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AUTHOR Corley, Gianetta; Pring, Linda
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ABSTRACT

The word and picture processing abilities of 11 children (ages 6-10) with partial vision were studied in a variety of ways over a period of 14 months. The studies found that in processing words partially sighted children, like fully sighted children, used both lexical and nonlexical processing, though perhaps in difference balance. Recognition and recall of pictures by the partially sighted children was as good as that of the fully sighted children. Fully sighted children performed better than partially sighted children when a preceding orienting question or a following elaborative sentence was provided. Results suggest that the partially sighted children had difficulty in integrating visual and verbal information which followed too closely. Results are discussed in the context of appropriate reading instruction for partially sighted children and the use they make of pictures. (Contains 21 references.) (Author/DB)

ABSTRACT.

PARTIALLY SIGHTED CHILDREN: THE VISUAL PROCESSING OF WORDS AND PICTURES.

Gianetta Corley and Linda Pring.
Goldsmiths' College, University of London. New Cross. London SE14 6NW. UK.

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Little is known of the word and picture processing capacity of partially sighted (PS) children. In this series of studies one group of eleven PS children aged 6-10 years was studied in a variety of ways over a period of 14 months.They were closely matched with groups of fully sighted (FS) children.

From the word processing tasks it was clear that PS children like FS children used both lexical and nonlexical processing, though perhaps in different balance.

In the case of picture processing, the conditions were made favourable for the PS children, in that adequate viewing time of the picture material was given. In addition, for the recall tasks, recall was counted as correct if an unambiguous description or the correct name of the recalled picture was given. Recognition of pictures by PS children was as good as that of the FS children. Their recall of pictures was also as good as that of FS children, given the method of recall allowed. Their performance, however, fell below that of the FS children if a preceding orienting question or a following elaborative sentence was provided. It was thought that they found difficulty in integrating visual and verbal information which followed too closely. This was not a difficulty experienced by FS children.

The results are discussed in the context of appropriate reading tuition for PS children and the use they make of pictures. The point is made that if integration of handicapped pupils into mainstream schools is to be successful, their teachers must be well informed as to the optimal method of literacy tuition to adopt.

Partially Sighted Children:
The Visual Processing of Words and Pictures.
Gianetta Corley and Linda Pring

Introduction.

The education of partially sighted (PS) children has traditionally been overshadowed by that of blind children. At the turn of this century PS children were typically educated with blind children, which caused a medical innovator in the field at the time, Dr Bishop Harman (1910), to describe the situation as absurd. An educational turning point came in 1908 with the setting up of the first class in the Western world especially for high myopes. It was located in a building in the playground of an elementary school which was farsighted indeed.

The separate educational needs of the PS were recognised in the Department of Education and Science Handicapped Pupils Regulations (1959) and in the Vernon Committee Report (1972). However, little has been recorded of the pedagogic methods and strategies which best meet the needs of this group of children, who outnumber the population of blind children by at least two to one.

There is also a very sparse research literature within a psychological framework in this field. An exception was Lansdown's study (1973) which identified a visuo-spatial impairment, or shape matching difficulty, amongst PS children aged 6-10 years of age, which did not, however, affect their ability to learn to read and write as well as their fully sighted peers by the age of eight. The PS children in Lansdown's study were all being educated in day special schools for the PS, so were presumably enjoying reading tuition by a method which had been devised for them over the years. However, Lansdown did not specify the nature of the tuition which has proved so successful. The present research makes good that omission and goes further by looking also into the strategics adopted by PS children when they process pictures.

There is a considerable body of research into the word processing strategies used by fully sighted (FS) children, a smaller amount investigating their picture processing capacities. The contention here is that if the integration of handicapped pupils in mainstream schools is to be pursued successfully then there must be a sound theoretical and practical basis for the teaching methodology, which goes beyond the provision of low vision aids and the ubiquitous support teaching.

The research reported here was based on three models of word and picture processing by fully sighted people. The word processing model of Ellis (1984) provides a dual process model summarising extensive work on lexical and nonlexical word processing. Ehri's model of linguistic competence (1978) provides a structure for the viewing interrelationship of reading and spelling, whilst the model of Paivio (1986) relates the processing of verbal and non-verbal.

such as, visual or tactile, information. Pring (1982, 1984,1985,1987, 1989,1992) has investigated the word and picture processing of blind children within these conceptual frameworks.

There are three main reasons for enquiring into the word processing strategies of PS children. The first is to see whether severely visually impaired children learn to read by a different process than that adopted by fully sighted children, perhaps by-passing the direct visual lexical process almost entirely.Linked to this line of enquiry is the gathering of information about the impact on word processing yielded by 'phonic' tuition, which is routinely decried nowadays. The second reason for such an enquiry is to analyse in detail the literacy tuition provided for a group of severely visually impaired children over a period of time so as to record the teaching craft employed as well as to investigate the outcomes of that tuition. The third reason is to try to integrate this group of children theoretically within the mainstream conceptual framework of the reading process.

The research falls into two discrete parts - relating to words and pictures. The question being asked in the first part concerned whether or not PS children, because of the predominantly 'phonic' tuition they received, were nonlexical readers. A series of lexical decision tasks was set against a background of a seven month study of tape-recorded samples of the reading tuition received by the PS children. This was supported also by an analysis of their spellings at the beginning and at the end of the 14 month period of data collection.

The question being asked in the second part was whether PS children could identify and recall picture material. As a considerable amount of information is presented to FS children by way of pictures in books, could PS children benefit at all from these sources of information. Traditionally blind children or their teachers have come to eschew pictures (see Pring, 1987, 1989, and Pring & Rusted 1985 for an alternative view) and it seemed possible that the same might be the case for PS children.

PS children are a heterogeneous group and the numbers are small. Research in this area is therefore difficult to carry out. The group of PS children studied here were unique in having been taught as one class for a period of time: all were exposed to one method of reading tuition, which was a very markedly 'phonic' method. Their strategies were compared with carefully matched groups of fully sighted children. The research methodology used here was both observational and experimental, providing both a detailed account of the reading tuition received and also experiemtnal evidence to test particular hypotheses. Such a research opportunity is unlikely to recur as increasingly such children are placed individually in separate mainstream schools.

Method.

Subjects.

The 11 PS children (6 girls and 5 boys) were all pupils at a school for visually impaired children.They were of average ability (mean IQ 103 s.d.13) They were aged from

7 - 10 years, with a mean age of 8 years 6 months (s.d. 1 year 1 month). Their mean reading age was 7 years 10 months (s.d. 1 year 6 months) with a range from 5 years to 9 years 10 months.Their mean score on the B.A.S. Recall of Digits test was 18 (s.d. 4). Full details of their visual status are provided in Appendix 1.

The matched control group for the word processing tasks consisted of 11 boys and 11 girls whose average age was 8 years 4 months (s.d. 1 year) with a range from 6 years 11 months - 10 years. They were of average ability as rated by their teachers or as tested on the British Ability Scales. Their mean reading age was 8 years 6 months (s.d.1 year 2 months) with a range from 6 years 5 months - 10 years 6 months. Each PS child had 2 matched FS controls. The two groups were matched on age, gender, ability and reading ability. The matching was achieved by testing the reading of upwards of 100 fully sighted children in a nearby primary school and from them drawing the sample.

The matched FS control group for the picture processing tasks consisted of 22 children (12 girls and 10 boys), all of whom attended a nearby mainstream primary school. They were of average ability as rated by their teachers, or as measured on the British Ability Scales IQ 107 (s.d. 10) The average age of the group was 8 years 6 months (s.d. 1 year 1 month, range 6 years 8 months - 10 years 3 months). Their mean score on the BAS Recall of Digits test was 18 (s.d. 4) .

These two groups were matched on age, gender, ability and, importantly for a memory task, on auditory recall. The matching on auditory recall was accomplished by testing over 100 FS children in the relevant age groups, and from those, matching first on age, gender and ability and then finally on auditory recall. Each PS child was matched with 2 FS children. (Full details of the experimental and control groups are provided in Appendix 2).

Materials.

For the word processing task lists of words, nonwords and, where appropriate, pseudohomophones were used for the lexical decision tasks. The words were drawn from the reading vocabulary of the PS children. Most words were rated A or AA on the Thorndike-Lorge ratings. There were three different types of display:

a) print was vertical or horizontal to ascertain whether this format distortion would interfere with lexical processing. b) upper and lower case were used to leave the Functional Spelling Units (FSUs) either intact or disrupted c) pseudohomophones were introduced as an additional type of nonword which might deceive the nonlexical processing system into letting them through as though they were words.

For the picture processing tasks, sets of pictures were prepared using the Snodgrass and Vanderwart pictures (1982) rated for their familiarity and complexity. There were two separate sets for the recognition tasks, and two sets for the recall task. Each set was carefully matched on the familiarity and complexity ratings.

Apparatus.

All children worked on the word processing tasks using a Visualtek Closed Circuit Television (CCTV). The stimulus material was placed on the moveable display trolley beneath the screen to be illuminated and enlarged.

The picture processing task required no special equipment. The pictures were held in the hand so that each PS child could gain the optimal viewing angle.

Design.

All data was analysed by use of a two-or three way ANOVA.

Word processing tasks:

The dependent measure was the number of correct lexical responses, both in rejecting nonwords and accepting words.

For the picture processing tasks:

The dependent measure was the number of correctly recognised or recalled pictures.

Procedure.

Words.

Each subject worked individually on the task, in a secluded area of the classroom. Each was told individually that the task was to view each word and to put a tick against it, if it appeared to be a genuine or true word, and a cross if it looked like a 'pretend' word, a word that 'had been made up'.

In each case, there were 5 practice trials, followed by the first set of experimental tasks, with a break of at least a day between the presentation of sets one and two of the experimental tasks.

Pictures.

Each picture was viewed for 5 seconds.For the first task the children were required to sort the pictures into piles according to whether they had seen them before at study time, whether the pictures bore the same name as one which had been viewed at study time, or whether the pictures were entirely new.

There were three different study conditions for the recall tasks: the pictures to be recalled were either viewed in silence, or they were preceded by orienting questions, or they were followed by elaborative sentences. Only the results of the first condition are reported here (see Corley ad Pring 1994 submitted).

The method of recall demands comment. At recall time, the child was required to name the pictures they could recall either by use of the name of the picture or by giving and unambiguous description of it. This meant that fragments of memories could serve to identify what was recalled.It also meant that the PS would not be unduly penalised for any lack of naming ability or partial identification.

Results.

Word Processing.

If children recognised regular words significantly better than irregular words (a 'regularity effect') , this would signify that they were using nonlexical rather than lexical processing.

Table 1.

Summary Table for five experiments.

Means and standard deviations for correctly recognised regular or irregular words.

Experiment		1		2.		3.		4.		5.	
		Reg.	Irreg.	Reg.	Irreg.	Reg.	Irreg.	Reg.	Irreg.	Reg.	Irreg.
1.P.S.	mean	15.5	15.4	32.4	28.7	66.4	62.2	15.8	14.3	17	15.3
	s.d.	3.5	3.6	5.4	8.5	12.8	12.9	4.3	2.9	2.8	3.9
F.S.	mean	17.7	17.3	36.9	36	76.1	74.5	17.3	16.6	18.5	17.5
	s.d.	2.2	1.9	3.3	4.6	5.8	6.5	2.5	2.5	2.2	2.4
		not significant		$p < 0.05$		$p < 0.05$		not significant		$p < 0.1$	

In three out of five experiments there was a significant 'regularity effect' but there was no significant difference between the performance of the PS and FS children.

If children recognised pseudohomophones to be nonwords significantly worse than legal and illegal nonwords (a 'pseudohomophone effect') this would signify that they were using nonlexical processing.

Table 2.

Summary Table for two experiments.

Means and standard deviations for correctly recognised pseudohomophones and nonwords.

Experiment	A		B		
	Pseudos.	Illegal nonwords	Pseudos.	Legal nonwords.	Illegal Nonwords.
PS.mean	16.9	26.8	20.86	22.09	25.36
s.d.	9.1	11.1	7.6	8.3	13.1
FS.mean	23.2	30.4	23.25	24.27	31.09
s.d.	8.5	9.2	10.7	10.45	12.6
	$p < 0.01$			$p < 0.01$	

There was a significant 'pseudohomophone effect' but this was evident on the part of both the PS and FS children. Both were therefore using nonlexical processing for these lexical decision tasks.

If children recognised words with disrupted FSUs significantly worse that those with intact FSUs this would signify nonlexical processing.

Table 3.

Summary Table for two experiments.

Means and standard deviations for correctly recognised words.

Experiment.	C				D			
	Int.Reg.	Int Irreg.	Dis.Reg.	Dis.Irreg.	Int. Reg.	Int. Irreg.	Dis. Reg.	Dis.Irreg.
PS.mean	17.5	15.5	16.6	15.3	15.8	14.3	14.7	14.5
s.d.	1.8	3	2.8	3	4.3	2.9	2.8	3.5
FS. mean	17.9	16.8	17.1	16.3	17.3	16.6	15.7	15.8
s.d.	2.6	2.6	3.	3	2.5	2.5	3.2	3.6
		$p< 0.05$				$p< 0.05$		

In both cases the words with disrupted FSUs were recognised significantly worse than those with intact FSUs, signifying use of nonlexical processing, but the PS were not significantly worse than the FS at this task.

If nonlexical processing was being used by the PS children, with very little reliance on direct visual lexical processing, then reducing the efficiency of lexical processing by visual format distortion should affect PS children less than FS children.

Table 4.

Means and standard deviations of correctly recognised words.

	Horizontal Print.		Vertical Print.	
	Regular words.	Irregular words.	Regular words.	Irregular words
PS mean	15.5	15.4	14.3	11.9
s.d.	3.5	3.6	2.0	4.1
FS.mean	17.7	17.3	14.5	14.6
s.d.	2.2	1.9	3.2	2.9

PS children performed significantly less well that the FS children overall ($p< .05$). Words in vertical print were significantly less well recognised that those in horizontal print ($p< .05$). None of the interactions reached significance, although the low mean score for the PS children's recognition of irregular words in vertical print indicates that they were using lexical processing for these words and that the distorted format did impair their efficiency.

If there was a significant interaction between any of the above main effects and an effect on the part of PS children, it would signify that PS children were using nonlexical processing more than FS children i.e. adopting a different means of processing words.

In none of the five experiments was there a significant interaction effect. The conclusion is that there was evidence of lexical processing on the part of the PS, and there was no evidence that the PS were using different strategies from the FS. Only the balance may have been slightly different in their respective uses of both lexical and nonlexical processing.

Picture Processing.

The Recognition of Pictures.

It was anticipated that PS and FS children would differ in their ability to recognise pictures.

Table 5. The means and standard deviations for the correct recognition by PS and FS children of pictures in the LOOK study condition, when recognition was immediate and delayed (max 32 per cell).

	PHYSICAL MATCH		NAME MATCH		NEW	
(correct scores)	PS	FS	PS	FS	PS	FS
LOOK mean.	24.5	22.0	15	16	31	27
IMM. S.D.	4.0	6.0	8	5	1.8	6.8
LOOK mean	19.5	18.1	18.	16.2	25.6	27.6
DEL s.d.	5.4	5.6	5.7	5	5. 5	4.2

There were no significant difference between the PS and FS on these recognition tasks. With regard to the difference in recognition level between immediate and delayed recognition, there was a significant difference ($F_{1,31} = 5.3$, $p < .05$). The differences between Physical Match, Name Match and New pictures were significant ($F_{2,62} = 60.14$, $p < .01$). As expected the Name Match pictures were the worst identified, but this was by both PS and FS subjects. The PS in particular were expected to experience most difficulty in recognising the Name Match pictures, because of their underlying shape matching difficulty and the associated problem of naming accurately what they saw.This was not so.

The Recall of Pictures.

It was expected that the PS and FS children would differ in their ability to recall pictures.

Table 6. The means and standard deviations for the correct recall of pictures in Experiment 2 by PS and FS children, both when recall was immediate and delayed (max 8 per cell).

	Immediate Recall	Delayed Recall
PS mean	4.2	3.1
s.d.	1.1	1.1
FS mean	4.0	3.0
s.d.	1.4	1.4

An ANOVA of Table 6 with 1 between subject factor, (Group) and 1 within subject factor, (Time Interval) revealed that overall, PS and FS performed this task equally well.($F_{1,31} = .16$, $p > .05$) There were significant differences in the recall of the pictures under the various time intervals ($F_{1,31} = 12.36$, $p < .01$), those recalled after a delay being fewer in number.

It was anticipated that PS and FS children would differ in their ability to name the studied pictures conventionally and to use this name for recalling what had been seen.

Table 7.

The means and standard deviations for the correct name or an adequate verbal description of each picture, given by PS and FS children, immediate and delayed recall combined (max 8 per cell)

	PS		FS	
	Name	Description	Name	Description
mean	3.6	3.6	5.2	1.7
s.d.	1.8	2.1	2.2	1.1

It is clear that PS children name or describe pictures equally often. A chi-square analysis of the FS distribution of frequencies in either category revealed a significantly above chance level of correctly named pictures (x=38.8, df1, $p < .01$) A comparison between PS and FS children of the correctly labelled pictures showed a significant difference between the two groups (t=-2.04, df31, $p < .05$, independent samples). The FS were able to name pictures more often than could the PS.

Discussion.

The findings of these experiments concerning word and picture processing show that, given suitable study conditions, there is no difference in the performance of PS and FS children on a range of tasks. They use the same strategies for word processing, though perhaps in different measure, and most startlingly PS and FS children recognise and recall equal numbers of pictures. The study conditions which made this level of picture processing possible was relatively lengthy, undisturbed, viewing time of the picture material and a mode of recall which enabled the PS children to identify the pictures by means of their partial recall of shape or partly identified bits or features in the pictures. When the viewing of the pictures was preceded or followed by either an orienting question or a following sentence, the performance of the PS fell significantly below that of the FS (see Corley and Pring, 1994, in press). The reason for this seemed to be that the PS children were not able to process the verbal and visual information quickly enough for it to be integrated and helpful. Instead, it was a hindrance and deflected their attention.

The interesting factor about their picture processing lay in the detail the verbal descriptions provided of what the PS children had seen. One child for example began her rinspection of one picture with 'along at the top: half a circle at the back, and then two legs'. Then she looked further and said 'a head like a horse' and finally recognised 'an ostrich'. There were three stages in the identification process: first the lines and shapes, then a feature or two, finally a category name or the name of a category member. Had viewing time been shorter, it seems that in many instances only the lines and shapes would have been identified.

Studying the word processing strategies of the PS children was undertaken in three ways,by means of a triangulation. The result of this triangulation showed that PS children do record specifically visual information. This is seen in their spellings where it is clear that they see and remember letters in words which they could not have reassembled by phonological means - the 'a' in 'beautiful' or the 'o' in women' or in 'done', for example.Moreover, the highly phonic tuition provided for the PS children did not lead to their production of a significantly higher level of 'phonic' errors than the writings of FS children (see Corley and Pring, 1994 in press). As Ehri emphasised, tuition which stresses the sounds corresponding to letters and letter patterns also enables a precise visual specification of each word to be entered in the lexicon. The tape-recorded reading lessons of eleven PS children over seven months provided a clear picture of the teaching method and the experimental work enabled precise hypotheses to be tested about the results of using the lexical or nonlexical word processing strategy.

Fluent sighted readers use lexical processing which is fast and visual. Inevitably all reading involves some visual processing, but it was not certain whether this capacity would be usable by children whose vision is severely impaired. The impact of distorting format suggests that the PS can easily be affected in their use of the lexical process, but they do use it.

The significance of this research is that it places young PS readers within the mainstream of research into reading processes. Moreover the picture processing work is paralleled by similar work and findings from clinical settings.(Humphreys and Riddoch, 1987). This area of work is less far advanced than that concerned with the processing of words. What has been learned here is that PS children, who inspect picture material very closely and carefully, can recognise and recall well what they have inspected. They may not always have had time to identify and name what it is they have viewed, however. Some of the stages in the process have been uncovered and in so doing, it becomes easier to determine the stage at which the PS child's strategies are stretched. Here, it was in integrating visual with verbal information presented in quick succession. There are practical implications for the teaching of PS children (see Corley and Pring 1993) and for enabling their successful performance. The first concerns the success of 'phonic' reading tuition for PS children. Nonlexical word processing is slower than lexical processing and this offers an additional explanation for the observed slow reading speed of PS children. With regard to appreciation pictures, time is needed for their close inspection. Accompanying verbal commentary may not be necessary and is likely to prove confusing if it either tries to direct the child's attention too soon, or follows too quickly after the visual inspection. An elaboration of the content of the picture after the PS child has had enough time to carry out this close inspection is likely to enable the child to rehearse and retain the visual image once it is out of sight.

The practical significance of this research lies in the fact that a successful method of teaching PS children was described which resulted in satisfactory spelling as well as reading. The method has a theoretical basis which places it within mainstream pedagogy. PS children tend to avoid using pictures for information as they read and some of the processes behind their picture viewing behaviour was unravelled here. Ways were suggested of enhancing their ability in this sphere.

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APPENDIX 1.

THE VISUAL STATUS OF THE PARTIALLY SIGHTED CHILDREN.

GENDER	DIAGNOSIS	ACUITY	PRINT SIZE	MEDIA	FIELD
G.	Retinitis Pigmentosa	6/24	N 18	clear	field loss
G	Retinal Aplasia	2/60	N 12		central loss
B.	Colobomata &				
	microphthalmos	6/18 & 6/36	N 12	clear	intact
G	Cataract	6/60 & 1/60	N 8	cloudy	intact
G	Retinoblastoma	6/24	N 48	clear	intact
	R eye only remaining.				
B.	Retinal Aplasia	1/60 & 6/60	N 24		central loss.
B.	High Myopia	6/18	N 18	clear	intact
B.	Retinitis Pigmentosa	6/24	N 12	clear	field loss
G.	Albinism	6/36 & 6/18	N 14	clear	intact.
G.	Cortical loss.	6/36	N 18	clear	intact
B.	Cataract	4/60 & 4/36	N 18	cloudy	intact.

APPENDIX 2.

SAMPLE OF PS AND FS SUBJECTS FOR THE LEXICAL DECISION TASKS.

PARTIALLY SIGHTED SUBJECTS.

SUBJECTS.	GENDER.	AGE.	READING AGE.	ABILITY.
1.	G.	7y	6y 7m	IQ 107
2.	G.	7y 2m	7y 11m	IQ 108
3.	B.	7y 4m	6y 10m	IQ 106
4.	G.	7y 4m	7y 2m	IQ 109
5.	G.	8y 0m	9y	IQ 97
6.	B.	8y 11m	9y 8m	IQ 117-8
7.	B.	9y 1m	5y	IQ 78
8.	B.	9y 4m	9y 1m	IQ 111
9.	G.	9y 6m	8y 7m	IQ 104
10.	G.	9y 6m	6y 6m	IQ 80
11.	B.	10 y	9y 10 m	IQ 117

PS mean age 8y 6m (s.d. 1y 1m) PS mean reading age 7y 10 m (s.d. 1y 6m, range 4y 10m) mean IQ 103 (s.d. 13)).

FULLY SIGHTED SUBJECTS

12.	G.	6y 11m	6y 6m	well below
13.	G.	7y	7y 2m	average
14.	B.	7y 4m	6y 5m	well below
15.	G.	7y 10 m	7y 11m	slightly below to average
16.	G.	8y 8m	9y	average
17.	B.	8y 7m	9y 10m	well above
18.	B.	8y 11m	6y 10 m	well below
19.	B.	9y 1m	9y	slightly above average
20.	G.	9y 3m	8y 9m	slightly below average
21.	B.	9y 6m	6y 11m	well below average
22.	B.	9y 9m	10 y	well above average
23	G.	6y 8m	7y 5m	IQ 120
24.	B.	7y 3m	7y 11m	IQ 109
25.	B.	7y 3m	8y 5m	IQ 110-111
26.	B.	7y 8m	7y 10m	IQ 112
27.	G.	8y 5m	9y 3m	IQ 112
28.	B.	7y 10m	9y 2m	IQ 120
29.	G.	8y 8m	9y 10m	IQ 82
30.	B.	9y 4m	8y 9m	IQ 113
31.	G.	9y 4m	10y	IQ 103-4
32.	G.	8y 10m	9y 2m	IQ 96
33.	G.	10y	10y 6m	IQ 105

FS mean age 8y 4m (s.d. 1y) mean reading age 8y 6m (s.d. 1y 2m, range 4y 1m) mean IQ 107 (s.d.10)

Partially sighted children were not included in the standardisation of The British Ability Scales, so caution must be taken in the interpretation of an individual's scores. Each PS child in the Studies for this thesis attempted 6 - 7 different subtests. They tested the following areas: Reasoning (Matrices, Similarities), Spatial Imagery (Block Design, Level and Power), Short Term Memory (Recall of Designs, Recall of Digits, Visual Recognition), Retrieval and Application of Knowledge (Word Definitions). Where a subtest score fell below the 1st Centile, it was omitted from the IQ calculation.

APPENDIX 2.
SAMPLES OF PS AND FS SUBJECTS FOR EXPERIMENTS WITH PICTURE STIMULI.
PARTIALLY SIGHTED SAMPLE.

	Gender	Age	BAS Auditory Memory. raw score (Digit Span)	Ability.
1.	girl	7y	21(6)	IQ 107
2.	girl	7y 2m	20 (5)	IQ 108
3.	boy	7y 4m	20 (5)	IQ 106
4.	girl	7y 4m	12 (4)	IQ 109
5.	girl	8y 0m	13 (6)	IQ 97
6.	boy	8y 11m	24 (7)	IQ 117 -18
7.	boy	9y 1m	17(5)	IQ 78
8.	boy	9y 4m	23 (6)	IQ 111
9.	girl	9y 6m	16 (5)	IQ 104
10.	girl	9y 6m	13 (4)	IQ 80
11.	boy	10y	19 (6)	IQ 117

FULLY SIGHTED SAMPLE.

12.	girl	6y 8m	19 (5)	average
13.	girl	7y 2m	19 (6)	slightly below average
14.	boy	7y 1m	20 (5)	average
15.	girl	7y 3m	13 (5)	average.
16.	girl	8y 1m	13 (4)	well to slightly below ave
17.	boy	8y 11m	22 (6)	well above average
18.	boy	9y	18 (6)	slightly below average

	Gender	Age	BAS Auditory Recall	Ability
19.	boy	9y 7m	26 (7)	well above average
20.	girl	9y 8m	15 (6)	average
21.	girl	9y 8m	12 (4)	well below average
22.	boy	9y 9m	19 (6)	average
23.	girl	7y	16 (5)	IQ 120
24.	boy	7y	17 (5)	IQ 109
25.	boy	7y 1m	15 (4)	IQ 110-111
26.	boy	8y	19 (5)	IQ 112
27.	girl	8y 8m	21 (6)	IQ 112
28.	boy	8y 1m	22 (6)	IQ 120
29.	girl	9y 0m	15 (4)	IQ 82
30.	boy	9y 7m	18 (7)	IQ 113
31.	girl	9y 7m	12 (5)	IQ 103 - 4
32.	girl	9y 1m	12 (5)	IQ 96
33.	girl	10y 3m	24 (6)	IQ 105

PS mean age 8y 6m (s.d. 1y 1m) PS mean Auditory Memory Score 18 (s.d. 4)
PS mean IQ 103 (13 points) PS Digit Span 4-7 digits.

FS mean age 8y 6m (s.d. 1y 1m) FS mean Auditory Memory Score 18 (s.d. 4)
FS mean IQ 107 (10 points) FS Digit Span 4-7 digits.