MICROETHOLOGY OF SPELLING BEHAVIOUR IN
NORMAL AND DYSLEXIC DEVELOPMENT

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The term microethology borrows from biology a concern with the natural stream of behaviour and, from cognitive psychology, a concern with analytical detail. The behaviour in this case was the writing (printing) of familiar words in one's own natural tempo. The words were written with a felt pen on a plexiglass panel, rather like writing on a blackboard, and were videotaped through the plexiglass. A counter was superimposed on the videotape, so the exact course of the writing could be analyzed on a millisecond by millisecond basis.

The objective of such microethological analysis is to discover lawful patterns of behaviour - for example, the points during spelling when orthographic decisions are being made. Spelling behaviour is not random. With sufficiently detailed analysis, lawful patterns are bound to emerge. On the basis of such patterns, formal models for producing written words can eventually be constructed. Hence, our research is in the tradition of parameter estimation rather than hypothesis-testing.

Our subjects were 20 adult college students, 12 normal 7-yr-olds, 12 normal 11-yr-olds, and 12 dyslexic 11-yr-olds. The normal children were controls for the dyslexics, and had been individually matched on IQ, sex, and family background. The 7-yr-olds were reading age controls - they were reading at the same level as the 11-yr-old dyslexics, approximately late first grade or early second grade level. The older normal children were chronological age controls. They were, as is typical of children with their family background, reading about two grade levels ahead of themselves. That means the dyslexics, given the same background - professional parents, and so on - were reading 4 to 6 years below their predicted grade level.
Table 1: Proportion of Words Spelled Correctly

<table>
<thead>
<tr>
<th></th>
<th>7-yr-olds</th>
<th>Dyslexics (11-yr-olds)</th>
<th>11-yr-olds</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36%</td>
<td>46%</td>
<td>93%</td>
<td>98%</td>
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</table>

Typical Dyslexic Errors: All Spelling Spelling These Words:

"cilder" children verbalize
"picher" picture bombard
"wowdow" window medication
"sitp" stupid signature
"borken" broken computation
"compuelt" compute stupidity
"srenl" signal muscular
"hissoty" history composition
"srelewsh" solution malignant
"meind" medicine gradation

Their spelling was commensurately poor. Table 1 shows the percentage of words correctly spelled by the four groups. The words spelled are also listed. All the children spelled the same words, and the dyslexics were only slightly better than the 7-yr-olds. Examples of typical dyslexic errors are listed.

However, although we have analyzed error patterns elsewhere (Farnham-Diggory, Nelson & Rohrlich, in preparation), the present report is primarily concerned with correctly spelled words, and with the processes of producing them, as contrasted with the products alone. We are asking two general questions: What are the developmental processes of correct spelling? And are these processes aberrant in dyslexic children?

To address such questions, we need an informal, working model of the spelling process. Figure 1 shows a very simple one, essentially a protomodel that can serve as a rough guide to experimental analysis.

We will be comparing groups within the framework of this protomodel. For example, we could begin by asking whether or not all groups heard the stimulus words equally well (Step 1). However, in this paper we will not be concerned with sensory mechanics, since all subjects were of normal hearing, and the stimulus words were presented quite audibly by tape recorder.