Articles that appeared in The American Journal of Occupational Therapy (vol 27, 1973 and vol 37, 1983) were reviewed and categorized according to the quantitative procedures employed. Data analysis revealed that the proportion of articles reporting no statistical information decreased from 57% in 1973 to 31% in 1983. Conversely, there was a significant increase in articles containing quantitative methods that were categorized as advanced, from 8% (vol 27) to 29% (vol 37). A trend was also revealed toward multiple authorship of articles over the ten-year period. In addition, the senior authors of articles appearing in 1983 were much more likely to possess graduate degrees than were senior authors of articles published in 1973. This paper discusses the implications of the increased use of quantitative procedures in the occupational therapy literature.

During the past decade, the importance of research in occupational therapy has received unprecedented attention. Many leaders in the profession have commented on the need for therapists to engage in research and related scholarly pursuits. For instance, Christiansen (1) recently elaborated some possible economic implications facing the profession if an empirical data base validating occupational therapy practice is not developed. He suggested that occupational therapy will not be viewed as a scientifically viable or competitive discipline “unless we have completed the research to validate our claims of efficacy and value” (p 198). Along similar lines, Gillette (2) has observed that “the practice claims of the profession must be established in order to provide ample evidence of the value of occupational therapy to consumers of the service and to other health care providers as well. In the absence of thorough documentation, members of a profession such as occupational therapy will not receive appropriate recognition nor adequate reimbursement for their services” (p 499).

In a provocative article published in 1975 and titled “Research or retrench: The rehabilitation fields challenged,” Basmajian (3) argued that the rehabilitation disciplines, including occupational therapy, were at a crossroads in terms of professional development. He noted that the rehabilitation specialties could either actively pursue professional status within the rehabilitation service hierarchy by encouraging research and scholarly activity in their respective fields or could continue on their present (1975) course, which appeared to be leading to the estab-

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lishment of a technological role. Basmajian observed that by not actively pursuing professionalization through research, the rehabilitation disciplines would be passively accepting the role of "respected technologies."

The discipline of occupational therapy has obviously chosen to pursue professional status and is vigorously promoting research and encouraging members to contribute to the profession's scholarly literature. This effort has resulted in a noticeable increase in the number of research reports appearing in the professional journals (4). For example, Ottenbacher and Short's (4) analysis of publication trends in Am J Occup Ther during 1970 to 1980 revealed a significant change in the type of specific articles appearing in the journal. There was an increase in data-based articles labeled as quasi-experimental, in which an independent and dependent variable were identified and a statistical test of a hypothesis was conducted. Conversely, the number of nonresearch articles labeled as descriptive decreased during this same period. The increase in data-based articles appearing in the occupational therapy literature implies a corresponding increase in the use of quantitative methods of data analysis. In fact, Ottenbacher (5) recently commented that "the expansion of a research literature in the profession has been paralleled by an emerging sophistication in the use of research designs and statistical analyses" (p 700). This increase in the use of quantitative procedures has direct implications for occupational therapy practice and education. Crocker (6) correctly observed that an increase in the "scientific quality" of published research reports will enhance the clinical practice of occupational therapy. However, this enhancement will occur only if therapists are able to understand and accurately interpret the professional research literature. Along this same line, Rogers (7) argued that one of the primary goals of occupational therapy education programs should be to produce graduates who are knowledgeable research consumers. The ability to accurately interpret research results and integrate them into clinical practice implies that the consumer has a basic understanding and familiarity with the procedures presented in the research literature.

As Greenstein (8) noted, it will be difficult for therapists to "interpret a research report without a general understanding of common statistical symbols and procedures" (p 323). The question of exactly which statistical concepts and techniques are most widely employed by researchers in occupational therapy remains largely unexplored. Thus, the purposes of the present study were to a) survey the occupational therapy literature to empirically determine the extent to which quantitative methods appear and b) identify the level of statistical procedures that are used most frequently in occupational therapy research investigations.

Methods

We reviewed all articles appearing in volumes 27 (1973) and 37 (1983) of The American Journal of Occupational Therapy. It should be noted that a number of these articles or features were not included in the analysis. Excluded articles included Nationally Speaking, Brief or New, The Student Speaks, editorials, book reviews, and official reports or position papers from association departments or task forces.

The reviewed articles were classified into four general categories, which were based on the level of quantitative analysis reported in the article. The first category contained articles that involved no statistical or mathematical procedures. The second category included studies that employed basic descriptive or noninferential statistics such as means, standard deviations, percentages, sums, and ranges as the highest level of analysis. The third category included studies that employed elementary statistical procedures commonly encountered in an introductory statistics course. Procedures included in this category were t-tests, chi-square, one-way analysis of variance (ANOVA), common measures of association such as rho and Pearson r, and simple linear regression. The fourth category included advanced or unusual quantitative procedures not commonly presented in introductory statistics courses. The procedures in this category included factorial ANOVAs, analysis of covariance, repeated measure ANOVAs, multiple regression, factor analysis, and various nonparametric tests. It should be noted that in articles in which more than one statistical procedure was employed, the highest level analysis was used to determine the categorical placement. For example, if an article reported the results of a t test between means (category 3) and also reported the results of a multiple regression analysis (category 4), then that article was placed in category 4.

Each article was reviewed and rated by the senior author and then placed in one of the four categories. A reliability estimate of the rating procedure was obtained by having two evaluators with earned research doctorates (PhDs) inde-
pendently code 25 of the articles. The number of agreements was divided by the number of agreements plus disagreements, this resulted in a percentage of agreement between the two raters of .92.

Additional descriptive information, including the highest degree held by the senior author of each article, the sex of the senior author, and the number of persons contributing to the authorship of the article, was also coded and included in the analysis.

**Results**

A total of 103 articles was reviewed: 51 from volume 27 and 52 from vol 37. The proportion of articles employing statistical procedures increased dramatically over the surveyed interval (see Figure 1). The percent of articles with no quantitative procedures decreased by more than 25% from 1973 to 1983, whereas the percent of articles employing some type of advanced quantitative procedure (factorial ANOVAs, multiple regression, etc.) increased by 21%.

A $4 \times 2$ chi-square using the four categories of quantitative status and the year of publication (1973 vs. 1983) as the factors was computed to analyze the changes occurring across the ten-year period. The analysis produced $X^2 = 11.76 (p < .008, df = 3)$, indicating that a statistically significant change in the use of various levels of quantitative analysis had occurred from 1973 to 1983.

![Figure 1](http://ajot.aota.org/pdfaccess.ashx?url=/data/journals/ajot/930454/ on 04/27/2018 Terms of Use: http://AOTA.org/terms)

**Figure 1**

Comparison of level of quantitative analysis for volume 27 (1973) and volume 37 (1983)

- A. No statistics used
- B. Descriptive statistics
- C. Elementary statistics
- D. Advanced statistics

The $t$ test was the most commonly employed inferential statistical procedure and appeared in approximately 15% of the articles reviewed. The Pearson $r$ was the next most frequently encountered statistical procedure other than means and standard deviations. The Pearson $r$ was computed in approximately 11% of the articles. Other commonly employed tests were the chi-square and ANOVA.

The increase in descriptive statistics from 12% in 1973 to 21% in 1983 was believed to be related to an increased use of single-subject research strategies. These small-N research designs allow the graphic presentation and summary of data but generally do not involve the computation of inferential statistical procedures.

There were other changes revealed in the analysis. For example, Figure 2 compares the type of academic degree held by the senior author of the articles reviewed. It shows that in volume 27 (1973), 43% of the first authors of reviewed articles held baccalaureate degrees, whereas in volume 37 (1983), 15% of the senior authors possessed such a degree. Conversely, the number of senior authors with graduate degrees increased dramatically over the ten-year period.

A related analysis revealed that the mean number of authors contributing to articles published in volume 27 was 1.4 (SD = .73). There was a trend toward multiple authorship across the decade, as evidenced by an increase in the mean number of authors to 2.0 (SD = 1.05) for the year 1983. Seventy percent of the articles reviewed in 1973 were written by a single author, compared with 38% in 1983 (see Figure 3).

The gender ratio of the senior
Sophisticated data analytic techniques than was necessary just a few years ago. The professional literature in other health-related fields reflects a similar trend toward an increased use of quantitative methods to help establish and refine an empirical foundation for practice (9–11).

In 1973, a reader who was familiar with simple descriptive statistics and measures of dispersion possessed the background necessary to "understand" 69% of the articles published. A reader familiar with elementary statistics (t test, one-way ANOVA, Pearson r, etc.) would have been capable of interpreting an additional 23% of the articles or a total of 92% of all articles published in 1973. The percentages have decreased to the point that the same reader would have the necessary quantitative background to accurately interpret approximately 71% of the articles published in 1983. A reader having only a knowledge of basic nonparametric descriptive statistics would be able to adequately interpret only 52% of the articles published in 1983.

Advances in computer access and technology, along with the introduction of new statistical procedures, permit more sophisticated research design and analysis of data than was previously possible. However, this trend also poses some new challenges for therapists and educators. In view of the increase in quantitative procedures revealed in this investigation, it is not surprising that many clinical therapists feel inadequately prepared to read and decipher the results of research articles appearing in the professional literature. Students in medical and health-related fields have been found to be disinterested in quantitative methodology.

Figure 2
Comparison of highest academic degree held by the senior author of reviewed articles for volume 27 and volume 37

<table>
<thead>
<tr>
<th>Degree</th>
<th>Percent of Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baccalaureate</td>
<td>60</td>
</tr>
<tr>
<td>Masters</td>
<td>30</td>
</tr>
<tr>
<td>Doctoral</td>
<td>10</td>
</tr>
</tbody>
</table>

Volume 27 1973: 80% female, 77% female in Volume 37 1983 (see Figure 4).

To further explore the descriptive findings reported above, three chi-square tests were computed to determine if a relationship existed between: a) the academic degree of senior author and the volume ($X^2 = 10.41$, df = 2, $p < .01$), b) the sex of senior author and the level of quantitative analysis ($X^2 = 4.24$, df = 3, $p = NS$), and c) single versus multiple authorship and the level of quantitative analysis ($X^2 = 19.07$, df = 3, $p < .01$). This last analysis suggests that statistical procedures were more commonly employed in articles having more than one author.

Discussion
This survey has empirically documented that the use of quantitative procedures in articles published in *The American Journal of Occupational Therapy* has increased over the past decade. To understand and interpret the statistical aspects of current articles requires familiarity with a broader range of sophisticated data analytic techniques than was necessary just a few years ago. The professional literature in other health-related fields reflects a similar trend toward an increased use of quantitative methods to help establish and refine an empirical foundation for practice (9–11).
and may even be openly hostile (12, 13). As Daubs (11) concisely stated, "statisticians have failed to present sufficient evidence to clinicians in general to convince them that the subject material is truly useful in actual practice" (p 801).

The discipline of occupational therapy is currently experiencing a dilemma directly related to its desire to establish scientific credibility. On one hand, we wish to regard as a scholarly profession and thus are developing an empirical literature that meets minimum standards of scientific validity and credibility demanded in the behavioral and social sciences. On the other hand, we would like to assume that the average reader of the professional literature is capable of understanding and interpreting research findings and relating them back to various clinical environments. If we wish to have both a scientifically respected professional literature and a professional population capable of synthesizing that literature with clinical practice, then several steps will need to be taken. First, students must be exposed to the procedures and methodology of scientific inquiry at an early stage in their basic professional education. An effort should be made to develop and integrate an attitude of critical inquiry throughout the educational experience. Rogers (7) has presented an excellent rationale and outline for educating the "scholarly practitioner." Practicing therapists must also be convinced that understanding the research process and related quantitative and qualitative methodologies is vital to clinical practice. The American Occupational Therapy Foundation has begun work in this area by sponsoring research-related workshops and supporting research activities designed for the clinical therapist. For example, the Partnership in Research workshops sponsored by the Foundation provided a structured opportunity for therapists from academic and clinical settings to work together on a research project. Therapists also need to be provided with articles in professional journals that give information on the research process. This latter approach has recently been implemented by New England Journal of Medicine in an attempt to enhance the data-analytic knowledge of that journal's readership (14).

Another method of enhancing the interpretability of the profession's research literature is related to the reporting of statistical information. Quantitative methods should be kept as straightforward as possible. With the vast array of data-analytic methods currently available, it is not practical to expect readers to be familiar with all possible procedures. When a complex or unusual quantitative procedure is employed, an attempt should be made to explain the technique, and adequate references should be provided, so that interested readers can pursue a more detailed study of the analysis. The method of reporting statistical re-
sults brings up an issue of long-standing controversy in the behavioral sciences, that of statistical significance. All of the articles reviewed that conducted a statistical test of a hypothesis reported information related to statistical significance. Statistical significance (traditionally $p < .05$) has been an indispensable part of the data-analytic tradition in the behavioral sciences for the past 50 years (15). Recently, however the role of statistical significance testing has been seriously questioned (15–18). Testing statistical significance is considered the sine qua non of assessing the inferential validity of a hypothesis against a chance distribution; however, many researchers are aware that such probabilistic tests do not provide information regarding the magnitude of any given experimental/treatment effect (17). The role of significance testing in occupational therapy research has been dealt with in other papers (19, 20) and will not be discussed here. It suffices to note that statistical significance is strongly influenced by sample size and other considerations and may be a poor indicator of practical or clinical significance. Ethridge and Mc-

sweeney (21) noted this fact in relation to occupational therapy research when they stated, “many investigators are tempted to use the significance level not only as an index of the credibility of the null hypothesis but also as an indication of the practical significance of the results” (p 51).

As the use of quantitative methods in the occupational therapy literature increases, there is a danger that statistically unsophisticated readers may confuse statistical significance with clinical significance and thereby allow the data-analytic procedures to serve as a substitute for critical cognitive analysis. There is often a tendency, even on the part of some researchers, to operationalize the inferential processes involved in empirical investigations and allow the statistical procedures to unduly influence non-statistical decisions. As Bakan (15) notes, this practice “removes the burden of responsibility, the chance of being wrong, the necessity for making inductive inferences, from the shoulders of the investigator and places them on the tests of significance” (p 430). Alternative procedures for determining and reporting the impact or effectiveness of a particular treatment are available (16–18). These procedures, which include the reporting of effect size estimates, measuring of relationship strength, and the establishment of social validation should seriously be considered by researchers who are interested in enhancing the clinical relevance and interpretability of their findings.

**Conclusion**

The increased use of quantitative methods in the occupational therapy literature reported in *The
American Journal of Occupational Therapy suggests that a scientific data base is gradually being established to guide theory development and validate clinical practice. This should be interpreted as a positive trend indicating that occupational therapy is responding to internal and external pressures to pursue true professional status within the health care fields. Obviously, such a trend implies changes. As these changes occur, members of the discipline will be required to assimilate new information and develop the skills necessary to integrate this new information into clinical practice. The philosopher/mathematician Bertrand Russell (22) once observed that “change is one thing, progress is another. Change is scientific, progress is ethical; change is inevitable, whereas progress is controversial” (p 8). As members of a developing discipline, we must have confidence that these changes reflect true progress toward the emergence of occupational therapy as a scholarly profession.

REFERENCES