Caveat Lector: The Necessity of Reading Critically

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"*Caveat lector* [Let the reader beware]." So cautioned Cornelius Celsus, the celebrated First-Century Roman physician and encyclopedist, in discussing some of the spurious medical writings of his day. The times have changed, but the advice remains true. Critical reading is still our best defense against misleading articles in the literature. The orthodontist is deluged annually with over 1700 pages of professional reading from just the issues of *The Angle Orthodontist* and the *American Journal of Orthodontics*. If he does not learn to be a selective and critical reader, he becomes by default a burdened and deluded one. How does one become a critical reader?

When a journal arrives, the articles selected by the reader are the ones which appeal to his interests and curiosity. This is an easy personal judgment. However, the next step in the process of critical reading is more complex and more exacting. It involves *discrimination*—in the best sense of the word. The reader must be able to discriminate articles of *substance* from articles of *faith*.

Even with editorial screening, a few unfit papers always manage to escape into print. If we permit, they would have us believe that some things are what they are not. So the ability to know what *not* to believe is a cardinal point in the process of learning to read critically.

What follows is an outline of our own approach to this difficult task, evolved over the years from thousands of sifted pages. It is neither authoritative nor infallible. There are exceptions to its rules. But this system of discrimination works for us, spares us hours of toil with unworthy articles, and may be of help to other clinical readers seeking the same relief.

Listed below are conditions which raise our doubts and suspicions about the quality of a published paper:

1. *Inadequate sample size and description.* Clinical samples undergoing statistical testing of $N < 30$ are generally inadequate.

2. *Missing data.* Little or no display of the originally measured variables; sometimes they are transformed into new variables with obscured clinical meaning.

3. *Incomplete data.* Absence of a minimum data description of variables (that is: N, $\overline{X}$, and SD), particularly of those variables undergoing significance testing, correlation, regression analysis, and the like.

4. *No consideration of procedural error.* No descriptive or statistical consideration of the error of the methods.

5. *Improper statistical interpretation.* Assigning *clinical* importance to data when the following limits are *not* met: for differences between means, $p \leq 0.01$; and for correlation analysis, $r \geq 0.7$.

6. *Questionable key references.* Especially unpublished studies and theses.

7. *Garbled writing.* A product of garbled thinking. If you can not understand what an author is saying, chances are he does not understand it either.

Many of the articles in the orthodontic literature are purely descriptive (e.g., case reports, technique re-

ports, reviews and essays) without resort to statistical inference. Obviously, the evaluation of conditions 1 through 5 is inappropriate for such contributions.

The decision, whether an article is or is not worth our careful study, is often an unsettled judgment. Common sense and clinical sense serve as superb "arbitrators" in most of these cases. Some articles are deficient in one or more conditions, but still convey useful knowledge and thus warrant our attention. However, an article showing a pattern of complete failure in several conditions of quality is immediately flagged and abandoned.

Further insight into the proper application of statistical reasoning to orthodontic problems is readily available. A 1958 paper[1] by Thurow is a classic in the field and is recommended for reading or rereading. Also highly recommended are reference articles by Garn[2] and by Gianelly[3] gearing statistics to the needs of the orthodontist. For those who seek a broader grounding in medical statistical procedure, a very readable textbook by Colton[4] may be a worthwhile library addition.

Years ago, a wise man offered his colleagues some timeless advice on reading professional literature:

> "Read it at least three times;
> first, to see what it is all about;
> secondly, to see what it says;
> and thirdly, in an attitude of
> friendly hostility."

Seasoned orthodontists may recall this plea for critical reading. It is the final sentence in the book by Edward H. Angle.[5]

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