Temporal or phonetic processing deficit in dyslexia? That is the question

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ABSTRACT
Katz, Healy and Shankweiler investigated poor and good readers’ performance on two order recall tasks which were differentiated by the extent to which phonetic memory strategies were employed. Contrary to their predictions, they found that poor readers were significantly impaired on both tasks. They attributed this unexpected finding to the rate at which stimuli were presented. However, results of studies that have experimentally manipulated rate of stimulus presentation in order recall tasks have demonstrated the opposite results to those predicted by these authors. The results of the present study support the hypothesis that poor readers are impaired in recalling the order of rapidly presented successive events.

In their recent paper in *Applied Psycholinguistics* (1983:4, 229–250), Katz, Healy, and Shankweiler hypothesized that poor readers’ deficits of temporal order recall were related to their difficulty using phonetic memory strategies. To assess this hypothesis, Katz et al. investigated poor and good readers’ performance on two recall tasks: (1) a temporal order recall task in which phonetic memory strategies have been shown to affect performance, and (2) a spatial order recall task in which phonetic memory strategies have been shown not to affect performance. As reported, the data failed to sustain these authors’ hypothesis. That is, poor readers performed significantly less well on both ordering tasks, regardless of the extent to which phonetic memory strategies were or were not involved in the task.

Rather than concluding what the data showed, that poor readers demonstrated significant deficits in ordering tasks, regardless of the extent to which phonetic memory strategies were or were not involved, additional evidence was sought to support the original hypothesis. In particular, Katz et al. concluded that their results differed from what they had expected because the rate of stimulus presentation was slowed down from that originally used by Healy with adults, to accommodate the children being tested in the study. They suggest: “It is likely that in modifying Healy’s paradigm for use with children, the presentation rate was kept slow enough to permit the subjects to recode phonetically in the spatial order recall condition as well as the temporal order recall condition” (p. 239). They
conclude by sustaining the original hypothesis that poor readers’ inferior memory for order should not be viewed as an independent disorder, but one involving the use of phonetic coding in working memory.

However, in those previous studies on order perception in dyslexics that were referenced in this article, as well as those that were not (Birch & Belmont, 1964; Doehring, 1968; Tallal, 1980; Tallal & Stark, 1982; Zurif & Carson, 1970), impaired order perception of dyslexics has been shown to be demonstrated most effectively by increasing the rate of presentation of stimulus items to be recalled, not slowing it down as was done in this study.

In tasks using nonverbal stimuli (designed specifically to reduce any possibility that phonetic coding might account for dyslexics’ poor perception of temporal order) increasing the rate of presentation should, according to Katz et al.’s argument, decrease rather than increase any potential for phonetic coding. If this is correct, then increasing the rate of presentation of stimuli should produce decreased potential for phonetic coding and, hence, decreased differences in order tasks between good and poor readers. However, the above-referenced studies investigating order perception of good and poor readers, which have directly manipulated the rate of presentation of stimuli experimentally, have found exactly the opposite result. That is, the faster the items are presented (hence presumably decreasing the possibility for phonetic coding), the greater the difference between performance of good and poor readers. Conversely, when items are presented more slowly, presumably allowing more time for phonetic coding according to these authors’ explanation, poor readers perform as well as good readers on temporal ordering tasks (Tallal, 1980). How could deficits in using phonetic memory strategies account for these results?

It is clear that a subgroup of dyslexic children have phonetic processing difficulties as our own previous work has demonstrated (Tallal, 1980; Tallal & Stark, 1982) and as these authors’ previous work and the error pattern analysis in the present study have so elegantly demonstrated. However, the question at this point seems to be not so much whether they have such difficulties, but what neurological processes might account for them. As data accumulate in the field, they continue to support the hypothesis that phonetic processing deficits themselves may result from inefficiencies or deficiencies of the processing mechanisms essential for processing the rapidly changing acoustic spectra which characterize the ongoing speech stream (Cole and Scott, 1973; Dorman, Cutting & Raphael 1975; Liberman, Cooper & Shankweiler, 1967), rather than vice versa as this study suggests. By “processing mechanisms” we do not refer merely to ordering per se but rather the rate of information processing essential for encoding simultaneous or rapidly occurring successive events. As such, it is significant to note that in the Katz et al. study both the temporal and spatial ordering tasks required subjects to respond to rapidly presented successive events. These are precisely the kind of stimuli that our previous studies would have predicted poor readers would have difficulty processing. Thus, this deficit could as well be attributed to poor readers’ difficulty in processing rapidly presented successive events as their reluctance to use phonetic strategies as shown in the error analysis of this study. Katz et al.’s results demonstrated that poor readers were deficient on both ordering tasks. The fact that error analysis demonstrated that phonetic
processing was used on both tasks by good readers does not negate the fact that poor readers were impaired on the tasks, nor does it allow the interpretation that the impairment could be attributed solely to phonetic processing difficulties. To do that it would be necessary to demonstrate that poor readers were not impaired on a rapidly presented ordering task in which phonetic memory strategies have been shown not to affect performance by good readers. This is precisely the condition anticipated by Healy et al. but unfortunately not achieved in this study.

REFERENCES


