

# Dumbing it down – The dangers of appealing to the lowest common denominator

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"It's not our job to appeal to the lowest common denominator – it's our job to raise it." - President Josiah Bartlet, *The West Wing*

In 1999, the APA Taskforce on Statistical Inference (Wilkinson et al., 1999) released their long-awaited recommendations regarding data analysis and methodology in the behavioral sciences. One of their recommendations was to choose the "minimally sufficient analysis," meaning that when presented with two alternative data analytic procedures, both of which could address the question of interest, it is in the interest of parsimony to choose the "simpler" one (although they leave the definition of "simpler" open to interpretation). For example, if the hypothesis is that two groups differ in mean level, it probably makes sense to conduct a *t*-test rather than a path analysis, although either procedure could be used to test the same hypothesis. We agree with Wilkinson et al.'s recommendation in spirit. However, we submit that an overlooked, but more frequently occurring, problem than using overly complex analyses is using overly simple ones.

In this article, we concern ourselves with *dumbing down* of statistical analyses. Dumbing down refers to bypassing an advanced technique that is appropriate in favor of a simpler technique that is not. Dumbing down has several negative effects on the scientific enterprise. First, favoring the use of simple analytic procedures over advanced techniques can in many situations yield reduced power, result in less precise estimates, and reduce descriptive clarity. For example, much

research on implicit and explicit attitudes using simple correlations has found weak (or no) relationships between these two constructs. With the use of more appropriate latent variable techniques, it is seen that these two constructs are moderately correlated (Cunningham, Preacher, & Banaji, 2000); this finding suggests that the "simpler" technique underestimates the true association between these constructs. Our point is that state-of-the-art methods are called state-of-the-art for a reason; they frequently result in tests with higher power, greater precision, and increased clarity.

Not only can the benefits of advanced techniques be lost by using simpler methods, but errors can actually be introduced. One classic example is the *median split* technique, wherein an investigator splits a sample into two groups (*high* and *low*) by using the median score on a given continuous scale as the point of division. By force of tradition, ignorance of the costs involved, and the illusion of simplicity, quantitative variables are often dichotomized in this way so that ANOVA may be used in place of linear regression. This is oversimplification with potentially disastrous consequences (MacCallum, Zhang, Preacher, & Rucker, 2002). For years, psychometricians have been fruitlessly warning psychologists that the consequences of dichotomization are loss of power, loss of reliability, the potential for spuriously significant results, and the false impression that latent groups exist. Despite the availability of more appropriate regression techniques (e.g., see Aiken & West, 1991), dichotomization continues to be used. At least 16% of the articles in the *Journal of Personality and Social Psychology* from 1998 to 2000 contain at least one

median split, and frequently more than one (MacCallum et al., 2002).

Other examples of dumbing down include the use of "canned" mechanical procedures often included in statistical software packages, sometimes as default options. These include procedures such as stepwise regression and principal components analysis, both perfectly reasonable procedures but with questionable applicability to most research situations in psychology. The infamous combination of principal components analysis, orthogonal varimax rotation, and retention of as many components as there are eigenvalues greater than 1.0 (a procedure called "Little Jiffy" by its proponents because it is supposedly quick and easy) continues to be used despite considerable literature demonstrating its obsolescence (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Floyd & Widaman, 1995; Ford, MacCallum, & Tait, 1986; Lee & Comrey, 1979; Preacher & MacCallum, 2000; Widaman, 1993).

Given the costs associated with dumbing down, why does it continue to occur? We see at least three primary reasons why researchers might choose to oversimplify statistical procedures. First, researchers may use simple techniques because the results conform better to their hypotheses and arguments. Second, a researcher may oversimplify out of a lack of knowledge; researchers may be unaware of, skeptical of, or untrained in advanced techniques more appropriate for their needs. Finally, researchers may oversimplify analysis because they believe reviewers and/or consumers will not understand the complexity of the most appropriate procedures; in this situation, dumbing down is intended to facilitate ease of presentation. We examine each of these justifications in turn.

## Increasing Support for Hypotheses

We submit that inappropriate simplification of data analysis for

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increasing support for a conclusion constitutes a type of "soft fraud," as described by Chris Crandall (2001). This is incontrovertibly a misuse of statistics; the outcome of a statistical analysis should never be considered as a justification for using the procedure in the first place. In agreement with Crandall (2001), we believe researchers must be accountable for their selection of statistics and resist the temptation of simplifying analyses for the sake of increasing support for their hypotheses.

### Lack of knowledge

The most frequent abuse of statistics is not characterized by deliberate misuse or malicious falsehood. Rather, lack of knowledge leads to the application of obsolete statistical analyses, the inappropriate application of otherwise legitimate analytic procedures, and the use of simple analyses when the benefits of more complex strategies would far outweigh the costs. We suggest that ignorance of how to carry out appropriate procedures is no excuse for implementing simpler but less appropriate (or entirely inappropriate) techniques. It is the investigator's *responsibility as a scientist* to seek out the most appropriate data analytic procedure, learn how to use it, and apply it. Such knowledge can usually be obtained without undue difficulty. Many universities have statistical consultants or knowledgeable faculty members that can assist with such tasks. Keeping abreast of recent articles and advances can also help to resolve this difficulty. Finally, reviewers can alert researchers who are using obsolete or inappropriate methods. One of the primary purposes of peer review is to ensure that the methods and analyses employed in a study adhere to scientific ideals.

Lack of knowledge can also lead researchers and reviewers to be skeptical of the merit of advanced techniques. Researchers may see

advanced techniques as some sort of "magic" that can, in the hands of a skilled user, be tweaked to produce any desired result. This perspective leads some to conclude that these techniques cannot be trusted. Advanced techniques are not witchcraft. In the hands of an investigator who has spent sufficient time learning how to use them, they can reveal much that would otherwise have remained hidden or uninvestigated entirely. We feel that this mistrust is misplaced – all statistical techniques are subject to knowing or unknowing manipulation. The perceived "tweakability" of a particular analytic technique does not constitute a reason to avoid the method, but rather to learn how to use it properly and effectively.

### Ease of Presentation

Researchers fully capable of carrying out the appropriate set of analyses may resort to dumbing down for the sake of reviewers or their audience. For example, a researcher may design her experiment in such a way that she can later perform an ANOVA, for the sole reason that she thinks an ANOVA will be easier to conduct (and its results easier to report and understand) than a regression analysis. Similarly, linear regression may be chosen as the proper analysis for a multi-classroom experimental design when the hierarchical nature of the data clearly calls for multilevel modeling. In such situations, the thinking typically is, "I know multilevel modeling is considered difficult, so my readers probably do not know much about it. More to the point, neither will my reviewers." Thus, there are frequently competing motivations to present accurate, illuminating results on one hand, and results simple enough for an article's readership to digest on the other.

How should we resolve this quandary? As a first step, we suggest that reviewers be given the benefit of the

doubt. Reviewers are usually selected because of their expertise and familiarity with the subject in question. More often than not, they are fully aware of what analytic strategies are the most appropriate and which ones are less than optimal, and are willing to learn something new when confronted with the need to do so. Also, whereas it is true that some readers may struggle with statistics, a paper should be written such that the findings can be understood regardless of the consumer's quantitative savvy. For those readers interested in understanding the methodology, a paper has the added bonus of encouraging them to learn and master the methods employed.

Of course, researchers may have complete confidence that reviewers and readers would understand advanced techniques, but defer to the idea that simple techniques provide parsimony. This would constitute a tragic misinterpretation of the APA Taskforce's recommendation regarding the minimally sufficient analysis. The Taskforce also stated that "complex designs and state-of-the-art methods are sometimes necessary to address research questions effectively" (Wilkinson et al., 1999, p. 598), an important point which should not be ignored. Thus, although parsimony is desirable, it should not come at the cost of sound statistical practice.

### Conclusion

Our position is that the choice of a statistical analysis should *never* be guided by assumptions about the intelligence or expertise of editors, reviewers, or the reading public. If a particular analytic procedure is obviously the most appropriate one for a research design, then use it – hopefully its appropriateness will be just as evident to reviewers and readers. If authors are worried that reviewers will not understand the analysis, they should be prepared to defend their

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appropriate registration. Full-text versions of manuscripts will be available in PDF format, and a search engine will also be available. Details about the registration process and online access will be provided by Sage in a subsequent mailing.

PSPR received 67 submissions last year (up from 51 in 2000), and had an acceptance rate comparable to that for PSPB. The mean editorial lag for the journal is a remarkable 11 weeks; editor Eliot Smith and associate editors Diane Mackie and Robert McCrae continue their terms through 2003.

*Committee reports.* The Diversity Committee, Training Committee, and Graduate Student Committee continue

their activities (see reports in this issue). Action taken at the Executive Committee meeting included endorsement and support of GASP, the gay-lesbian-bisexual-transgender alliance in SPSP, an increased budget allotment to the Diversity Committee for operating expenses and activities, and passing of a proposal to include a half-hour meeting for graduate students in the SPSP convention program agenda each year.

The Committee also enthusiastically endorsed a proposal presented by Eliot Smith for a Summer Institute in Social Psychology. This summer school program would be based on the European Association of Experimental Social Psychology (EAESP) model, in which graduate students are brought

together for intensive training in areas presumably not covered by their home departments. Eliot Smith, Chick Judd, and Harry Reis have drafted an NSF proposal that, if awarded, would run a bi-annual, two-week long summer session for some 100 social psychology graduate students. A proposal will be submitted this year, with the goal that workshops begin in summer 2003.

*Awards.* The Executive Committee considered offering two new Society Awards: Service to the Society, and Service to Personality/Social Psychology. Also approved was a proposal for a new "Theoretical Innovation Prize" (see story on p. 6). The Committee was also pleased to endorse the following awardees: The 2002 Jack Block Award winner is Paul Ekman, and the 2002 Murray Award winner is Seymour Epstein. ■

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choices, not merely write to the lowest common denominator. In conclusion, oversimplification avoids the benefits granted by more complex methods and sometimes introduces errors and violates assumptions (as with the median split technique). The primary reasons for dumbing down statistical analyses, when considered, are clearly unjustifiable.

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