

# **Evaluating the State of a Field: Effect Size Reporting in Gifted Education**

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**ABSTRACT.** The authors examined the use of effect sizes across an entire field, satisfying a goal J. Cohen (1997) suggested. They analyzed the extent to which researchers had reported effect sizes in the 5 major journals on gifted education between 1996 and 2005 and compiled data on the types of manuscripts published, whether researchers reported effect sizes when appropriate, and which effect size measures they reported. The authors analyzed 2 time periods, hypothesizing that the latter period would show greater incidence of effect size reporting due to researchers' and professional organizations' increasing calls for their use. The observed increase in reporting effect sizes was limited. The authors recommend that journal editors adopt a policy requiring effect size reporting where appropriate.

**Keywords:** editorial policy, effect size reporting, gifted education, research methods

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EFFECT SIZES OFFER researchers a statistical means of describing the magnitude of observed between-groups differences or observed relationships in quantitative research studies. Effect size estimates play an important role in determining statistical power when researchers select research designs, conduct meta-analytic reviews of the literature on a particular topic (Cooper & Hedges, 1994), or interpret the results of primary research (Grissom & Kim, 2005). Although statisticians have long advocated effect size reporting, researchers have been somewhat slow to respond to this call (Grissom & Kim; Huberty, 2002; Thompson, 1996).

In 1994, the fourth edition of the *Publication Manual of the American Psychological Association* encouraged authors to report effect sizes. Since then, numerous researchers have addressed the importance of effect size reporting (e.g., Cohen, 1997; Daniel, 1998; Olejnik & Algina, 2000; Thompson, 1996, 2002; Thompson, Diamond, McWilliam, Snyder, & Snyder, 2005; Vacha-Haase & Thompson, 2004). In 1999, Wilkinson and the APA Task Force on Statistical Inference stated, "Always provide some effect-size estimate when reporting a *p* value . . . always present effect sizes for primary outcomes" (p. 103).

The fifth edition of the APA manual (2001) characterized the failure to report effect sizes as one of several potential "defects in the design and reporting of research" (p. 5), noting furthermore that "it is almost always necessary to include some index of effect size or strength of relationship in your Results section" (p. 25) when interpreting quantitative findings. In 2006, the American Educational Research Association (AERA, 2006; Thompson, 2007) followed APA's precedent by implementing a policy mandating the reporting of effect sizes in its journals.

Gifted education is a small field of study that draws its authors and researchers primarily from the ranks of educators, psychologists, and counselors. Pfeiffer (2003) defined expertise in gifted education on the basis of editorial board memberships, journal article publications, and governance roles in the National Association for Gifted Children. Using these criteria, he identified 142 individuals as experts in this field of study. The American Educational Research Association's special interest group, Research on Giftedness and Talent, has approximately 200 members who are primarily researchers or graduate students in this area. Approximately five to eight peer-reviewed journals publish research in gifted education, either full-time or occasionally yet regularly, and all of these require that manuscripts follow the APA (2001) publication manual's style guidelines.

Until recently, few researchers in gifted education have focused on reporting effect sizes. The earliest mention of effect sizes in a gifted education article appears to have been in Asher's 1986 publication focusing on the technique of

meta-analysis. Kulik and Kulik (1992) published a highly visible application of effect sizes in an influential meta-analysis of grouping practices in the flagship journal *Gifted Child Quarterly (GCQ)*. However, researchers did not widely apply effect size reporting to other types of research in gifted education. In 1997, Plucker examined 4 volume years from three gifted education journals and found that authors rarely reported effect sizes, with multivariate effect sizes reported slightly more frequently than univariate ones.

Paul and Plucker (2004) examined selected studies published in gifted education between 1995 and 2000 and again found that authors reported effect size indicators infrequently and inconsistently. Those researchers suggested that both authors' unfamiliarity with effect size interpretation and journal editorial policies that rarely required effect size reporting were likely responsible for this lack of reporting. Paul and Plucker suggested that APA's (1994, 2001) and others' increased emphasis on effect size reporting might increase effect size reporting over the next few years.

Because of its relatively manageable size, the field of gifted education offers an ideal setting for researchers to examine trends in effect size reporting. In the present study, we investigated the gifted education literature from 1996 through 2000 and from 2001 to 2005 to evaluate the hypothesis that effect size reporting has increased since the publication of the fifth edition of the APA (2001) manual and to determine the degree to which this expected development may have taken place.

## Method

We analyzed five journals: *GCQ*, *Gifted and Talented International (GTI)*, *Journal for the Education of the Gifted (JEG)*, *Journal of Secondary Gifted Education (JSGE)*, and *Roeper Review (RR)*. With the exception of *High Ability Studies*, a European-based journal, these five journals publish the majority of peer-reviewed primary research in the field of gifted education. We examined all issues of the journals published from 1996 through 2005. During this period, none of the journals mandated effect size reporting.

The research methods were similar to those that researchers have followed for earlier analyses of effect size reporting, particularly those by Plucker (1997) and by Paul and Plucker (2004). We used a flow chart to classify articles as either empirical or conceptual. We further subdivided empirical articles into qualitative, quantitative, and mixed-methods studies. Because effect sizes do not apply to qualitative research designs or to conceptual articles, we examined only those articles classified as quantitative or mixed-methods studies for effect size reporting. Among these quantitative and mixed-methods studies, we classified as *not applicable* those that were purely descriptive, that concerned instrument development, or that were otherwise unsuited to effect size reporting. We classified the remaining articles, that is, those in which effect size reporting would be appropriate, on the presence

or absence of such reporting. If the researchers reported effect sizes, we also noted the names of the effect size statistics.

We divided the 10-year span that we analyzed into two periods, those from 1996 to 2000 and from 2001 to 2005. Because of the relatively small total number of articles, summarizing the results in the two 5-year periods evened out some of the variation in results from year to year. This approach was also consistent with our research question regarding the influence of the fifth edition of the APA (2001) manual. In the first phase of analysis, we examined results in each journal, using the analytical technique that we described earlier. Next, we aggregated these results and compared them across journals to examine variation in effect size reporting practice. In each of these phases of analysis, we compared results for the first 5-year period with results for the second period. Because this was primarily a descriptive study with no new statistical comparisons, effect sizes were not reported.

## **Results**

The distribution of conceptual articles versus empirical articles varied across journals, and in some cases it also varied over time within a journal. Effect size reporting also varied across journals. Tables 1 and 2 summarize these findings for each journal, as do the following paragraphs. Effect size reporting increased between the periods 1996–2000 and 2001–2005 in each of the five journals that we examined. Despite these increases, all effect size reporting rates remained below 60%.

### *GCQ*

*GCQ* published, on average, 21 articles each year with three empirical studies for every conceptual article from 1996 to 2005. There were 99 quantitative, 47 qualitative, and 18 mixed-method studies published during this 10-year period. From the total of 117 quantitative and mixed-method articles, we eliminated 16 studies for which there was no reason to report effect sizes (Table 2). This left 101 *GCQ* studies in which the authors should have included effect size estimates to interpret their statistical findings. Authors reported effect sizes on average across the entire 10-year period in 44% of the cases in which such reporting was warranted. At the onset of this project, we hypothesized that we would find an increase in the incidence of authors reporting effect sizes across the two 5-year periods. Such an increase was observed in *GCQ*. For 5 years, from 1996 to 2000, effect sizes were reported, on average, 28% of the time, whereas from 2001 to 2005 they were reported 59% of the time.

### *RR*

*RR* published an average of 35 articles each year. There were fewer empirical studies than conceptual ones in both 5-year periods, and the overall number of

**TABLE 1. Numbers of Conceptual and Empirical Articles and Percentage Classified as Conceptual, Disaggregated by Journal and Year**

Year	GCQ			RR			GTI			JEG			JSGE		
	C	E	%	C	E	%	C	E	%	C	E	%	C	E	%
1996	7	17	29.2	23	19	54.8	2	11	15.4	10	10	50.0	2	14	12.5
1997	2	18	10.0	24	17	58.5	3	4	42.9	5	9	35.7	2	14	12.5
1998	7	13	35.0	30	23	57.7	5	9	35.7	4	15	21.1	5	14	26.3
1999	5	13	27.8	13	19	40.6 <sup>c</sup>	5	8	38.5	17	5	77.3	8	9	47.1
2000	7	13	35.0	34	21	61.8 <sup>d</sup>	5	7	41.7	3	11	21.4	13	5	72.2
1996–2000	28	74	27.5	124	99	55.6	20	39	33.9	39	50	43.8	30	56	34.9
2001	2	21	8.7	12	11	52.2 <sup>c</sup>	5	6	45.5	1	14	6.67 <sup>a</sup>	22	6	78.6
2002	5	16	23.8	24	11	68.6	4	6	40.0	3	9	25.0	9	7	56.3
2003	3	19	13.6	14	10	58.3	7	6	53.8	16	4	80.0	10	10	50.0
2004	4	18	18.2	4	19	17.4	5	8	38.5	0	8	0.00 <sup>b</sup>	12	4	75.0
2005	7	16	30.4	15	11	57.7	9	8	52.9	7	6	53.8 <sup>c</sup>	2	14	12.5
2001–2005	21	90	18.9	69	62	52.7	30	34	46.9	27	41	39.7	55	41	57.3

Note. C = Conceptual; E = Empirical; GCQ = *Gifted Child Quarterly*; RR = *Roeper Review*; GTI = *Gifted and Talented International*; JEG = *Journal for the Education of the Gifted*; JSGE = *Journal of Secondary Gifted Education*. GTI is published biannually; all others are published quarterly except as noted in the following. We categorized JSGE using volume numbers nearest to the publication year (i.e., we counted Volume 16 as 2005) because the publication schedule was off schedule by approximately half a year. Gentry (GCQ), Worrell (RR), McCoach (GTI), D. Matthews (JEG), and Dixon (JSGE) conducted classifications and analyses and M. Matthews tabulated them.

<sup>a</sup>JEG 2001 total listed includes three empirical articles, one quantitative and two qualitative, in an issue dated "Winter 2000/01." <sup>b</sup>Volume year includes only two issues instead of the usual four. <sup>c</sup>Volume year includes only three issues instead of the usual four. <sup>d</sup>Volume year includes five issues instead of the usual four.

**TABLE 2. Total of Quantitative and Mixed-Methods Articles With Effect Sizes Reported, Not Reported, or Not Applicable, by Year and Journal**

Year	GCQ			RR			GTI			JEG			JSGE		
	R	NR	NA	R	NR	NA	R	NR	NA	R	NR	NA	R	NR	NA
1996	5	8	3	0	6	9	0 <sup>a</sup>	6	2	1	7	1	1	4	1
1997	0	14	0	4	8	4	0	4	0	2	5	0	1	7	1
1998	5	5	0	3	6	6	1	1	5	2	5	2	1	5	1
1999	3	2	4	2	9	4	0	1	5	0	1	0	2	3	0
2000	1	7	0	6	6	4	0	4	0	4	4	1	0	4	0
1996–2000	14	36	7	15	35	27	1	16	12	9	22	4	5	23	3
2001	6	9	1	1	2	3	2	1	1	1	4	3	2	4	0
2002	7	1	2	1	2	0	0	3	1	4	1	0	1	5	0
2003	5	1	2	1	3	3	0 <sup>a</sup>	2	2	0	0	1	1	5	0
2004	6	5	1	6	5	2	0	7	1	2	2	1	1	2	0
2005	6	5	3	4	1	1	2	4	2	4	2	0	5	5	0
2001–2005	30	21	9	13	13	9	4	17	7	11	9	5	10	21	0

Note. R = Reported; NR = Not Reported; NA = Not Applicable; GCQ = Gifted Child Quarterly; RR = Roeper Review; GTI = Gifted and Talented International; JEG = Journal for the Education of the Gifted; JSGE = Journal of Secondary Gifted Education. Counts do not include the empirical qualitative articles included in the counts listed in Table 1.

<sup>a</sup>Correlations were reported ( $r$  or  $r^2$ ), but effect sizes were not provided for associated tests of mean differences, so the single article in each of these cases was classified as not reporting effect size information. These two correlations were not included in the counts presented in Table 3.

articles published decreased markedly from 222 in 1996–2000 to 131 in 2001–2005. Although we did not collect descriptive statistics, the decrease appears to be largely due to an increase in the average length of articles in the second time period.

During the 10-year period, *RR* published 112 quantitative or mixed-method studies and 48 qualitative studies. Among the quantitative and mixed-method articles, there were 36 studies that did not require effect size reporting (Table 2). This left 76 studies in which the authors should have included effect size estimates. From 1996 to 2000, authors provided effect sizes in 15 of 50 (30%) articles, although this rate increased to 13 of 26 articles (50%) in 2001–2005. This represents an overall effect size reporting rate of 37% over the 10 years.

### *GTI*

*GTI* published, on average, 12 articles each year (6 per issue; this is the only one of the five journals examined that published biannually rather than quarterly). Between 1996 and 2005, approximately 6 of every 10 articles published in *GTI* were empirical (see Table 1). There were 16 qualitative, 50 quantitative, and 7 mixed-method studies published during this 10-year period. From the total of 57 quantitative and mixed-method articles, we eliminated 19 studies in which effect size reporting was not warranted (Table 2). This left 38 studies in *GTI* in which the authors should have included effect size estimates.

In *GTI*, across the 10-year period, effect size was less likely to be reported for *t* tests and ANOVAs, and effect size for studies of group differences was rarely reported in this set of studies. Only one study across the entire 10-year period included Cohen's *d*. In contrast,  $R^2$  (or *r*) was commonly reported for correlational studies and regression-based designs. *GTI* published many descriptive studies that used no inferential statistics. Across the two 5-year periods, *GTI* published greater numbers of conceptual articles and fewer empirical ones. Although effect size reporting in *GTI* increased threefold, from less than 6% in the 1996–2000 period to 19% for the 2001–2005 period, the percentage of studies reporting effect sizes remained quite low, and most reported effect sizes in this journal were from correlational studies.

### *JEG*

*JEG* published an average of nearly 16 articles per volume year. From 1996 to 2005, it published 60 quantitative or mixed-method studies and 31 qualitative studies. Among the quantitative and mixed-method articles, 9 studies did not require effect sizes (Table 2). This left 51 *JEG* studies in which the authors should have included effect size estimates. *JEG* had an overall effect size reporting rate of 39% over the 10-year period. From 1996 to 2000, authors provided effect sizes

in 9 of 31 articles (29%), whereas this rate increased to 11 of 20 articles (55%) in 2001–2005.

### *JSGE*

*JSGE* published an average of 18 articles per year from 1996 to 2005 and had many special issues with a major focus on conceptual articles. Of the 182 articles published, 97 (53%) were empirical. We eliminated 3 of 60 articles that used quantitative or mixed methods because they did not require effect size reporting. There was an increase in reporting of effect sizes, from 18% in 1996–2001 to 32% in 2001–2005. Despite the increase, there were still relatively few authors reporting effect size.

### *Use of Effect Size Indicators*

Table 3 tabulates the effect size indicators that we used for each of the five journals we examined for this study. Authors used correlational indicators in approximately 65% of studies reporting an effect size, whereas the remaining 35% of studies reported an indicator of standardized mean differences. The high reporting rate for correlational indicators may reflect in part that correlational studies always report  $r$  or  $r^2$ , whereas researchers using  $t$  tests and other statistics comparing mean differences need to calculate the effect size by an additional step.

### **Limitations and Conclusion**

The present study had several potential limitations. Because of the time demands of the analysis, a different individual examined each journal (see Table 1 note). Each researcher followed the written classification process that we describe in the Method section. Study author Michael S. Matthews reexamined approximately six issues with consistent results, but it is possible that a comprehensive reexamination would turn up some slight differences in how various examiners classified a particular article.

There clearly has been some growth in the use of effect sizes in gifted education research that authors have reported between the periods 1996–2000 and 2001–2005. In all five journals we examined, the rate of articles reporting effect sizes increased substantially between the two time periods. Overall, the rate of effect size reporting (i.e., including effect sizes when appropriate) increased from approximately 5 of every 20 articles (25.6%) in the field in 1996–2000 to 9 in 20 (45.9%) during 2001–2005. Within-journal reporting rates ranged from a low of 5.7% (in *GTI*, 1996–2000) to a high of 59% (in *GCQ*, 2001–2005). During the later 5-year period, despite all of the journals' requests that manuscripts follow APA style—which calls for reporting effect



**TABLE 3. Effect Size Indicators Listed in the *Publication Manual of the American Psychological Association* (APA; 2001)<sup>a</sup> and Their Prevalence in the Gifted Education Literature, by Count in 1996–2000 and 2001–2005 and by Percentage of All Effect Sizes Reported in 1996–2005**

Indicator	Type	Usage	1996–2000	Usage	2001–2005	%
Correlation coefficient ( $r^2$ )	Correlation	<i>GCQ</i>	2	<i>GCQ</i>	3	6.1
		<i>RR</i>	1			
Eta squared ( $\eta^2$ )	Correlation	<i>GCQ</i>	2	<i>GCQ</i>	6	21.2
		<i>RR</i>	2	<i>RR</i>	3	
		<i>GTI</i>	1			
		<i>JEG</i>	2	<i>JEG</i>	5	
		<i>JSGE</i>		<i>JSGE</i>	2	
Omega squared ( $\omega^2$ )	Correlation	<i>GCQ</i>	2			2.0
		<i>RR</i>	4	<i>GCQ</i>	8	29.3
$R^2$	Correlation	<i>RR</i>	7	<i>RR</i>	3	
		<i>GTI</i>	1	<i>GTI</i>	3	
		<i>JEG</i>	3			
		<i>RR</i>	2	<i>RR</i>	3	6.1
Cramer's <i>V</i>	Correlation	<i>RR</i>	2	<i>RR</i>	3	
		<i>JEG</i>	1			
Cohen's <i>d</i>	Mean difference	<i>GCQ</i>	2	<i>GCQ</i>	3	31.3
		<i>RR</i>	2	<i>RR</i>	6	
	<i>JEG</i>	3	<i>JEG</i>	7		
	<i>JSGE</i>	3	<i>JSGE</i>	4		
$f^{2b}$	Mean difference	<i>RR</i>	1			4.0
		<i>JEG</i>	1	<i>JEG</i>	1	
		<i>JSGE</i>		<i>JSGE</i>	1	

*Note.* *GCQ* = *Gifted Child Quarterly*; *RR* = *Roeper Review*; *GTI* = *Gifted and Talented International*; *JEG* = *Journal for the Education of the Gifted*; *JSGE* = *Journal of Secondary Gifted Education*. Counts include indicators and their variants (i.e.,  $R^2$  includes reports using *R* and reports providing adjusted  $R^2$  or the canonical  $R_c^2$ ).

<sup>a</sup>Several indicators mentioned in the fifth edition of the APA *Publication Manual* are not included in this table because these were not found in the gifted education literature. These include Phi squared ( $\phi^2$ ), Kendall's *W*, Cohen's *K*, Goodman-Kruskall's  $\lambda$  and  $\gamma$ , Roy's  $\Theta$ , the Pillai-Bartlett *V*, and Jacobson and Truax's (1991) and Kendall's (1999) proposed measures of clinical significance. <sup>b</sup> $f^2$  appears in four articles but is not mentioned by name in the APA *Publication Manual* list.

size information—the maximum effect size reporting rate in any single journal did not exceed 60%.

Although we did not disaggregate our counts of nonreporting articles by the type of effect size indicator, our doing so would perhaps have revealed our present

estimate of effect size reporting to be artificially high. We looked for the presence or absence of effect size indicators, and the majority of those counted were correlational indicators rather than estimates of standardized mean differences. Correlational indicators—which formed 65% of all the effect size indicators we observed—are routinely reported. They are almost impossible to fail to report in correlational studies. If these indicators were reported but not interpreted, the inclusion of correlational effect sizes may have artificially inflated our overall estimate of effect size reporting.

This bias toward correlational effect size indicators was particularly evident in *GTI*, in which only a single study had reported Cohen's *d* across the 10-year period. Therefore, if we had read all the journal articles for effect size interpretation rather than simply noting the presence or absence of effect size indicators, our findings would likely have been less sanguine. If future investigation supports this potential bias, it would further strengthen our rationale for mandating effect size reporting by journal editors.

We did not record the magnitude of the effect sizes that the articles' authors reported, although in hindsight we would likely do so if we replicated these analyses. As Thompson (2006) and others have noted, it is probably not appropriate to continue following Cohen's reluctant classification of effect sizes as small, medium, or large. Rather, we should try to establish criteria about what magnitude of effects could be considered small, medium, or large in each particular discipline of research. We hope that as more editors mandate effect size reporting, this issue will become easier to address.

In late 2006, *JSGE* was renamed the *Journal of Advanced Academics*. With this change, the journal's new coeditors (one of whom, D. Betsy McCoach, is a coauthor of the present study) implemented editorial policies, including submission requirements that mandate the reporting of effect size estimates when they are appropriate. We see this as a positive change and hope to see more journals in gifted education follow this lead in the near future.

Effect size reporting remains a serious issue. The failure to report and interpret effect size indicators marginalizes the field of gifted education from more rigorous educational research and limits the possible applications of powerful meta-analytic techniques to the study of gifted development and learning. Effect size reporting merits attention from all who contribute to the research knowledge base and from those who rely on this base for making important decisions about educational policy and practice.

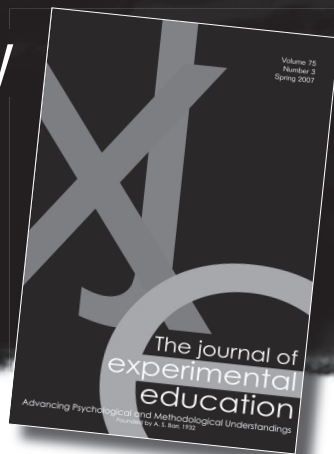
Effect size reporting is an issue that affects the broader context of educational research in general, regardless of the area of specialization. By examining specific journals from one field, the present study has served educational research both by illuminating current practice in effect size reporting and by demonstrating the need to take stronger steps to increase the quality of reported research in this particular field. We suggest that future researchers in other subfields of

education conduct similar critical self-examinations, with the ultimate goal of improving research practice across all areas of education.

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Summarize the data and their statistical treatment. Consider rival hypotheses and the importance of related studies and educational theory. Present summary data (means, standard deviations, frequencies, correlation coefficients, etc.) in tabular or graphic form. Report means, standard deviations, degrees of freedom, and sample sizes. Report statistics to 2 decimal places. Discussion of the data should be interpretive.

In consideration of contemporary thinking about statistical significance tests, reflected in the 1993 *JXE* theme issue (Vol. 61,

No. 4), authors are encouraged to use the phrase “statistical significance” rather than only “significance” whenever referring to the results of inferential tests. Furthermore, authors are required to report and interpret magnitude-of-effect measures in conjunction with every  $p$  value that is reported (see the Snyder & Lawson article in the 1993 [Vol. 61, No. 4] *JXE* theme issue on statistical significance testing). A helpful summary of ways to meet this requirement, and of other resources (“Computing Effect Sizes”), is available on the Internet at home page address: <http://acs.tamu.edu/~bbt6147/>

### Discussion

Summarize your findings and state the support or nonsupport of the original hypotheses. Compare your results with the work of others. Describe any theoretical or practical implications of the results. Suggest improvements on your research, or propose new research questions.

### Style

Use *The Publication Manual of the American Psychological Association* (APA), fifth edition (2001), as a style manual in preparing manuscripts. The text of the manuscript should follow typical reporting style for educational research. You can consult recent issues of the journal (or similar journals such as the *Journal of Educational Research*, *American Educational Research Journal*, or *Journal of Educational Psychology*) for examples of acceptable reading formats.

**Format.** Submit the manuscript electronically as a double-spaced Word file with minimal formatting in Times. Do not use style sheets, forced section or page breaks, or automatic footnotes.

**Title.** Use a short title, preferably no more than 10 words. Avoid superfluous phrases, such as “A Comparison of . . .” or “A Study of . . .”

**Subheads.** Articles are frequently improved by the judicious use of subheads.

However, avoid the use of “Introduction” for a lead section.

**Tables.** Prepare tables precisely as they are to appear in the journal. Caption each with a brief, to-the-point title, and number consecutively with Arabic numerals: Table 2—Intercorrelation Matrix, Variables Optimally Ordered.

**Figures.** Draw any graphs and charts in black ink on good quality paper, title each, and number consecutively: Figure 4—School Enrollment. Ordinates and abscissas should be shortened to occupy as little space as possible.

**Footnotes.** Avoid explanatory footnotes by incorporating their content in the text. However, identify any essential notes with consecutive superscripts, and list them in a section entitled Notes at the end of the text and preceding the References.

**References.** Citation of references in text should follow the author–date style. Reference listing should follow *APA Manual* guidelines.

### Procedures

The managing editor assigns manuscripts to at least two consulting editors and to one of the executive editors for final disposition in such a manner that author identity is blind to these individuals.

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