentic recall tasks i.e. concrete materials, real-world relevance and/or personal relevance. On this occasion, 89% agreement with an independent source was recorded.

In some cases, where uncertainty may otherwise have existed, scrutiny of individual pupil justifications confirmed the trend: a subject who had cited being good at remembering: "... all the stops on bus rides," for example, went on to describe how he used concrete aids such as a particular shop, underground station or garage along the way to mentally "peg" his whereabouts. His justification would therefore be categorized as concrete materials.

These features are detailed below (Table 37), together with examples of subject justifications which typify the categories.

**Table 37**
**Categorization of Subject Justifications**

| Category Assignment | Typical Subject Justification |
|---|---|
| Concrete Materials | "I'm good at remembering things on a shopping list because when you go into a shop you can see all the things." |
| Real-World Relevance | "I can remember all the street names in "Monopoly" because they are the names of real streets." |

## Table 37
## Categorization of Subject Justifications (cont.)

| Category Assignment | Typical Subject Justification |
|---|---|
| Personal Relevance | "I"m good at remembering birthdays when it's someone in my family because then it's important." |

Closer scrutiny of pupil justifications, however, (and liaison with an independent source) indicated that the proposed taxonomy was not complete; justifications relating to being good at remembering "pop songs" or "records", for example, were devoid of references to the categories concrete materials, real-world relevance or personal relevance to account for their memorableness, but instead referred to features such as aural appeal. Similarly, justifications relating to being "good at remembering computer games" referred to features such as the presence of scoring systems, practical engagement or the visual appeal of the displays.

In the light of these findings a taxonomic shortfall was indicated and therefore the need for additional task features to account for subjects' memory performance was established.

By once again applying the criterion "salient features", analysis of aspects of subject justifications not subsumed under the three established categories indicated that they related to one or more of the following factors:

- visual or auditory appeal;
- scoring systems and/or the presence of definite goals;
- practical engagement.

Reference to an independent source indicated agreement in excess of 90%.

These justifications are subsequently labelled Sensory Appeal (SA), Game Format (GF) and Practical Engagement (PE) respectively and are detailed below (Table 38), together with examples of subject justifications which typify the categories.

**Table 38**
**Categorization of Subject Justifications: Additional Categories**

| Category Assignment | Typical Subject Justification |
|---|---|
| Sensory Appeal | "I'm good at remembering some of our computer programmes because they have good graphics - like PacMan." |
| Game Format | "I play Bridge with my Dad and I"m good at remembering which card has been played because that's how you score points." |
| Practical Engagement | "I'm good at remembering cookery recipes because it's easy to remember things you do." |

Since all aspects of pupil justifications have now been subsumed under one or more of the categories, the researcher is in a position to state that, with reference to the justifications supplied, the proposed taxonomy is now complete and is detailed below (Table 39) as a set of suggested features for inclusion in recall tasks which are effective in prompting the employment of mnemonic strategies in MLD subjects. It is pertinent to emphasize, however, that the taxonomy at this stage has only the status of a hypothesis still to be tested.

**Table 39**
**A Proposed Taxonomy of Authentic Recall Task Features**

Real-World Relevance (RWR)
Personal Relevance (PR)
Concrete Materials (CM)
Practical Engagement (PE)
Sensory Appeal (SA)
Game Format (GF)

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## Analysis of Individual Memory Items: Pupils

Having identified categories of justifications present in pupil responses (now labelled authentic task features) the final phase of analysis of pupil-generated data was the scrutiny of individual justifications with a view to determining the presence or absence of authentic task features. It should be noted that the categories were independently derived from the list of justifications and not from the items remembered. As such, the artefact of circularity was avoided.

Researcher opinion was checked with an independent source, with agreement in excess of 85% being achieved.

It will be recalled that it is the perspectives of the subjects themselves which are represented in this fourth part of the Research Study; thus, whilst the pupil memory item "games - like Monopoly" (subject 1) includes concrete materials in its own right, on this occasion it was the real-world relevance of the place names, together

with the game format, which the subject felt caused her to be "good at remembering" the cited memory item.

Table 40 therefore details the individual subject responses, together with the depiction of the presence or absence of authentic task features *from the perspective of the memorizer*, based on scrutiny of subject responses and endorsed by an independent source. Presence or absence of authentic task features is indicated by + or - respectively.

**Table 40**
**Presence or Absence of Authentic Task Features**

| | Authentic Task Features | | | | | |
|---|---|---|---|---|---|---|
| **Subject/Item** | **RWR** | **PR** | **CM** | **PE** | **SA** | **GF** |
| (S1)People's names on T.V programmes | + | - | - | - | - | - |
| (S1)Pop songs | - | - | - | - | + | - |
| (S1)Shopping list | + | - | + | + | - | - |
| (S1)Games - like "Monopoly" | + | - | - | + | - | + |
| (S1)Friends' birthdays | - | + | - | - | - | - |
| (S1)Bringing things to school | - | - | - | + | - | - |
| (S1)Friend's telephone numbers | - | + | - | - | - | - |
| (S1)How to get to places | - | - | - | + | - | - |
| (S1)The scores of all our netball matches | - | + | - | + | - | + |
| (S2)Computer programmes | - | - | - | - | + | - |
| (S2)Electronic games, like Nintendo | - | - | - | + | + | + |
| (S3)Words of songs | - | - | - | - | + | - |
| (S3)Places I've been to before | - | + | - | - | - | - |
| (S3)All the names of Ninja Turtles | - | + | + | - | - | - |
| (S3)Computer games | - | - | - | + | - | + |
| (S3)Which newspaper each house gets on my paper round | - | + | - | + | - | - |
| (S3)Street names on my paper round | - | + | - | + | - | - |
| (S3)Words of records | - | - | - | - | + | - |
| (S3)T.V. programmes | + | - | - | - | - | - |
| (S4)Anything about my football team | - | + | - | - | - | - |
| (S4)Family names | - | + | - | - | - | - |
| (S4)Important phone numbers | - | + | - | - | - | - |
| (S4)All about "Neighbours" (T.V. prog.) | + | - | - | - | - | - |
| (S5)My favourite television programmes | - | + | - | - | + | - |
| (S5)Friends' and family birthdays | - | + | - | - | - | - |
| (S5)Shopping lists | + | + | + | - | - | - |

## Table 40
## Presence or Absence of Authentic Task Features (cont.)

| | Authentic Task Features | | | | | |
|---|---|---|---|---|---|---|
| **Subject/Item** | **RWR** | **PR** | **CM** | **PE** | **SA** | **GF** |
| (S5)Measuring in maths | + | - | + | + | - | - |
| (S5)How to get to places | - | + | - | + | - | - |
| (S6)Pop songs | - | - | - | - | + | - |
| (S6)Shopping for cookery lessons | - | + | + | - | - | - |
| (S6)Playing Bridge (card game) | - | - | - | - | - | + |
| (S6)Computer programmes | - | - | - | - | + | - |
| (S6)T.V. serials | + | - | - | - | + | - |
| (S6)Names of people I meet | - | + | - | - | - | - |
| (S6)Birthdays | - | + | - | - | - | - |
| (S6)Friends' telephone numbers | + | + | - | - | - | - |
| (S6)Finding my way to a place | + | - | - | + | - | - |
| (S7)How to play games | - | - | - | + | - | + |
| (S7)Names of people in my school | - | + | - | - | - | - |
| (S8)Names of records in the top 20 | - | - | - | - | + | - |
| (S8)Telephone numbers | - | + | - | - | - | - |
| (S9)Words of songs | - | - | - | - | + | - |
| (S9)Computer programmes | - | - | - | + | + | - |
| (S9)Girls' names | - | - | - | - | + | - |
| (S9)Names of people in my favourite groups | - | + | - | - | - | - |
| (S9)The book we're reading in class | - | + | - | - | - | - |
| (S9)Television programmes | + | - | - | - | - | - |
| (S10)Shopping lists | + | - | + | - | - | - |
| (S10)Family birthdays | - | + | - | - | - | - |
| (S10)Some films, like "Grease" | - | + | - | - | + | - |
| (S11)Scores in darts | - | + | - | - | - | + |
| (S11)Prices of things for my Saturday job | + | + | - | - | - | - |
| (S11)All the games Liverpool played | - | + | - | - | - | - |
| (S11)The foreign names of countries when they're on stamps | - | + | + | - | - | - |
| (S11)Some science experiments | - | - | - | + | - | - |
| (S12)What has happened in "Neighbours" | + | - | - | - | + | - |
| (S12)Words of songs | - | - | - | + | + | - |
| (S12)Friends' telephone numbers | - | + | - | - | - | - |
| (S12)How to get to places | - | + | - | + | - | - |
| (S12)Names of people I like | - | + | - | - | + | - |
| (S12)Things to do with football | - | + | - | - | + | + |
| (S13)Music | - | - | - | - | + | - |
| (S13)Arsenal players | - | + | - | - | - | - |
| (S13)Scores on computer games | - | + | - | - | - | + |
| (S13)Lists for the tuck shop | + | + | - | - | - | - |
| (S13)The Snooker World Championship | - | + | - | - | - | + |
| (S13)Grand Prix winners | - | + | - | - | - | - |
| (S14)Words of songs | - | - | - | - | + | - |
| (S14)Names and numbers of Pizzas in my job | - | + | + | - | - | - |
| (S14)Telephone numbers | - | + | - | - | - | - |
| (S14)What happened last in T.V. serials | + | - | - | - | - | - |
| (S14)Football scores | - | + | - | + | - | + |
| (S14)How to play computer games | - | - | - | - | - | + |

## Table 40
## Presence or Absence of Authentic Task Features (cont.)

| | Authentic Task Features | | | | | |
|---|---|---|---|---|---|---|
| **Subject/Item** | **RWR** | **PR** | **CM** | **PE** | **SA** | **GF** |
| (S15)Names of all the videos in our shop | + | - | - | - | - | - |
| (S15)Tactics in "Mazes" (computer game) | - | - | - | - | - | + |
| (S15)Football scores in Division One | - | + | - | - | - | - |
| (S15)How to get to places on the tube | + | - | - | + | - | - |
| (S15)Where things are in Waitrose | - | + | + | + | - | - |
| (S15)Words of records | - | - | - | - | + | - |
| (S15)When my favourite T.V. programmes are on | - | + | - | - | - | - |
| (S16)Important telephone numbers | - | + | - | - | - | - |
| (S16)All the stops on bus rides | - | - | + | - | - | - |
| (S16)"Neighbours" (T.V. prog.) | + | - | - | - | + | - |
| (S16)Records and groups | - | - | - | - | + | - |
| (S16)Football players and teams | - | + | - | - | - | + |
| (S16)Telephone numbers | - | + | - | - | - | - |
| (S16)Important times, like when school starts | - | + | - | - | - | - |
| (S17)Rugby, especially the World Cup | - | + | - | - | - | + |
| (S17)Television programmes | - | - | - | - | + | - |
| (S17)Pop songs | - | - | - | - | + | - |
| (S17)Things on a shopping list | + | - | + | - | - | - |
| (S17)Birthdays | - | + | - | - | - | - |
| (S17)Friends' telephone numbers | - | + | - | - | - | - |
| (S17)How to get to places I've been to before | - | - | - | + | - | - |
| (S17)Board games | - | - | + | - | - | + |
| (S17)Roald Dahl books | - | - | - | - | + | - |
| (S18)The maths we are doing | + | - | + | + | - | - |
| (S18)Records | - | - | - | - | + | - |
| (S18)Favourite T.V. serials | - | + | - | - | + | - |
| (S18)How to use different computers | - | - | + | + | - | - |
| (S18)How to make things in technology | - | - | + | + | - | - |
| (S18)Names of people in school | - | + | - | - | - | - |
| (S18)Tactics in American football | - | + | + | - | - | + |
| (S18)American football cards | - | + | - | - | - | - |
| (S19)The words of records | - | - | - | - | + | - |
| (S19)Some television programmes | + | - | - | - | + | - |
| (S20)Pop records | - | - | - | - | + | - |
| (S20)Computer games | - | - | - | + | + | + |
| (S20)Which house has which car on my car washing round | - | + | + | - | + | - |
| (S20)What happened last in T.V. serials | + | - | - | - | - | - |
| (S20)Nintendo games | - | - | - | - | + | + |
| **Total** | **23** | **55** | **17** | **25** | **34** | **19** |

Inspection of Table 40 yields a number of significant trends, which will be considered separately:

1. Whilst authenticity is quite clearly in the mind of the memorizer (for example, for one MLD learner "the book we are reading in class" was considered to be memorable because of its personal relevance, whilst for another child "Roald Dahl books" were considered to be memorable because of their sensory appeal) considerable agreement *in general* exists amongst the MLD memorizers themselves as to what makes a particular item memorable. Thus, in the case of T.V. programmes (particularly so-called "soap-operas"), it is principally real-world relevance which is considered to make them memorable, whilst for music-related items it is principally sensory appeal.

Thus, it may be that some items have a degree of "in-built" authenticity (or at least a high chance of being perceived as authentic) whilst others *become* authentic as a result of within-child factors. Whichever may be the case for individual memory items, perusal of the various items and accompanying justifications suggests that, in all cases, the perception of authenticity is achieved via an interaction between child and item, rather than being solely attributable to either the child or the task.

2. In awarding personal-relevance the highest rating (a total of 55 mentions) to account for the memorableness of their cited memory items, MLD learners as a group display a considerable degree of consistency, over various contexts, in terms of rationalising their

mnemonic capabilities and preferences. It will be recalled from previous sections of the present study, for example, that when required to remember (or to make mnemonic judgements about) context-free items, MLD children displayed a tendency to import context of a personally relevant nature, thereby demonstrating their dependence on (and preference for) a task framework within which they can find a personal reality. At times, this practice distorted the perspective of the task. When personally relevant material was provided, however, (for example, in the case of text recall in Part III of the Research Study) MLD pupils displayed mnemonic skills that were equal to those of their typical peers.

As previously stated, this group preference for personally relevant tasks has obvious implications for the designing of appropriate instructional environments for MLD children. It is also significant, of course, that - not only do MLD children have these mnemonic preferences - but they are *aware* of, and can *articulate,* them.

3. Scrutiny of pupil justifications suggests that (in some cases at least) *individual* learners may have particular mnemonic preferences in terms of task authenticity. Thus, for subject 4, for example, "relevance" (either real-world or personal) appears to be a particular preference, for subjects 2, 9 and 20 sensory appeal seems important, whilst for subject 1 practical engagement is the mnemonic preference.

In the light of these findings, it may be pertinent for those who are responsible for designing instructional environments for MLD pupils to adopt an initial diagnostic approach with a view to discovering particular *individual* mnemonic preferences for deciding upon task authenticity.

Points 2 and 3 (above) will be addressed more fully in the recommendations section which concludes the present study.

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Whilst the taxonomy is still, at this stage, hypothetical, initial perusal of data from past MLD mnemonic performances suggests that the proposed taxonomy *is* an accurate predictor of future mnemonic success. For example, it will be recalled from the previously-presented case study that Carl (an MLD memorizer) displayed areas of relative recall excellence in tasks relating to his interest in football. In noting that, from Carl's perspective, football-related tasks include a number of the proposed authentic task features, his recall excellence is perhaps not surprising.

The notion of more rigorous testing of the taxonomy will be addressed in Part V of the Research Study.

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By way of providing comparative perspectives, the views of the teachers are presented below. This analysis will not, however, be extensive since it is the perspectives of the memorizers themselves which are central to determining task authenticity.

## The Teachers: Identification of Memory Items

In response to the request to list: "Areas in which, in your experience, your MLD children display memory skills over and above those which you would normally expect, given your knowledge of him/her as a learner," the teachers returned a total of 37 responses (mean 3.7). These are depicted in Table 41 (below).

On the whole, teachers provided fuller responses to the questionnaire than did their pupils and tended to supply examples and descriptions where appropriate. These elaborations remain unabridged on those occasions when they are considered to add significantly to the data.

Responses tended to be made with a particular pupil in mind, or with reference to MLD pupils as a group; either was considered to be acceptable.

## Table 41
## Teacher Responses: Areas of Relative Recall Strengths in MLD Pupils

| Subject | Memory Item |
|---|---|
| S1 | Details relating to places they have been to before, for example where they and other pupils sat the previous year on a theatre visit |
| S1 | Tasks where they have concrete aids to help them, such as using the school "shop" to purchase items and calculate bills |
| S1 | Telephone numbers |
| S2 | The names of other children in the class |
| S2 | Their own telephone numbers, including ones dating back from several house moves |
| S2 | Stations on the Underground system |
| S2 | Everything to do with a particular football team |
| S3 | Significant dates and times, for example, remembering the precise day, date and time when we had a fire at school |
| S3 | All their friends' telephone numbers |
| S3 | People's names, even those who are casually met |
| S4 | Items related to areas of particular pastimes, for example, one pupil who knows (off by heart) all the engine numbers on his train-spotting expeditions |
| S4 | Important or meaningful telephone numbers |
| S4 | Sport, for example every move in the snooker championships |
| S4 | When significant events happened, like the 1966 World Cup |
| S5 | Significant places, for example, all the places visited on a previous school trip |
| S5 | People/events on T.V. programmes, particularly "soap-operas" |
| S5 | Words of pop songs |
| S5 | Lists of instructions when the pupil has to do something as a result, for example, assembling models |
| S5 | Names of the entire Liverpool football team, going back over years |
| S6 | Telephone numbers of family and friends |
| S6 | Practical things, such as shopping lists |
| S7 | Names of all the children in the school |
| S7 | Significant places/sites along a route (even ones travelled some time before) and being able to predict what comes next |
| S7 | Anything to do with sport - people, events, scores, times etc. |
| S7 | Birthdays of everybody in the class |
| S8 | Names of their "heros", such as football players |
| S8 | Activities related to using a computer, including remembering individual programmes on a large number of discs |
| S8 | Names, makes and models of cars |
| S8 | Favourite T.V. programmes |
| S8 | Anything to do with pop music |
| S9 | Relevant dates and times |
| S9 | Anything to do with football |
| S9 | Other children's names - even those who left the school some time ago |
| S9 | The use of concrete objects to act as a memory prompt |
| S10 | The names of characters in certain T.V. programmes |

## Table 41
## Teacher Responses: Areas of Relative Recall Strengths in MLD Pupils (cont.)

| Subject | Memory Item |
|---|---|
| S10 | Things related to sport |
| S10 | Words of favourite songs |

Once again, initial perusal of the list of memory items indicates a low incidence of "school-type" items and a high incidence of those items which MLD pupils themselves considered to be areas of mnemonic strengths. The classification exercise depicted below (Table 42) confirms this.

## Table 42
## Classification and Rank Order of MLD Mnemonic Strengths (Teacher Responses)

| Memory Item | Total No. Mentions | Rank Order |
|---|---|---|
| Sport | 6 | 1 |
| Telephone numbers | 5 | 2= |
| Names | 5 | 2= |
| Places/Directions | 4 | 4= |
| Dates/Times | 4 | 4= |
| T.V. | 3 | 6= |
| Music | 3 | 6= |
| Practical activities | 2 | 8= |
| Concrete aids | 2 | 8= |
| Trends/Hobbies | 2 | 8= |
| Micro-electronics | 1 | 11 |

Whilst some items could feasibly appear in more than category (for example: "Names of the entire Liverpool football team" could be classified under "Sport" or "Names") this factor was not considered to be significant since it is the *features* of these items which is of interest. On this occasion, agreement with an independent source in excess of 80% was secured.

With the exception of concrete objects and practical activities (as items rather than justifications) all memory items classified in Table 42 duplicate those mentioned by the MLD subjects themselves: only rank order of number of mentions differ. Thus, as illustrated in Tables 36 and 42, there is general consensus among both teachers and pupils as to the *areas* of relative recall expertise in MLD children.

Inspection of teacher responses (and subsequent discussions with them) yielded no indication of their feeling that the conceptualization of an MLD pupil as an expert memorizer was a contradiction in terms; all teachers acknowledged the existence of areas of relative recall excellence in MLD pupils and were thus able to supply full and rich descriptions of this excellence in order to illustrate a response. One teacher, quoted below, described a pupil's expertise in recalling the names of underground stations:

"Leo has memorized every station on the London Underground and is able to recite them - in order - when given the name of the line."

According to Leo's teacher, Leo demonstrated this mnemonic "trick" following a class visit to London where he discovered he could rote learn the stations in a cumulative fashion whilst on the train. The teacher went on to describe other "places-related" areas of recall excellence in MLD children.

A second teacher, referring to a pupil who had not yet acquired the ability to name colours in isolation, described how the pupil used an elaborative technique to "link" colours with familiar concrete objects.

If presented with red, for example, and asked: "What colour?", the child would always respond: "Jelly-red". Similarly, if presented with blue and asked: "What colour?" the child would respond "Jumper-blue" (the school uniform). Thus, whilst the pupil had not yet acquired a concept of the "redness-of-red" or the "blueness-of-blue" he nevertheless knew that the red or the blue he was being presented with was the same colour as the jelly and the jumper which he had selected as his personally relevant context.

Of practical interest, of course, is the notion that, although consensus exists regarding these areas of relative recall excellence in MLD pupils, perusal of curriculum tasks and activities rarely reflect (or attempt to capitalise on) them.

## Analysis of Individual Memory Items: Teachers

The final phase of analysis of teacher-generated data was the scrutiny of individual justifications (by means of reference to the proposed taxonomy) with a view to comparing these justifications with those of the pupils.

Table 43 therefore details the individual teacher responses, together with the depiction of the presence or absence of authentic task features, as determined by previous analysis of pupil justifications. Once again, agreement with an independent source in excess of 85% was achieved. Presence or absence of authentic task features is indicated by + or - respectively.

On this occasion, responses were abridged and modified for clarity where necessary

**Table 43**
**Presence or Absence of Authentic Task Features**

| | Authentic Task Features | | | | | |
|---|---|---|---|---|---|---|
| **Subject/Item** | **RWR** | **PR** | **CM** | **PE** | **SA** | **GF** |
| (S1)Places previously visited | - | + | - | + | - | - |
| (S1)Tasks with concrete aids | - | - | + | + | - | - |
| (S1)Telephone numbers | - | + | - | - | - | - |
| (S2)Classmates names | - | + | - | - | - | - |
| (S2)Telephone numbers | - | + | - | - | - | - |
| (S2)Underground stations | + | - | - | + | - | - |
| (S2)Football team | - | + | - | + | - | + |
| (S3)Significant dates and times | - | + | - | - | - | - |
| (S3)Friends telephone numbers | - | + | - | - | - | - |
| (S3)People's names | - | + | - | - | - | - |
| (S4)Items related to pastimes | - | + | - | - | - | - |
| (S4)Telephone numbers | - | + | - | - | - | - |
| (S4)Sport | - | + | - | + | + | + |
| (S4)Significant events | + | + | - | - | - | - |
| (S5)Significant places | - | + | - | + | - | - |
| (S5)People/events on T.V. progs. | + | - | - | - | + | - |
| (S5)Words of pop songs | - | - | - | + | + | - |
| (S5)Following a list of instructions | - | - | + | + | - | - |
| (S5)Names of Liverpool football team | - | + | - | - | - | - |
| (S6)Telephone numbers | - | + | - | - | - | - |
| (S6)Practical items eg. shopping lists | - | - | + | + | - | - |
| (S7)Names of children in school | - | + | - | - | - | - |
| (S7)Significant places/sites | - | + | - | + | - | - |
| (S7)Sport | + | - | - | + | + | + |
| (S7)Birthdays | - | + | - | - | - | - |
| (S8)Names of their "heros" | + | + | - | - | - | - |
| (S8)Using a computer | - | - | + | + | + | + |
| (S8)Names/makes/models of cars | + | + | + | - | + | - |
| (S8)Favourite T.V. programmes | + | - | - | - | - | - |
| (S8)Pop music | - | - | - | + | + | - |
| (S9)Relevant dates and times | - | + | - | - | - | - |
| (S9)Anything to do with football | - | + | - | + | + | + |
| (S9)Other children's names | - | + | - | - | - | - |
| (S9)The use of concrete objects | - | - | + | + | + | - |
| (S10)Names in T.V. programmes | - | + | - | - | + | - |
| (S10)Things related to sport | - | - | - | + | + | + |
| (S10)Words of favourite songs | - | - | - | + | + | - |
| **Total** | **7** | **24** | **6** | **17** | **12** | **6** |

The most striking aspect of the teacher data is the considerable amount of agreement shared between teachers and pupils as to the mnemonic benefits of personal relevance. This (and other areas of agreement) is illustrated more clearly when presented in rank order form.

Table 44 (below) therefore depicts the rank order, based on total number of mentions, assigned to the six authentic task features by MLD pupils and their teachers.

**Table 44**
**Rank Orders of Authentic Task Features**

| Rank | MLD Pupils | Rank | Teachers |
|---|---|---|---|
| 1 | Personal Relevance | 1 | Personal Relevance |
| 2 | Sensory Appeal | 2 | Practical Engagement |
| 4 | Real-World Relevance | 3 | Sensory Appeal |
| 5 | Game Format | 4 | Real-World Relevance |
| 3 | Practical Engagement | 5= | Game Format |
| 6 | Concrete Materials | 5= | Concrete materials |

Thus, as illustrated in Table 44, there is once again considerable and significant agreement between the teachers and pupils for *all* areas ($r$ = .91), but particularly in terms of the mnemonic benefits of personal relevance, real-world relevance and game format.

Despite these shared perceptions as to what prompts "good" mnemonic performance in MLD pupils, however, perusal of curriculum tasks and activities once again indicated little attempt to reflect or capitalise on them.

In terms of how well the taxonomy "worked" as a means of identifying the nature of teacher justifications (bearing in mind that it was derived from pupil justifications) all but four teacher justifications could be subsumed under the authentic task features; these four tended to relate either to motivational issues such as pupils remembering pop songs "to be like their friends" or to teachers holding stereotypical views about MLD children having "a knack" for retaining certain items or being "obsessive" about remembering particular items (in this instance, numbers of train engines).

What is clear from the results of this fourth phase of the Research Study is that both pupils and teachers are not only aware that MLD children have areas of relative recall excellence, they also appear to know what it is about these areas of excellence which cause them to be so. Despite considerable consensus, however, this shared perception does not seem to transfer to its practical application in the classroom.

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The previous section of the Research Study indicated that MLD subjects were capable of spontaneously engaging in active and effective rehearsal mechanisms for authentically-perceived tasks, whilst this fourth phase of the study has attempted to identify which task features determine authenticity from the perspective of the memorizer; in fulfilling the latter aim the researcher has presented a proposed taxonomy of authentic recall task features.

By referring to the proposed taxonomy, the fifth (and final) phase of the study will be an investigation to test the effectiveness of the taxonomy through strategic employment across a range of tasks, both authentic and non-authentic.

# The Research Study Part V

## The Research Study Part V

## Conditions Under Which MLD Subjects Spontaneously Employ Mnemonic Strategies

This fifth phase of the Research Study will compare the incidence of strategic employment by children with moderate learning difficulties for recall tasks of an authentic versus a non-authentic nature. It will focus on identifying under which conditions MLD children spontaneously will employ strategies and will also seek to extend the investigations described in Parts III and IV of the Research Study by confirming that MLD children *can* spontaneously employ strategies to aid recall in the first place.

### The Sample

Participants were two groups of 10 MLD subjects attending two day special schools for children with moderate learning difficulties. Since testing took place approximately twenty-three months after Part II of the Research Study, neither group had participated in previous studies. As indicated, two special schools for pupils with moderate learning difficulties were used on this occasion - as opposed to the single special school used for Parts I and II of the Research Study. School "S" was the same all age day special school used in previous studies, whilst school "M" was a secondary age special school situated in a residential area within a mixed urban and rural county. Subjects were chosen on the basis of age and class grouping. Subjects from school "S" therefore comprised a class group of 4 girls and 6 boys with a mean age of 12 years 6 months, whilst subjects from school

"M" comprised a class group of 5 girls and 5 boys with a mean age of 12 years 5 months. No subject was included if there were indications of gross sensorimotor deficits or severe emotional disturbances.

### Stimulus Materials and Experimental Procedure

Subjects were again tested over one sitting in their respective schools. All subjects were tested individually, in a quiet room seated at a table opposite the researcher. In line with previous experimental procedures, teachers of each group were asked to confirm that all subjects could recognize, label and/or read the stimulus materials. The experimenter also read and/or labelled the materials for all subjects as they were presented.

Tasks were designed to be either authentic (A) or non-authentic (NA). Non-authentic tasks were those which comprised discrete and unrelated or context-free items, whilst authentic tasks were those which were assumed to include one or more proposed authentic features, namely:

- Real-World Relevance (RWR);
- Personal Relevance (PR);
- Concrete Materials (CM);
- Practical Engagement (PE);
- Sensory Appeal (SA);
- Game Format (GF).

In order to compare spontaneous strategic employment across authentic and non-authentic tasks, 10 subjects attempted recall of authentic tasks only, whilst a second 10 subjects attempted recall of non-authentic tasks only, matched for number and type of items.

Subjects were assigned to each condition on a random basis. Tasks were numbered 1-6 and include the suffix (A) or (NA) to indicate authenticity or non-authenticity.

Stimulus materials for non-authentic tasks replicated those used for authentic tasks, in terms of their assigned label. Task 1(A), for example, comprised a range of concrete items (a crayon, a toy snake, a small puzzle etc.) whilst task 1(NA) comprised a list of matched words (crayon, snake, puzzle etc.). Similarly, experimental procedures for both sets of tasks (authentic and non-authentic) were replicated as far as possible.

Table 45 (below) summarises task characteristics and stimulus materials used for tasks 1-6 of Part V of the Research Study. Examples of stimulus materials are given where appropriate.

**Table 45**
**Task Characteristics and Stimulus Materials**

**Authentic Tasks**

| Task Number | Task Characteristics / Stimulus Materials |
|---|---|
| 1(A) | Free recall (concrete/category free): 10 unrelated concrete objects placed in a fixed grid. Example: crayon, snake, balloon |
| 2(A) | Free recall (concrete/category related): 9 concrete objects from three taxonomically related categories, 3 objects per category, placed at random. Example: car, bus, lorry as a "vehicle"category. |
| 3(A) | Free recall (registration): car registration plate comprising a letter-digit-digit-digit-letter-letter-letter sequence. |

## Table 45
## Task Characteristics and Stimulus Materials (cont.)

### Authentic Tasks

| Task Number | Task Characteristics / Stimulus Materials (cont.) |
|---|---|
| 4(A) | Free recall (class names): seating plan of 9 classmates and subject mounted on a 2x2 and 2x3 rectangle grid. |
| 5(A) | Free recall (telephone number): series of 10 digits presented on 5x30cm card in a digit-digit-digit hyphen digit-digit-digit hyphen digit-digit-digit-digit sequence. |
| 6(A) | Free recall (categories/playing cards): 9 playing cards from three suits, 3 cards per suit, dealt at random. |

### Non-Authentic Tasks

| Task Number | Task Characteristics / Stimulus Materials |
|---|---|
| 1(NA) | Free recall (nouns/category free): 10 unrelated common nouns mounted on 5x30cm card. Example: crayon, snake, balloon |
| 2(NA) | Free recall (nouns/category related): 9 common nouns from three taxonomically related categories, 3 nouns per category, individually mounted on 5x5cm card placed at random. Example: car, bus, lorry as a "vehicle" category. |
| 3(NA) | Free recall (letters/digits): letter-digit-digit-digit-letter-letter-letter sequence mounted on 5x20cm card. |
| 4(NA) | Free recall (names): set of 10 names mounted on 20x10cm card, displayed on a 2x2 and 2x3 rectangle grid. |
| 5(NA) | Free recall (digits): series of 10 equally-spaced digits mounted on 5x30cm card. |
| 6(NA) | Free recall (categories/numbers & symbols): 9 numbers and symbols from 3 matching categories, individually mounted on 9x6cm card, dealt at random. |

For all tasks a study-test procedure was utilised, whereby subjects were instructed to study the stimuli with a view to future recall. In line with previous research procedures, subjects were familiarized with a study/cover/recall procedure and with the experience of studying "for about a minute" and "until ready".

For tasks 3(A) and 3(NA) subjects were instructed to study the stimuli: "Until you are ready", whilst for all other tasks they were instructed to study: "For about a minute".

Tasks 1(A) and 1(NA) and 2(A) and 2(NA) were preceded with the introduction: "Here is a set of objects/words which I would like you to try to remember." All items were then labelled and simultaneously pointed to by the researcher. Stimulus materials for tasks 1(A) and 1(NA) were "fixed" (concrete items were set into a grid, whilst nouns were mounted on a single piece of card) in order to discourage subjects from re-arranging the array. Stimulus materials for tasks 2(A) and 2(NA), by way of contrast, were placed at random with the invitation to subjects to: "... move the objects/words if you want."

For task 3(A) subjects were first shown a colour photograph of a car (a distinctive "sports" model) and asked to point to the registration number. Any child who was unable to do so was helped by the researcher. Subjects were then told to go out into the car park (a distance previously reckoned to take in the region of 30 seconds to negotiate) to find out the registration number of the car: "Like the one in the picture" and to come back and tell the researcher. The non-authentic equivalent task (task 3(NA) ) required the subjects to look at a set of letters and digits (identical in terms of both form and array to the registration plate of the car) until ready and, following a 30 second pause time, to recall as many letters/digits as possible.

For task 4(A) subjects were shown a seating plan (with pupil names filled in and rectangles to indicate desks) of their particular class. Subjects from school "S" sat two-to-a-table in a class of 10 pupils, arranged 2x2 in the front and 2x3 in the back, therefore the plan depicted two blocks of two names in the front, followed by three blocks of two names at the back. Subjects were simply asked to: "Look at these names for about a minute and then try to say them back to me." The stimulus materials and experimental procedure used for task 4(A) were then replicated for study 4(NA), except that the names contained within the rectangles were devoid of personal relevance.

Tasks 5(A) and 5(NA) were preceded with the introduction: "Here is a set of numbers which I would like you to study for about a minute." Digits comprising the stimulus material for task 5(A) included a set of three digits equivalent to a regional code, a second set of three digits equivalent to a local code, each divided by a hyphen, followed by a 4-digit number. Stimulus materials used for task 5(NA) comprised the same digits, equally spaced and unhyphenated.

Task 6(A) was preceded with the introduction: "I am going to give you nine cards. I want you to try to remember as many cards as you can. You can remember them in any order. You have about a minute." Cards were dealt (in random order) face down from the top of a pack in order to comply with usual conventions and comprised

three sets of three consecutively numbered cards (e.g. 6, 7 and 8 of spades). Prior to testing the researcher had ensured that all subjects could identify the three suits represented (i.e. spades, hearts, diamonds). The experimental procedure employed for task 6(A) was replicated for the non-authentic equivalent task. In contrast to the commercially produced playing cards used for 6(A), cards were "home-made" and comprised three sets of three consecutive numbers and matching symbols (e.g. 8+, 9+, 10+).

In line with the analytical approach adopted in Part III of the Research Study, a direct measure used to investigate subject responses to tasks 1(A) and 1(NA) was an examination of the serial position curves of each group, again with special reference to primacy and recency effects in serial position curves. For tasks 3(A) and 3(NA), 4(A) and 4(NA) and 5(A) and 5(NA) serial order of recall of stimulus items was examined, whilst for tasks 2(A) and 2(NA) and 6(A) and 6(NA) clustering scores were compared.

Indirect measures employed to confirm or deny the employment of mnemonic strategies, and also to elicit perspectives regarding the presence or absence of authentic task features, included a series of open-ended interview questions of the type previously employed in Part III of the Research Study, together with observation of subject study behaviour. The rationale for crediting subjects with strategic employment adopted and described in Part III of the Research Study was similarly adopted in this fifth phase of the study.

Researcher opinion which was formed as a result of the referring exercise was compared with that of an independent source's. All researcher opinions were subsequently ratified by the independent source.

## Results

Prior to considering actual recall, questions regarding aspects of authenticity will be discussed.

### 1. How do children decide which items are authentic?

Table 46 (below) depicts the presence of individual authentic task features from the perspectives of the memorizers. As previously stated, all tasks attempted by half of the group (i.e. 10 subjects) were designed to include at least one authentic feature. On this occasion, the *number* of judgements made in relation to the presence of authentic task features is indicated. Thus, for task 1(A), for example, all ten subjects indicated the presence of concrete materials (CM), eight of these also mentioned sensory appeal (SA), whilst two also mentioned practical engagement (PE) and personal relevance (PR).

In deciding on category assignment reference was made to the subject responses to the open-ended interview questions posed following recall. Thus, with reference to task 6(A), the subject who stated that he'd: "... played cards loads of times with my dad," would be credited with identifying the presence of personal relevance (PR)

and game format (GF), whilst the subject who felt that the registration plate was easy to remember because it was: "... a real thing, not just letters and numbers," and that the car itself was: "Wicked," would be credited (after interpretation) with identifying real-world relevance (RWR) and sensory appeal (SA). Since subjects were free to mention as many (or as few) task features as they wished, the total number of features mentioned had the potential to exceed the total number of respondents (i.e. > N = 10).

**Table 46**
**Number of Subjects Indicating the Presence of Authentic Task Features**

| Task | RWR | PR | CM | PE | SA | GF | Total |
|---|---|---|---|---|---|---|---|
| 1(A)concrete objects (cf)* | 0 | 2 | 10 | 2 | 8 | 0 | 22 |
| 2(A)concrete objects (cr)** | 1 | 4 | 10 | 7 | 8 | 0 | 30 |
| 3(A)registration plate | 6 | 4 | 3 | 4 | 4 | 0 | 21 |
| 4(A)class names | 0 | 10 | 0 | 0 | 0 | 0 | 10 |
| 5(A)telephone number | 9 | 2 | 0 | 0 | 0 | 0 | 11 |
| 6(A)playing cards | 0 | 6 | 0 | 4 | 0 | 6 | 16 |
| | -- | -- | -- | -- | -- | -- | -- |
| Total | 16 | 28 | 23 | 17 | 20 | 6 | 110 |

* category free
** category related

Once again, personal relevance (PR) features highly in terms of the subjects' judgements, even though only one task (task 4A) was deliberately designed to be personally relevant. On all other occasions when personal relevance was mentioned the tasks were made so by the subjects themselves. Two subjects, for example, noted that part of the telephone number (task 5A) was : "... like Rupa's" (a "best" friend's) whilst a second reported that the number was: "... a bit like mine." In addition, a number of subjects volunteered that they owned, aspired to own or knew someone who

owned, one or more of the concrete objects used for tasks 1(A) and 2(A).

In the case of task 4(A) it was *only* the feature personal relevance which caused the task to be viewed as authentic, in so far as all ten MLD subjects mentioned personal relevance and no other authentic task feature and yet, as will be seen in a subsequent section, the task elicited the highest recall accuracy out of all six authentic tasks.

The *group* preference for personally relevant tasks described in Part IV of the Research Study will be recalled, as will MLD children's tendency to import personal relevance in the absence of context (described in Parts I and II of the Research Study).

There is some evidence to suggest that the mode of presentation of stimulus materials also affects whether or not tasks contained certain *individual* authentic task features from the perspectives of the memorizers and whether or not they were considered authentic in the first place.

In terms of whether tasks were viewed as containing certain individual features, concrete materials, for example, presented in a fixed grid (task 1A) elicited only two practical engagement (PE) judgements, whereas concrete materials presented at random (and therefore available for re-arrangement) elicited seven practical engagement judgements. Assuming that practical engagement is related to enhanced recall performance (in so far as it is seen to be

an authentic task feature), then this finding is of practical relevance in terms of designing instructional environments for MLD pupils.

In terms of the effect of mode of presentation on whether or not tasks *as a whole* are viewed as authentic, all subjects considered task 5(A) to be authentic to some degree whereas only one subject considered task 5(NA) to be authentic (as expected), and yet the only difference between the tasks was the mode of presentation (i.e. digits in task 5(A) were appropriately "chunked" and hyphenated to replicate the presentation of telephone numbers whereas digits in task 5(NA) were evenly spaced). Thus, whilst it was found in an earlier section that "embeddedness" can be achieved in more subtle ways than was hitherto supposed (for example, by supplying a title to text) this may also be the case for task authenticity.

**2. Do some tasks possess in-built authenticity?**

It will be recalled from Part IV of the Research Study that speculation was voiced regarding the possibility of a degree of "in-built" authenticity existing in some tasks, or of some tasks having a high chance of being perceived as authentic. Inspection of Table 44 (and consideration of earlier data) would seem to support this notion in so far as concrete materials with sensory appeal appear to have a high chance of being perceived as authentic, regardless of individual subject characteristics or preferences. Given that the contention is that task authenticity is related to enhanced recall performance, this

finding must also be of relevance to those responsible for planning learning environments for MLD subjects.

### 3. Are some tasks imbued with authenticity by the child?

It was similarly speculated in Part IV that some tasks owe their authenticity to within-child factors: an example of this is task 6(A), in so far as it was the factor of personal relevance (rather than the intended game format) which made the task authentic for individual subjects.

Inspection of individual recall scores for task 6(A), together with consideration of judgements made regarding the presence or absence of authentic task features, suggests that it was only those subjects who also found the task to be personally relevant who returned enhanced recall performances; game format alone did not appear to facilitate enhanced recall. A subject who returned a "9" score and who also demonstrated a perfect clustering technique, for example, said that he played cards regularly and considered himself to be: "Ace". By way of contrast, three subjects who considered task 6(A) to be devoid of personal relevance, tended to view the task as a non-authentic one and therefore, in returning recall scores of 3, 4 and 3 respectively, performed as if it were de-contextualised and disembedded.

Post-recall interviewing of subjects in the (NA) condition indicated that, as intended, tasks 1-6(NA) were, on the whole, devoid of

authentic task features; the exceptions to this were task 3(NA), which was imbued with real-world relevance by two subjects, and task 5(NA) which was perceived as being personally relevant by one pupil. The effects on recall performance of these non-authentic tasks becoming authentic will be considered further in the following section.

## Effects of Task Authenticity on Recall Performance

In order to test the hypothesis that (A) tasks promote recall, actual recall scores were compared for (A) and (NA) tasks; Table 47 therefore summarises the subject responses in relation to the recall of authentic and non-authentic tasks. To assess the significance of the difference in recall for (A) and (NA) tasks the "T" test for independent samples was calculated. The results of this are also shown on Table 47.

**Table 47**
**Subject Responses in Relation to the Recall of Authentic and Non-Authentic Tasks**

| Task | Items Recalled | | Task | Items Recalled | | "T" |
|---|---|---|---|---|---|---|
| | Mean | sd | | Mean | sd | |
| 1(A) | 7.6 | 0.84 | 1(NA) | 3.8 | 0.63 | 11.40**** |
| 2(A) | 8.5 | 0.97 | 2(NA) | 5.3 | 0.95 | 7.45**** |
| 3(A) | 6.6 | 0.70 | 3(NA) | 4.7 | 1.40 | 3.80*** |
| 4(A) | 9.9 | 0.32 | 4(NA) | 5.1 | 0.88 | 16.30**** |
| 5(A) | 9.0 | 0.82 | 5(NA) | 3.6 | 0.70 | 15.89**** |
| 6(A) | 7.1 | 2.64 | 6(NA) | 2.2 | 1.48 | 5.12**** |

df=18
**** significant at the .0001 level
*** significant at the .001 level

Inspection of Table 47 indicates that, in all cases, (A) items were significantly better recalled than (NA) items, with the aid to recall being assumed to come from the authentic task features. Thus, the contention that the taxonomy *is* an accurate predictor of future recall success appears to be supported.

Table 48 summarises the total number of subject self-reports of strategy use, together with the total number of observed incidences of strategic behaviour.

**Table 48**
**Reported Strategic Employment and Observed Strategic Behaviour for Authentic and Non-Authentic Tasks**

| | Total Number | | | Total Number | |
|---|---|---|---|---|---|
| Task | Reporting | Observed | Task | Reporting | Observed |
| 1(A) | 5 | 6 | 1(NA) | 1 | 2 |
| 2(A) | 8 | 8 | 2(NA) | 2 | 3 |
| 3(A) | 10 | 10 | 3(NA) | 3 | 5 |
| 4(A) | 10 | 10 | 4(NA) | 2 | 3 |
| 5(A) | 10 | 10 | 5(NA) | 2 | 1 |
| 6(A) | 7 | 7 | 6(NA) | 0 | 0 |
| | -- | -- | | -- | -- |
| Total | 50 | 51 | Total | 10 | 14 |

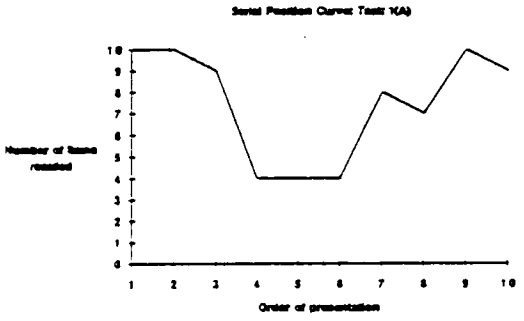
The enormous difference between reported strategic employment and observed strategic behaviour for (A) versus (NA) tasks is self-evident.

Aspects of strategic employment which are of interest to the present study will be considered separately below.

## Order of Recall

It will be recalled from previous sections that enquirers such as Ellis (1970) argued that MLD children do not demonstrate a serial position effect in recall. Inspection of the serial position curve depicted in Fig. 5 in respect to the recall of concrete items (task 1A) does not support this contention.

**Fig. 5**
**Serial Position Curve for Task 1(A)**

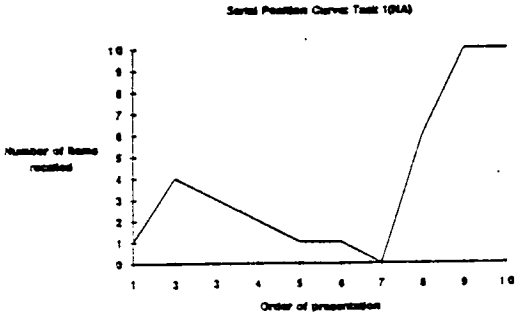


As depicted in Fig. 5 authentically-perceived tasks (in this case, those including concrete materials and sensory appeal) appeared to be effective in eliciting an effective rehearsal strategy to aid recall. This contention is supported not only by actual recall performance (mean 7.6 items) but by the negligible differences between recall scores for initial and terminal items illustrated in the adult-like serial position curve depicted in Fig. 5. This finding supports and extends the finding for task 1 in Part III of the Research Study.

By way of contrast, for the non-authentic task (where the modal strategy adopted was "looking"), a strong recency effect in terms of

order of items recalled is observed and depicted in Fig 6, with a consequently poorer recall performance (mean 3.8 items).

**Fig. 6**
**Serial Position Curve for Task 1(NA)**



Tasks 3(A) and 5(A) were similarly effective in eliciting an effective rehearsal technique, with all subjects also being observed to be highly motivated by the tasks (in particular the practical element of task 3A) and appearing to approach them with expectations of success; the subsequent recall performance for each task (mean 6.6 and 9.0 items recalled respectively) suggests that these expectations were well-founded. Post-recall questioning revealed also that the subjects were aware of the *purpose* of these tasks and, consequently, of the need to respond accordingly; as one MLD pupil noted with reference to task 3(A), for example: "It's not much help for people like the police if you only remember a little bit of the registration number or if you get it jumbled up."

It will be recalled from Question 3 in this results section that for two subjects task 3(NA) *became* authentic in so far as they considered the letters/digits array to: "... look like a car registration plate". The

effect on serial order of recall (and recall performance) for these two subjects is depicted in Fig. 7 below.

**Fig. 7**
**Serial Order of Recall For Task 3(NA)**

| Subject 1 | | Subject 5 | |
|---|---|---|---|
| Order of Presentation | Order of Recall | Order of Presentation | Order of Recall |
| 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 |
| 3 | 0 | 3 | 3 |
| 4 | 3 | 4 | 4 |
| 5 | 4 | 5 | 5 |
| 6 | 5 | 6 | 6 |
| 7 | 6 | 7 | 7 |
| | -- | | -- |
| Total | 6 | Total | 7 |

As illustrated, subject 1 returned a near-ideal recall score and recalled items in a near-ideal order, whilst subject 5 returned an ideal score with items recalled in an ideal order. Post-recall interviewing indicated that these two subjects (both of whom imbued the task with real-world relevance) were sensitive to the recall requirements of the task and consequently attempted to respond accordingly. Both, for example, asserted that the order of recall "mattered" or was "important", whilst one (subject 5) expanded on this by explaining to the researcher the nature and purpose of the letter/digit/digit/digit/letter/letter/letter array of a registration plate. Thus, for these subjects, it was the *authenticity* of the task (imbued by themselves) which prompted the spontaneous employment of a rehearsal strategy to aid recall.

A similar effect was observed for the subject in the (NA) condition, who imbued task 5(NA) with personal relevance. Thus, when recalling the middle portion of the digits in exact order of presentation, the subject was able to attribute this area of expertise to the fact that the number string was identical to a "best" friend's. The remaining subjects in the (NA) condition in task 5, meanwhile, exhibited the same strong recency effect demonstrated in task 1(NA), whereas the subjects in the (A) condition in task 5 demonstrated almost ideal order of recall and actual recall (mean 9.0 items recalled). All subjects in the (A) condition understood the importance of the order of recall of the digits and attempted to comply with the task requirements by "chunking" their responses accordingly (i.e. pauses to correspond to national codes/regional codes/actual number).

A similar "making sense of the task" approach was observed in subjects in the (A) condition in task 4 who, without exception, spotted the personal relevance of the task and subsequently went on to exploit it by using the seating plan as the loci to aid recall of class-mates' names; subjects in the (NA) condition, by way of contrast, failed to find a reality in the task and once again adopted a "looking" strategy to aid recall. The relative effectiveness of these approaches can be judged by comparing recall scores (mean 9.9 names recalled in the (A) condition, compared to a mean 5.1 items recalled in the (NA) condition).

As far as the order of recall of potentially categorizable items are concerned, Table 49 illustrates the clustering scores assigned to subjects in relation to recall of items for tasks 2(A) and 2(NA). Perfect clustering is considered to be those occasions when three taxonomically-related items are recalled consecutively, partial clustering is when two taxonomically-related items are recalled consecutively and no clustering is when only one item is recalled or when all three items are missed.

**Table 49**
**Clustering Scores for Tasks 2(A) and 2(NA)**

| | Instances of Clustering | | | |
|---|---|---|---|---|
| | Perfect | Partial | None | Chi Square |
| Authentic Tasks | 8 | 2 | 0 | 13.78*** |
| Non-Authentic Tasks (vehicles) | 0 | 7 | 3 | df=2 |

| | Instances of Clustering | | | |
|---|---|---|---|---|
| | Perfect | Partial | None | Chi Square |
| Authentic Tasks | 7 | 3 | 0 | 10.5*** |
| Non-Authentic Tasks (clothing) | 1 | 3 | 6 | df=2 |

| | Instances of Clustering | | | |
|---|---|---|---|---|
| | Perfect | Partial | None | Chi Square |
| Authentic Tasks | 8 | 1 | 1 | 13.5*** |
| Non-Authentic Tasks (animals) | 0 | 3 | 7 | df=2 |

*** significant at the .01 level

As illustrated in Table 49, MLD children in the authentic condition were significantly more successful than MLD children in the non-authentic condition at using a clustering technique to aid recall of three groups of three taxonomically related concrete items. As

indicated, at least nine MLD subjects in the authentic condition were able spontaneously to employ either perfect or partial clustering to aid recall of all three groups, whilst only one MLD child in the non-authentic condition displayed perfect clustering for one taxonomically related group (clothing), seven demonstrated partial clustering for vehicles and a further three for clothing and animals. Eight MLD children in the authentic condition re-arranged the randomly placed items into related groups, whilst no MLD child in the non-authentic condition did so. Reference to actual recall performance (Table 47) indicates that the employment of a clustering technique was related to enhanced recall performance, with MLD subjects in the authentic condition returning a mean recall accuracy of 8.5 items, compared to MLD subjects in the non-authentic condition who returned a mean recall accuracy of 5.3 items.

A similar effect was observed for tasks 6(A) and 6(NA), with MLD children in the authentic condition returning a total of 21 instances of partial or perfect clustering to aid recall of playing cards, compared to MLD children in the non-authentic condition who returned only 1 instance of perfect or partial clustering to aid recall of consecutively numbered cards, matched for symbols. It has already been seen, however, that it was the feature *personal relevance*, combined with game format, which appeared to facilitate this clustering as an aid to recall, whereas subjects in task 2(A) appeared not to need personal relevance to prompt a clustering strategy. This finding would support the contention that concrete

objects with sensory appeal (as used in task 2A) have a degree of "in-built" authenticity in their own right.

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The aim of this fifth and final phase of the Research Study was a more rigorous testing of the taxonomy with a view to identifying conditions under which MLD children spontaneously will employ mnemonic strategies, together with a confirmation that they *can* spontaneously employ strategies in the first place. From the data presented here the evidence is that the taxonomy *is* an accurate predictor of future recall performance in so far as the inclusion of the identified authentic task features have been shown to prompt the spontaneous employment of mnemonic strategies and hence enhance item recall.

The implications of this will be discussed in the conclusions and recommendations section which follows.

# Conclusions and Recommendations

*(i) Summary*

*(ii) Recommendations: An Instructional Approach to Spontaneous Strategic Employment*

*(iii) Concluding Comments*

## Conclusions and Recommendations

This research study has been based on a number of beliefs and assumptions regarding children with moderate learning difficulties. These can be summarized as follows:

1. Strategy deficits, seen to be a particular domain of MLD children, are not caused solely by factors within the child, but are the outcome of an interaction between child and task. As such, it should be possible to design tasks which are effective in prompting the spontaneous employment of strategies to aid recall.

2. MLD children *potentially* are participating members of the learning process; their opinions and preferences regarding their learning processes should be viewed as serious attempts to communicate something of significance and, consequently, should be taken account of when designing recall tasks. The *aim* that MLD children *spontaneously* should employ learning strategies remains paramount, although a consequence of this may be that, at least initially, the *means* by which they will do so could be different from so-called typical children.

3. Research practices which fail to acknowledge the interactive nature of child and task by persisting in pursuing the elusive transfer and generalization of experimenter-imposed strategies are based on an unacceptably stigmatizing conceptualization of the MLD child as a deficient strategist. An interactive view of strategic

employment renders categorization of children as memorizers as non-feasible.

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These beliefs and assumptions about MLD children's learning and memory processes (based upon practical experience) shaped and guided the investigation, which set out, firstly, to demonstrate that MLD children *spontaneously* could employ strategies and, secondly, to identify under which conditions they would do so.

The major finding which emerged from the investigation was that, contrary to a plethora of previous research findings, MLD children *could* spontaneously employ a range of mnemonic and learning strategies to aid recall.

On those occasions when the task characteristics were effective in prompting the utilisation of a range of strategies already at the disposal of MLD children, differences in recall performance between these and typical children were diminished and, at times, eliminated.

The investigation of the hypothesis that certain types of tasks were viewed by the subjects as "authentic" (and therefore worthy of cognitive effort) indicated that, from the perspectives of the memorizers, the inclusion of one or more specific task features were effective in facilitating spontaneous strategic employment. These task features were presented as a taxonomy of authentic task

features and were separately identified as real-world relevance, personal relevance, concrete materials, practical engagement, sensory appeal and game format. Testing of the taxonomy indicated that it *was* an accurate predictor of future recall performance.

Of particular interest was, firstly, that the MLD children were capable of articulating their own mnemonic strengths and preferences and, secondly, that considerable agreement existed between them and their teachers as to the identification of these strengths and preferences. Furthermore, considerable agreement was also indicated between the MLD children, their teachers and the investigator as to what qualified as an authentic task.

Equally striking (and particularly relevant in terms of future research practices) were the benefits derived from adopting an diagnostic interviewing approach in respect to MLD children's "wrong" mnemonic responses.

Other significant trends which emerged from the study were:

1. A range of metamnemonic judgements made by the MLD subjects were not random but were based on accurate prior knowledge of their own mnemonic performances.

2. There were indications that the MLD children were aware of the notion of memory monitoring and of the need to allocate mnemonic effort appropriately. As such, when presented with appropriate

recall tasks, they were able to approach them in an active, organized and planful manner.

3. When striving to make sense of hypothetical situations, or when required to recall de-contextualised and disembedded material, the MLD children had a tendency to import personally relevant context or to centre on secondary or less relevant aspects of the task: practices which, on occasions, distorted the perspectives of the tasks.

4. Task "embeddedness", seen to facilitate the spontaneous employment of mnemonic strategies, can be achieved in a number of ways, some of them more subtle than had hitherto been supposed.

5. The MLD subjects, possibly as a result of past experiences, appeared to have a high tolerance for so-called "nonsense" material: a learning style which is congruent with the view of MLD children as essentially passive learners who fail to make sense of (or "interrogate") tasks.

6. On some occasions, initial encounters with task materials acted as a "setting" condition for the MLD children which consequently precluded a cognitively flexible approach to adapting to task requirements.

7. Distractable and/or general off-task behaviour by MLD children during the study period for authentic tasks was generally not observed; neither was aimless "looking" as a prelude to future recall.

8. Concrete items with sensory appeal and tasks which incorporated a practical element appeared to have a particularly strong motivational appeal for MLD children.

9. Some tasks, for example those comprising concrete materials with sensory appeal, appeared to possess a degree of in-built authenticity.

10. There was considerable agreement among the MLD subjects as to their preference for personal relevance in recall tasks.

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## Recommendations

These findings will, of course, have implications for the general view held about MLD children as memorizers and will also have more specific implications for educational and research issues.

As far as the conceptualization of the MLD child as a memorizer is concerned, it has already been stated in the present study that a major re-orientation in thinking is required in order to accommodate the notion of MLD children as potentially active, planful and goal-directed strategists who are capable of demonstrating these skills *providing that the tasks requirements are effective in eliciting them.*

In accepting this interactive view, research practices would thus more profitably be directed towards a refinement of the identification of authentic task features. (Part V of the Research Study, for example, indicated that the taxonomy is not additive, in so far as *more* authentic features did not appear to be necessarily better: a notion which invites further investigation).

In terms of educational issues, that MLD children have been shown to have areas of relative recall excellence for contextualised and embedded material is, of course, highly significant. However, the usefulness of their strategic skills appears to be bounded by context whilst, conversely, the nature of academic work contained in the curriculum of schools requires them to think abstractly and to use strategies to recall rote-type and disembedded material (see Doyle, 1983); failure to address this issue would be as divisive (and delimiting) as the pervasive view held of MLD children as deficient strategists. What is indicated, then, is the need for the MLD child to move *towards* the theoretical and abstract and to spontaneously adopt learning strategies whilst doing so. As such, consideration will be given here to applying and extending the reported findings to an instructional policy in relation to MLD children, with a particular view towards bridging the divide between the context bound to the context free.

Specifically, this final section will propose a classroom-based instructional model which is intended to facilitate spontaneous strategic employment, initially for authentic tasks but ultimately for

more traditional "school-type" tasks. The model has, of course, only the status of a hypothesis to be tested but, by way of illustration, will be trialled on one MLD subject (Carl, the subject of the Case Study described in Chapter 5).

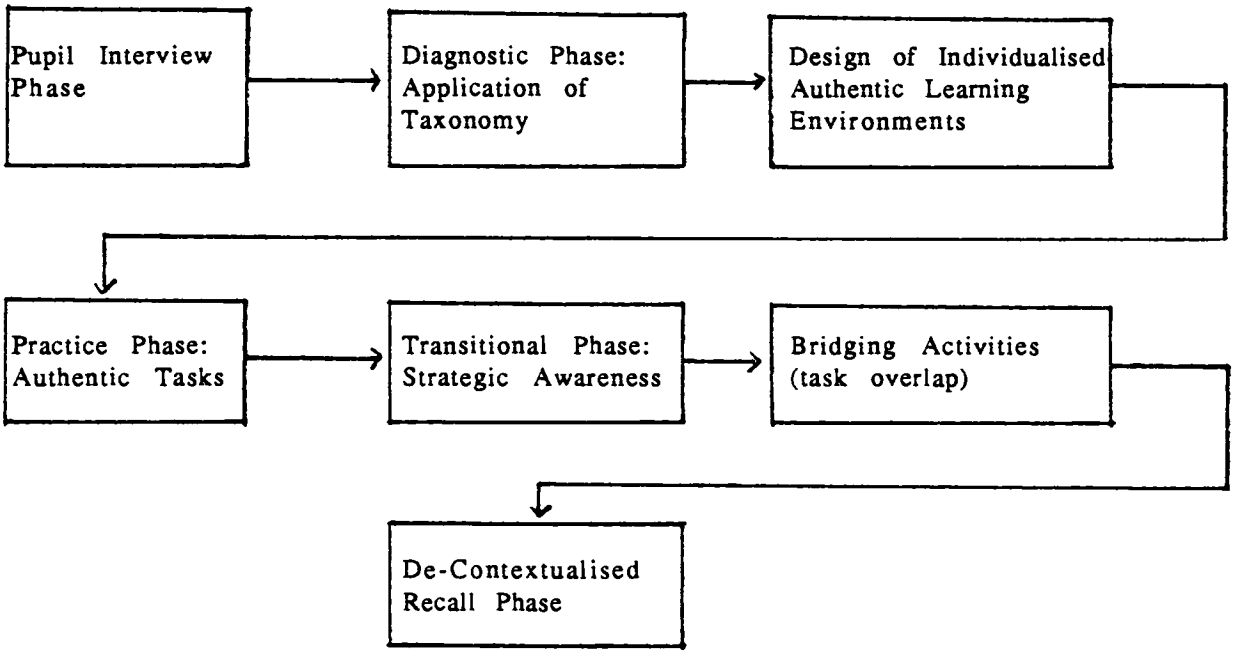
## An Instructional Approach to Spontaneous Strategic Employment: A Proposed Classroom-Based Model

The proposed method of instruction should be viewed as an integral part of the curriculum. It applies to all learning and recall activities, not simply "paper and pencil" ones, and is based on the notion that, at least initially, children's interests and abilities are seen to be at the centre of the learning process. It stresses the importance of individualised programmes but, in so far as considerable agreement has been reached between MLD children as a group as to what constitutes authenticity, it does not (and should not) preclude the possibility of collaborative working.

The proposed model involves seven phases: Pupil Interview Phase; Diagnostic Phase; Design of Individualised Authentic Learning Environments; Practice Phase; Transitional Phase: Bridging Activities; De-Contextualised Recall Phase.

Fig. 7 (below) depicts the model. A brief description of each phase and how the model can be used in a classroom setting will follow, together with an example of the practical application of the model in respect to one MLD subject.

**Fig. 8**
**An Instructional Approach to Spontaneous Strategic Employment: A Proposed Classroom-Based Model**




Each of the phases will now be considered in some detail.

## Pupil Interview Phase

The aim of this first phase of the model is to determine which (if any) strategies the pupil currently has in his/er repertoire. The phase should be accomplished by means of a series of open-ended interview questions, together with the presentation of traditional rote-type and authentic memory tasks. Since it appears to be the case that concrete items with sensory appeal have a high chance of being perceived as authentic by MLD learners in general, then memory tasks such as those described in tasks 1A and 2A (Research Study Part V) would be appropriate assessment instruments for the

authentic tasks, whilst their equivalent non-authentic tasks (task 1NA and 2NA) would be appropriate assessment instruments for the rote-type tasks.

From this initial interview phase three possible categories of MLD learners would emerge:

> Category 1: Those learners who are proficient in terms of the spontaneous employment of strategies for rote-type and authentic tasks;
>
> Category 2: Those learners who are proficient (or who are moving towards proficiency) in terms of the spontaneous employment of strategies for authentic tasks only;
>
> Category 3: Those learners who have yet to begin to acquire strategies for solution of authentic tasks.

Within the MLD population it would be anticipated that the majority of learners would be categorized as Category 2. Category 1 learners would exit as this initial interview phase, whilst Category 3 learners would require teaching intervention at an earlier stage than is indicated by the model in order to begin to acquire some rudimentary strategies. The remaining phases of the model apply to Category 2 learners only.

It will be recalled from the case study (Chapter 5) that Carl performed poorly on rote-type, de-contextualised recall tasks but performed proficiently when required to recall authentic tasks. His preferred strategy for the former type of task was a "looking" one, whilst for authentic tasks he was able spontaneously to employ

effective rehearsal, clustering and elaborative strategies. Carl would therefore be categorized as a Category 2 learner.

## Diagnostic Phase: Application of the Taxonomy

The aims of this second phase of the model are:

To identify the learner's interests and abilities;

To identify his/er preferred *type* of strategy for solution (if any);

To identify his/er preferred authentic task feature (if any).

The aims would be achieved by means of a series of open-ended interview questions of the type employed in previous sections of the present study (particularly those used in Parts IV of the Study), followed by application of the taxonomy as depicted in Table 43 (Part IV).

In order to identify whether or not a learner has a preferred *type* of strategy (for example, rehearsal) it would also be appropriate to observe his/er strategic behaviour across a range of teacher-devised authentic tasks.

At the end of this second phase the teacher would need to decide whether the focus of instruction would be on achieving proficiency in the spontaneous utilisation of one type of strategy per cycle of the

model or on a range of strategies per cycle (i.e. concurrent strategy proficiency). Account would need to be taken of individual learner characteristics and of particular curriculum requirements.

It had already been established in the case study that football was a particular interest of Carl's. Further discussions with Carl revealed that he also enjoyed playing cards and listening to music. He had a part-time job on a fruit and vegetable stall, which he considered he performed competently, and was interested in cars. He also considered himself to be good at remembering football-related activities, practical activities (such as journey-details) and details relating to his job (such as prices and names of different types of fruit and vegetables). Carl's justifications for his perceptions of his areas of relative recall excellence are depicted in Table 50. Presence or absence of authentic task features is once again indicated by + or - respectively.

**Table 50**
**Presence or Absence of Authentic Task Features: Carl**

| | Authentic Task Feature | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **RWR** | **PR** | **CM** | **PE** | **SA** | **GF** |
| Football related | - | + | - | + | + | + |
| Cards | - | + | - | + | - | + |
| Music | - | - | - | - | + | - |
| Cars | + | + | - | + | + | + |
| Employment-related | - | + | - | - | + | - |
| Practical activities | - | + | - | - | - | - |
| | -- | -- | -- | -- | -- | -- |
| **Total** | 1 | 5 | 0 | 3 | 4 | 3 |
| **Rank** | 5 | 1 | 6 | 3= | 2 | 3= |

For Carl, personal relevance, sensory appeal, practical engagement and game format are all important features. Observation of his

strategic behaviour during the case study indicated that, whilst he had a range of strategies at his disposal when required to recall authentic tasks, he appeared to be particularly motivated when tasks possessed categorizable potential. Carl himself said that he liked to see things "going together." The focus of instruction would therefore be on achieving proficiency in the spontaneous utilisation of a categorization technique.

## Design of Individualised Authentic Learning Environments

During this third phase of the model the teacher designs appropriate authentic learning environments based on the pupil interview data gleaned from the previous phase of the model. Attention should be given to the potential benefits of collaborative learning opportunities for pupils and to the notion that, as previously stated, the model embraces *all* classroom activities, not simply "paper and pencil" ones. It may be appropriate, for example, for pupils with similar learning styles and interests to be grouped together when working to the model.

A range of authentic activities were designed for Carl which were intended to include at least one of his preferred authentic task features and which took account of his inclination towards categorization. Individual task characteristics will be considered in greater detail in subsequent descriptions of the separate phases.

## Practice Phase: Authentic Tasks

The aim of this fourth phase of the model is for the pupil to become increasingly proficient and confident in the spontaneous employment of learning strategies for the solution of authentic tasks. It is based on the notion that: (1) efficient learning processes appear to be related to the development of interest and motivation which, in turn, develop from successful encounters with new information (e.g. Sternberg, 1987) and (2) very differential and criterion-referenced achievement feedback has a performance-promoting influence (e.g. Lissman and Paetzold, 1983). The phase should therefore be characterised by:

Finely graded, authentic learning tasks which have achievable goals and which ensure success;

Regular teacher monitoring and review;

Differential criterion-referenced achievement feedback;

Systematic recording of success;

Tangible rewards;

Considerable repetition, reinforcement and consolidation of skills.

During this phase Carl spent half an hour per day for a week working on a series of authentic recall tasks similar to those described

elsewhere in the present study. His successes were carefully recorded and each new session began with a "reminder" of the previous day's performance. Frequent criterion-referenced feedback of the type: "That was a good idea to group those things together to help you remember" was given.

A particular goal which Carl set for himself was to "beat" his previous day's mean score.

Carl enjoyed these activities, consistently performed well and was particularly motivated by a graphical presentation of his performance over the week. He was given tangible rewards in the form of a "free-choice" period at the end of each session.

Throughout this practice phase he again demonstrated the effective spontaneous strategic employment evidenced in the case study, *provided that the authentic task features were very explicit.* A task featuring the recall of odd and even numbers, for example, failed to find a reality with Carl and items were therefore poorly recalled in random order, *even though Carl had acquired the concept of "odd" and "even" and could group the numbers accordingly when required to do so.*

Thus, the indications are that task authenticity during this practice phase must be *extremely* explicit, finely graded and tailored to *individual* learning needs.

## Transitional Phase: Strategic Awareness

This fifth phase of the model is based on attribution theory (as described by Weiner, 1974) and proposes a number of goal expectancies for the pupil. These are:

> To become increasingly aware of the nature of the strategy s/he is employing;
>
> To become increasingly aware of the benefits of strategy utilisation in terms of enhanced recall performance;
>
> To discern a close covariation between his/er own strategic behaviour and the resultant mnemonic success;
>
> To begin to use past history information in order to produce expectations of success in respect to future encounters with new material.

Teacher-as-mediator is essential to this phase of the model, which is characterised by close pupil-teacher contact in the form of teacher probes and the encouragement of overt pupil verbalisation of mnemonic actions and outcomes.

Carl's response to this transitional phase of the model will be illustrated with reference to one particular task: "The Garage Game". Carl's verbalisations are included below, abridged and modified for clarity.

Prior to commencing the task the researcher reminded Carl of the previous week's work. In particular, he was helped to recognize his successes over the week and was given explicit examples of his "good work". He was also asked to relay to a peer what *precisely* he had

done to achieve success with individual tasks. Before embarking on the next task he was asked how he thought he might perform on similar tasks. He felt he would "do well" and would get "high marks".

The stimulus materials which accompanied the task comprised four pieces of 10x10cm card spread out on a table, each labelled "garage".

## "The Garage Game"

**Researcher**: This is the same sort of task as we were doing last week. It's about a car dealer who has got twelve cars to put into these four garages. He is going to put three cars in each garage. Once he has put the cars in the garage he is going to lock them up so he will need to remember which car is in which garage. He needs to put the cars together in a way which is easy to remember. You can choose which sort of car is in each garage. Which sorts of cars could you put together so that they would be easy to remember?

**Carl**: Red ones.

**Researcher**: Just red ones?

**Carl**: No, you could put all red ones in that garage, blue ones in that garage, black ones in that garage and silver ones in that garage.

**Researcher**: That's a good idea. Then he would know he had three red cars, three blue cars, three black cars and three silver cars. What could he write on his garage doors to help him remember?

**Carl**: The colours.

**Researcher**: Good. Can you remember doing another task like this?

**Carl**: We did one where we put the footballers in their teams, so Rush went with red because that's his team, then I remembered all the Liverpool players.

**Researcher**: That's right. Colour can be a good way of dividing things up to help us remember, but what would happen if somebody wanted to know about the make of the cars? Could you divide the cars so that they would still be easy to remember but he would know the makes?

**Carl**: You could put all the "Fords" together, so you could have an Escort, a Sierra and an Orion and then have other makes.

**Researcher**: Good idea. What could he write on his garage doors to help him remember?

**Carl**: Ford ... Austin Rover ... Vauxhall ... and one other, maybe Renault.

**Researcher**: What about if you jumbled up the makes and had, say, an Orion with a Metro. Would they be easier to remember or harder?

**Carl**: Harder I think.

**Researcher**: Why?

**Carl**: Because if you put all the same sort of cars together you remember them better because it doesn't seem like you have to remember so many things. You only have to remember "Ford" and then the cars come back to you.

**Researcher**: Do you think there are lots of ways that cars could be divided up, or only a few?

**Carl**: Quite a lot, when you think hard. You could do things like registration numbers ... if it's a "D" reg. or a "C" reg... and engine size if you knew it.

**Researcher**: Would these make the cars easy to remember?

**Carl**: Some would... like the make, but I think things like engine size would be harder.

**Researcher**: Would it be a good idea to choose engine size then?

**Carl**: No... not really.

Carl then went on to perform the recall task. He first elected to divide the cars according to country, thus his categories included three French cars, three British cars, three Italian cars and three American cars. During this process he was asked to verbalise what he was doing and why.

**Researcher**: Right. The car dealer has got his cars in the garage. What does he need to write on this garage door in case somebody asks him about the cars inside?

**Carl**: He could write "French Cars".

**Researcher**: Good. Then he would only have to remember that he had a French garage. That's easier than remembering all three cars, isn't it? How many cars do you think you can remember all together?

**Carl**: All of them!

Testing revealed that Carl was accurate in his assessment of his mnemonic ability.

Working with Carl during this phase indicated that, once again, precise and focussed prompting was required, together with extremely explicit task materials and requirements. Much also depended upon Carl's familiarity with the materials to determine how successful he was at "dividing up" the items as a prelude to recall. It is acknowledged, therefore, that this phase of the model has implications for the allocation of resources in terms of teacher-time. However, the long term benefits of motivated and effective learners should make this "injection" of resources defensible. In the short term, grouping of pupils is clearly feasible.

### Bridging Activities (task overlap)

The sixth phase of the model is where the pupil begins to transfer and generalize the previously utilised strategies to tasks which are designed to move from the context bound to the context free. The importance of this phase lies in the deliberate and gradual introduction of aspects of the task which include rote-type and abstract materials. During this phase careful teacher monitoring will be required in order to gauge the gradations required (in terms of moving from authentic to abstract). *Task overlap* is particularly significant in terms of ensuring at least partial success for each learning experience. Teacher probes of the type used in the previous phase of the model can be similarly employed for these bridging

activities. The pupil's acquired internal positive attributions should also be capitalised on during this phase.

With reference to Carl, task overlap was attempted by means of supplementary activities to the "Garage Game" (described above), which utilised the basic principle of "dividing things up" into taxonomic groups prior to recall. Carl was thus given a series of personally relevant materials to recall which, *across* the total set of items, had high perceptual and/or taxonomic salience but, *within* the set, had high perceptual and/or taxonomic relatedness. Concrete items were used to stress the salience/relatedness dimensions. Thus, the twelve items for task 1 comprised three different fruits; three football rosettes for different teams, three model cars of different makes and three different musical instruments.

Other stimulus materials comprised the same four 10x10cm pieces of card which, on this occasion, were each labelled "Market Stall".

Carl was reminded of the "Garage Game" and was then introduced to: "A game which is almost the same and which is called the "Market Game"'. He was told that the point of the game was to remember all twelve items which were on sale at four different market stalls. He was first asked to decide what (with reference to the "merchandise") the four different market stalls were selling.

**Carl**: Fruit and veg,. things like music, maybe toys and football.

Each stall was subsequently labelled according to Carl's categories. Carl was then asked if he could think of anything which he could do to help him remember the twelve items and was reminded how he had divided up the twelve cars to help the car dealer remember. His responses are included below.

**Carl**: We could do the same as before - put them on stalls.

**Researcher**: That's a good idea. Which ones would we put on this stall? *(indicating the fruit and veg. stall)*

**Carl**: These *(fruit)* .

**Researcher**: Good. What about the other stalls?

**Carl**: Put these (model cars) on the toy stall, these (rosettes) on the football stall and these (instruments) on the music stall.

**Researcher**: That's a good way of dividing them up. How many do you think you can remember?

**Carl**: All of them!

Throughout the exercise Carl was encouraged physically to place the items on the corresponding stall. Assessment of recall yielded 100% accuracy.

The task overlap was achieved, firstly, by presenting Carl with the equivalent materials in abstract form (i.e. the written words presented individually mounted on card) and then asking him if the abstract items were the same (in terms of assigned label) as the concrete items he had seen before. Once agreement was reached he was then asked if they could be divided up in the same way as previously. Carl readily agreed that they could and was

subsequently encouraged to do so. Assessment of recall again yielded 100% accuracy.

Carl then attempted a number of replications of the task where only the stimulus materials differed (e.g. rooms in a house, items in a supermarket etc.), with all tasks including, firstly, an authentic element and, secondly, an abstract element. On all occasions Carl was able to achieve the transition from context-bound to context-free with relative ease, *providing that initial teacher input was available to ensure that salience/relatedness was noted and utilised and to provide prompts to action.*

## Decontextualised Recall Phase

This phase refers to the pupil's ability *spontaneously* to utilise learning strategies to recall rote-type, de-contextualised materials. Whilst this is the ultimate goal for all MLD pupils, the model should be viewed as circular rather than linear. Thus, earlier phases of the model may be re-entered if difficulties are encountered. In this way, learning can progress at the pupil's *own* rate and can take account of the pupil's need to experience success.

The philosophical "under-pinning" to the model is that children with moderate learning difficulties (like all learners) do not have difficulties until they are confronted with a task which they cannot do. Thus, if difficulties are evident during a phase of the model the *task* requires modifying. A key to this, of course, is careful formative

and summative assessment to span the teaching and learning process.

The criterion for successful completion of the final phase of the model is that, not only should the MLD child be able to utilise strategies to aid recall, but s/he should be able to do so across a range of materials and without recourse to instructional prompts. In order to test Carl's spontaneous strategic employment, then, he was simply given a series of twelve abstract stimulus items with categorizable potential and asked to recall them following a study period. Relevant aspects of the data yielded by these final recall tasks are summarized below:

1. Perceptual/taxonomic relatedness *within* categories and perceptual/taxonomic salience *across* sets of items is positively related to spontaneous employment of mnemonic strategies to aid recall of abstract items. Thus, when *clear* categories existed within the total set of items to be recalled Carl demonstrated some ability spontaneously to employ mnemonic strategies. More subtle grouping of items, however, was not effective in prompting spontaneous strategic employment.

2. In the case of categorization, Carl's prior knowledge of the items was directly related to his ability to create categories as a mnemonic aid. The further removed the items were from his day-to-day experience, the less likely he was *spontaneously* to generate categories, although he could be helped to do so. Thus,

employment/non-employment of strategies appears to occur on a continuum, rather than being a simple dichotomy.

3. *Time* was a relevant variable in terms of determining whether or not a strategy would be employed. Thus, trials conducted on the same day as those which included bridging activities were more likely to elicit strategies than those conducted a week later. The effects of the bridging activities did, however, endure across a number of days. Clearly, further investigation is needed to establish an "expiry date" for the bridging effect; at this point subjects would then need to re-enter an appropriate phase of the model.

4. Whilst the trial described here did not assess the effects of teacher-input, it would be anticipated that outcome (in terms of spontaneous strategic employment as an aid to recall) is related to the amount of *direct* and *focussed* instruction received during earlier phases of the model.

Despite these strictures, however, (and taking account of the obvious limitations of a short-term single-subject case study) there is some evidence to suggest that MLD children *can* spontaneously adopt learning strategies to aid recall of rote-type, de-contextualised materials. Clearly, further investigation of the model is indicated.

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In conclusion, the present study has indicated that, contrary to previous research evidence, MLD children *can* spontaneously employ learning and recall strategies to aid recall and has identified the conditions under which they will do so.

Initial testing of the instructional model proposed in this final chapter rendered encouraging evidence to suggest that, with explicit and focussed teaching, MLD children *may* be able to develop and extend these skills and abilities by spontaneously employing learning and recall strategies to aid recall of a *range* of items - including rote-type and de-contextualised ones. Furthermore, the indications are that they may be able to do so without recourse to experimenter-imposed strategies.

The challenge remains for future research to exploit the interactive view of the MLD learner offered in the present study by extending the task-focussed (as opposed to a within-child deficit) approach described and advocated in the present study.

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# Appendix 1: Stimulus Materials

*(i) Case Study*

*(ii) Research Study Part I*

*(iii) Research Study Part II*

*(iv) Research Study Part III*

*(v) Research Study Part V*

*(Stimulus materials are included in the appendix when the nature of the item is not obvious from the text itself and/or to allow for replication. Where replication is not feasible - as is the case with recognition of photographs of peers - stimulus items are omitted).*

## Case Study: Stimulus Materials

**Table 4**

| **Task 2.1.** (random) | **Task 2.2** (elaborative) | **Task 2.3** (categorizable) |
|---|---|---|
| Rocastle | Barnes | Robson |
| Platt | Beardsley | Hughes |
| Brightwell | Rush | McClair |
| Wegerle | Gascoigne | Adams |
| Stewart | Lineker | Limpar |
| Shilton | Mabbutt | Thomas |
| Ratcliffe | Sheedy | Bright |
| Fairclough | Southall | Wright |
| Dorigo | Cottee | Salako |
| Speedie | Gunn | |
| | Sherwood | |
| | Fleck | |
| | cards: red, blue, yellow, white | |

| **Task 4.1** (random) | **Task 4.2** (elaborative) | **Task 4.3** (categorizable) |
|---|---|---|
| pen | rope | lorry |
| doll | road | car |
| baby | railway | bicycle |
| sun | wool | trousers |
| chair | window | jumper |
| egg | wire | coat |
| bird | box | horse |
| man | boy | sheep |
| hat | bridge | cow |
| | yard | |
| | yacht | |
| | year | |
| | cards: red, blue, yellow | |

## The Research Study Part I: Stimulus Materials

**Question 1: Task 1**
(digit recall)

6
1
13
18
9
15
8
16
3
7

**Question 4: Task 1a**
(shorter versus longer list)

| | |
|---|---|
| kettle | flower |
| cow | plane |
| bus | eggs |
| pie | tap |
| chicken | |
| jug | |
| bag | |

**Question 4: Task 1b**
(familiar versus unfamiliar material)

| | |
|---|---|
| beach | lethe |
| king | naif |
| circle | pottle |
| police | cestus |
| coffee | sumach |
| water | aulic |
| mouse | epode |

**Question 4: Task 1d**
(recall versus recognition)

| Set A | | Set B |
|---|---|---|
| lorry | tree | clock |
| apple | pen | plate |
| garden | cup | bottle |
| school | car | comb |
| pencil | gate | shirt |
| picture | | boat |
| flower | | leaf |
| dog | | horse |
| chair | | knife |
| spoon | | key |

(columns in "A" combined for recognition judgement)

**Hypothetical situation to accompany Sets A and B (Question 4: Task 1d)**

Two boys (girls) had a memory test. The first boy (girl) was shown a list of words and then asked to say all the ones s/he remembered. The second boy (girl) was shown a list of words and then shown another list of words and asked which ones he had seen before. Who had the easiest test, or were they both the same?

## Question 4: Task 1c

(semantic gist versus exact linguistic form)

The time he was most afraid was when he was eleven. He had gone with his friends to the leisure centre where there was a huge pool with slides and diving boards. All his friends were really good swimmers, but he had only learned a few months ago and was still a bit unsure about the water. He got changed and they all dived in. He jumped in the shallow end. Then they all started going on a long plastic slide with bumps on it and calling to him to join them. One of his friends started calling him "chicken". He decided to try one of the slides, but half way up he remembered he didn't like heights. His friends were all below him, egging him on. He took a breath, pushed off and headed downwards ...

(adapted from a pupil's work in "Preventing Difficulties in Learning", edited by Booth, Potts and Swann (1987) Blackwell/O.U. Press)

## Question 4: Tasks 2(a), (b), (ci)

(effects of time/person variables; selection of study items)

wood
bead
glue
cabbage
sky
dress
light
paint
truck
step
wool
road

## Question 4: Task 2(cii)

(selection of additional study item)

bicycle
yacht
plane
train
coach
boat
helicopter
motorbike
car

tree bus dog

## Question 5

(selection of appropriate strategy)

| **Task 1** (digit recall) | **Task 2** (shopping list) | **Task 3** (category recall) |
|---|---|---|
| 9 | tea | red |
| 6 | apples | orange |
| 13 | milk | green |
| 20 | butter | chair |
| 5 | washing powder | desk |
| 1 | lettuce | table |
| 2 | pet food | fish |
| 15 | | cat |
| 4 | | dog |
| 8 | | |

| **Task 4** (photographs) | **Task 6** (nouns) | **Task 7** (telephone number) |
|---|---|---|
| banana | spoon | 427-1291 |
| book | pen | |
| girl | glasses | |
| bricks | gloves | |
| skirt | knife | |
| purse | cup | |
| envelope | broom | |
| camera | scissors | |
| umbrella | ball | |
| iron | soap | |

**Task 5** (Hypothetical Situation)

Semina is asked by her teacher to bring in to school 50p for a trip to the swimming pool. Semina also has to bring in her P.E. kit, her homework and some ingredients for cookery the next day.

## The Research Study Part II: Stimulus Materials

| **Task 1** (digit recall) | **Task 2** (abstract items) | **Task 3** (nouns) | **Task 4** (categories) |
|---|---|---|---|
| 3 | because | pen | cup |
| 7 | does | doll | plate |
| 9 | every | baby | bowl |
| 10 | if | sun | white |
| 16 | before | chair | blue |
| 8 | as | egg | brown |
| 19 | when | bird | apple |
| 5 | of | man | banana |
| 12 | from | hat | pear |

| **Task 5** (shopping list) | **Task 6** (concrete items) | **Task 7** (congruent) | **Task 8** (incongruent) |
|---|---|---|---|
| bread | ball | fish can swim | cows have wings |
| onions | purse | dogs can bark | the moon is wet |
| fruit juice | snake | the sea is blue | cats can drive |
| coffee | puzzle | stars shine | trees can run |
| biscuits | marbles | wheels go round | cars have legs |
| cheese | balloon | the sun is hot | sheep lay eggs |
| apples | boat | birds can fly | horses wear hats |
| margarine | book | ships can float | snow is hot |
| beef | crayon | bells can ring | grass is red |

**Task 10: Teeth**

Each one is held in place by a root. The hard white part is called a crown. The centre contains nerves and pulp. Most children are born without any. At first they do not need them. At about eight months the first ones appear, but these are soon lost. They are lost at about age seven. By about age fourteen children should have all their permanent ones.

## The Research Study Part III: Stimulus Materials

| **Task 1** (concrete items) | **Task 2** (shopping list) |
|---|---|
| doll | butter |
| ship | milk |
| bat | soup |
| bag | beans |
| horse | tea |
| sharpener | sugar |
| frog | fish fingers |
| ruler | pizza |
| dice | cake |
| whistle | crisps |

## The Research Study Part V: Stimulus Materials

| **Tasks 1(A & NA)** (concrete items/nouns) | **Tasks 2(A & NA)** (concrete items/nouns) | **Tasks 3(A & NA)** (registration plate/ abstract array) |
|---|---|---|
| crayon | car | F296 EKR |
| snake | bus | |
| balloon | lorry | |
| puzzle | blouse | |
| ruler | skirt | |
| marbles | trousers | |
| dice | cow | |
| whistle | sheep | |
| sweet | horse | |
| picture | | |

| **Task 4(A)** (personally relevant names) | **Task 4(NA)** (non-relevant names) | **Task 5(A & NA)** (telephone number) |
|---|---|---|
| Anna | Carol | 0814273596 |
| Esther | Rebecca | |
| Leila | Helen | |
| Vicky | Sarah | |
| Jonathon | Michael | |
| Simon | Ben | |
| Jitan | Jigar | |
| Rindeep | Dasha | |
| Kishor | Imran | |
| Andrew | Brian | |

| **Task 6(A)** (playing cards) | **Task 6(NA)** (numbers/symbols) |
|---|---|
| 8 hearts | 8+ |
| 9 hearts | 9+ |
| 10 hearts | 10+ |
| 2 spades | 2* |
| 3 spades | 3* |
| 4 spades | 4* |
| 6 diamonds | 6 ± |
| 7 diamonds | 7 ± |
| 8 diamonds | 8 ± |

# Appendix 2: Data

*(i) Research Study Part I*

*(ii) Research Study Part II*

*(iii) Research Study Part III*

*(iv) Research Study Part V*

*(Individual scores are included in the appendix only when they do not appear in the text itself).*

Table 14
Estimated and Actual Recall: Digits

| MLD | | Typical | |
|---|---|---|---|
| Estimated | Actual | Estimated | Actual |
| 10 | 3 | 5 | 9 |
| 10 | 5 | 8 | 9 |
| 1 | 5 | 8 | 8 |
| 9 | 6 | 9 | 9 |
| 10 | 5 | 2 | 8 |
| 9 | 6 | 6 | 8 |
| 5 | 6 | 8 | 8 |
| 5 | 6 | 7 | 8 |
| 10 | 6 | 9 | 9 |
| 1 | 5 | 9 | 7 |
| 3 | 4 | 7 | 8 |
| 4 | 6 | 6 | 8 |
| 10 | 6 | 7 | 9 |
| 10 | 6 | 5 | 8 |
| 7 | 5 | 5 | 6 |
| 8 | 5 | 10 | 10 |
| 7 | 2 | 4 | 7 |
| 9 | 6 | 8 | 8 |
| 2 | 5 | 6 | 7 |
| 10 | 4 | 6 | 7 |

## The Research Study Part II: Data

Table 29

| Task1 (digits) | | Task 2 (abstract) | | Task 3 (nouns) | |
|---|---|---|---|---|---|
| Typical | MLD | Typical | MLD | Typical | MLD |
| 6 | 1 | 4 | 2 | 8 | 2 |
| 7 | 4 | 4 | 2 | 7 | 3 |
| 8 | 5 | 3 | 3 | 5 | 5 |
| 8 | 4 | 6 | 3 | 8 | 2 |
| 9 | 2 | 5 | 3 | 6 | 2 |
| 9 | 3 | 7 | 0 | 9 | 2 |
| 9 | 1 | 7 | 1 | 8 | 4 |
| 9 | 7 | 6 | 3 | 6 | 6 |
| 8 | 4 | 6 | 2 | 9 | 3 |
| 9 | 4 | 6 | 4 | 9 | 5 |
| 7 | 4 | 7 | 4 | 7 | 4 |
| 7 | 2 | 6 | 1 | 7 | 3 |
| 6 | 3 | 6 | 3 | 6 | 4 |
| 7 | 4 | 7 | 2 | 9 | 4 |
| 8 | 4 | 6 | 2 | 6 | 4 |

| Task 4 (categories) | | Task 5 (shopping list) | | Task 6 (concrete items) | |
|---|---|---|---|---|---|
| Typical | MLD | Typical | MLD | Typical | MLD |
| 8 | 3 | 6 | 6 | 6 | 6 |
| 6 | 4 | 7 | 6 | 7 | 6 |
| 6 | 4 | 8 | 5 | 6 | 6 |
| 8 | 3 | 8 | 7 | 9 | 6 |
| 7 | 3 | 9 | 8 | 8 | 5 |
| 9 | 3 | 9 | 9 | 9 | 8 |
| 8 | 3 | 9 | 9 | 8 | 6 |
| 7 | 4 | 9 | 8 | 8 | 9 |
| 6 | 6 | 8 | 9 | 9 | 8 |
| 9 | 5 | 9 | 9 | 9 | 7 |
| 8 | 4 | 7 | 9 | 8 | 9 |
| 9 | 3 | 7 | 6 | 7 | 8 |
| 7 | 3 | 9 | 9 | 8 | 7 |
| 9 | 2 | 9 | 8 | 9 | 8 |
| 9 | 3 | 9 | 8 | 8 | 8 |

**Task 7**
(congruent)

| Typical | MLD |
|---|---|
| 8 | 3 |
| 3 | 7 |
| 9 | 6 |
| 8 | 7 |
| 9 | 7 |
| 7 | 7 |
| 9 | 8 |
| 7 | 7 |
| 8 | 8 |
| 6 | 7 |
| 9 | 7 |
| 9 | 6 |
| 9 | 2 |
| 9 | 7 |
| 9 | 7 |

**Task 8**
(incongruent)

| Typical | MLD |
|---|---|
| 6 | 2 |
| 7 | 2 |
| 4 | 4 |
| 6 | 2 |
| 7 | 3 |
| 6 | 2 |
| 8 | 5 |
| 4 | 6 |
| 5 | 3 |
| 8 | 2 |
| 5 | 3 |
| 4 | 4 |
| 7 | 1 |
| 8 | 3 |
| 9 | 2 |

**Task 9**
(untitled text)

| Typical | MLD |
|---|---|
| 5 | 0 |
| 2 | 2 |
| 6 | 2 |
| 5 | 6 |
| 5 | 1 |
| 6 | 1 |
| 6 | 5 |
| 2 | 1 |
| 6 | 0 |
| 6 | 7 |
| 3 | 0 |
| 6 | 1 |
| 6 | 2 |
| 7 | 5 |
| 3 | 0 |

**Task 10**
(titled text)

| Typical | MLD |
|---|---|
| 5 | 2 |
| 2 | 3 |
| 4 | 5 |
| 4 | 2 |
| 5 | 5 |
| 7 | 4 |
| 6 | 3 |
| 6 | 7 |
| 5 | 3 |
| 7 | 6 |
| 6 | 3 |
| 7 | 5 |
| 6 | 6 |
| 7 | 4 |
| 7 | 6 |

## The Research Study Part III: Data

**Task 1 (Group 1): Free recall/category free/concrete**

| Order of Presentation | Number of Items Recalled per Group (N=5) |
|---|---|
| 1 | 4 |
| 2 | 5 |
| 3 | 4 |
| 4 | 3 |
| 5 | 3 |
| 6 | 2 |
| 7 | 4 |
| 8 | 4 |
| 9 | 5 |
| 10 | 5 |

**Task 2 (Group 2): Free recall/shopping list items**

| Order of Presentation | Number of Items Recalled per Group (N=5) |
|---|---|
| 1 | 4 |
| 2 | 5 |
| 3 | 5 |
| 4 | 3 |
| 5 | 2 |
| 6 | 3 |
| 7 | 2 |
| 8 | 3 |
| 9 | 5 |
| 10 | 5 |

**Task 3 (Group 3): Text recall/tilted**

| Order of Presentation | Number of Items Recalled per Group (N=5) |
|---|---|
| 1 | 5 |
| 2 | 5 |
| 3 | 5 |
| 4 | 5 |
| 5 | 5 |
| 6 | 4 |
| 7 | 4 |
| 8 | 5 |
| 9 | 5 |
| 10 | 5 |

## The Research Study Part V: Data

### Table 47

| Task 1(A) (concrete) | Task 1(NA) (nouns) | Task 2(A) (concrete) | Task 2(NA) (nouns) |
|---|---|---|---|
| 8 | 5 | 9 | 7 |
| 9 | 4 | 9 | 4 |
| 8 | 3 | 9 | 6 |
| 7 | 4 | 9 | 5 |
| 8 | 4 | 8 | 6 |
| 7 | 4 | 9 | 6 |
| 6 | 3 | 6 | 4 |
| 8 | 4 | 8 | 5 |
| 8 | 3 | 9 | 5 |
| 7 | 4 | 9 | 5 |

| Task 3(A) (registration) | Task 3(NA) (letters/digits) | Task 4(A) (PR names) | Task 4(NA) (nonPR names) |
|---|---|---|---|
| 7 | 6 | 10 | 5 |
| 7 | 6 | 10 | 5 |
| 7 | 4 | 10 | 3 |
| 6 | 3 | 10 | 5 |
| 7 | 7 | 10 | 6 |
| 6 | 3 | 10 | 5 |
| 5 | 5 | 9 | 6 |
| 7 | 5 | 10 | 5 |
| 7 | 3 | 10 | 5 |
| 7 | 5 | 10 | 6 |

| Task 5(A) (telephone no.) | Task 5(NA) (digits) | Task 6(A) (playing cards) | Task 6(NA) (nos./symbols) |
|---|---|---|---|
| 10 | 5 | 9 | 4 |
| 9 | 4 | 3 | 1 |
| 8 | 3 | 8 | 2 |
| 10 | 3 | 9 | 2 |
| 9 | 4 | 9 | 3 |
| 8 | 4 | 4 | 0 |
| 8 | 3 | 3 | 4 |
| 9 | 3 | 8 | 0 |
| 10 | 4 | 9 | 3 |
| 9 | 3 | 9 | 3 |