

vertical axis or that the natural direction of visual processing was top-to-bottom, then native Hebrew speakers would probably not have been different in this respect. Thus the effect is most likely to be due to the alphabets rather than to their users. The effect may vary with the type font used but this just supports the point.

This conclusion is strengthened in view of the region-width interactions in Figure 2. If "completing" missing parts (or, inferring the identity of the whole from the partial sensory cues) in one direction suffers a disadvantage with respect to the other direction, that disadvantage should add to the disadvantage associated with the larger mutilation rather than interact with it. The most plausible account of this result seems to be that the distribution of informative segments along the vertical axis of letters is skewed, so that most of them are located at both upper quarters in English (and both lower ones in the Hebrew alphabet). Removing the margin of the informative half eliminates a considerable number of identity cues; but there are still a lot of cues in its more central part which are eliminated by a larger mutilation. That is not the case with the less informative half in which each quarter contains just a few cues.

Consider, for example, the number of letters which are made ambiguous when seen in isolation under each of the four ways of mutilation shown in Figure 1. We counted 4, 4, 9, and 8 lower-case Roman letters, and 11, 17, 11, and 8 Hebrew letters (out of 27) for mutilating the very bottom, lower half, upper half, and very top respectively. Of course, recognizability may suffer even when the letter is still unambiguous on thorough inspection. We presume, however, that the degree of recognizability of unambiguous mutilated letters under a given way of mutilation is not uncorrelated with the number of ambiguations it brings about. The empirical results reported here seem to support such a view.

1. Vertical size was defined as the height of lower-case letters. Thus the texts mutilated at the bottom had the extra advantage of showing a large part of the several upper-case letters which appeared in the passages.

### References

- Huey, E. B. *The Psychology and Pedagogy of Reading*. The MacMillan Company, 1908. Reprinted: Cambridge, Mass.: MIT Press, 1968.
- Kimura, D. "The effect of letter position on recognition." *Canadian Journal of Psychology*, 1959, 13, 1-10.
- Kolers, P.A. "Clues to a letter's recognition: Implications for the design of characters." *The Journal of Typographic Research* (now *Visible Language*), 1969, 3, 145-168.

## Figure/ground, Brightness Contrast, and Reading Disabilities

Olive Meares

*Evidence is cited which indicates that the maximum brightness contrast of black-on-white print was a strong contributing factor in the reading disabilities of children attending a New Zealand reading clinic. Children's responses to questions and general comments about their perception of a printed page indicate a need for research into the figure/ground and brightness contrast organization of children's books. The ill-effects of maximum brightness contrast print could range from a minor irritation to a massive barrier to progress in learning to read.*

TEACHERS HAVE long been aware that some children of average or above average intelligence have quite extraordinary difficulty in learning to read. There is no general agreement about the nature and causes of such difficulty. Vellutino (1977) has presented a fine overview of the extensive, inconclusive, and conflicting research which has developed in this complex area. The purpose of this paper is to ask researchers to consider a factor which does not seem to have received adequate attention: the print that children look at. In my own reading, I have found only four related references to print and its possible interference with reading:

1. Critchley (1964) speculates about the reasons why some "dyslexics" have a marked preference for small print.
2. Monroe and Rogers (1964) consider that children's complaints about print blurring and jumping are an indication of vision defect.
3. Bedwell and Grant consider that "bits of the print blur or disappear" because of the child's poor eye control. (From an account of their work in *National Education* [N.Z.], January 1978.)
4. In a checklist of faulty vision symptoms Jordan (1972) lists:
  - Sees double images.
  - Loses place when reading.
  - Skips line above or below.
  - Loses place when making return sweep to begin a new line.
  - Words "spread apart."
  - Letters or symbols appear to move about.

Symbols "blink on and off."

Parts of words or symbols "come and go" during reading.

Jordan comments that disabled learners usually do not volunteer information about how they see; that they are unaware of their abnormal vision; that when such problems as those noted in the checklist are finally detected after years of struggling to read, the student frequently replies "no one ever asked me about it before"; that eye specialists do not specifically ask "Do things blink on and off when you look at a page?"; that such children often receive an eye specialist report: "This child has 20/20 vision. There is no visual problem." Jordan considers that there is an undetected visual defect responsible for the faulty vision symptoms itemised in his checklist. This paper offers a different hypothesis.

Experience working with children in a reading clinic tells me that blurring, moving, jumping, flickering print distortions are indeed a visual reality for many children. Their comments suggest that this is not the result of a vision defect, but rather that it is due to perceptual instability stemming from and induced by the conventional figure / ground organization of books i.e. black print on a white page.



A chance meeting (mid 1970) with the above figure and its accompanying caption—"Are you one of the few people who immediately recognize that this is the word FLY?"—triggered a chain of thought which led me to a long investigation of children's ideas about print. It seemed to me that the only people who would see FLY immediately were those who gave immediate attention to the white background. I decided to get clinic children's responses to this figure. If the response was "black shapes" (or similar comment) that would be that. If the response was "fly," a print probe would follow. I would record everything the children said, as they said it and in their exact words. No child would be aware that any other child was being questioned, so any similarity in response and discussion would be all the more striking and compelling.

All the children had three things in common:

Extreme reading disability

Average or above average intelligence,

All attended the same clinic which is part of the New Zealand state education system. Pre-admission assessments and IQ testing had been done by Education Department psychologists. Vision and hearing checks were arranged by them.

### *Part I. The Children's Responses*

Some children responded to the black shapes:

*Paula* "Heck! A lot of funny black things." (no further questioning)

*Michael* "A broken-up triangle, a supermarket with a parking space, a funny sort of a house, the head of an arrow, and that one looks like an Eastern Island statue." (no further questioning)

The responses of other children were more interesting:

*Ian* (A non-reader on admission - average I.Q.) "Fly."

"Why could you see the word so quickly? It took me a long time to see it."

"Well, it's there." (He outlined the word with his finger).

"But that's in the white of the page. When I want to read a word, I look at the black marks. What about you?"

"Oh yes, I do too. But you've got to keep putting the white away. It stands out a lot."

"If this were printed the other way with white marks on a black paper, you'd have to look at the black to find fly. Do you think you'd find it as quickly?"

"No, because then I'd be looking at the white marks. White on black blends out. Black on white blends in."

"If you were a printer, how would you print books?"

"The other way round."

"Do you mean white words on a black page?"

"That would be better, but I'd rather not have any black or white at all. It's too dazzling."

"What would you have?"

"Just light words on a dark paper—not black. Light grey words on a dark grey paper would be good. You don't want too much difference between the words and the paper."

*Robyn* (A non-reader on admission, superior intelligence) "Fly."  
"You read that very quickly. It took me quite a long time. I wonder why you were so quick?"

"Well, it's there; it's looking at you, so you just say it."

"Robyn, what do you think of the way books are printed? You know, black words on white paper."

"Oh it's silly! It's not fair! They make the covers so you can read them, and then you want to read the book and you can't because it's all black and white and glaring. They know it gives you a headache but they don't care. People who design posters are clever. They want you to read what they say, so they print it so you *can* read it. But people know kids have got to read books at school, so they don't bother about the print—just for the cover. They make that good. It's not fair."

"Can you show me a book with a good cover?" Robyn indicated a book which had an off-white title on a mottled grey-blue background. (Later, other children commented on the readable book covers. They told me that new book covers are pretty to look at, but older book covers are better to read. Time and the soil of much handling has "greyed-down" the stark whiteness of the print).

"How would you print books, Robyn?"

"I'd have light, bright colours on a dark base. People like bright colours and light colours because you *have* to look. There shouldn't be any black and white together."

"Why not?"

"Because white glares at you and gives you a headache, and it makes your eyes water so you shouldn't have it. And you can't see black letters clearly so you shouldn't have them."

*Nigel* (A non-reader on admission. Low-average IQ) "Fly."

Nigel picked up the possible alternation of FLY and black shapes. We discussed this briefly, but I did not question him about print. Because of his general inarticulateness, I wrongly assumed that he would not have anything interesting to say.

*Steven* (Brother of Robyn. A non-reader on admission. Superior intelligence. Attended clinic 1966-68. The only ex-clinic child I questioned) "Fly."

"Now just look at the black shapes."

"What black shapes?" (He found them after a considerable lapse of time).

"Steven, why should you see fly immediately? I couldn't. For a long time all I could see was black shapes."

"You tend to disregard the white and concentrate on the black. It's easy for you to look at the black. I can *make* myself look at the black, but the white keeps coming through at me. It's natural for me to look at the light colour."

"Books are almost always printed with black words on white paper. What do you think of it?"

"It's rotten! When you try to read it, very black on very white comes out a muddy mess."

"How would you print books?"

"I'd have light coloured print on a dark background. It would stand out well. The words wouldn't blur."

"If you were printing light on dark, just what colours would you use?"

"It wouldn't really matter as long as it was light for the words and the least possible contrast between the colours. Light grey on dark grey would be good. Light green on dark green would be good too. A blackboard is good to read."

*Peter* (A non-reader on admission, average IQ) "Fly."

"That was quick. I had a lot of trouble finding that word."

"Gee, it's easy! I can read it."

"Peter, do you like the way books are printed? You know, black words on white paper."

He shook his head vigorously, but didn't speak. The head shaking was an answer so I asked, "Why not?"

"It's all the little white rivers. . . ." Then a flood of tears came.

That completed the first part of the investigation. For the next eight months, my out-of-school hours were largely devoted to wide reading, much thinking, and some writing. Two questions exercised my mind and guided my reading: First, had children's complaints about problems with print already been dealt with by researchers? At that time, I could find only Critchley's reference to small print being favoured by many dyslexics. Second, what did research tell us about children's print needs? The conclusion of Tinker (1963) and of many other researchers was that the maximum brightness contrast of black on white provides the most legible print.

University students were the subjects in Tinker's research which was directed at adult print needs. Children's needs are mentioned but in quite summary fashion. Tinker quoted research which shows that ocular motor patterns are stabilised by the end of fourth grade. "This suggests that children read enough like adults so typographical arrangements having optimal legibility for adults should also be

optimal for children who are about ten years of age or older" (p. 4). Younger children get even less attention from Tinker. "For the poor readers, and especially for children who are learning to read, illegible letters can be a real problem. . . . It may be concluded, therefore, that in children's books the individual letters should be as legible as possible. . . . In addition, the typeface should be larger than that used for adults" (p. 37).

Tinker does deal with irradiation—the encroachment of a white area upon an adjacent black area. This is responsible for the apparent "thinning" of black letters on a white ground. The serifs are the barriers which stem the encroachment of the white, maintain clarity of outline, and prevent thinning of the letters. This matter of thinning of black letters interested me greatly. I had corresponded with R.H.O. Northcote, a member of the New Zealand Road Signs Committee. He had told me that for night visibility, road signs had to be light on dark because black symbols would thin down; "In fact, they can disappear." Tinker's work explained this phenomenon and made clear that it is not restricted to night conditions.

The paramount thought in my mind was always, "What's in this for my children?" These children had made it clear that, for them, white has maximum interference qualities. They seem to be drawn to the white even against their wills. Remember Ian, "You've got to keep putting the white away." And Steven, "The white keeps coming through at me." And Robyn, "The white glares at you and you can't see black letters clearly." I wondered whether, for these particular children, the effects of irradiation are extreme, whether the serif barriers are inadequate to stem the encroaching white, and whether in extreme cases, the white encroachment might be so strong and the serif barriers so ineffectual that letters could actually disappear—even if only momentarily.

The principal of the school, knowing my interest in print, gave me a set of four booklets called *Write Away*. Each double-spread had a different figure / ground contrast, e.g., pink on grey, green on fawn, etc. I thought the children's reactions would be interesting and that it was time to probe for further information.

## Part II.

*Peter* (Now about 11 years 3 months) Peter had made some progress in the intervening eight months and I thought it would be safe to try to get him talking about print. He was about to start a new book (7-year level). The print was very black, the paper was very white.

"My word Peter, this is good clear print. Do you like it?"

He tensed immediately. This time there were no tears but a torrent of words. "It's awful! There's all the little white streams running down the page and there's all blurry black in between them. Sometimes I have to shake my head three or four times before a word will come."

"Show me the streams."

"There they are—you can see them." He ran his finger down the page several times following different streams (the inter-word spacings stepping down from line to line).

"How would you like your books printed, Peter?"

"Lots of the book covers are good, but not white words, just kind of light words. Black words might be O.K. as long as there wasn't any white anywhere. The white gives you the streams."

On his next clinic day he sailed straight into the topic. "You remember when we were talking about the white streams?"

"Yes, I remember."

"Well, the dams don't make any difference when you're reading."

He sat down and picked up his book. I felt overwhelmed; not just by the inexplicability of what he had said, but by the sudden certainty that *he did not know* that I do not share his experience.

"Where are the dams Peter?" (That surprised him. He described the construction and function of dams very clearly).

"Yes, I understand that."

"Well, there are the dams." He pointed to the large blocks of white at the paragraph ends. "They stop one lot of streams from flowing and they start the next lot off."

I was beginning to have some understanding of the dreadful reality that lies behind those words, "severe problems of visual perception."

Thinking of Peter's complaints about "the blurry black" I decided to attempt a little experiment which might provide information about my excessive irradiation/inadequate serifs conjecture. When Peter next arrived, I got him talking animatedly about a favourite topic, then interrupted him mid-sentence by saying loudly, urgently, and very quickly, "Peter! What do you see when you look at

a page?" As I spoke, I turned quickly and flicked a book open at a pre-marked place; no pictures, just black words and white paper. He was startled and turned to the book quickly. He seemed to catch the urgency of my voice and manner. He burst forth instantly with, "A white page and then all the white streams run and the blurry black comes in between."

On his next visit, Peter said, "Remember I said I see a white page and then the streams come and the blurry?"

"Yes, I remember."

"Well, I've been thinking about it. I don't know if I really do see a white page first. I don't think I do."

What had happened? Did reason tell him it could not be so? Did the memory of what he had said seem ridiculous? Did he actually see a white page for such a minute split second of time that deliberate reflection destroyed the memory? Or, for some obscure reason, did he just give a wrong answer which, by rare chance, happened to parallel my conjecture? I'll never know.

On this same day, I showed Peter the *Write Away* books with their appealing colour contrasts and greatly reduced brightness contrast. He was delighted with the colour combinations and, at one page, greatly excited. "Look! That's it! Done big! That's the kind of blurry I see!" I looked at the page. It had moved during the printing process and each word was double-printed. When his initial excitement had subsided, Peter took great care to make sure I understood that he does not see double. He made it clear that this doubling showed in exaggerated form, the blurredness that he experiences with black words on white paper. (His vision had been checked).

*Nigel* (The boy I hadn't questioned about print).

I gave Nigel the *Write Away* books to browse through and asked him to tell me what he thought of the various colour combinations. After some minutes, he said fervently, "Gee! These are great. Why don't we have our books printed like that?"

"Why do you like them so much, Nigel?"

"Because the words don't move."

I was so taken aback I couldn't think of anything to say except, "Do words *move*?"

He was decidedly cross. "Of course they do! Look at them! The white makes them move. And they move a lot worse if you stop to work out a word." Then, rather grumpily, he added, "Come on! Let's get on with our story."

On his next clinic day, Nigel had a question for me. "Don't the words move for you?"

"No Nigel, they don't."

"Oh—I was going to show you how to stop them moving." (Like Peter, Nigel had obviously thought I shared his experience).

"Well, I hope you *will* show me. It might help me to help some other child."

"It's quite easy. You just put a perspex sheet on the page. It's a lot better if you use a dirty one."

When the children write, the same book can be used by many children if they write with a Chinagraph pencil on a perspex sheet placed on the page. I had always known that the children love writing on these perspex sheets. I had assumed that they had high novelty value. I had thought, too, that the complete erasure of errors was probably appealing. I checked this matter after school using both a new perspex and a "dirty" one (the Chinagraph tends to rub into the fine scratch marks which perspex soon acquires). It seemed to me that Nigel was quite right. The perspex seemed to enhance the clarity of definition.

*Mathew* This lad had been at clinic a very short time. He just loved those perspex sheets. One day he commented:

"I wish our teacher had these at school."

"Why do you like them Mathew?"

"'Cos they put the 'flecting back away."

"And what difference does that make?"

"Then the words don't jump."

About this time I read about the work of reading specialist Laurel Lynch. Miss Lynch tells how, as a special treat, she occasionally gives the children slates and slate pencils to use. She tells of the children's joy in using the slates. She attributes this joy to novelty and the permanent erasure of errors—parallel with my thinking about the perspex sheets. Nigel and Mathew had shown clearly that they had far more important reasons for liking the perspex. Could it be that Lynch's children had similar reasons for liking the slates? Would use of a slate tend to stabilise perception? A slate gives exactly what Ian and Steven said would be good print; a light grey figure on a dark grey ground. I bought two slates and a supply of pencils.

Peter was my first pupil next day. Instead of preparing his newsprint book before school, I used a slate. I shall never forget Peter's reaction to his "slate letter." He beamed and said very slowly, "That's lovely! You can read it so easy." I thought back to my early childhood. All my early writing efforts were on a slate. I remember

much blackboard reading. It is possible that there were hidden benefits in the very paucity of material in the schools of those days? Is it possible that some children were kept afloat who today would sink?

Remembering Critchley's assertion that many dyslexics have a marked preference for small print, I decided to switch Peter from 7-year books to 9 to 10-year books (the print is much smaller; indeed, it approximates adult print). This was a tremendous text difficulty leap and I was apprehensive. To our mutual delight, Peter handled this much more difficult material with greater ease than his previous simple book. I hoped he would comment on the small print. He did.

"I read this hard book a lot better than that old easy one."

"You certainly do. I've been wondering why."

"The print's a lot smaller."

"Come off it, Peter! That would make it harder, not easier."

"No! It's easier. When the print's small that makes a lot more words on the page and that makes a lot more black and that makes a lot less white and *that* makes it easier." He paused for breath and further thought. "It breaks it up and mixes it up."

If you look at a small print book and a large print book (given comparable paper and inking), you will see just what he means. The small print does away with the stark BLACK / WHITE. The "drawing-togetherness" of the small print gives the illusion of a greying of the whole page; an apparent reduction of brightness contrast.

I questioned Robyn who had long since left large print books behind. "Which would you rather read, Robyn, small print or big print?"

"Small print, of course!"

"Why?"

"Because the white doesn't glare at you so much and you can see the words better."

I questioned Martin (whose problems eventually defeated me utterly). "Martin, would you rather read big print books or small print books?"

He looked at me in silence for a moment, then said (and I wish I could reproduce the intensity of his voice), "Man! It's gotta be small if you gonna read it."

*Steven* This boy, who has already contributed to these pages, warrants a section all to himself. His intelligence is superior; his problems were extreme; his determination to succeed was quite exceptional, and the humiliation and misery of failure had eaten into him deeply. He had a strong inclination to read down, not across, a

page. When he was looking at print, he screwed his eyes up so tightly that he was peering through the merest slits, and he never blinked—never. His blinking at all other times seemed, as far as I could judge, normal. I asked for another vision check. The specialist reported no vision defects. He said to Steven, very bluntly, "Only one thing wrong with you, you're word blind."

Steven left clinic after three years reading well up to chronological age level. He left me a legacy of many unanswered questions. Years later, when this investigation was under way, I found a possible answer to every one of the following questions. Why had learning to read been such a mammoth task for this very clever boy? When he left clinic, Steven was a very good reader by anybody's standards and got much pleasure from reading, so why should reading still entail intense concentration? If the tightly slitted eyes were part and parcel of failure-induced tension (which seemed a reasonable surmise), why did not the glow and joy of achievement relax him sufficiently to open his eyes, or to afford him the relief of an occasional blink while reading? Once I came across a story which I knew Steven would find particularly pleasurable. The pages had almost missed the inking process. The words were discernible, but in a very faint light grey. When I apologised for suggesting a story with such poor print, he looked at me in wide-eyed surprise. "This is the best thing I've ever seen for reading." Why? Steven's silent reading rate was just as slow for exceedingly simple as for extremely complex material. Why? Why did he lose the place so frequently, omit lines, or begin to re-read a line already read? It is interesting but unhelpful to read that such behaviour is one of the many possible symptoms of dyslexia. That may be a fact, but it isn't an answer to the "why?" Why did he sometimes say that it would be much better if we printed words down the page instead of across? "You know, like the Chinese do." The only answer he could give to my "why?" was, "It would make reading much easier." But why?

My correspondent on the road signs committee sent me some unexpected material. He had had a paragraph typed on plain white paper. This paper was put through a machine which gave a reverse type copy; white words on a dark grey ground. I took these papers to Steven's home, sure that he would make some interesting comments. In relating what happened, I shall refer to the original as "conventional print" and to the copy as "reverse print."

Days passed. Then a third hole was found near the barn. The hole was new and not very deep. John felt sure it was Bozo's hole, and he was not wrong.

John soon learned that Bozo would dig only before anyone woke up. John was sorry that Bozo did not want to be seen at work.

Days passed. Then a third hole was found near the barn. The hole was new and not very deep. John felt sure it was Bozo's hole, and he was not wrong.

John soon learned that Bozo would dig only before anyone woke up. John was sorry that Bozo did not want to be seen at work.

Steven (then over 15 years) looked at the two papers carefully, then laughed. Pointing to the reverse print he said "You wouldn't lose the place if you were reading this, would you?"

"Why not?"

"Well, the white words are their own white line. When you're looking at the white line, you're looking at the words, so you *wouldn't* lose your place. But when you're reading *this* [conventional print] you can't help looking at the white lines and when you make yourself go back to the black, you've lost the place."

"Do you remember when you were at clinic we used to have lots of trouble because you'd miss out lines or start to read the line you'd just finished? Can you tell me anything about that?"

"It wouldn't happen with this" (reverse print).

"Why not?"

"Well, the white words are their own white line and when you get to the end of a line, you just step down to the next one. But when you're reading *this* [conventional print] you're reading between the white lines and it's easy to get muddled when you move to the other side of the paper."

From this one can see that Steven's page presented quite a different picture from Peter's page. Peter's page had white streams (the inter-word spacings) flowing *down*. Steven's page had white lines (the inter-line spacings) going *across*. It was at this stage of the investigation that I realised I had at least tentative answers to all the "whys" Steven had posed.

Why had learning to read been such a mammoth task? His comments about print must surely indicate that this was a large part of his problem.

Why did he look at print through tightly slitted up eyes? Because this habit markedly reduced the amount of light entering his eyes, thus reducing the brightness contrast.

Why did Steven never blink when he was reading? A reasonable assumption would be that, having managed to suppress the white and fasten on to those elusive black symbols, he dare not blink for fear of losing them.

Why did he say that the very poorly printed page was "the best thing I've ever seen for reading?" Again—a reduction of brightness contrast.

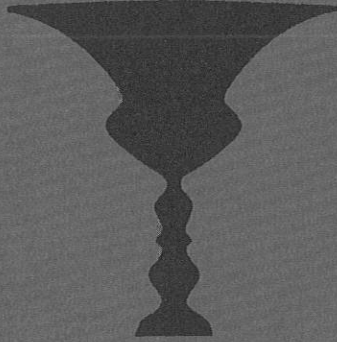
Why did he read very simple material just as slowly as very difficult material? Because very simple material was in large print and he was faced with stark, harsh BLACK / WHITE. Very difficult material was in small print which gives at least an illusion of brightness contrast reduction.

Why did reading still entail intense concentration at the time Steven left clinic? Black on white print demanded of him continuing intense effort to highlight the black symbols and to prevent the white from "coming through."

Why did he lose the place, omit or begin to re-read lines? He answered this question when he commented on the conventional print and reverse print material.

Why did he sometimes say it would be much better if we printed words *down* the page? By reading down the page Steven would cut out of direct vision those distracting horizontal white lines which, from his own account, drew him so compellingly. They would be in peripheral vision only.

*Part III. Children's responses to a different reversible figure*



This well-known reversible figure suggested further opportunities for eliciting interesting information from my children. The absence of language symbols appealed greatly. I felt that the children's responses would be less likely to be coloured by reaction to reading failure. I decided to reproduce the vase and profiles on a slate. On one side I used the slate pencil to reproduce the profiles, and on the second side, the vase. I then showed the children the book figure and both slate figures. Their comments are shown in the accompanying table.

NAME	BOOK FIGURE	SLATE PROFILES	SLATE VASE
Gordon	Experienced alternation. "They're coming and going and now I can't stop them."	"They don't come and go like they do in the book. I know why! The book's harder to focus than the slate."	Reported no alternation. "When I'm reading, when I stop to work out a word, when I look at it, it starts to come and go. If books were in slate colours, I don't think there'd be coming and going."
Anna	Experienced alternation.	Reported no alternation.	Reported no alternation. "You know, if print is too big you get moving backwards and forwards. It's not quite like that book, but it does move. I hate big print."
Nigel	Experienced alternation. "It's quicker than the coming and going when you stop in a book to work out a word."	Reported slight alternation. "But it's slow, not like that book—that's fast."	Reported slight alternation.
Phillip	Experienced alternation. "When you stop to work out a word it vibrates. The black and the white sort of flicker together. It's a bit like this book, but it's not exactly the same. It happens so quickly I don't know how to describe it."	"There's slow change. It's not strong."	"It's like the other side. It changes slowly. It isn't strong."
Robyn	Experienced alternation. "It flicks on and off like it does when you're reading. When you look at a page for a while the words come out and go back and go down."	"Isn't it good. It doesn't flick on and off. You just see the faces."	"It flicks on and off slowly. It's not strong. You mostly see the vase."

Other clinic children were shown the book figures and the slate figures. They all reported either no or minimal alternation on the reduced brightness contrast slate figures. However, they made no comments.

*Part IV. Evidence from people who do not have reading problems*

Following are two examples (from many gathered) of what seems to be print-induced perceptual distortion. One concerns a very young child; the other, a young adult.

*Mary (aged 5½ years)*

This child, in her few months at school, had made such remarkable reading progress that her teacher decided 7-year reading material would be appropriate. Knowing of my interest in print, she deliberately chose a book with unconventional figureground layout; brown print on a dark pink ground. The child enjoyed the story and told her teacher she liked the pretty pages "because the words don't wobble." When told that she had never mentioned wobbling words before, the little girl said she hadn't known there are words that *don't wobble*.

*Christopher (aged 25 years)*

This young man asked me if I would help him to increase his reading rate. When he told me that print tires his eyes, although he has excellent vision, I put a tinted perspex sheet over a page and asked him if he thought that would help speed up his reading. He said, "Fabulous! The negative images have gone!" I asked for a written explanation. Here it is: "For me reading requires great concentration. My first impression of a printed page is one of a shimmering blur. The shimmering is, in fact, white on black overlaid between the lines of the print—a negative image of the print."

Additional information from questioning showed that the negative image was under, slightly to the right of, and partly overlapping the line of print. This young man had never had reading problems, but had always been a very slow-paced reader. He had the same problem with reading music. (He is a member of a brass band and a past member of the New Zealand National Youth Orchestra.) This made him a poor sight-reader which he found infuriating. He decided to use sunglasses for all future reading. He had never spoken to anyone about this matter before because he did not know we do not all experience the same.

I think Christopher threw light on something which had long puzzled me. In response to the very general question, "Do you ever notice anything odd about print?" one of my clinic children said, "Well, there's all the funny little things in the white lines. They're a bit like little ducks swimming in a river." Did this child, too, experience negative images?

Christopher's prompt decision to use sunglasses interested me. I had made such a suggestion to children who complained of blurring, moving print, but the suggestion was not favoured; indeed, it seemed to embarrass them. Yet those same children accepted with alacrity the suggestion of a tinted perspex sheet clipped onto the book. Peter was the only child who gave an explanation. "If I wore sunglasses *you* wouldn't be able to get rid of the white. Anyway, I'd never use sunglasses. Everybody would think there's something wrong with me. When I use the coloured perspex, you can tell it's the book that's wrong." Over the last six years, many children have used that tinted perspex, and it is still in use today. As reading improves some of the children use it less and less and finally discard it, usually when they move on to smaller print. Others cling to it as to a lifeline. My children's comments convince me that print—which is an observable, manipulable, external condition—deserves our close attention. I think these children's task (and ours) is made unnecessarily difficult by maximum brightness contrast print. For me, the outcome of all this reading, writing, thinking, talking, and above all, *listening* is the conviction that these children know what they are talking about.

This paper is really a plea from children. I hope researchers will respond with answers to the questions it raises. And a concluding question: Where else in the child's world does he meet, let alone be required to attend closely to, such an extreme brightness contrast as on the pages of a book?

*References*

- Critchley, MacDonald. *Developmental Dyslexia*. London: Heinemann, 1964.  
Jordan, Dale R. *Dyslexia in the Classroom*. Chicago: Bell & Howell, 1972.  
Meares, Olive. *Some Children Talk About Print*. Auckland, mimeo, 1972.  
Meares, Olive. *Some Further Notes About Print*. Auckland, mimeo, 1974.  
Monroe, Marion, & Rogers, Bernice. *Foundations for Reading*. Glenview, Ill.: Scott, Foresman & Company, 1964.  
Nalder, Shirley J. *Reading Difficulty: Contrast and Figure/Ground Relationship in Print*. Unpublished thesis, University of Auckland, 1976.  
Tinker, Miles A. *Legibility of Print*. Ames: Iowa State University Press, 1963.  
Vellutino, Frank. "Alternative Conceptualizations of Dyslexia: Evidence in Support of Verbal-Deficit Hypothesis." *Harvard Educational Review*, 47, No. 3 (August 1977).