

## Reply to Skottun and Skoyles: Statistical and practical significance of extra-wide letter spacing for dyslexic children

In their letter, Skottun and Skoyles (1) question our conclusion (2) that extra-wide letter spacing is more beneficial to dyslexic children than to normally developing children. Here, we show the pitfalls of their reasoning.

First, Skottun and Skoyles (1) mistakenly purport that our conclusion is based on a null effect in the control group (younger normal readers matched for reading level). However, the crucial result is not the null effect in the control group but the significant interaction between group and spacing in the ANOVA, which shows that the spacing benefits are significantly larger for dyslexics than for controls. Thus, our conclusions were based on a positive effect rather than a null effect. Nevertheless, recent Bayesian statistics allow researchers to assess the evidence for the null hypothesis. Bayesian paired *t* tests (3) yield Bayes factors (null/alternative) in favor of the null for controls (1.811 for accuracy and 4.187 for speed), as opposed to strong evidence against the null for dyslexics (0.004 for errors and 0.023 for speed).

Second, Skottun and Skoyles (1) argue that the lack of significance for the control group might be due to a floor effect for errors and a ceiling effect for speed. With regard to the latter, the average text reading speed in Italian nondyslexic children increases linearly across development to reach about five syllables per second in grade 8 (4). Mean speed in our control group was 1.87 syllables per second, which leaves plenty of room for improvement. Unsurprisingly, the number of errors for the controls was low but well above zero, with enough room for a drop proportionally equivalent to that of dyslexics.

Third, more important than quarrels based on *P* values are replications with different participants, texts, and spacing manipulations. Indeed, a recent study in Spanish (5) mirrored our findings: Letter spacing improved text reading in dyslexic children, but the effect was not significant in young normal readers.

Fourth, is it really important that the spacing manipulation has no effect on young normal readers? We do not think so. From

a developmental point of view, in which dyslexia is seen at the lower end of a developmental continuum, it is possible that beginning or poor readers might also benefit from wider letter spacing. However, this is an important empirical question, one that is of tremendous social and educational importance. We have actually started to address this issue by launching a large-scale online experiment that is implemented as a smart-phone application that can be downloaded for free.\*

In conclusion, it strikes us as rather unfortunate that Skottun and Skoyles (1) focus on statistical significance (which is not an issue in the present study because all critical results are significant) rather than practical significance. Statistical significance asks whether differences between two sample means are unlikely to have occurred by chance. In contrast, practical significance asks whether these differences are big enough to have real meaning. Not only does the spacing benefit have real meaning for a dyslexic child, but the ease with which letter spacing can be manipulated in clinical and daily life settings, together with the potential benefits for an individual child, highlights the practical and clinical significance of the letter spacing effect.

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\*<http://itunes.apple.com/us/app/dys-help-people-with-dyslexia/id529867852?mt=8>.