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Technical Report 559

SUFFICIENCY IN THE REPORTING OF RESEARCH RESULTS: SOME GUIDELINES

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March 1982

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FOREWORD

This report on guidelines for research reporting was presented by the senior author at a symposium on "Problems with Meta-Analysis of Decision-Making Research" at the 13th Annual Meeting of the American Institute for Decision Sciences on November 18, 1981, in Boston, Massachusetts. The guidelines were developed by the authors as a consequence of their experiences in conducting a meta-analysis of the career counseling outcome research published during 1950-1980. A substantial part of that published research overlaps with the research reported in ARI Technical Paper 316. This 1978 report, "Outcome Measures for Career Counseling Research," was authored by Laurel W. Oliver under Army Project 2Q762717A766.

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SUFFICIENCY IN THE REPORTING OF RESEARCH RESULTS: SOME GUIDELINES

BRIEF

Requirement:

The US Army Research Institute for the Behavioral and Social Sciences (ARI) conducts research on issues of interest to the Army. Similar research may be accomplished by other services, Government agencies, and in the civilian community. Over time, a substantial amount of research in the same area may accumulate. The problem then becomes one of integrating those research results in a way that is meaningful for Army decision makers. The meta-analysis approach used by Glass (1976) and his colleagues has proved useful for integrating the results of many studies.

Procedure:

The authors of this report are conducting a meta-analysis of the career counseling outcome research published during the period 1950-1980. They have found that the data needed for this type of research integration are not always available in research reports or published articles. Accordingly, the authors have developed some guidelines for research reporting which, if followed, would facilitate research integration.

Findings:

Inadequacies of research reporting encountered by research integrators include: failure to provide needed data, selective reporting of data, and incomplete descriptions of samples or interventions. Attempts to obtain needed information from authors are generally unsuccessful, especially if considerable time has elapsed since the research was conducted. The guidelines the authors present are: (1) Report means and standard deviations (or correlation coefficients), and N's for all groups; (2) Report exact levels of significance (if available) and degrees of freedom for significance tests; (3) Organize data for analysis by outcome variable and do not conduct separate analyses for every item in an instrument; (4) Report nonsignificant as well as significant findings and report results for all groups included in the analysis; (5) Insure accuracy of data. For the purpose of using research results for organizational decision making, it is the responsibility of the research integrator to portray the results of the meta-analysis in a realistic manner.

Utilization of Findings:

The purpose of this report is to encourage researchers to report their research results in a manner that will make their results more useful in a meta-analysis. Given adequate reporting of research results and meticulous implementation of the meta-analysis approach, decision makers will have access to more valid information on which to base their decisions.

CONTENTS

SUFFICIENCY IN THE REPORTING OF RESEARCH RESULTS: SOME GUIDELINES

INTRODUCTION

At a meeting of the American Psychological Association (APA) a little over a year ago, Frank Schmidt stated that "the most important problem in psychology and the social sciences today is the failure to produce cumulative knowledge" (Schmidt, 1980). We agree with Dr. Schmidt. For decades, we have conducted research on a wide variety of organizational topics. These have included personnel selection, leadership and management, socio-technical systems, and many others. Some of these topical areas are directly relevant to the decisions organizations must make in allocating and developing their resources. In many instances, however, we have discovered that this plethora of research leaves us in a confused state. For example, many authors find it difficult to arrive at general summary statements which capture the essence of the results and make these results useful to the reader. Thus, as researchers we seem to have produced a great many findings, but we have usually not integrated the results of our research in a meaningful way.

Reviewers who use traditional narrative or literary approaches to integrating the results of many studies have based their conclusions on their personal reading of a set of studies on a given topic. The conclusions drawn from these customary reviews are necessarily subjective and may be even more so if the reviewer has excluded certain studies deemed methodologically inferior or otherwise inappropriate. Some reviewers employ the more sophisticated "vote-counting" (or "box-score") approach in which the results of each study are sorted into positive significant, negative significant, and nonsignificant categories and bases his or her conclusions on the resulting tallies. Although more systematic, and certainly more revealing when dealing with a considerable number of studies, the vote-counting approach does not take into account the size of the effects tabulated and, as Hedges and Olkin (1980) have shown, may still result in biased estimates of outcomes.

Traditional methods are not adequate for reviewing the results of a sizable body of resarch. In integrating the findings of career counseling outcome research, we are following the lead of Glass (1976) and others by employing techniques of "meta-analysis." Meta-analysis provides a means of quantifying and combining results of individual studies. The unit of analysis is a standardized mean difference known as the "effect size." As Smith and Glass (1977) and Smith, Glass, and Miller (1980) have defined it in applying meta-analysis to the psychotherapy research, the effect size is the difference between the means of the experimental and the control groups divided by the standard deviation of the control groups on a dependent variable. That is,

$$ES = \frac{M_E - M_C}{SD_C}$$

Thus only three statistics are needed to calculate an effect size: mean of the experimental group, mean of the control group, and standard deviation of the control group. We naively assumed that these basic data must surely be reported in every study. Not so! As others have found before us, we discovered a surprising number of studies that contained data which were insufficient for the application of the usual meta-analysis techniques,[1] Our efforts to obtain missing data from the authors reporting the research met with only partial success. The longer the lapse of time since the study was published, the more difficult it was to secure the data we needed.

Although the content of our meta-analysis is of most interest to those in the field of career counseling, the problem this paper addresses is the inadequacy of research reporting. Our experiences have convinced us that there should be certain basic requirements for reporting research. With the proliferation of research in almost every area of investigation, we believe the integration of research results will become an increasingly important task. Thus, it is important for authors to report their research results in a manner that will facilitate efforts to combine the results of many studies. The purpose of this paper is to offer authors guidelines which we believe will make their research findings directly usable in any subsequent meta-analysis.

GUIDELINES FOR RESEARCHERS REPORTING RESULTS

Commonly Encountered Problems

A number of problems may ensue when one embarks on a project of retrieving data from research reports in order to aggregate the results. In our review of the career counseling outcome research published during the period 1950-80 (Oliver & Spokane, 1981), we encountered a number of difficulties. These problems included the failure to provide needed data,[2] selective reporting of data, errors, incomplete descriptions of interventions or samples, and the difficulty of obtaining required data

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[1]There are ways in which effect sizes can be estimated when final status means and standard deviations are not reported. However, these are estimates calculated from other data which may or may not be reported. See Glass, McGaw, and Smith (1981) and Rosenthal (1980) for details.

[2]Some of the articles we included in our integrative analysis of the career counseling outcome literature came from journals whose audience consists primarily of counselor practitioners. Such articles sometimes report results as "statistically significant" and do not include means, standard deviations, or the level of significance. Our position is that authors of this type of article could, in most cases, include a small supplementary table or, at the least, make their basic data available to other researchers.

from authors. The statistic most frequently omitted was the standard deviation. Occasionally, authors failed to report N's. We also found a number of obvious errors in tables. (We do not, of course, know how many unobvious errors we failed to detect.) Sometimes the descriptions of the career interventions were so limited that it was difficult to determine what kind of an intervention was intended (let alone replicate such an intervention from the description). Inadequate descriptions were particularly troublesome in categorizing control conditions. We had decided to classify control groups as "controls" only if they had received no career intervention. Some control groups (especially those labeled "placebo" controls) had in fact received a minimal intervention. And it was sometimes not possible to tell from the author's description how the subjects in such groups had been handled. Where feasible, we requested (by telephone or mail) the required information. Such efforts were generally not successful. People move, die, throw out data, or cannot find data they believe they have kept. We have concluded that there is no adequate substitute for a complete presentation in the research report.

Suggestions for Authors (and Editors)

In this section, we present some suggestions we believe would render research reports more usable for research integration. By research reports, we mean journal articles, organizational reports of research, and conference papers.

1. Basic data. At the very least, researchers should report means and standard deviations (or correlation coefficients if a correlational analysis) plus N's for all groups. While it would also be helpful to have these data given for the entire sample, we realize that journal space limitation may preclude this course of action. However, these data could easily be included in the original institutional report of the research (if there is one). In any case, they should be obtainable from the author of the article. If change scores are used,[3] the pretest and posttest data (means and standard deviations) should be reported as well. If analysis of covariance is used, the correlation between the covariates and the dependent variables should be reported. It is also desirable for authors to report unadjusted posttest means and standard deviations if no pretest differences among groups were found. Editors and reviewers who wish to conserve costly journal space should be careful not to displace these basic data.

2. Significance tests. In cases where significance tests have been made, authors should report F ratios or t values (or correlation coefficients) with their exact probability levels (not p> .05," but p = .13"), if available,

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[3]Because of the problems associated with change (difference/gain) scores, we would not encourage researchers to use them. Knapp (1980) has discussed the unreliability of change scores in counseling research. See the Cronbach and Furby (1970) review article and Harris' (1963) book for more detailed discussions of measuring "change."

and degrees of freedom. It was our experience that when no significant differences resulted, authors sometimes neglected to report those non-significant results and merely settled for a statement of "no significant difference was found."

3. Organization of data for analysis. Another dilemma facing the would-be research integrator is the way authors organize and analyze their data. We encountered a number of studies in which an analysis was conducted on each item in a questionnaire with data reported only for individual items. In such cases, we feel that items should be grouped by type of dependent variable and data also reported for each cluster of items. All items relating to career information seeking, for example, should be subsumed under that variable. Even if subscales of a test or inventory are of individual interest, a total score should generally be reported for the instrument, where appropriate.

4. Selective reporting of data. In a few instances, authors chose to report only part of the data generated from a study. Although this practice is certainly acceptable when a study is too large to report in its entirety, failure to report nonsignificant findings or deletion of results for certain groups makes proper research aggregation impossible. We believe authors should report results for all groups on all dependent variables.

5. Making data available. As we noted earlier, published articles may be directed to a practitioner audience rather than to researchers. Such articles often do not contain the basic data needed to calculate effect sizes. If it is clearly inappropriate or space limitations do not permit the inclusion of a table reporting means, standard deviations, and N's for all groups, we encourage authors to make these basic data available to researchers in some alternate fashion. The difficulty of the "make available" procedure is that it is not always possible to contact authors, especially if a considerable period of time has elapsed since the publication of the article. Accordingly, we urge editors to permit the inclusion of such a summary table, perhaps as a short appendix. For most research published in practitioner journals, these tables should not be very extensive. Oliver and Spokane (1981) found that 70 percent of the career counseling outcome studies they surveyed employed only one or two dependent variables.

6. Accuracy of data. From time to time, we noticed errors in articles. We suggest authors completely recheck data in the final versions of their reports against the computer printouts containing their results. If an article is revised, the final revision should again be checked against the printout. Page proofs can then be checked against the final version. (We of course believe authors should check and recheck their entire papers, but here we are focusing on the data required for meta-analysis).

BEYOND SUFFICIENT REPORTING OF RESULTS

We discovered a number of shortcomings in the published research in career counseling as we attempted to integrate the results across a large

number of studies. We have reported these deficiencies in the hope that future reviewers might encounter fewer stumbling blocks. We realize that our suggestions, even if heeded, will not be reflected in the content of journal articles for a considerable period of time. An even longer period would be required for the findings to be incorporated into an integrative analysis. Garvey (1979) has suggested that the process of disseminating and communicating findings, from the time a given study is completed until it appears as a part of a body of knowledge in a textbook takes 13 years. We made use of the data available to us, however limited, in our analysis of the effects of career counseling.

We do want to comment briefly in two areas, namely, the applications of such aggregate findings in the decision-making process and, secondly, the limitations of meta-analysis that argue for restricting generalizations about the findings.

Making Use of Integrative Findings

Glass and Smith (1980) have described meta-analysis as "nothing more than the attitude of data analysis applied to quantitative summaries of individual experiments" (Glass and Smith, 1980, p. 277). In our experience, however, the set of statistical techniques embodied in the meta-analysis approach are employed to derive summary statements with respect to a body of research. Because these techniques are increasing in popularity and, in light of some cogent criticisms of meta-analytic procedures that have recently been proposed, we feel that it is important to delineate areas in which these findings can be usefully employed. Here, we rely substantially on points made by Pillemer and Light (1980).

Translating the results of empirical research to non-scientists. A number of groups may have interest in the conclusions drawn from integrative reviews. In the field of career counseling, this might include a large and diverse group of professional practitioners of varying levels of sophistication. These consumers may wish to extract a germ from the evidence without having to wade through a profusion of individual studies. Other groups may include teachers of counseling, directors of counseling centers, the general public, or makers of public policy (e.g., legislators). Some members of these groups have a tendency to seek simple answers to complex problems. They might not be inclined to recognize the limitations inherent in conclusions from integrative reviews.

Pillemer and Light (1980) have suggested that meta-analysis benefits the reviewer by: (a) increasing power by increasing sample size, (b) obtaining a more precise estimate of effect magnitudes, (c) describing the form of a relationship, and (d) harnessing the results of contradictory findings. These advantages improve the generalizability of reviews, but must be carefully qualified. If decisions are to be based on such data, then estimates of our confidence in the findings should be provided e.g., by employing Rosenthal's (1980) "file drawer" calculations for estimating

the number of studies with null results not included that would be necessary to overturn a given conclusion. Meta-analytic findings are temptingly clear and simple. We caution that there are rarely neat answers to complex questions and that the intricacies of these procedures are difficult to convey. Nonetheless, meta-analysis does seem useful in decision making.

Information about the efficacy of interventions. Meta-analysis has been used to garner data on the differential effectiveness of one form of treatment or intervention as compared to another. This has been done with the literature on psychotherapy (Smith and Glass, 1977), sex bias in counseling (Smith, 1980), and instructional practices (Kulik, Kulik, & Cohen, 1979). To the extent that such treatments are comparable with respect to the differential selectivity of subjects they employ, as well as the duration, intensity, and frequency of treatment, such comparisons may well be useful. However, we agree with Gallo (1978) who suggests that decisions about which treatment to employ eventually rest on the relative costs to the individual or society of that method. A small improvement in one arena may be considerably more valuable and important than a large one in some less critical area. The context of these decisions may in some cases be more important than the findings.

Limitations of Meta-Analysis

We feel that the principal shortcoming of meta-analysis is the false sense of security that use of the approach may engender in the user of the aggregated research results. Quantifying study outcomes and applying statistical techniques to the resulting effect sizes may imply a greater degree of precision than actually exists. In addition, use of the meta-analysis approach usually results in general summary statements which encapsulate the results of a sizable body of research. Cook and Leviton (1980) believe meta-analysts run the risk of overlooking "the importance of contingency-specifying interactions that in most situations have an inferential precedence over statements about main effects" (p. 464) and give an example. While we agree that meta-analysts may ignore interactions, we feel this can also happen with other methods of research intergration. There are a number of other meta-analysis limitations, and these have been ably discussed Jackson (1980) as well as Cook and Leviton (1980).

For the purpose of using research results for organizational decision making, we feel it is the responsibility of the research integrator to portray the results of the meta-analysis in a realistic manner. This presentation of results obviously must follow a thorough literature search, a thoughtful choice of pertinent study characteristics, reliable coding, and careful analysis. Given adequate reporting of research results and meticulous implementation of the meta-analysis approach, we believe decision makers will have access to more valid information on which to base their decisions.

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