Learning from Data
Leonard J. Press, OD, FAAO, FCOVD, Editor-in-Chief

In the introduction to his new book The Art of Statistics: How to Learn From Data,¹ British statistician David Spiegelhalter quotes fellow statistician Nate Silver as saying: “The numbers have no way of speaking for themselves. We speak for them. We imbue them with meaning.”

Later on, in a chapter titled “Learning from Experience the Bayesian Way”, Spiegelhalter reinforces this notion: “Bayes’ legacy is the fundamental insight that the data does not speak for itself – our external knowledge, and even our judgment, has a central role.” A discussion about who Thomas Bayes was, and how his thinking factors into current research in health care is beyond our limitations of space here, but there is a concise primer on Bayesian inference and probability that you can access through Brown University.²

Caveats abound about inferences drawn from data, particularly with regard to studies that fail to find anticipated relationships. When you stop and think about it, this isn’t entirely surprising. The enterprise of research is built around the deductive technique of seeking to falsify hypotheses. Citing the philosopher of science Karl Popper, A.C. Grayling notes: “We test the conjecture; a negative outcome refutes it, a positive outcome ‘corroborates’ but does not confirm it; it might still be refuted by further evidence.”³

Writing in the October issue of Scientific American regarding the interpretation of statistical significance, contributing editor Lydia Denworth observes: “The same cannot be said for biomedical research, where the risk tends toward false negatives, with researchers reporting no statistical significance when effects exist. The absence of evidence is not the evidence of absence, just as the absence of a wedding ring on someone’s hand is not proof that the person isn’t married, only proof that the person isn’t wearing a ring.”⁴

One of Spiegelhalter’s main themes is the manner in which the results of research are interpreted and communicated. I raise this issue because of the recent headline of a news release from the National Institutes of Health (NIH) on the Convergence Insufficiency Treatment Trial – Attention and Reading Trial-ART (CITT-ART) study.⁵ The headline reads: “Treatment for common vision disorder does not improve children’s reading skills”. Looking at the data from the actual study, however, reveals that the subtitle of the release is a more accurate portrayal: “NIH-funded study finds therapy for convergence insufficiency is no better at improving reading than placebo.”

Elsewhere I’ve blogged about the significance of this issue,⁶,⁷ and it acquires added meaning because the design and methodology of the CITT-ART was originally described in the pages of this journal.⁸ The aim of the study, as stated in that article, was that its results would contribute to a better understanding of the relationship between CI and reading and attention. Parents, eye care professionals, educators, and other health care providers would be better able to make informed decisions in caring for children with reading and attention problems.

The “X-Factor” in the study design may be the nature of the activities done by the
children in the placebo group. It appears that these procedures involved more attention and processing than done by the children who were involved in the CI training group. While this is understandable since the criteria for the placebo group was that their activities did not elicit direct change in accommodation and vergence, it seems in retrospect that the placebo group experienced reading gains because their attention and processing activities enhanced reading readiness. The reason why so many parents report gains in their children’s reading and academic behaviors in clinical practice may be due to the skill of the doctor or therapist in incorporating attention and processing factors into optometric vision therapy programs, whether or not the child has been diagnosed with convergence insufficiency.

In hindsight, one might argue that a placebo arm in a study of this nature could be designed to more closely mirror what occurs in drug treatment trials. For example, the placebo group would receive various treatments consisting of ocular lubricants. These lubricants have no direct effect on accommodation and vergence, nor do they directly impact attention or processing skills. However, they might impact reading performance by improving visual comfort and visual resolution when the child is engaged in sustained reading. An elaborate protocol could be designed to have the child engage in their normal reading and homework activities, but with various forms of artificial tear supplementation, chemical composition, dosages, dosing schedules, and objective dry eye analyses.

A placebo group of this nature is not far-fetched. A number of items in the Convergence Insufficiency Symptom Survey (CISS) relate to visual comfort and the appearance of print. And in practice, there are children with convergence insufficiency whose symptoms are presumptively attributed to ocular surface disease. When these children present with chief concern regarding reading, there are practitioners who suggest that ocular lubricants be used as a primary treatment. Some will acknowledge that they expect the child to respond positively based on a placebo effect. It would therefore be reasonable to randomly assign patients to a CI treatment control group, or the type of placebo group utilized in practice.

In any event, buildup to the CITT-ART study has placed a spotlight on its data and its interpretation. No doubt the study chair, Dr. Mitchell Scheiman, will address these complexities in his continuing education presentation on the subject at the upcoming COVD annual meeting in Toronto.

REFERENCES


AUTHOR BIOGRAPHY:
Leonard J. Press, OD, FAAO, FCOVD
Lakewood, New Jersey
- OD 1977, Pennsylvania College of Optometry
- Principal Owner, Press Consulting, P.C.
- Adjunct Faculty, Southern College of Optometry
- Editor-in-Chief, Vision Development & Rehabilitation
- Past President, COVD